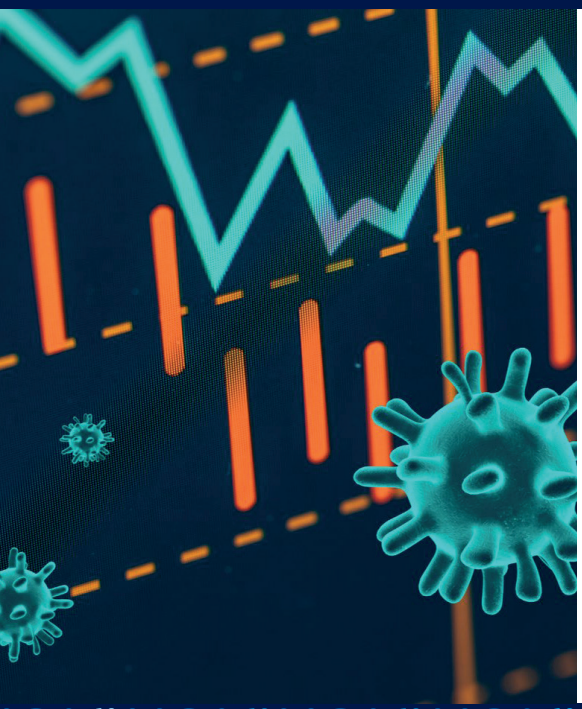


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ECONOMICS AND BUSINESS OF THE POST COVID-19 WORLD

Research monograph – First Edition

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ECONOMICS AND BUSINESS OF THE POST COVID-19 WORLD

Research monograph – First Edition

FOREWORD

Dear readers, authors, reviewers and colleagues,

The research monograph Economics and business of the post COVID-19 represents a fourth series in our digital transformation effort. We were fortunate to enjoy presentations by more than 50 researchers at the conference, mainly from the Central and Southeastern Europe region. As every year, the main goal of the research effort is to determine the main interdependencies between digitalization and economic dynamics. The social and economic disruptions caused by the pandemic were not only a temporary shock, but also have long-term consequences. However, in addition to the negative effects, we have also seen a significant increase in digitization processes in all areas of society

The conference was organized from June 24 to 26, 2021 (www.edt-conference.com). The main theme of the conference was related to the social and economic dynamics after the crisis COVID-19. This year we were honored to have the keynote lecture by the distinguished professor Brad DeLong from the University of California, U.C. Berkeley, Berkeley, California, USA. We also had two conference panels, as we do every year. One related to the field of smart cities under the theme New Future of Urban Life, where we had the opportunity to hear presentations by Nicholas Zingale from Maxine Goodman Levin University of Urban Affairs, Cleveland State University, USA, on *Are smart cities being smart enough about advanced technology and the future of city life? and Network IQ and the Future of Work* by Daria Tataj, Tataj Innovation. The presentations were followed by a discussion with Jelena Stanković, University of Niš, Faculty of Economics, Serbia, and Jason Papathanasiou, University of Macedonia, Greece. The panel discussion was moderated by Saša Drezgić, University of Rijeka, Faculty of Economics, Republic of Croatia.

This year's Unger Family Foundation panel focused on The World After Covid, chaired by Andrej Kričković, Higher School of Economics, Moscow, Russia, and discussant Al Saracevic - Editor-in-Chief of the San Francisco Examiner. The panel featured four presentations by Predrag Pale, University of Zagreb, Faculty of Electrical Engineering and Computer Science, Zagreb, Republic of Croatia; Kristijan Kotarski, University of Zagreb, Faculty of Political Science, Zagreb, Republic of Croatia; Gracielle Li, University of California, Berkeley, California, USA; and Andrei Eydlin, Higher School of Economics, Moscow, Russia. As always, the panel had a transdisciplinary focus on the consequences of the pandemic. The final day of the conference featured a panel on the state of play in financial and monetary issues, with Boris Vujčić, Governor of the Croatian National Bank, and Ante Žigman, Chairman of the Board of the Croatian Financial Services Regulatory Authority, providing an outlook on the global and local dynamics of the financial sector.

We are deeply indebted to all our participants, sponsors, supporting institutions, partners and all members of the programme and organization team. It is a special honor that the President of the Republic of Croatia, Zoran Milanović, supported and opened the conference with his introductory

speech. We also thank Boris Vujčić, Governor of the Croatian National Bank, and Ante Žigman, Chairman of the Board of the Croatian Financial Services Supervisory Authority, for their continued support. We also thank Nicholas C. Zingale (Maxine Goodman Levin School of Urban Affairs, Cleveland State University), whose support made it possible to organize the panel discussion on smart cities. Our special thanks to Andrej Kričković, who moderated the Unger Family Foundation panel discussion, and to all the panelists. Finally, we thank the American Embassy in Zagreb and the Unger Foundation for providing a substantial grant that contributed greatly to the quality of the conference.

We are sure that the papers published in this monograph will be a valuable contribution to students and researchers in the field of economics.

Rijeka, July 2022

Editors

Table of Content

INTRODUCTION 17

CHAPTER 1 19

Dejan Bodul
Workplace privacy and new technologies: Case study of ECHR jurisprudence as a guideline for time after COVID-19?

CHAPTER 2 35

Matija Damjan
Pandemic-driven suspension of IP rights: A new way for promoting public policy objectives?

CHAPTER 3 51

Francesco Gaspari, Giuseppina Agata Di Guardo
Distance learning as a test bed for administrative digitalisation in Italy during and after the Pandemic: The way forward between data protection and the surveillance capitalism issues

CHAPTER 4 77

Dionis Jurić, Antonija Zubović
Online formation of limited liability companies

CHAPTER 5 93

Romina Alkier, Vasja Roblek, Nenad Petrović
The emergence of smart touristic destinations and further development in the post-covid period

CHAPTER 6 113

Maja Matanić Vautmans, Filip Gelo
Long term care (LTC) in Croatia: Current state, COVID-19 impact and development strategy

CHAPTER 7 141

Tomáš Hanák, Ivan Marović, Lucie Kopečková
Impact of the Covid-19 pandemic on the operation of construction companies in the Czech Republic

CHAPTER 8 161

Jelena Mušanović, Jelena Dorčić
Topic modelling of Croatian five-star hotel brands posts on Facebook using Latent Dirichlet Allocation

CHAPTER 9 181

Ana-Marija Stjepić, Dalia Suša Vugec
How the application of technological innovations supports the healthcare industry in the COVID-19 pandemic?

CHAPTER 10 197
Lea Perinić, Nada Denona Bogović, Saša Čegar
The role of social innovations in the green transition of cities

CHAPTER 11. 213
Tanja Fatur Šikić, Djula Borozan
Meeting the low-carbon challenge: The role of EU energy policy

CHAPTER 12 231
Helena Šlogar, Heri Bezić, Ivan Zagorac
Digitalization of city services through smart applications and e-services

CHAPTER 13 247
Viktorija Kunštek
The potential for the digital transformation of the central state office for Croats abroad

CHAPTER 14 265
Darwin Beletić, Nenad Vretenar
Student's perception of robots in the workplace

CHAPTER 15 283
Marko Brkić, Danijela Sokolić, Iva Zdrilić
Critical success factors for implementation of ERP system in a public institution

CHAPTER 16 301
Bono Beriša, Dejan Miljenović
Evaluation criteria for ˝Portfolio Greenness˝ within financial retail products

CHAPTER 17 317
Iva Gregurec
Digital marketing activities during COVID-19 pandemic – database review

CHAPTER 18 335
Lana Galić, Josipa Višić
Integrating data science in business: Evidence from Croatia

CHAPTER 19 355
Marko Tomljanović, Danijela Sokolić, Igor Cvečić
Recent dynamics of the European labour market

CHAPTER 20 375
Helena Blažić
Smart city/local tax: Specific consumption/sales tax for the post COVID-19 Croatia

CHAPTER 21 393
Denis Buterin
Optimal structure of taxation and response to COVID-19

CHAPTER 22 409
Josip Grgić
The role of EU funded financial instruments in addressing the COVID-19 crisis and post recovery period

CHAPTER 23 425
Neda Vitezić, Dejana Dojčinović Drilo
Effectiveness of traditional going concern forecasting models based on financial indicators in Croatian economy

CHAPTER 24 453
Marko Vešligaj
The process of fiscal decentralization in the Republic of Croatia in the conditions of the COVID-19 crisis

CHAPTER 25 473
Hrvoje Jošić, Berislav Žmuk
COVID-19 as an ultimate stock market Black Swan

CHAPTER 26 493
Mario Pečarić, Šime Jozipović, Andrej Ilievski
The expected impact of a digital euro on non-Eurozone EU member's states and EU candidate countries: The case of Croatia and North Macedonia

CHAPTER 27 515
Antonio Kuzmanić, Jasmina Dlačić
Determinants of a sports fans' loyalty to a sports club

CHAPTER 28 535
Joško Marić
Indebtedness and growth of the transition countries of the EU: When public debt affects negatively on economic growth?

CHAPTER 29 553
Carla Morrone, Luca Attias, Daniela Battisti, Giuseppe Iacono
Italian digital transformation team: The relevance of the digital awareness

CHAPTER 30 575
Jasmina Popovska
Contribution of European innovation scoreboard towards europeanization of innovation policies

CHAPTER 31 595
Filip Škunca
Investment portfolio optimization using alternative investments

CHAPTER 32 617
Marijana Oreb, Saša Drezgić
Role of government guarantee measures in COVID-19 crisis

INTRODUCTION

This research monograph consists of 31 papers related to the economy and business of the post-COVID-19 dynamics. The chapters of the research monograph deal with the relationship between the rapid changes in the social, economic and business context and new technologies, legal dilemmas, the state of affairs in certain sectors, the impact on tourism, financial and tax issues, and innovations in marketing.

As our authors outline, the Covid-19 pandemic is having a significant impact on economies worldwide. To prevent the spread of the virus, governments have often been forced to take action and implement certain restrictive measures. The extent of the measures taken varies from country to country and between economic sectors in terms of the possibility of the virus spreading. On the other hand, modern information technology has brought changes to all areas of life and work. The degree of "digitalization of everything" is so great that some authors have called this process the "digital revolution" and the modern economy the "digital economy." Over time, this process is accelerating, and the changes are beginning to affect all areas of economic and social life. These changes are becoming increasingly complex, interacting and accelerating, and taking on a global character that raises new challenges, problems and issues that need to be addressed. However, due to the complexity of the globalization process, the development of technology, information systems and communications, and the related changes in all areas of economic and social life, it is currently difficult to accurately predict the future forms and content of economic activities. Therefore, the contributions in this monograph attempt to provide a transdisciplinary and interdisciplinary perspective on the outcomes and future prospects of the changes triggered by the pandemic shock.

We recognize that 2022 will be challenging because of the many uncertainties arising from the lingering effects of the pandemic, as well as the risks posed by the impact of unprecedented fiscal and monetary measures and instruments to prevent the negative consequences of the crisis. However, we are confident that both scientists and practitioners have solutions to meet the future challenges, as we did with the pandemics COVID-19. We therefore hope you enjoy reading the contributions of our authors and that you will attend the next conference in June 2022.

Rijeka, July 2022

Editors

CHAPTER 1

WORKPLACE PRIVACY AND NEW TECHNOLOGIES: case study of ECHR jurisprudence as a guideline for time after COVID-19?

Dejan Bodul[1]

Abstract

By signing the Convention for the Protection of Human Rights and Fundamental Freedoms, the Republic of Croatia aims to harmonize its legislation with the ECHR jurisprudence, and seeks to fulfil this obligation by harmonizing existing laws and future legislation with ECHR practice. The indicative method of determining the impact of the Convention and the practice of the ECHR in the analysed case law of domestic courts indicates a tendency of increase number of references on the practice of the ECHR, but also higher degree of this practice by parties and proxies. Thus, our case law accepts the fact that the ECHR jurisprudence affirms the principle of precedent case law and thus case law as a formal source of law. Starting from the thesis that the modernization of labour legislation must take place in the direction of its Europeanization, we will analyse the jurisprudence of the ECHR and domestic courts in labour disputes defined by technological factors. Primarily, by presenting the practice of the ECHR and Croatian courts, we will point out the legal-logical decision-making mechanisms in this type of labour disputes. The secondary goal is to find an answer to the question of whether domestic jurisprudence meets the requirement of effective legal protection in this type of dispute. Last goal is to analyse whether we need to entirely rethought and transformed Workplace privacy and new technologies for a post–COVID-19 world.

***Key words**: labour law, new technologies, case law, tendencies, Covid 19.*

***JEL Classification:** O3, K0, J0*

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1. Discussion framework

Accelerated development of information technologies, means of communication and supervision at the beginning of XXI century has led to the processing of a large amount of different information in real time, which increases the risk of compromising the right to privacy. Developing an appropriate legal response to these risks is neither simple nor unambiguous. Moreover, legal analysis shows practical shortcomings, stativity and ambiguity of existing regulations. Therefore, there is a need for a more systematic and in-depth examination of the very idea of the right to employee privacy by presenting the jurisprudence of both domestic courts and the ECHR.

The first problems appear already in the attempt to define the key concepts of the paper. Therefore, having in mind the complexity and topicality of the problems dealt with in this paper, we consider it important to explain certain concepts ab initio in summary: new technologies; the right to privacy; employment and labour dispute.

New technologies should not be understood as a purely technical innovation, but also as an organizational innovation based on the so-called, “Intellectual technology”. Thus, new technologies must also be viewed as new production methods that consist of a combination of organizational procedures and technological decisions. Thus, understanding new technologies in the broadest sense, the question is whether digitalization will positively or negatively affect the position of employees, which depends primarily on the approach that employers and the state have to the benefits that digitalization brings. An empirical level (i.e. statistical data) shows that there is a significant number of unemployed in the Republic of Croatia. In addition, those who are employed have relatively low incomes compared to the EU average. These data, together with the fact that a large number work “illegally”, i.e. unreported, conditions the general feeling that someone is happy to have a job and consequently that these employees do not have much opportunity to control working conditions. In addition, union organization is very weak and exists with private employers only as an exception, mainly in privatized former state-owned enterprises. In addition, where they exist, unions are becoming weaker with fewer members, which ultimately means that the employee can only (as an individual) fight for their rights. In such circumstances, a large number of employees spend more and more time at work, is available to the employer and outside working hours (via email, mobile phone, GPS, etc.), so it is understandable that the boundary between business and private is becoming weaker, often for both sides.

In this context, the issue of the right to privacy is becoming one of the burning issues of modern labour law practice. Namely, like all basic concepts, the phrase privacy is an “empty” concept that is filled with content only when placed in a particular social context. Namely, we certainly find the legal basis for the protection of privacy in the Constitution of the Republic of Croatia, on the basis of which privacy is guaranteed to every person and citizen (Articles 35 and 37). Moreover, Art. 8. The Convention, which analyses the right to privacy through ECHR practice, also recognizes a number of legal grounds on which citizens may suffer certain restrictions in respecting and

exercising their right to privacy. However, for the purpose of this paper, the right to privacy should be analysed as the right to protection of personal data in the workplace, protection against wiretapping (fixed or mobile), controlled surveillance via video surveillance, controlled surveillance via GPS, controlled identification of employees, controlled use of the Internet et seq., all in accordance with applicable regulations. It is clear that employees do not leave their right to privacy (...) every morning at the workplace, but it is debatable where are the limits of that right. Ultimately, there are also situations where employees may be sanctioned for something they did in private time, outside the business premises, which further complicates the issue of privacy, and the most obvious example is the judicial profession where there is a thin line between private and business domain of life. Although the basic act for labour regulations is the Labour Act (Art. 29), its rules in the subject domain represent more principles than clear practical guidelines, so most problems with employee privacy remain outside the focus of the LA. A more detailed regulation is the GDPR which regulates the collection, processing, use and protection of personal data and supervision over the processing of personal data in the Republic of Croatia, but also the Occupational Safety and Health Act (Art. 43). Also, the right to protection of personal data is prescribed by Art. 8. Of the Grapher of Fundamental Rights of the EU and Art. 16 of the Treaty on the Functioning of the European Union, as well as Art. 8. Conventions. The Republic of Croatia, as a member of the Council of Europe, is also a signatory to the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data (Convention 108) and the Additional Protocol to Convention 108 concerning Supervisory Authorities and International Data Exchange. As the Court of Justice has emphasized, the right to the protection of personal data is not an absolute right, but must be considered in relation to its importance in society. The protection of personal data is closely related to the protection of private and family life protected by Art. 7. Graphers. This link between the two fundamental rights is also evident in Regulation 216/679, which ensures that Member States will protect the fundamental rights and freedoms of natural persons, and in particular their right to privacy, with regard to the processing of personal data.

Furthermore, employment relationship is a central and probably the most complex issue of labour law. The dominant part of production, service, creative and any other work that aims to provide the necessary goods and services in modern society, within the employee-employer relationship falls under the legal term employment relationship defined primarily by the provisions of LA. However, the aim of this paper is not to present the institute of employment in its entirety, since it would be impossible, but to point out the complexity of changes in the structure of modern society that are so layered that it is extremely difficult to give a complete and final definition of employment. It is a dynamic legal institution, which is constantly adapting to socio-economic and national circumstances, and even needs. For example, the consideration of subordination in employment raises the question of the difference between private and professional life. However, the same analysis indicates that a clear and precise demarcation of the private and professional spheres is not an easy task, because, exampli gratia, the increasingly flexible

understanding of working hours, due to the intensive development of different forms of work. In situations where the private and business aspects of life are firmly and spatially intertwined, one should strive to consider that violating the privacy of employees is prohibited in principle, but only to the extent that it is really necessary in order to exercise employment rights and obligations.

On the other hand, we find similar problems in trying to define a labour dispute. Namely, determining civil disputes in the provision of Art. 1. of the Law on Civil Procedure, explicitly states “labour dispute”. It should be noted, however, that neither the LCP nor the LA define the notion of labour dispute. On the contrary, the LCP, regulating a special procedure, uses the phrase “employment lawsuits” (Art. 433 - 437 of the LCP).

2. Relevant literature review

Empirically and literary analysis of the use of new technologies in labor relations is conceptualized in the works of a number of practitioners and theorists. From the point of view of research, the literature more or less communicates, in a consensual sense, about the positive effects, but also about the problems of using new technologies in labor law. Literature indicates that we are in the time of the strongest social transformations, so the old social and other everyday problems catch up with the new ones and together with them form extremely complex challenges to the protective functions of organized society towards workers and employers. However, the situations of new technologies in labor disputes has remained unresolved in the existing literature. From what has been said, we notice that the existing literature does not provide an answer, as well as useful explanations and appropriate approaches regarding the position of new technologies in the context of civil litigation. The aim of this analysis is to find an answer to the question of whether the existing legislative framework meets the requirement of effective legal protection from the perspective of relevant EU law standards. A limiting factor in the context of this analysis is the lack of well-established case law, given that regulations/problems are relatively recent and consequently results in modest court practice.

3. Methodological Approach

The paper is divided into five chapters.

In order to make a more comprehensive analysis of the topic, after defining the terms, Chapters 2 and 3 indicate an overview of the relevant literature and methodological approach.

Chapter 4 analyses legal regulations and domestic case law. Significant emphasis was also placed on the analysis of the jurisprudence of the European Court of Human Rights in proceedings under Art. 8. of the Conventions, because we start from the assumption that knowledge about this can be the key to understanding the problems of this paper.

In the concluding remarks (Chapter 5), the findings of normative and

statistically descriptive analysis are synthesized, pointing out the complexity of the problem, and parallel initiating a dialogue on appropriate LA changes.

4. A relevant jurisprudence of ECHR and of domestic courts

The provision of means of work by the employer, including, for example, a computer system with internet access and a mobile phone, raises the issue of regulating the employer's right to monitor and control the employee's performance and the way in which the employee uses these means. From the employee's point of view, the basic means of work provided by the employer must be used to perform work tasks and perform work duties. Since the purpose of official means of communication is entirely related to the execution of business tasks, the employer as their owner has the right to control and restrict the use of these means. This type of control raises a number of contentious issues, two of which are particularly sensitive: first, whether employees have the right to use official means of communication for personal purposes and, if so, to what extent; and second is whether employers can legitimately supervise (control) employee behaviour using modern technology and, if possible, to what extent, under what conditions, and for what purposes. The ECHR didn't in Art. 8. defined the right to privacy or the right to private life bearing in mind its breadth and often the fact that it overlapping with other interests and rights that enjoy protection under, primarily, Art. 8. of the Conventions. Yet instead of offering clear definitions, the Court has identified different cases determining from case to case which aspects of life fall within the scope of protection of privacy in the context of employment always bearing in mind that the Convention is "a living instrument which, ..., must be interpreted in the light of today's conditions ".

4.1. Monitoring the use of telephones and the Internet in the workplace

Case Barbulescu v. Romania of 5 September 2017 (Grand Chamber - Judgment) dealt with the decision of a private company to dismiss an employee - the applicant - after monitoring his electronic communications and accessing their content. The applicant complained that his employer's decision was based on a violation of his privacy and that the domestic courts had not protected his right to respect for his private life and correspondence. The Grand Chamber, by eleven votes to six, concluded that there had been a violation of Art. 8. of the Convention, finding that the Romanian authorities had not adequately protected the applicant's right to respect for his private life and correspondence. Namely, in the said case, the Court reaffirmed that Art. 8. of the Convention was applicable to the applicant's case because communication in the workplace falls within the scope of the terms "private life" and "correspondence". He pointed out that, whether or not the applicant could reasonably have expected privacy given the employer's restrictive Internet use regulations known to him, the employer's instructions could not reduce private social life in the workplace to zero. There was still a right to respect for private life and the privacy of correspondence, despite the fact that it was limited to a certain extent. Although the monitoring measure of

the applicant's communication which resulted in his dismissal was taken by a private company, the domestic courts upheld its justification. The Court therefore concluded that the applicant's claim should be examined in the light of the State's positive obligations. Namely, the domestic authorities were obliged to strike a balance between competing interests - the applicant's right to respect for private life, on the one hand, and the employer's right to take measures to ensure smooth functioning of company, on the other. In assessing whether the domestic authorities had struck a fair balance between those interests, the Court first noted that the domestic courts had expressly invoked the applicant's right to respect for his private life and the applicable legal principles. The Court of Appeal also referred to the relevant European Union Directive and the principles set out therein, namely necessity, purpose specification, transparency, legitimacy, proportionality and security. The domestic courts also examined whether the disciplinary proceedings had been conducted in an adversarial manner and whether the applicant had an opportunity to present his arguments. However, the domestic courts had not established whether the applicant had been informed in advance of the possibility from his employer who was taking communication control measures, nor of the nature of such measures. Namely, the County Court simply noted that the employees' attention was drawn to the fact that one employee was fired for using the Internet, telephone and a photocopier for personal use. The Court of Appeal held that the applicant had thus been warned not to use the company's resources for personal use. However, the Court considered, following international and European standards, that the employer should have informed the employees before the supervisory measures began, that such notification could be considered prior notice within the meaning of those standards, especially because it was a supervision of correspondence. From the case file, the ECHR concluded that the applicant had not been previously informed of the scope and nature of the monitoring by his employer or of the possibility that the employer might have access to the actual content of his messages. As to the scope of the monitoring and the degree of interference with the applicant's privacy, this issue was not examined by any domestic court, although the employer recorded the content of all the applicant's communications during the real-time monitoring period and printed their content. The domestic courts did not sufficiently assess whether there were justifiable reasons justifying the monitoring of the applicant's communication. The County Court invoked the need to avoid damaging the company's information system or imposing liability on society in the event of illegal activities via the Internet. However, these examples can only be seen as theoretical, as there was no indication that the applicant had indeed exposed the company to any of these risks. Furthermore, no domestic court has sufficiently examined whether the objective the employer wanted to achieve could have been achieved by less intrusive methods than accessing the content of the communication. Moreover, no domestic court considered the seriousness of the consequences of the follow-up and disciplinary proceedings that followed, i.e. the fact that - by being dismissed - he received the most severe disciplinary sanction. Finally, the domestic courts did not determine at what point the employer accessed the content of the disputed communication. Taking into account the above considerations, the ECHR

concluded that the domestic authorities had not adequately protected the applicant's right to respect for his private life and correspondence and that they had consequently failed to strike a fair balance between competing interests. Therefore, there was a violation of Art. 8. of the Conventions. It is interesting to mention that the dissenting opinion in this case was given by as many as six judges. The essence of their opinion was the following: the domestic courts found that the applicant had received sufficient warnings to be able to know that his actions are monitored, which is why they consider that he could reasonably expect his activities to be monitored; the national authorities also took into account the applicant's right to respect for his private life and the employer's right to be involved in monitoring workers, including appropriate disciplinary powers; the employee has committed a disciplinary offense in violation of his or her employer's internal regulations prohibiting the use of computers for personal purposes; The legitimate aim pursued by the employer in following the applicant's communication was to "exercise the rights and duties to ensure the smooth running of the company", so it is not unreasonable for the employer to verify that his employees carry out their professional duties when using the equipment he has made available to them at the workplace and during working hours, taking into account also that the Court of Auditors found that supervising the applicant's communication was the only way for the employer to achieve that legitimate aim; the monitoring to which the applicant was subjected was limited in time, the employer only monitored the applicant's electronic communication and internet activity and not any other aspect of his private life; the evidence, the results of the follow-up procedure, was used exclusively for the purpose of disciplinary proceedings against the applicant, and only the persons involved in that procedure had access to the content. Finally, the applicant violated the relationship of trust between the employee and the employer by denying the use of his employers' resources for personal purposes. In view of the above, the six judges who gave a separate opinion concluded that there had been no breach of the applicant's right to respect for his private life and correspondence and that there had been no violation of Art. 8. of the Convention.

Although it is not a matter of direct supervision, the decision of the Constitutional Court of the Republic of Croatia is interesting. Namely, the Constitutional Court of the Republic of Croatia emphasizes that when it comes to labour relations, the relationship between employer and employee must be based on mutual trust and good faith behaviour. However, good faith conduct does not imply an absolute duty of loyalty to the employer, nor such a degree of discretion that the worker would be completely deprived of his right to freedom of expression, especially if he exercises his right in a way that does not constitute gross insult to the employer and it must be without offensive expressions. In the applicant's case, the comments she made on Facebook expressing her opinion on the organization of the defendant's work were not, in the opinion of the Constitutional Court, aimed at insulting the employer and were not of such intensity as to require the strictest termination of employment relationships. The Constitutional Court does not deprive the employer of the right to impose an extraordinary dismissal measure on an employee when due to a particularly serious breach of an employment

obligation or due to some other particularly important fact it is not possible to continue the employment, however, the courts are obliged to examine whether the legitimate aim it pursued - to protect the honour and reputation of the employer and whether it was possible to impose another, milder measure, or whether a fair balance was achieved between the employer's right to honour and reputation and the right of workers to freedom of opinion and expression. In the opinion of the Constitutional Court, the impugned judgment the Supreme Court failed to examine the proportionality of the measure of extraordinary dismissal imposed on the applicant and failed to strike a fair balance between the defendant's right to honour and reputation and the applicant's right to freedom of opinion and expression. Following the above, the Constitutional Court finds that in the specific case the applicant's right to freedom of opinion and expression guaranteed by Art. 38, par. 1 and 2 of the Constitution, i.e. Art. 10. of the Conventions was breached.

Furthermore, from the audit understanding of the Supreme Court no. Revr-85/2014 follows that in case where the employer voluntarily puts a GPS device in the employee's vehicle, monitoring and tracking must be transparent to the employee or must have a purpose for which the employee is aware and the data should not be used for any other purpose. In the present case, the employer monitored its employees on the basis of a contract concluded with a licensed detective agency and on the basis of embedded GPS devices, and the Supreme Court took the view that tracking workers in this way was legal.

In the next case of the Supreme Court of the Republic of Croatia, the termination of the employment contract was assessed as legal the day after the employer hired a detective agency to monitor the workers because he had a justified suspicion that they violated the legal ban on competing with the employer. In the present case, on the basis of evidence gathered from the detective agency, the workers were dismissed from their employment.

Also, in the case before the Supreme Court of the Republic of Croatia it was indicated that the employer can tolerate the employee to conduct some private conversations from the official telephone during working hours and this behaviour could not be considered a violation of work obligations. The defendant's telephone and the damage suffered thereby by the defendant for private telephone conversations is not insignificant which is a justifiable reason for the termination of the employment contract.

4.2. Open personal files stored on your computer in the workplace

In the Case (Libert v. France), the applicant alleged that his employer had violated his right to privacy when he opened the files on his computer's hard drive without him being present. The applicant was suspended and, after returning to work, discovered that his work computer had been confiscated. He was informed that the person who had replaced him during the suspension had alerted his superiors to the documents which had attracted his attention on the applicant's work computer. The applicant was dismissed for items found on his computer. Since the applicant was employed by the State SNCF (Société nationale des chemins de fer - French National Railway Company),

he claimed that the public body had infringed his right to privacy. The Court considered whether his objections had a legal basis and concluded that - at the relevant time, domestic law allowed the employer, to a limited extent, to open files stored on the employee's work computer. The Court then considered whether the interference pursued a legitimate aim and found that it didn't. The Court acknowledged, however, that the interference was intended to protect the "rights" of others, i.e. those employers who would legitimately want to ensure that employees use the employer's computer equipment available to them for the purpose of performing their duties. Finally, the Court considered whether interference with the right to privacy was necessary in a democratic society: "The notion of necessity implies that interference corresponds to an urgent social need, and in particular that it is proportionate to the legitimate aim pursued .... domestic courts had to ensure that the employer introduced measures to monitor correspondence and other communications, regardless of the scope and duration of such measures, appropriate and sufficient safeguards against abuse. In this context, it emphasized that proportionality and procedural safeguards against arbitrariness were essential. ... French positive law contains provisions on the protection of privacy. The principle is that while an employer may open any professional files stored on the computer's hard drive that are available to employees for the performance of their duties, it may not secretly open files that are found to be personal "except in the case of serious risk problems or exceptional circumstances". Such files may be opened only in the presence of the employee concerned or after he has been duly summoned. "The Court notes that the computer files in this case were not clearly identified as personal. In these circumstances, the Court concluded that there had been no violation of the right to privacy under Art. 8 of the Convention.

4.3. Video surveillance in the workplace

In Köpke v. Germany from 5 October 2010 (decision on admissibility), the applicant, a supermarket cashier, was dismissed without notice of theft, following a secret video surveillance procedure carried out by her employer with the help of a private detective agency. She unsuccessfully challenged the dismissal before the domestic labour courts. Her constitutional complaint was also dismissed. The Court declared it inadmissible, as manifestly unfounded, the applicant's complaint under Art. 8. of the Convention, finding that the domestic authorities had struck a fair balance between the employee's right to respect for her private life and her employer's interest in protecting his property rights and the public interest in the proper administration of justice. The Court noted in particular that the measure od surveillance was limited in time (two weeks) and covered only the area around the cash register and was not available to the public. The visual data obtained were processed by a limited number of persons working for the detective agency and the employer's employees. They were used only in connection with the termination of her employment and proceedings before the labour courts. It therefore concluded that the interference with the applicant's private life was limited to what was necessary to achieve the objectives on which the video surveillance was based. The Court noted, however, in this case that the

competing interests in question could take on a different weight in the future, taking into account the extent to which intrusions into private life were made possible by new, increasingly sophisticated technologies.

In the case of López Ribalda and Others v. Spain from 17 October 2019, Ms Lopez and her four colleagues (the applicants) were employed as cashiers in a Spanish supermarket chain. After the manager determined discrepancies between the situation in the warehouse and daily sales, the owner of the chain decided to investigate potential thefts with the help of video surveillance. He set up visible and hidden cameras, informing workers only of those visible. The applicants were caught with hidden cameras stealing and helping customers and colleagues steal goods from the store, after which they were fired. Ultimately, all five applicants challenged the dismissal in court. However, the court before which the dispute was conducted assessed their dismissals as admissible or justified, and the video evidence as legal. In the proceedings before the ECHR, the applicants complained that their right to privacy under Art. 8. of the Conventions and the right to a fair trial under Art. 6. of the Conventions were violated. The ECHR concluded that, regardless of the fact that the owner of a private company is responsible for the disputed video surveillance, the state has a positive obligation to establish an appropriate balance between protecting the private lives of its citizens and the interests of the employer. Under Spanish law, individuals must be clearly informed about the collection and processing of personal data. However, despite the fact that the applicants were not warned of this, the domestic courts justified the secret video surveillance by the existence of a reasonable suspicion that thefts were taking place, where, in their view, there was no other (milder) way to prove the thefts. The ECHR recalled that in a similar situation, in the case of Köpke v. Germany, it found that there had been no violation of the rights of (secretly) recorded employees because, unlike Spanish, there were no clear provisions in German law on how to use video surveillance in such cases. But in this case, all employees were subjected to video surveillance, for several weeks, during all working hours. Furthermore, the ECHR disagreed with the Spanish courts as to the proportionality of the measures, especially given the explicit provisions of Spanish law on the information of persons under surveillance. He also considered that the protection of the employer's interests could be achieved by more lenient measures, for example, by providing applicants with general information on supervision. The ECHR therefore concluded that the Spanish courts had failed to strike a balance between the interests of all involved, to the detriment of the applicants, and their right to privacy. Although it found that video surveillance violated the applicants' right to privacy, the ECHR found that the use of surveillance camera footage in the court proceedings did not violate the right to a fair trial in a labour dispute, as evidence other than video was used.

When we talk about video surveillance, it is necessary to single out the decision of the Supreme Court no. Revr-1803/09. The worker challenged the dismissal due to the workers' misconduct due to a particularly serious injury recorded by a video camera located approximately 150 meters from the worker, which was recording toll booths on the highway. The video showed that the worker failed to register 10 vehicles and that he stole the money

obtained by collection. The recording was made without the employee's knowledge and without prior warning, so for that reason the employee in the procedure pointed out that it was illegal evidence. The Supreme Court essentially determined that the disputed recording referred to the recording of a public space, a motorway, the person of the worker who performed the work in the toll booth was not visible and in this particular case there was no violation of workers' privacy. Finally, the court took the view that the fact that the worker had not been previously warned of the recording did not make that recording illegal evidence and that the dismissal from workplace was permissible.

The situation is somewhat similar in the recent Supreme Court case, where a person's employment contract was justifiably terminated because it was registered through video surveillance that in the period: 16-18. September 2017 in the performance of his duties he committed 24 violations of employment obligations by failing to issue invoices for certain collected consumption, and taking cash from the cash register, etc., which was justifiably assessed by the employer as violations of employment obligations.

Regarding the legality of video surveillance recording, the decision of the Split County Court is also important. "… In such a state of affairs, when the worker knew of the existence of video surveillance in the workroom (kitchen), and taking into account the need for a fair balance between the worker's right to privacy and the employer's legitimate business interest to monitor the work process, this appellate court in the present case, believes that the video surveillance was allowed, and thus evidence by reviewing the recorded material with a video camera".

5. Concluding remarks

Modern information technology has brought changes in all areas of life and work. The degree of "digitization of everything" is so great that some authors have called the process a "digital revolution" and the modern economy a "digital economy". Over time, this process accelerates and changes begin to affect all segments of economic and social life, changes are increasingly complex, interact and accelerate, taking on a global character that poses new challenges, problems and issues to be addressed. However, due to the complexity of the process of globalization, development of technology, information systems and communications and related changes in all segments of economic and social life, at this time it is difficult to accurately predict future forms and contents of economic activities and the role of the state as legislator in new work processes.

It is undisputed that employees legitimately expect to be able to keep their private life private and that they are also entitled to a certain degree of privacy in their work environment. Yet, the speed at which these new technologies have been deployed is concerning. Fifty new apps and technologies have been released since the pandemic began, not accounting for existing, unchanged technologies that now are being marketed as workplace surveillance tools to combat COVID-19. Exempli causa, on June 16 alone,

both Fitbit and Amazon released new workplace surveillance tools. From an employer's perspective, this rapid deployment is driven mainly by the urge to bring workers back to the workplace. But the invasion of privacy that workers face is alarming, especially considering that the effectiveness of these technologies in mitigating the spread of COVID-19 has not yet been established.

Analysing the practice of ECHR, we see that it primarily determined whether there are certain internal rules by the employer that regulate the boundaries of business and private in a particular employment relationship. Precisely by considering whether the employee was (or could have been) informed of any restrictions, the Court determined whether the employee's expectations in each individual case were realistic or not. Their purpose, i.e. restrictions, is also important for the ECHR because it must be sufficiently legitimate and linked to the employment relationship in order to be accepted. Based on these parameters, the Court determined whether the employee in a particular case could realistically expect a certain degree of privacy in the workplace or not. Thus, it is clear from the analysed cases that the ECHR will assess the proportionality of the measures used to supervise employees and whether such measures pursue a legitimate aim before finding that there has been no violation of the right to privacy under Art. 8. of the Conventions.

From the Croatian perspective, we see that the decisions of higher courts made in the field of the right to privacy in labour relations paved the way for regular lower courts to properly apply regulations in this area, because ab initio there were confusion and doubts about the proper application of constitutional, convention and legal provisions. For now, although the normative-legal framework governing the issue of privacy rights in some segments is vague and inconsistent, the case law satisfactorily follows the dialectic of changes in this segment of the legal system. What is visible as a problem is the evaluation of information technologies as evidence in labour disputes. Namely, the Civil procedure act, as a basic procedural regulation, does not contain or elaborate the notion of illegally obtained evidence, although this notion is contained in the Constitution of the Republic of Croatia (Art. 29). However, what the jurisprudence indicates is that the legality of obtaining evidence in such situations should be assessed on a case-by-case basis, i.e. ad hoc. Specifically, according to the circumstances of the case, it is assessed whether obtained evidence violated the privacy of the workers. But even when it is violated, it is necessary to assess whether a right or interest of the employer is still stronger than the right of the worker to protect his privacy. In deciding whether certain evidence has been "obtained illegally", courts have greater discretion in deciding civil cases. The same position was taken by the ECHR in the case of Perić v. Croatia : „18. The requirements covered by the concept of a fair hearing are not necessarily identical in cases involving civil rights and duties, and in cases involving criminal liability. …Therefore, although these provisions are relevant outside the framework of criminal law (see mutatis mutandis, Albert and Le Compte v. Belgium, judgment of 10 February 1983, Series A. no. 58, 20, para. 39), Courts in civil proceedings have greater freedom than when deciding in criminal cases (see, Pitkanen v. Finland, no. 30508/96, par. 59, 9 March 2004). "

But ultimately the author's recommendation, and in order to avoid all potential disputes, is for the employer to set an accessible, clear and precise framework for protecting employee privacy because flat-rate restrictions on the "impossible that you didn't know" principle cannot and should not enjoy protection.

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CHAPTER 2

Pandemic-Driven Suspension of IP Rights: A New Way for Promoting Public Policy Objectives?

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ABSTRACT

The COVID-19 pandemic has increased the need to accelerate the production and distribution of newly developed vaccines against it, which are largely protected by patents and other IP rights. These are supposed to finance the costs of research and development but may also hinder the manufacture and increase the prices. TRIPS Agreement allows governments to impose compulsory licensing allowing the local production or import without IP rights holder's consent, against a set fee. Developing countries are arguing that this solution has not prevented production bottlenecks or ensured price availability of vaccines in the current emergency. South Africa and India have proposed to temporarily suspend certain international IP norms to ensure equitable access to COVID-19 vaccines around the world. The paper analyses and compares the mechanisms of compulsory licence and of a waiver of obligations under the TRIPS Agreement, pointing out that suspending IP rights alone will not be sufficient to ramp up vaccine production where transfers of know-how and technology are necessary to use the patented knowledge. The adoption of the TRIPS waiver might herald a return of a more pragmatic view of IP rights as adaptable public policy tools rather than immutable property rights. New restrictions of IP rights might be introduced to address other global concerns, such as environmental crises.

Key words: *intellectual property, pandemic, compulsory licence, TRIPS Agreement, waiver of rights*

JEL classification: *K2, O34, L24*

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1. Introduction

The Covid-19 pandemic has increased the need to accelerate the production and worldwide distribution of newly developed vaccines against the disease, as well as medicines and medical equipment, particularly ventilators, for treating the infected patients. Modern pharmaceutical products and medical technology are largely protected by patents and other intellectual property (IP) rights, which are supposed to finance the costs of research and development. However, in the current extraordinary situation, the requirement to obtain licences from patent holders acts as an obstacle to expanding the manufacture, thus limiting the availability, and increasing the prices of vaccines, drugs, and medical equipment. To protect public health in such a situation, the classical arsenal of IP law offers the instrument of compulsory licences, which may be imposed by national governments to allow the local production or import of the patented product without patent holders' consent but against a fee. The modern international framework of IP law takes special regard for the needs of developing countries in defining the conditions under which compulsory licensing may be used to provide better access to essential medicines. Nevertheless, developing countries are arguing that this solution is too slow and cumbersome, and has not prevented production bottlenecks or ensured price availability of vaccines in the global health emergency. Therefore, South Africa and India have proposed the World Trade Organisation (WTO) to temporarily waive the international IP norms contained in its Trade Related Aspects of Intellectual Property (TRIPS) Agreement in order to ensure equitable access to Covid-19 vaccines and medicines around the world. The waiver of international obligations of member states is an established instrument in WTO law, however, it has never been used on such a wide scale before.

The paper will first overview the legal framework for compulsory licensing of patents and examine its shortcomings. Then, we will look at the proposed mechanism of the TRIPS waiver and critically assess its adequacy to achieve the anticipated objectives. Finally, we will reflect on whether the the adoption of the TRIPS waiver might herald a return of a more pragmatic view of IP rights as adaptable public policy tools rather than immutable property rights.

2. Private rights with a public policy objective

IP rights are by their legal nature private rights belonging to individuals or private legal entities, even though they are granted by public authorities and based in national legislation and international conventions (Guan, 2016: 423). However, these private rights are not meant to merely serve the interests of their holders but are granted by the states to achieve certain public policy goals. As famously declared by the Constitution of the United States (Article I, Section 8, Clause 8), IP rights are supposed to *"promote the progress of science and useful arts."* The phrase reflects the incentive theory under which the grant of time-limited exclusive rights over the use of an invention (if we focus on patents) is justified as an encouragement to inventors to create new inventions and share them with the public. The resulting acceleration of the

technological progress should benefit the society as a whole. The disclosure of the invention is an important part of the mechanism since the advance of knowledge would not occur if inventors could keep the patented invention as a trade secret. So, the patent system also aims for the diffusion of technology and technological transfer (Frankel and Lai, 2015: 150).

These public policy objectives are also reflected in the modern international legal framework which to a large extent standardises IP rights around the world. Whereas the Paris Convention for the Protection of Industrial Property of 1883 was silent on the goals of the protection granted, the TRIPS Agreement of 1994 elaborates in Article 7 that *"[t]he protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations."*

For the purpose of balancing rights and obligations, the principles of the TRIPS Agreement allow members to adopt measures necessary to protect public health and nutrition, and to promote the public interest in sectors of vital importance to their socio-economic and technological development', and measures to prevent right holders' IP rights abuse or anti-competition practices, as long as these measures are TRIPS consistent (Art. 8(1)). To achieve that, member states may provide for various exceptions and limitations to IP rights and other use without authorization of the right holder (Guan, 2016: 422). Public health is stated as the first of the public interest objectives of that may justify limiting the exclusive rights. This is important in the Covid-19 pandemic since the TRIPS Agreement was an important driver of the standardisation of legal protection of pharmaceuticals around the world. Prior to the TRIPS Agreement, which was signed concurrently with the establishment of the WTO in 1994, many developing and least developed countries had excluded pharmaceutical products from patentability, mainly to ensure more affordable drug prices (Wong, 2020: 1; Wakely, 2011: 299). Under the WTO rules, which now bind almost all countries in the world, pharmaceuticals and medical technology must be eligible for full protection by IP rights. Yet, TRIPS at the same time provides certain flexibilities to alleviate the negative impact of patents on access to pharmaceutical products (Urias and Ramani, 2020: 368).

A global health emergency is a situation where the financial interests of pharmaceutical manufacturers for the commercial exploitation of their patent rights should give way to the public interest for global availability and affordability of Covid-19 vaccines and drugs, particularly because significant public investment has been made in Covid-19 research and development. Consequently, the limitations of exclusive rights protected by TRIPS come into play to ensure an appropriate balance between the rights and obligations.

3. Compulsory licensing

3.1. Concept

A licence in IP law is a permission to use the subject matter of an IP right (patented invention in the case of patents), which makes such use non-infringing upon the exclusive right. Unlike in assignment of rights, the ownership of the right remains unchanged as the licensor only transfers on the licensee certain limited rights of use, which revert to the right holder once the licence has terminated. Whereas a voluntary licence is granted by the right holder, a compulsory license is issued by a state authority to allow the use of a patented invention without the consent of the patent holder. Although a compulsory licence is granted *ex officio* it does not amount to an expropriation of the right holder, but only limits the right holder's prerogative to prohibit a certain use of the protected object. So, for example, a patent holder may still use the patented invention, grant voluntary licences, and collect royalties, but cannot refuse to conclude a contract under the compulsory licence. Dhenne points out that compulsory licences should not be detrimental to innovation since they do not deprive the inventor of reward as they normally cover situations where the patentee would otherwise not have received any royalty, e.g., in a low-income country that cannot afford regular prices. Additionally, compulsory licensing reduces the costs of numerous bilateral negotiations with potential partners since this task is carried out by state authorities (Dhenne, 2020a).

3.2. Legal bases

A classic case where a compulsory licence is justified is where a patent holder does not exploit the patented invention and refuses to license the patent without a rational explanation. This is particularly problematic with inventions that cannot be simply substituted or "invented around" and the patent holder can achieve high prices by minimising the exploitation of the invention (Frankel and Lai, 2015, p. 152). To this end, Article 5 of the Paris Convention allows countries to provide for the grant of compulsory licences "*to prevent the abuses which might result from the exercise of the exclusive rights conferred by the patent, for example, failure to work*". Insufficient working is just an example of reasons due to which a state might grant a compulsory licence. The Paris Convention gives the member states free hands to set the grounds for compulsory licensing in their domestic legislation and does not even establish a right to remuneration on behalf of patent right holders (Guan, 2016: 439). The only limitation is that the granted compulsory licences must be non-exclusive and non-transferable, even as sub-licences.

The TRIPS Agreement incorporates the Paris Convention but lays down additional safeguards concerning compulsory licensing (without expressly using that term). Article 31 stipulates that the ex officio authorisation of use must be considered on its individual merits; the scope and duration of the compulsory licence must be limited to its purpose; the licence must be non-exclusive and non-assignable and granted mainly for the supply of the domestic market of the member state; it must be capable of being terminated

if circumstances change and must be subject to adequate remuneration. Furthermore, the legal decision on granting the compulsory licence and on the remuneration for it must be subject to judicial review or other independent review (Frankel and Lai, 2015: 156). Prior to obtaining a compulsory licence, the proposed user must make efforts to obtain a voluntary licence from the right holder. However, this requirement does not apply in cases of national emergency or other situations of extreme urgency or where the compulsory licence is to be used for public non-commercial use (government use) (Wakely, 2011: 300).

The requirement that compulsory licence serves mainly for supplying the domestic market turned out to be an inadequate solution for developing and least developed countries that lack pharmaceutical manufacturing capacity to produce generic drugs and must rely on import of pharmaceuticals. Since Article 31(f) TRIPS prohibits the exportation of medicines produced under compulsory licence, countries with pharmaceutical manufacturing capacity were prevented from exporting medicines under compulsory licence to countries in need (Wakely, 2011: 300). The problem was recognised by WTO member states in the Declaration on the TRIPS Agreement and Public Health (Doha Declaration) of November 2001, which affirmed that the TRIPS Agreement "*can and should be interpreted and implemented in a manner supportive of WTO Members' right to protect public health and, in particular, to promote access to medicines for all*". The declaration stressed that each member state has the right to determine what constitutes a national emergency or circumstances of extreme urgency that justify compulsory licensing without prior negotiations with right holders, it being understood that public health crises, including those relating to HIV/AIDS, tuberculosis, malaria, and other epidemics, can represent a national emergency or other circumstances of extreme urgency (Ong, 2015: 241).

In 2003, WTO General Council adopted a decision that the export restriction from Article 31(f) TRIPS could justifiably be waived to the extent necessary to produce pharmaceutical products under a compulsory licence and to export them to importing countries facing health crises (Greenbaum, 2008: 148-149). The waiver was subsequently incorporated into the TRIPS Agreement as Article 31bis through an amending protocol issued by the General Council in 2005 and formally adopted by the WTO members in 2017 (Urias and Ramani, 2020: 368-369). Under the Article 31bis system, both an eligible importing country and the exporting country must grant a compulsory licence and notify the TRIPS council of the specific names and expected quantities of the patented pharmaceutical products covered by it (Ong, 2015: 242-243).

To utilize the Article 31bis system, member states can introduce appropriate rules in their national patent law to enable the import or export of patented pharmaceuticals made under a compulsory licence. Of course, the member states are not required to do so. The European Union (EU) opted out of this system and its member states are thus ineligible to import medicines manufactured under compulsory licences. On 7 April 2020, in the light of the Covid-19 pandemic, over 30 organisations and 36 experts asked WTO members that have opted-out of the Article 31bis mechanism to reverse

that decision and consider themselves eligible to import drugs, vaccines or diagnostic tests manufactured under a compulsory license in another country (Access to Medicines Ireland et al., 2020).

In the EU, granting of compulsory licences falls within the competence of its member states which do so under their national patent law and only for their respective territories. There is no option of granting EU-wide compulsory licences (Colpaert, 2020). Regulation (EC) 816/2006 on compulsory licensing of patents relating to the manufacture of pharmaceutical products for export to countries with public health problems establishes a procedure for companies in the EU wishing to manufacture generic medicines for use in the developing world to apply for a compulsory licence. Any producer who has failed to secure authorisation from the patent holder may submit a request for a compulsory licence to the relevant national authority. This must be backed by a specific request from the eligible country concerned, a non-governmental organisation or a United Nations body. Products made under licence must be clearly identifiable by specific labelling or marking and may not be reimported and sold in the EU.

3.3. Covid-19 and inadequacies of compulsory licensing

In the light of Doha Declaration there can be no doubt that the Covid-19 pandemic constitutes a case of extreme (global) emergency in the sense of Article 31 TRIPS, so that prior negotiations with the right holders are not a prerequisite for granting compulsory licences for the production, export and import of Covid-19 medicines, vaccines, diagnostic tests and any other pharmaceutical products required to cure the disease or prevent it from spreading. Since vaccines against Covid-19 have been newly developed and are certainly covered by patents, most attention has been paid to potential compulsory licensing of those vaccines. But generic drug manufacturers could of course also be authorised through compulsory licences to produce low-cost generic versions of patented medicines necessary to treat Covid-19 (Ong, 2015: 236).

Countries wishing to use compulsory licensing must have in place appropriate procedures for authorising such licences in their domestic legislation. During 2020, several countries (Canada, Germany, France, Ecuador and Chile) legislated to facilitate swift compulsory licensing or to encourage the use of compulsory licences in response to the Covid-19 pandemic (Wong, 2020: 3-4). Despite that, the mechanism seems to have been used in only a few cases, most notably in Israel's compulsory licence to import generic versions of lopinavir/ritonavir active ingredient (Ling, Dorigo and Abegg, 2021).

This may confirm the often-expressed criticism that even after the introduction of Article 31bis, the compulsory licensing mechanism under TRIPS provisions is too complex and slow since it is subject to numerous conditions (Dhenne, 2020a). Compulsory licences can only be issued on a "drug-by-drug, country-by-country and case-by-case" basis, which makes it difficult for the manufacturers of generic versions of patented drugs to make long-term supply capacity planning decisions due to the uncertainties relating to the

size of foreign markets. Whereas eligible importing countries are motivated to issue compulsory licences for the use of imported drugs, exporting countries are less interested in taking on the administrative burden of compulsory licensing of production for export, setting the appropriate quantities of pharmaceuticals covered by the licence and ensuring that the entirety of this production is exported to the eligible importing country (Ong, 2015: 245).[2] Hence, compulsory licensing under TRIPS rules is only seldom used. Perhaps the best-known case are compulsory licences for antiretroviral drugs that were issued in response to HIV crisis in the 2000's by Brazil, Ecuador, Ghana, Indonesia, Malaysia, Mozambique, Thailand, Rwanda, Zambia, and Zimbabwe. While most countries issued licenses for a specific patented drug, Ghana and Zimbabwe issued compulsory licenses covering the entire category of antiretroviral drugs (Wong, 2020; Frankel and Lai, 2015: 157).

The EU rules on the authorization and supervision of pharmaceuticals are also cited as hindering the effective use of compulsory licensing in Europe. Under the Regulation (EC) 726/2004 laying down Community procedures for the authorisation and supervision of medicinal products for human and veterinary use and establishing a European Medicines Agency, applicants for market authorisation must supply the European Medicines Agency (EMA) with the necessary data on the safety and effectiveness of a pharmaceutical. Afterwards, authorized medicinal products benefit from an eight-year period of data protection and a ten-year period of marketing protection, which are both independent from any IP rights. However, Regulation 816/2006 expressly allows applicants for compulsory licences to reference this exclusive data in their applications during the protection period (Colpaert, 2020, see also Vincent, 2020: 36-37).

4. Proposal for TRIPS waiver

4.1. Political developments

Due to the apparent failure of the TRIPS compulsory licensing regime to deal with the global health crisis, South Africa and India proposed a radically different alternative. In October 2020 they submitted a joint communication (IP/C/W/669) to the TRIPS Council proposing a temporary waiver from certain provisions of the TRIPS Agreement that would allow member states to exempt an entire category of medicinal products (including diagnostic kits, medical masks, other personal protective equipment, and ventilators, as well as vaccines and medicines) from IP protection. The states would be free to choose to neither grant nor enforce patents and other IP rights related to any COVID-19-related medicinal products for the duration of the pandemic. Whereas compulsory licences must be granted for each medicinal product and for each country's territory separately, the waiver would apply globally, in all WTO member states, without the need for any further licencing procedures. Due to the blanket nature of the waiver, it could be granted in a short timeframe, even considering the required amendments to national laws

2 See a detailed examination of the shortcomings and failings of Article 31bis at Vincent, 2020, pp. 21-32.

in member states. A TRIPS waiver provides specific advance authorisation for member states and producers to take measures that would otherwise violate the TRIPS Agreement and concrete IP rights in the state (Burgeois and Burns, 2002: 855).

The proposal by South Africa and India attracted significant attention and is now officially backed by 63 co-sponsoring governments, with around 100 countries supporting the proposal overall. It has gained worldwide support by hundreds of civil society organisations, academics, scientists, medical associations, trade unions and United Nations agencies, including the WHO and UNAIDS (Médecins Sans Frontières, 2021). In July 2021, more than 100 IP lawyers and academics published a letter in support of the TRIPS waiver, stressing that it is a necessary and proportionate legal measure towards the clearing of existing intellectual property barriers to scaling up of production of COVID-19 health technologies in a direct, consistent, and effective fashion (Kang et al., 2021).

The legal basis for South Africa's and India's proposal is Article IX (paras 1, 3 and 4) of the Marrakesh Agreement Establishing the WTO (WTO Agreement), which, as an exceptional measure, allows a member to apply for a waiver of its WTO obligations. The request needs to contain a justification based on the exceptional circumstances, the conditions and the time when the waiver terminates. The application for a waiver is decided at the Ministerial Conference or the General Council, in principle by a three-fourths majority of all member states, but in practice member states always seek to reach a consensus (Montañá, 2021: 349). TRIPS Council's report on the proposal by South Africa and India was submitted to the General Council in December 2020. Despite the wide support for the TRIPS waiver, a group of countries, including EU member states, Japan, Switzerland and the United Kingdom continues to oppose it, also due to the objections of the big pharmaceutical producers that such a measure is not necessary (Médecins Sans Frontières, 2021). Against expectations, the United States announced its support to the waiver in May 2021 but only mentioned vaccines for COVID-19 and did not mention other technologies for treatment, prevention and containment (Office of the US Trade Representative, 2021).

In June 2021, the EU submitted an alternative proposal to the TRIPS Council (IP/C/W/680) calling for limiting export restrictions, supporting the expansion of vaccine production, and facilitating the use of current compulsory licensing provisions in the TRIPS Agreement, particularly by clarifying that the requirement to negotiate with the right holder of the vaccine patent does not apply in urgent situations such as a pandemic, among other issues. In parallel, the EU submitted a communication to the WTO General Council (WT/GC/231) containing IP elements suggesting that governments should encourage voluntary actions of pharmaceutical corporations towards the expansion of production and recommending reliance on clarified compulsory licenses on patents.

At the TRIPS Council and the General Council meetings in July 2021, discussions on both proposals continued, but a consensus was not yet reached (WTO, 2021). Thus far, the prospect of TRIPS waiver offering a

quick solution has failed. But, unfortunately, the pandemic continues, and a large part of the world remains with all to limited access to Covid-19 vaccines and medicines (Médecins Sans Frontières, 2021).

4.2. Operation of the waiver

Waivers are an existing mechanism in the WTO regime to allow member state to be exempt from their legal obligations in exceptional circumstances. The use of waivers has a long history in the practice of WTO and its predecessor GATT.[3] We have already mentioned the 2003 waiver related to Paragraph 6 of the Doha Declaration that created a flexibility for developing countries to allow easier importation of cheap generic medication under a compulsory license (Greenbaum, 2008: 143). Usually, a waiver involves a specific request made to the WTO by a member state wishing to be relieved of its obligations. The proposed TRIPS waiver, however, is not specific, but is of a very broad blanket nature, since it would cover whole categories of products and apply to four types of IP rights: patents, undisclosed information, industrial design and copyrights. The proposal calls for a waiver to be applicable for all WTO member states – including developing, developed, and least-developed countries. Montañá questions whether such measure can technically still be called a waiver since it appears closer to a temporary suspension of four sections of the TRIPS Agreement (Montañá, 2021: 350).[4]

The duration of waivers under the WTO Agreement is not limited in principle and can be extended (Burgeois and Burns, 2002: 856). The original proposal by South Africa and India did not specify a duration of the TRIPS waiver other than recommending that it should continue until widespread vaccination is in place globally, and the majority of the world's population has developed immunity. The revised proposal, submitted in May 2021 specifies a minimum duration of three years beginning from the date of decision of the General Council. Thereafter, the General Council is tasked with reviewing the exceptional circumstances justifying the waiver and determining the date of termination of waiver if such circumstances cease to exist.

If the TRIPS waiver is adopted, each WTO member state interested in relying on it will have to implement the waiver in its national legislation, so that it will temporarily suspend the legal protection of Covid-19-related medicinal products with IP rights. To create an operative solution, a general statutory provision will not be sufficient. To avoid legal uncertainty, either the law itself or its implementing regulations will probably need to contain at least indicative lists of medicinal products which are temporarily exempt from legal protection with IP rights. Of course, the TRIPS waiver is not compulsory, and if a member state does not wish to waive IP protection in its national law, it

3 Waivers of the most-favoured-nation obligation of the GATT have played a major role in addressing the specific needs of developing countries and establishing a special and differential treatment in their favour (Burgeois and Burns, 2002: 853).

4 Montañá points out that the issue is not solely terminological. Under the 1969Vienna Convention on the Law of Treaties, the consent of all the parties to the treaty is required to suspend the application of an international treaty.

will not be compelled to do so. In this case, the holders of IP rights will retain their exclusive rights in that country's territory.

Unlike compulsory licensing, the waiver of IP rights does not require payment of royalties to rights holders by entities that rely on the waiver. While the rights are waived (or suspended) in national legislation, the patented inventions and other protected subject matter are effectively in public domain and can be used by anyone for free. In this regard, a rights waiver is closer to expropriation of IP rights than is the case with compulsory licensing. Therefore, when implementing the waiver, member states will also have to consider their obligations under other international treaties that are outside of the scope of WTO, particularly those protecting fundamental rights. In Europe, the right to property is protected under Article 1 of the Protocol No. 1 to the European Convention on Human Rights (ECHR), which states that every natural or legal person is entitled to the peaceful enjoyment of their possessions. The European Court of Human Rights has consistently held that this provision also protects non-physical assets such as trademarks, copyrights, and patents.[5] ECHR provides that no one can be deprived of their possessions except in the public interest and subject to the conditions provided for by law and by the general principles of international law. Of course, the Covid-19 pandemic could be recognised as a situation justifying the public interest for a temporary expropriation of IP rights. ECHR does not expressly prescribe compensation as a condition for expropriation; however, compensation terms are relevant in assessing the proportionality of the measure. Taking of property without payment of an amount reasonably related to its value will normally constitute a disproportionate interference in the property right and a total lack of compensation can be considered justifiable only in exceptional circumstances.[6] We can arrive at similar conclusions based on EU Grapher of Fundamental Rights, which protects the right to property in Article 17, expressly listing IP rights as a type of protected property and expressly making any expropriation subject to fair compensation being paid in good time. After the main economic policy response to the COVID-19 pandemic has been a significant fiscal stimulus funded largely through monetary expansion, the lack of funds to purchase medicinal product could not be credibly cited as an obstacle for effectively addressing the public health crisis as an exceptional circumstance. Consequently, any EU countries legislating to take advantage of the TRIPS waiver, if adopted, will have to set up a mechanism to pay to the affected right holders an appropriate compensation for the use of their rights. The compensation could also be paid directly by the generic vaccine and medicine producers relying on the waiver. In financial terms, the waiver of IP rights will then be effectively very similar to a compulsory licence. Just the procedure of adopting the waiver might be quicker than granting a separate compulsory licence for each producer and each IP right.

5 See cases Anheuser-Busch Inc. v. Portugal (73049/01) and Melnychuk v. Ukraine (28743/03).

6 Former King of Greece and Others v. Greece (25701/94).

4.3. Need for technology transfer

Opponents of the proposed TRIPS waiver contend that suspending IP rights not sufficient to ramp up vaccine production. The pharmaceutical industry has long argued even against compulsory licences, pointing out that the main barriers impairing access to modern pharmaceuticals in least-developed countries are the absence of international aid finance, weak political will, and poor medical infrastructure (Attaran, 2002: 861). Whereas lifting IP rules may enable the production of well-established Covid-19 treatments based on traditional chemical pharmaceuticals and are relatively easy to reproduce, such as remdesivir, the same may not be true where cutting-edge new technologies are concerned, such as mRNA-based vaccines against Covid-19 (Moderna and Pfizer/BioNTech).[7] Here, transfers of know-how and technology required to use the patented knowledge are required, which is difficult to achieve without the cooperation of the innovating companies, i.e., the patent holders. Pharmaceutical companies argue that the only way to do this is through voluntary licensing agreements. An alternative model is the Covid mRNA vaccine technology transfer hub that is being set up by WHO and its COVAX partners in cooperation with a South African consortium. Technology transfer hubs are training facilities where the technology is established at industrial scale and clinical development performed. Interested manufacturers from low- and middle-income countries can receive training and any necessary licenses to the technology (WHO, 2021). This is in the spirit of Article 66 TRIPS, which obliges member states who are developed countries to provide enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members in order to enable them to create a sound and viable technological base.

5. Conclusion: A long-term change in the view of IP rights?

Compulsory licensing and waivers of TRIPS obligations have long existed in the WTO's legal repertoire; however, their use has been infrequent and mainly limited to the specific needs of developing or least-developed countries. In contrast, the current proposal for a TRIPS waiver would apply worldwide and for whole categories of IP rights inasmuch and as long as necessary to deal with the Covid-19 pandemic. Rather than a narrow instrument to deal with a specific situation, the new waiver would operate as a global IP policy tool. The fact that the proposal attracted a wide support worldwide, by developing and developed countries, by international organisations, civil society and academia demonstrates what can be described a wider change in the global

7 The claim that the production of mRNA vaccines is too complex to succeed without an extensive know-how and technology transfer is disputed. Some researchers claim that the RNA vaccine platform technology offers the flexibility of producing a very large range of vaccine products using the same production process, quality control system and facility, rapidly and at high capacity. Therefore, the production of new vaccines could be achieved around ten times faster compared to conventional vaccine production technologies (Doctorow, 2021; Kis et al., 2020).

outlook on IP rights.

The TRIPS Agreement in its first two decades expanded IP protection on pharmaceutical products around the world and reinforced the view of IP rights as private property rights with patents being granted primarily to incentivise innovation and finance the costs of research and development. Nevertheless, TRIPS articles 7 (objectives) and 8 (principles) articulate the need to find a balance between the protection of exclusive rights and other public goods, which is a reflection of the "social contract" between the right holders and the society (Frankel and Lai, 2015: 159). In the light of this, we could say that the support for the Covid-19 TRIPS waiver stems from the reawakening of a modern utilitarian model of IP rights, which no longer views them as absolute rights but as relative to societal concerns (Dhenne, 2020b). It is probably no coincidence that this occurred in the circumstances of a global health crisis that affected all countries in the world at the same time, so that they share the same public policy goal.

Opponents of the TRIPS waiver may be right in claiming that in the current situation, IP rights are not the main obstacle for a better worldwide access to Covid-19 vaccines and drugs. More limited compulsory licences in combination with measures for the accelerated transfer of the connected technology and know-how might be sufficient to achieve this goal. Nevertheless, the EU currently seems a relatively isolated political actor advocating this view. The reasons are political. The proposed TRIPS waiver is not just a technical exercise in the WTO's legal framework but also a declaration of shared global values that can override financial interests of IP rights holders. Hence, even if the consensus for the adoption of the TRIPS waiver is never reached, the consequences of the initiative will still be felt. As many commentators have noted, just the mere public announcement or discussion of potentially issuing a compulsory license of compulsory licensing often operates as a useful lever for governments to encourage pharmaceutical manufacturers to expand production to developing countries or lower prices, thus ensuring access to healthcare (Dhenne, 2020a; Wong, 2020: 2).

A longer lasting heritage of the TRIPS waiver proposal might be the strengthening of the geopolitical and socio-economic roles of IP rights, so that they serve the society in parallel to protecting the interests of the right holders. In the WTO context this means that IP rights will no longer be viewed solely as immutable private rights but as adaptable public policy tools. Apart from fostering technological progress and equitable growth, new of IP policies might be introduced to address other global concerns, such as the climate change and other ecological crises, e.g., by limiting exclusive rights on green technologies and new sources of clean energy with a view to ensuring access to them in developing and least-developed countries. A reduction of e-waste by preventing the early obsolescence of electronic devices might be achieved by limiting IP rights on information technologies, thus allowing the production of spare parts and the upgrade of firmware/software. If this prediction turns out correct, this will only confirm that IP rights are private rights that serve a public policy objective – and in the WTO context, these objectives can also be global.

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CHAPTER 3

Distance learning as a test bed for administrative digitalisation in Italy during and after the Pandemic: the way forward between data protection and the surveillance capitalism issues[1]

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Abstract

Digital priorities, broadband, digital technology, the Internet, digital agenda and connectivity are the most common keywords in the political and scientific debates in course in Italy as regards the topic of digital development in general, and in the Public Administration in particular. Indeed, the spread of digital services, by virtue of their nature of general purpose technologies, usually determines a series of socio-economic benefits, which are manifested both at the individual level (consumers and businesses) and at the aggregate level (local and national) including, inter alia*, an increase in productivity, better access to health services (e-health), improved relations between public administrations and citizens (e-government), greater social inclusion and civic participation, as well as more effective education and training (e-education).*

The first part of the paper reviews the relevance of the digitalisation process in the Public Administration in general, while the second part aims to draw a picture of the state of the art in the emblematic education sector, which has become a test bed over the past year. This sector has been severely tested by the Pandemic emergency and has been affected by an explosion of distance learning tools, which have posed new problems (especially in terms of data

1 This paper has been developed and written with the joint efforts of both the authors. However, paragraphs 1, 2 and 3 can be attributed to Giuseppina Agata Di Guardo, while paragraphs 4, 5 and 6 to Francesco Gaspari.

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protection with reference to a possible drift towards data capitalisation), but also new challenges, affecting fundamental rights, that regulators and legislators are called to handle and regulate. The paper concludes by putting forward some proposals to address and manage such new challenges.

Key words: *Administrative Digitalisation, Education, Distance Learning, Data protection, Fundamental Rights, Surveillance Capitalism.*

JEL classification: *K23, K24, K36, K38*

Summary - 1. The relevance of the digitalisation process in the Italian Public Administration – 2. A brief overview of the Italian legislation on digitalisation - 3. The school system in a digital Public Administration - 4. The digitalisation of teaching and the administrative organisation of schools during the health emergency: the enormous increase in the use of distance learning. A legislative and regulatory overview - 5. Critical profiles with reference to data protection: risks related to the use of free platforms and a possible drift towards data capitalisation – 6. Reflections, prospects and challenges for the future: some proposals

1. The relevance of the digitalisation process in the Italian Public Administration

The encounter between technological innovation and administration has not just arisen today. Indeed, the literature shows that over the last twenty years studies on administration and related reforms have had the common objective of launching a process of modernization aimed at achieving an adequate and consistent change of administration in line with the social changes taking place in the country. A process that proceeded, and still continues, with a common aspiration towards efficiency and economy as the founding principles of public administration provided for by Article 97 of the Italian Constitution. Indeed, if we start from the assumption that technologies represent a multiplier for the growth of freedom and we agree with the fact that the Administration's mission is to protect citizens' rights (Allegretti, 1996: 18), all the regulatory options and administrative practices necessary to implement e-Government policies can be considered to be assisted by a presumption of constitutionality/legality. More specifically, these options and practices would be supported by the presumption of being constitutionally oriented to the extent that they materialize in actions aimed at simplifying the activity and organization of Public Administrations in order to provide citizens and users with better public services, as well as in actions aimed at making administrative activity more transparent and participatory. Numerous initiatives have been undertaken both at European and national level, which are directed to making the most of the potential offered by digital technologies to foster innovation, economic growth and progress. In this sense, the Digital Agenda[4] sets a series of objectives that each country in the European Union (EU) should achieve. In June 2020, the European Commission announced in its communication entitled "Europe's moment: Repair and prepare for the next generation" (EU Commission, 2020a) that the digital single market will be a pillar in the recovery from Covid-19. Proposals include the development of an electronic identity, investments in artificial intelligence, cybersecurity, 5G networks, quantum computing and blockchain, building a real data economy and developing national systems for electronic public procurement. Furthermore, in December 2020 the European Commission presented

4 Following up on the Lisbon Strategy, the Digital Agenda for Europe (DAE) (https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A52010DC0245) was conceived as one of the seven flagship initiatives of the Europe 2020 strategy adopted by the Commission. Published in May 2010, it sets out to define the key enabling role that the use of ICTs will have to play if Europe wants to succeed in its ambitious 2020 goals. In order to ensure a fair, open and secure digital environment, the Commission consequently built the Digital Single Market Strategy (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52015DC0192) on three pillars: providing better access for consumers and businesses to digital goods and services across Europe, creating the right conditions for digital networks and services to flourish, and maximising the growth potential of the digital economy. In this sense, see also the Proposal for a Regulation of the European Parliament and of the Council establishing the Digital Europe programme for the period 2021-2027, available on the web page https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A434%3AFIN.

a reform package, including a law on digital services (the so-called Digital Services Act: EU Commission, 2020b), aimed at regulating the security, transparency and conditions of access to online services, and a law on digital markets (the Digital Markets Act: EU Commission, 2020c), dedicated to commercial and competitive aspects. Both are in addition to the proposal of 25 November 2020 for a Data Governance Act (DGA) (EU Commission, 2020d), which aims to promote the availability of data and to strengthen trust in the intermediaries, as well as to enhance data allocation tools and mechanisms, in particular with regard to the reuse of the same by the public sector and their sharing between companies.

All these proposals are strongly interrelated and are part of the broad framework prepared by the Commission Communication of 19 February 2020 "Shaping the digital future" (EU Commission, 2020e) and, therefore, related to the policies for the promotion of the so-called "Digital sovereignty" of the European Union. Lastly on this issue, it is worth noting the document containing the 2030 European Digital Targets (EU Commission, 2021a), in which, among other things, it is hoped that each member country will dedicate at least 20% of the funding from the Recovery and Resilience Facility[5] to digital transition.

From the point of view of the Italian legal system, on the one hand the attention of the legislator has been focused on digital administration and on the added value of the use of technologies (Mangiameli, 2017: 147 ff.[6]) to modernize the administrative apparatus, thanks to its reorganization in a logic of collaborative coordination; on the other hand, on the simplification of procedures and rationalization of processes and cost reduction, also emphasizing the values of transparency, the use of IT archives and interoperability between administrations. In other words, the systemic application of digital technologies to the public administration has been progressively identified as the way to reduce bureaucracy and achieve simplification, transparency, safety and accountability. Moreover, digital technology supported Italy during the lockdown and is now considered indispensable for its recovery. The Public Administration was fundamental in managing the emergency and will play a crucial role in the coming months.

2. A brief overview of the Italian legislation on digitalisation

The process of applying digital technologies in the Administration actually began a good number of years ago and saw the approval (in 2005) of Legislative Decree No. 82, namely the Italian Digital Administration Code (CAD) (Cardarelli, 2012: 227 ff.[7]), in which the use of technology is no longer

5 As concerns the Italian Recovery and Resilience Plan see https://www.mef.gov.it/en/focus/documents/PNRR-NEXT-GENERATION-ITALIA_ENG_09022021.pdf

6 The author focuses on the function of the technique in point of construction and deconstruction of the forms of social regulation and states that technology improves daily life and even concepts, legal institutions, interests and rights are increasingly delineated and transformed by this openness to the virtual.

7 This author highlights that the foundation of the digital administration in our legal

limited to the "dematerialisation" of documents, but rather to the extension of administrative action towards new services and new ways of performing tasks (Duni, 2007: 13-15). More specifically, the provisions of the Digital Administration Code identify a sort of status of the digital citizen (both for individuals and for companies) based, in short, on the right to demand digital interaction from public offices, to which corresponds, therefore, the obligation of the Administration to adapt from a technical and organizational point of view to satisfy the users' rights. Digital rights refer to institutions already known in the Italian legal system (such as access), but also to new cases, such as the availability and usability of data, with respect to which the Public Administration must guarantee the widest availability of electronic services, in compliance with the principles of equality and non-discrimination. The question of the constitutional coverage of the so-called "new" rights – which also include those connected to the evolution of technologies, such as, *ex multis*, the right to the IT administrative procedure (Article 4), the right to make electronic payments with central administrations (Article 5), the right to communication by e-mail, with the relative "positive actions" such as the free release of a certified e-mail box (Article 6), the right to quality services in terms of ICT (Article 7), the right to computer literacy (Article 8) – was notoriously set by the Italian doctrine on the interpretation of Article 2 of the Constitution, which "recognizes and guarantees the inviolable rights of man, both as an individual and in the social formations where his personality takes place", from the prevailing doctrine understood as an "open case" provision, that is, suitable to include rights that are not expressly recognized, but which must be considered the result of the change in customs and social consciousness and, above all, as regards the topic under discussion, of technological development (Barbera, 1975: 50 ff. and 96).

The Digital Administration Code has been subject to several subsequent regulatory changes up to the fairly recent Legislative Decree No. 179/2016[8], which proposes its rewriting, reconciling itself in a coherent way with the New Public Management and with the Digital Era Government model (Dunleavy et al., 2005; Fang, 2002: 1; Fishenden and Thompson, 2013: 977), already advocated by the 2014 OECD Recommendation (OECD, 2014), focused on an overall reinterpretation of the processes, functional to the global participation of citizens in the latter. The aforementioned Legislative Decree No. 179, approved by the Government in line with the mandate received with

system is the result of "a confused regulatory stratification and object of continuous successive manipulation". Others (Caio, 2014: 41) define the *CAD* a sort of constitution on how to digitise the Public Administration, which is well-structured but often ignored by the legislator itself.

8 Legislative Decree 26 August 2016, No. 179, entitled Amendments and additions to the Digital Administration Code, referred to in Legislative Decree 7 March 2005, No. 82, pursuant to article 1 of the law of 7 August 2015, No. 124, concerning the reorganization of public administrations. This Decree was adopted on the basis of the delegation pursuant to Law No. 124/2015 and the principles of eIDAS Regulation No. 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC.

Law No. 124/2015[9], declined the CAD reform mainly on three guidelines: - 1) Overcoming the technological backwardness through actions aimed at "promoting digital culture among citizens with particular regard to minors and categories at risk of exclusion, also in order to encourage the development of legal IT skills and the use of digital services by public administrations with specific and concrete actions" (Article 8); - 2) The definition of the contents of digital citizenship (Faini, 2019: 1099[10]), with a generalization of the right to use technologies *vis-à-vis* public administrations[11]; - 3) The start of a management and structural reorganization process of public administrations (Articles 12-13) on the basis of technical rules provided for by Articles 15 and 71, in order to ensure the "transition" to the digital operating mode.

Despite this regulatory framework, the state of implementation of the same is still not entirely satisfactory if we look, for instance, at the results of the DESI 2020 Report, which sees Italy in 25th place among the Member States of the Union in the European Commission's Digital Economy and Society Index[12] for 2020, thus still in a position below the EU average in terms of digital skills,

9 Law 7 August 2015, No. 124, *Delegations to the Government regarding the reorganization of public administrations*. In particular, Article 1 of Law No. 124/2015, titled digital citizenship grapher, in order to guarantee citizens and businesses the right to access, also through ICT, all data, documents and services of interest to them in digital mode, delegated the Government to issue decrees reform, modification, integration of the Digital Administration Code, identifying multiple guiding criteria. Among others, the simplification of proceedings; the definition of tools to qualify the minimum standard of safety, quality, usability, accessibility and timeliness of online services; single authentication through the public digital identity management system (SPID); access and data reuse; participation in the decision-making processes of public institutions using digital methods. For more information on the rights recognized by the Code, please refer to Frosini, 2013: 487, in which are described the rights accrued by the person due to technological evolution.

10 Regarding the contents of digital citizenship and related rights, we note the position of some authors (and specifically Biferali, 2018), who propose a vision on the basis of which today the rights and protection of the person in the sharing society, in which personal information is intended for circulation, must not be evaluated as the only objective to be achieved, but rather considered "part of a set of interests aimed at the development of the market and the digital economy" (our translation).

11 This general right is expressed by several provisions, such as, *inter alia*, the introduction of the right for citizens to elect a digital domicile for communications and notifications by public administrations and publicly controlled companies (Article 5 *bis*); the right to make all payments with electronic payment systems (Article 5); the electronic democratic participation (Article 9); the possibility of contacting the digital *ombudsman* established pursuant to Article 17, paragraph 1 *quater*; the provision, at the Presidency of the Council of Ministers, of the Permanent Conference for technological innovation as an open system of participation to which to submit the proposal of rules and administrative acts that could have an impact on the matters governed by the Digital Administration Code (Article 18).

12 This Index (DESI) monitors 5 parameters to measure the level of digitalisation of European countries: connectivity, digital skills, use of the Internet by individuals, use of digital technologies by companies and digital public administration.

human capital, connectivity and digital public services[13].

The same report also shows the ready availability of online public services and open data, the consolidation and diffusion of digital medical services, the growth, albeit below average, of fast broadband coverage and the spread of its use, but also a severe delay and slow progress in superfast connectivity. At the same time, it appears that three out of ten people still do not use the internet regularly and more than half of the population does not have basic digital skills. In spite of the picture just presented, the Three-Year Plan for Information Technology in the Public Administration 2019-2021[14], in accordance with the "Ministerial Declaration on e-Government[15]", already signed by the Italian Government in Tallinn in October 2017, provides ambitious goals for public administrations giving precise indications with the scheduling of the time deadlines within which to implement them. Therefore, the administrations are "required" to fulfill obligations regardless of assessing the actual maturation towards digital. Thus, what is represented induces, on the one hand, an awareness of the delays and, on the other, a reflection on the reasons that transversally underlie the separation between formal regulatory compliance and a substantial change in the organization of the Administration which, instead, would be desirable when working towards a truly native digital administration. If we consider that the first draft of the Code of Digital Administrations dates back to 2005, a feeling of astonishment is justified at the persistence of the aforementioned, after 11 years since the "transition" from paper to digital: an unequivocal sign of the failure of the reform initiated at the time and which legitimizes the consideration of those who argued that "*once the CAD is done the digital PA remains to be done*" (Longo, 2016).

However, such a change could be achieved through an inversion of the role of the Administration, no longer simply following the reforms implemented by the legislator, but being an active protagonist and an aware guide to these

13 For the DESI index referring to Italy in 2020, consult the website https://digital-strategy.ec.europa.eu/en/policies/desi-italy. The report shows that Italy ranks 25th out of 28 EU Member States in the 2020 edition. Data prior to the Pandemic shows that the country has a good ranking in terms of 5G preparedness, as all the pioneer bands have been assigned and the first commercial services have been launched. There are significant gaps as regards Human Capital. Compared to the EU average, Italy records very low levels of basic and advanced digital skills. The number of ICT specialists and ICT graduates is also well below the EU average. These gaps in digital skills are reflected in the low use of online services, including digital public services. Only 74% of Italians are regular internet users. Although the country ranks relatively high in its offer of e-government services, public take-up remains low. Similarly, Italian enterprises lag behind in the use of technologies such as cloud and big data, as well as in the uptake of e-commerce.

14 Three-year Plan for IT in the Public Administration 2019-2021 (*Piano Triennale per l'Informatica nella Pubblica Amministrazione* 2019–2021), available on the web page https://www.agid.gov.it/sites/default/files/repository_files/Piano-Triennale-ICT-2019-2021.pdf

15 Tallinn Declaration on eGovernment, available at the following link: https://teamdigitale.governo.it/upload/docs/2017/10/Tallinn_egov_declaration_final_3oct2017.pdf .

reforms. This would occur also thanks to the presence of personnel with adequate digital culture and skills[16] and using strategic planning by objectives, which will see the same protagonist in the design phase of the technologies to be used in the administrative action. *Inter alia*, Administrations should consciously design their own software, having a clear idea of the concrete administrative needs that lead them to develop a specific technology and the elements of technological design through which to facilitate its understanding by public officials. In this process, it is easy to identify the school system as one of the factors capable of accelerating the digitalisation process and multiplying its effects in terms of social well-being, precisely because schools form the citizens of the future who will, in any case and inevitably, always be more digitalised.

3. The school system in a digital Public Administration

Schooling represents a central formative moment in the life of citizens, encouraging skills and abilities and thus making it central to the future development of a society, also in a digital sense. The digitalisation of the school system, as will be shown later in the paper, is an extremely complex process which, in addition to requiring careful planning, is primarily based on the construction of infrastructures. Indeed, the provision of more advanced technological tools for teaching (innovative devices such as tablets, overhead projectors, wi-fi connections) represents the minimum necessary condition to which must be added the adequate skills of a teaching staff who want to guarantee both the digital management of knowledge, and the implementation of the elements of innovation within the several *curricula*. Moreover, a real digitalisation that starts from the priority terrain of the school is the same precondition for the effectiveness of digital rights and represents a concretization of the principle of substantial equality provided for by Article 3 of the Italian Constitution[17], which, in the specific case, is declined as a right of digital equality and which presupposes, for its concrete realization, the overcoming of the so-called digital divide (Sartori, 2006; Papa, 2008; Maggipinto, 2008: 54 ff.). In truth, inequalities which characterize access to new technologies are nothing more than the reflection, sometimes amplified, of inequalities already existing in society, which request not only action aimed at ensuring accessibility to the network, but policies to support and encourage the broadest use of digital technologies. These considerations

16 In truth, with Legislative Decree No. 179/2016, figures such as the Digital Transition Manager (*Responsabile della transizione digitale* - RTD) were introduced, who should play the role of e-leader, but the conditions for the training of human resources have not been created.

17 Article 3 of the Italian Constitution provides that: “All citizens have equal social status and are equal before the law, without regard to their sex, race, language, religion, political opinions, and personal or social conditions. It is the duty of the Republic to remove all economic and social obstacles that, by limiting the freedom and equality of citizens, prevent full individual development and the participation of all workers in the political, economic, and social organization of the country” (our translation).

refer to that interpretative approach to rights connected to the so-called "Stato di prestazione" ("State of performance") (Ridola, 2006: 180) which is particularly emphasized here by the inclusion of new technologies among the forms to promote even greater democratic participation on the part of citizens (the so-called e-Democracy).

Indeed, it is evident that it is in the technological field that substantial inequalities can assume particularly large dimensions, to the point of compromising the very practicability of a digital administration[18]. Consequently, the problem of computer literacy is increasingly affirming itself as a real specific social right which our legal system should ensure to everyone, becoming an increasingly essential component of the right to education (Article 34 of the Italian Constitution[19]), the guarantee and promotion of which is included among the essential tasks of the Republic itself, in a perspective of close correlation with the principle of substantial equality.

The issues mentioned here acquire, as we will see in the following pages of the paper, a much more particular importance due to the pandemic emergency and the increase in the use of distance learning, with the consequent problems, on the one hand, of accessibility to technologies by all students and, on the other, of the protection of their personal data.

4. The digitalisation of teaching and the administrative organisation of schools during the health emergency: the enormous increase in the use of distance learning. A legislative and regulatory overview

In Italy, a number of primary and secondary legislation[20] have been adopted since February 2020 to deal with the health emergency.

In particular, article 1, paragraph 2 of Decree Law No. 6 dated 23 February 2020[21] expressly provides for the hypothesis of suspending face-to-face

18 It should be remembered that Article 8 of the Italian Digital Administration Code, a programmatic rule which establishes that "The State promotes initiatives aimed at developing the computer literacy of citizens with particular regard to the categories at risk of exclusion, also in order to favour the use of the telematic services of Public Administrations " (our translation), was included in the CAD following opinion No. 11995/2004 issued by the Council of State on the draft decree, which stated the concern that the advent of the digital administration could have the effect of further penalizing those who had not been able to use the new technologies.

19 This article significantly provides in its first paragraph that "Schools are open to everyone" (our translation), with a parallelism that could be made with respect to today's right to digital literacy.

20 For an overview of the measures aimed at reconciling the protection of the health of students and school and university staff with the safeguarding of the right to study, while at the same time guaranteeing the same from any detrimental effects resulting from the suspension of face-to-face teaching see Camera dei Deputati, Ufficio Studi, 2020a.

21 Urgent measures for the containment and management of the epidemiological emergency caused by COVID-19.

schooling, delegating the power to adopt the measures necessary to manage the emergency[22] to the competent authorities. The Prime Ministerial Decree dated 25 February 2020[23] established that "school managers in institutions where teaching activities have been suspended due to a health emergency may, in agreement with the competent collegiate bodies and for the duration of the suspension, activate distance teaching methods, also taking into account the specific needs of pupils with disabilities" (Article 1, paragraph 1, letter d)) (on these regulatory measures, see Carloni, 2020: 4).

This option became a necessity with the subsequent Prime Ministerial Decree dated 4 March 2020 (Article 1, paragraph 1, d) and g)) (Nicodemo, 2020: 3). Subsequently, the Departmental Note No. 388 dated 17 March 2020[24] offered educational institutions an operational didactic reference framework, also clarifying what is meant by distance learning. In this document, this latter is defined first positively and then negatively. In the first case, "distance learning" means "direct or indirect, immediate or deferred connection, through videoconferences, video lessons, group chats; the reasoned transmission of teaching materials, by uploading them onto digital platforms and the use of class registers in all their communication and teaching support functions, with subsequent revision and discussion carried out directly or indirectly with the teacher, interaction on interactive educational systems and apps that are strictly digital". On the negative side, "distance teaching" (in which, as far as possible, the "virtual classroom" mode should be privileged) does not consist in "only sending materials" or in "merely assigning tasks that are not preceded by an explanation of the content in question or that do not provide for subsequent clarification or restitution by the teacher"; such practices "should be abandoned, because they lack elements that can stimulate learning". From this point of view, the same note underlines that "Distance learning provides for one or more moments of human contact between the teacher and the students, through which the teacher can affirm the sense of what the students have done autonomously, useful also to ascertain, in a process of constant verification and improvement, the effectiveness of the tools adopted (...)".

Again in terms of the regulatory framework, Decree-Law No. 22 dated 8 April 2020, converted by the amendments in Law No. 41 dated 6 June 2020, establishes that teaching staff shall ensure teaching services in distance modes, using available computers or technological tools (Article 2, paragraph 3), and therefore integrates the obligation, previously in force only for school managers pursuant to the Prime Ministerial Decree dated 4 March 2020

22 Article 1(2)(d) states that: "Among the measures referred to in paragraph 1, the following measures may also be adopted [...]: d) suspension of childcare services and schools of all levels, as well as of attendance at school and higher education activities, including university, except for distance learning activities" (our translation).

23 Further provisions implementing Decree-Law No. 6 dated 23 February 2020 on urgent measures to contain and manage the epidemiological emergency caused by COVID-19.

24 *Health emergency from the new Coronavirus. First operational indications for distance learning activities.*

(Article 1, paragraph 1, letter g)), to "activate" distance teaching, an obligation concerning, in the case of the head teacher, mostly obligations relating to the organisation of delivery times, technological tools, aid to families in difficulties as well as teachers without sufficient connectivity[25].

The subsequent Decree-Law No. 34 dated 19 May 2020 financed further measures to strengthen teaching, including distance learning, and to provide schools and students with the tools necessary to use teaching methods that were compatible with the emergency situation, as well as to encourage inclusion and adopt measures to combat pupil drop-out.

The regulatory framework was then enriched by an important decree from the Minister of Education No. 39 dated 26 June 2020, which adopted the "Document for the planning of school, educational and training activities in all the institutions of the National Education System for the school year 2020/2021" (the so-called 2020-2021 School Plan), aimed at providing a reference framework within which to plan the resumption of school activities in September, with particular reference to the need for schools to adopt a School Plan for integrated digital teaching (on this measure – School Plan 2020-2021 – see Di Lascio, 2021: 100 ff.).

In the light of this measure, the Minister of Education's decree dated 7 August 2020 issued the Guidelines for Integrated Digital Teaching[26], which provide indications for the design of the School Plan for Integrated Digital Teaching to be adopted in high schools, in a complementary manner to face-to-face teaching, as well as by all educational institutions of any degree, should the need arise to contain the infection, also should it become necessary to suspend face-to-face teaching again due to contingent epidemiological conditions.

In December 2020, the Unified Conference adopted the Guidelines containing the commitment of all levels of government to ensure the smooth running of the 2020-2021 school year, "to ensure that any further suspension or limitation of face-to-face teaching is envisaged as a residual measure" (Di Lascio, 2021: 113).

5. Critical profiles with reference to data protection: risks related to the use of free platforms and a possible drift towards data capitalisation

25 With specific reference to the methods and criteria on the basis of which to establish the work and obligations by teaching staff, as long as the state of emergency continues, please refer to the provisions of paragraph 3-*ter* of the same Decree Law No. 22/2020.

26 Integrated Digital Teaching is defined by the same Guidelines (p. 2) as an "innovative teaching-learning methodology" and is "aimed at all secondary school students". It is – as the same document states – a "complementary teaching method that complements the traditional classroom experience", but which, in the event of a new lockdown, will concern "pupils of all school levels", according to the indications contained in the same Guidelines. (Our translations).

One of the most delicate aspects of distance learning – the subject of numerous interventions by the Data Protection Authority in the various phases of the Pandemic – concerns the protection of personal data.

The aforementioned Guidelines dated 7 August 2020 do not deal *ex professo* with this delicate aspect of digital teaching, limiting themselves to providing a reference to a further and subsequent document, which the Ministry of Education is called upon to prepare, in collaboration with the Authority for the protection of personal data, referred to above.

Therefore, the document in question[27] was prepared by a joint working group from the Ministry of Education and the Office of the Data Protection Authority and was adopted on 4 September 2020. The stated objective is to provide common guidelines and general principles for the implementation of integrated digital education, with particular regard to the profiles of security and protection of personal data, based on the provisions of Regulation (EU) 2016/679[28]. The note from the Cabinet Office of the Ministry of Education accompanying this document then clarifies that it is a document "in support of educational institutions".

With regard to the protection of personal data, particular issues could arise in the event that the educational institution intends to proceed with the use of a platform available free of charge for distance learning, as happened during the Pandemic (Carloni, 2020: 10[29]).

The aforementioned document prepared by the Joint Working Group on 4 September 2020 specifies that even in this case, the relationship with the provider with regard to the processing of personal data must be regulated by means of a contract or other legal act, pursuant to Article 28 of the GDPR.

This is a particularly important point since, as has been clearly highlighted in the Facebook case, first by the Italian Competition Authority (AGCM[30]) and then by administrative case law[31], the services offered by the platforms

27 *Didattica Digitale Integrata e tutela della privacy: indicazioni generali. I principali aspetti della disciplina in materia di protezione dei dati personali nella Didattica Digitale Integrata*.

28 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation).

29 This author notes that during the lockdown schools made use of the services available, especially those provided free of charge by the big Internet operators, such as Gsuite (with Meet and Classroom), Webex, Teams, Zoom, but also ClasseViva, Fidenia, Classmill, Socloo, and others.

30 Provision No. 27432 approved at the meeting of 29 November 2018.

31 Administrative Regional Court of Lazio, Division I, judgement 10 January 2020, No. 260 (this decision was confirmed in appeal by the Supreme Administrative Court: see Council of State, Division VI, judgement 29 March 2021, No. 2631), where reference is made (see especially point 7 of the grounds of the judgment) to other cases (subject of provisions of the Antitrust Authority in 2017, of the European Commission in 2014 and of the European Consumer Protection Cooperation Network under Regulation 2006/2004/EC in a document of 2016) on the

(websites and apps) are not free of charge, since in the face of a claim that the service is free of charge, generally the collection and use for commercial purposes of the collected data is not clearly and unambiguously declared by the suppliers[32].

Awareness of the economic value of data (not only personal data, such as those provided to social media, including Facebook, but also big data, collected simply by surfing the Net, for instance, by entering a query on a search engine, such as Google) among Internet users and of the possibility that such data may be sold for a fee to third parties, such as marketing companies (Caravita, 2021: ix[33]), is not yet widespread.

As pointed out by the Italian Antitrust Authority, the information on the gratuitousness of the service offered is in such cases untrue and misleading, since the collection and exploitation of users' data for remunerative purposes is configured as a counter-performance of the service offered through the platform (in this case, by the "social network"), because it has a commercial value[34]. Administrative jurisprudence has considered this practice as incorrect, therefore qualifying as legitimate the sanction imposed by the Antitrust Authority. In particular, it has been affirmed that "in general terms, the economic value of the user's data requires the professional to communicate to the consumer that the information that can be obtained from such data will be used for commercial purposes that go beyond the mere use in the "social network": in the absence of adequate information, or in the case of misleading statements, the practice put in place can therefore be qualified as misleading"[35]. This practice "was sanctioned because of the incomplete information provided, which in the face of the 'claim' of 'free' service did not allow the consumer to understand that the professional would then use the user's data for remunerative purposes, pursuing a commercial intent"[36].

In this perspective, the Data Protection Authority[37] qualifies as "inadmissible the conditioning, by the managers of the platforms, of the fruition of the distance teaching services to the subscription of a contract or to the giving

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economic value of data.

32 With reference to the Facebook case, see AGCM, Provision No. 27432, cit., par. 18.

33 By the same author, see the Speech given at the Webinar "*Le strade dell'intelligenza artificiale. Un dialogo a tre voci*", organised by the University "Sapienza" of Rome, and held on 17 June 2021.

34 In the Facebook case, the AGCM was able to ascertain that revenues from online advertising, based on the profiling of users on the basis of their data, constitute the entire turnover of Facebook Ireland Ltd. and 98% of the turnover of Facebook Inc. (point 5 of the measure).

35 Administrative Regional Court of Lazio, Section I, judgment of 10 January 2020, No. 260, paragraphs 10 and 13 of the grounds. See also point 13 of the grounds. Furthermore, see Council of State, Division VI, Judgment No. 2631 of 29 March 2021, Grounds 8, 9, 10 and 11.

36 Administrative Regional Court of Lazio, Division I, judgement 10 January 2020, No. 260, cit., ground paragraph 11. See also Council of State, Division VI, judgement 29 March 2021, No. 2631, paragraphs 8, 9, 10 and 11 of the grounds.

37 Provision of 26 March 2020, cit.

– by the student or by the parents – of the consent to the treatment of the data connected to the supply of further online services, not necessary to the teaching activity". In such a situation, the consent would not be validly given, "because it is unduly conditioned by the pursuit of purposes other than those of distance learning"[38].

On the other hand, where the educational institution considers that it is appropriate to use more complex platforms that include a wider range of services, including those not exclusively aimed at teaching, it will be necessary to verify, with the support of the Data Protection Officer (DPO), that only those services strictly related to distance learning are activated, configuring the services in such a way as to minimise the personal data to be processed both during the activation of the services and during their use by teachers and students (avoiding, for example, the use of geolocation data or social login systems which, by involving third parties, entail greater risks and responsibilities[39]).

Predictably, these issues have also emerged outside Italy. For instance, in February 2020, in New Mexico in the United States, a lawsuit was filed against Google for an alleged violation of privacy implemented through the educational products it provides to schools in the same State through the collection, registration and use of information relating to students in classes using Gsuite. In particular, New Mexico Attorney General Hector Balderas alleged that the company tracks students' activities on their personal devices outside of educational activities[40]. Indeed, Google offers its educational products to schools for little or no apparent cost, but the 'hidden' price would be children's data, which it collects without their knowledge or the necessary parental consent, even when the technology is not used for educational purposes. It is also necessary to underline the size and the consequences in terms of breach of confidentiality, as well as, more generally, the seriousness of the phenomenon, since, just considering Italy, distance learning has involved about 3 million children and young people (Mascheroni et al., 2021; Save the Children, 2021).

In the German state of Hesse, the Commissioner for Data Protection and Freedom of Information (*Der Hessische Beauftragte für Datenschutz und Informationsfreiheit*), Michael Ronelleniftsch, banned the use of cloud services provided by Microsoft within public schools as far back as 2017, following investigations that found that it violated GDPR regulations because it did not

38 Article 7 and recital 43 of the GDPR.

39 Data Protection Authority, Provision 26 March 2020, cit., and more recently Ministry of Education and Data Protection Authority, *Didattica digitale integrata e tutela della privacy*, cit., p. 4.

40 Balderas accused Google of violating the Children's Online Privacy Protection Act (COPPA) — one of the only federal laws regulating digital data privacy — as well as the State's Unfair Practices Act. See the letter that the General Attorney of New Mexico. For information on the lawsuit, please consult the following web address: https://www.nmag.gov/uploads/PressRelease/48737699ae174b30ac51a7eb286e661f/AG_Balderas_Sues_Google_for_Illegally_Collecting_Personal_Data_of_New_Mexican_School_Children.pdf.

provide sufficient data protection according to EU rules, as it relied on servers in the United States. A year later, Microsoft announced that it would no longer distribute contracts for cloud use on servers in the US, moving data to servers in Europe. However, the Hessian Data Protection Authority recently banned this practice as well: "Microsoft Office 365 should not currently be used in schools because of privacy concerns for students and teachers, because even if the servers are in Europe, as a result of Trump's Cloud Act the data may be transmitted to US intelligence" (Hessian Commissioner for Data Protection and Freedom of Information, 2019). The latter measure allows US authorities to access information stored by technology companies if they believe it is useful for the protection of national security. For this reason, the Office 365 cloud would expose German students' data to possible privacy violations. Moreover, the risk would not be eliminated even if parents gave their consent, as this would not take into account the special rights of children under European law. Hence the banning of Microsoft's programmes in schools until a solution is found at a legislative level that guarantees adequate protection of children's personal information.

Given this overview and the related problems, one could try to offer a solution through the use of self-managed distance learning tools and platforms by educational institutions, without recourse to external parties. In this case, no act of appointment as data controller is required[41]. From the aforementioned document prepared by the Joint Working Group on 4 September 2020, it emerges that recourse to a party external to the educational institution for the management of digital educational services is not necessary, but rather, in light of the previous note from the Data Protection Authority dated 4 May 2020, the ideal solution seems to be recourse to internal solutions, possibly supplementing the regulation of the use of the electronic register, "the centrality of which is desirable in the context of tools aimed at favouring the dematerialisation of part of the teaching activity" (Italian Data Protection Authorit*y,* 2020).

This would make it possible to implement distance learning while protecting personal data from market logic (to which some authors refer using expressions such as 'platform capitalism' or 'surveillance capitalism'[42] or, more generally, the 'fourth industrial revolution': see Schwab, 2016, who refers to the growing interpenetration between the physical, digital and biological worlds; Floridi, 2009; Floridi, 2017; Floridi, 2020) and from the risk of their 'capitalisation', a phenomenon typical of the new economies of digital markets[43].

41 Ministry of Education and Data Protection Authority, *Didattica digitale integrata e tutela della privacy*, cit., p. 4.

42 Surveillance capitalism is understood as a new economic order that claims human experience as the raw material for occult business practices of extraction, prediction and sale (Zuboff, 2019).

43 As upheld Administrative Regional Court of Lazio, Division I, judgement 10 January 2020, No. 260, cit., in particular see paragraph 6 of the grounds.

6. Reflections, prospects and challenges for the future: some proposals

The fundamental question that summarises the conclusions of our work is whether it is inevitable to entrust distance learning to proprietary, private and oligopolistic platforms, or whether, instead, it is possible to contrive and practice free, public alternatives. It is necessary to underline that there are about 9 million minors of compulsory school age in Italy, who, due to the precautionary measures put in place to deal with the Covid-19 emergency, have had to use, on a more massive scale than ever before, the distance teaching tools that schools have found themselves forced to prepare in a very short time, in order to ensure the educational and relational continuity of their pupils.

Without taking into account the digital divide, that is, the still profound inequality of access to the Internet and to computers or devices that allow the use of digital platforms with which schools would like to tackle distance learning (see Dreesen et al., 2020) also in the future, this emergency, crisis situation has offered an opportunity to extend the business of data extraction to the big players in the surveillance capitalism field, such as Google and Apple, Microsoft and Promethean, who have offered their platforms free of charge to teachers and parents. Not only does the right to education risk becoming even more segmented as a result of this crisis, creating *de facto* discrimination between those who have access to distance learning and those who do not, but also the education system will be exposed to even more serious risks, such as those linked to the indiscriminate use of sensitive data, moreover of minors, for purposes not even moderately related to those of teaching.

Google offered the Italian Ministry of Education and Research, as it did in other countries, email accounts for teachers with unlimited space and platforms for telematic education (G Suite for Education, Hangouts Meet and/or Google Classroom). The problem is that in these cases the digital infrastructures are managed by private operators who, in fact, impose the use of their proprietary platforms to which the public school is subordinate and dependent; moreover, the teacher-student relationship itself is mediated by channels that are primarily means of data extraction.

It is well known that the globalisation of markets is also, and above all, based on the digital economy. In this scenario, private economic powers have taken on an increasingly decisive role – also because of the growing privatisation policies and the consequent retraction of the state and public powers – with the risk of a potential regression of the guarantees of the constitutional state (see Kotkin, 2020; Caravita, 2021: ix)[44]. Leveraging the network effect, online platforms "*estraggono valore dalla creazione di una community e dalle interazioni fra i loro membri nel quadro di una fitta rete di rapporti economici e*

44 The author dwells on the relations between the digital sphere, the governance of private economic powers and the risk of a potential regression of the guarantees of the constitutional state.

giuridici" (Caggiano, 2021: 3)[45].

The European Union is belatedly attempting to remedy these critical issues through a package of legislative proposals regarding online services and platforms[46]. The general objective of the DSA is to strengthen the guarantees of fundamental rights in this field, as highlighted in the Explanatory Memorandum accompanying the Proposal in question, as well as in recital 3 of that Proposal, which states that "Responsible and diligent behaviour by providers of intermediary services is essential for a safe, predictable and trusted online environment and for allowing Union citizens and other persons to exercise their fundamental rights guaranteed in the Grapher of Fundamental Rights of the European Union ('Grapher'), in particular the freedom of expression and information and the freedom to conduct a business, and the right to non-discrimination".

From the Italian legal point of view, the hypothesis that we intend to propose appears to be that in which educational institutions make use of tools and platforms for distance teaching managed autonomously, without recourse to external parties. This would make it possible to carry out distance learning while protecting personal data from market logic and the risk of their undue "capitalisation".

However, the regulatory measures adopted to date – which have provided for the allocation of 170 million euros[47] – are limited in scope, since they were designed to deal with the current health emergency (linked to the coronavirus[48] pandemic) and to enable state educational institutions to meet the sudden, current, urgent need to implement integrated digital teaching.

Today, the use of digitalisation in schools does not appear to be part of a programme in the strict sense of the word (Carloni, 2020: 12), but is the result of ideas and projects and, therefore, ontologically specific and transient (Nicodemo, 2020: 5). Even the so-called Plan for the Recovery of Europe (Next Generation EU) is not exempt from this logic and has many critical

45 *Verbatim*: "extract value from the creation of a community and from the interactions between their members within the framework of a dense network of economic and legal relations".

46 This package includes the Proposal for a Regulation of the European Parliament and of the Council on a Single Market for Digital Services (Digital Services Act) and amending Directive 2000/31/EC COM/2020/825 final (Digital Service Act, DSA).

47 We refer, in particular, to the 85 million euros allocated by Decree-Law No. 18 dated 17 March 2020 (the so-called "cura Italia" decree) implemented by the decree of the Minister of Education dated 26 March 2020 (on which see https://www.miur.gov.it/web/guest/-/scuola-azzolina-firma-decreto-al-via-distribuzione-85-milioni-per-la-didattica-a-distanza) and the additional 85 million euros for integrated digital teaching allocated by Decree-Law No. 137 dated 28 October 2020 (the so-called "ristori" decree).

48 The initiatives undertaken by the Ministry of Education in the emergency period to counter the digital divide, such as the provision of funds to less well-off students in order to allow them to purchase technological tools for distance learning purposes, have been widely analyzed by several authors (see Zuddas, 2020, 299 ff.; Ciarlo, 2020).

aspects (Gaspari, 2020a: 69 ff.).

According to the latest version of the National Recovery and Resilience Plan (PNRR[49]) presented by the Italian Government on 24 April 2021 and forwarded to the European Commission (on the approval procedure of the Plan, see Carloni, 2021: 9 ff.), the Plan provides for the allocation of an amount of around € 191 billion to Italy, of which € 9.75 billion is specifically earmarked for digitalisation, innovation and security in the public administration, € 19.44 billion for the "Enhancement of the supply of education services: from kindergartens to universities", and € 11.17 billion for "Social infrastructure, families, communities and the not-for profit sector".

The use of digital technology does not obviate and indeed implies even more an unprecedented need for planning, that then requires effective implementation[50], which should take the form of upgrading infrastructures (both tangible and intangible) and creating new ones (Di Lascio, 2021: 117 [51]), not least to ensure safety in schools[52]. This paradigm shift has not taken place to date, as is clearly highlighted by the Parliamentary Commission of Inquiry into the level of digitalisation and innovation in public administrations and overall investment in the technology sector, established by resolution of the Chamber of Deputies on 14 June 2016, whose report on the work carried out dated 26 October 2017 states that in public administrations "There is a clear and widespread awareness of the strategic projects pursued by the Government, but also an adhesion to the intangible infrastructures envisaged by the three-year plan, such as SPID (Sistema Pubblico d'Identità Digitale – Public Digital Identity System) or PagoPA (the platform for electronic payments for the PA) seems more often than not to be an act carried out with the logic of symbolic fulfilment rather than a decisive paradigm shift leading to the complete transformation of services" (Camera dei Deputati, 2017)[53].

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49 Piano Nazionale di Ripresa e Resilienza (National Recovery and Resilience Plan), available at the following web address: https://www.governo.it/sites/governo.it/files/PNRR.pdf.

50 Contrary to what happened with Law No. 107 dated 13 July 2015 (so-called "*La buona scuola*"), on the Reform of the national education and training system and delegation for the reorganisation of the legislative provisions in force, whose indications (see, in particular, Article 1, paragraph 1) "*si sono rivelate un mero manifesto di principio*" (*verbatim:* "turned out to be a mere manifesto of principle") (Nicodemo, 2020: 23).

51 Other scholars focus on the lack of national planning "such as to guarantee adequate investments [...] in school buildings" as well as "the renewal and modernisation of infrastructures" (see Nicodemo, 2020: 5 and 19, as well as, on the recent planning interventions, especially for school buildings, Fiorentino, 2020, 581 ff.).

52 With regard to recent interventions regarding school safety (especially in the wake of the Covid-19 health emergency) see the recent report of Research Office of the Italian Chamber of Deputies (Camera dei Deputati, Ufficio Studi, 2020b).

53 In the Italian text "*Esiste una chiara e diffusa conoscenza dei progetti strategici portati avanti dal Governo, ma anche l'adesione alle infrastrutture immateriali previste dal piano triennale, come SPID (Sistema Pubblico d'Identità Digitale) o PagoPA (la piattaforma dei pagamenti elettronici per la PA) sembra essere il più delle volte un atto compiuto con la logica dell'adempimento simbolico piuttosto*

The aforementioned need for planning also implies the training of teaching staff and students and, more generally, is aimed at creating the conditions whereby technology is not exclusive (as happened in the Covid-19 emergency: see Nicodemo, 2020: 19) but inclusive, since distance learning and the digitalisation of schools is a factor that can enable the State to recover its capacity to act as a social state, even once the pandemic has ended (consider, for instance, students who, for economic or other reasons, are unable to move from their city to another city where schools or universities are located) (Nicotra, 2020 [54]).

This objective is now – in the context of the Covid-19 emergency – farther than ever from being pursued (Nicodemo, 2020: 5, 6 and 8 ff.; Gaspari, 2018a; Gaspari, 2018b: 1 ff.; Gaspari, 2019a: 441 ff; Gaspari, 2019b: 71 ff.; Gaspari, 2020b: 345 ff.), also in the light of the recent data relating to the Digital Economy and Society Index (DESI) of the European Commission, concerning connectivity (which includes broadband and ultra-broadband)[55], digital skills (basic and advanced)[56], as the European Commission[57] itself points out, and e-government[58].

In truth, even as regards the use of internet services, although registering a high level of users including students[59], a more detailed examination of the data (referring to 2019 and, therefore, to the pre-Covid period) shows that distance learning (which we can trace back to the item "Doing online courses" in the relative Index) concerns only 11% of internet users (9% in 2017), while the most significant online activities concern music, videos and games, as

che un deciso cambio di paradigma che porti alla trasformazione completa dei servizi". See p. 153 of such document.

54 This author considers that such an objective can be pursued through digital infrastructures and the unification of the network, thus allowing the internet to reach even the most remote areas of the country.

55 With regard to "*very high capacity network (VHCN)*" coverage, the last eight years (2011-2019) have seen improvements in overall terms (from 10% to 44%), but in rural/inland areas the growth has been much lower (from 2% to 20%) over the same period: DESI 2020, Connectivity, p. 10. In Italy, this coverage is the lowest among EU Member States, except for Bulgaria and Greece: DESI 2020, *Connectivity*, cit., p. 11.

56 Ensuring internet access for all (an ambitious goal in itself) is not enough, as it is also necessary for everyone to acquire basic digital skills in order to exercise their e-society rights. According to the most recent data (DESI 2020, Human capital, p. 4), only 20% of Italians have basic digital skills, while in the EU 58% (on average) of citizens have basic digital skills. Italy, Bulgaria and Romania occupy the last places in this special ranking.

57 DESI 2020, *Human capital*, cit., p. 3, where it is stressed that "having an internet connection is not sufficient; it must be paired with the appropriate skills to take advantage of the digital society".

58 In this context Italy occupies last place among the EU member states: DESI 2020, *Digital public services*, p. 4.

59 As shown by the data: "The most active internet users are young individuals (97% of those aged between 16 and 24 are regular internet users), those with a high level of formal education (97%) and students (98%)": DESI 2020, *Use of internet services*, p. 4.

well as *shopping and social networks*[60], among others.

These reasons also constitute the need for more decisive public intervention to remove the above-mentioned obstacles to achieving full digital literacy.

In its recommendation on Italy's 2020 National Reform Programme, the Council invites Italy to adopt measures aimed, *inter alia*, at reinforcing "distance learning and skills, including digital ones" (Council Recommendation, 2020; EU Commission, 2020f).

Furthermore, in the Digital Education Action Plan 2021-2027, the European Commission identifies two aspects related to digital education to which the Plan's strategic priorities respond: the need to set up digital infrastructures and the need to strengthen digital competences (EU Commission, 2021b).

In this sense, the European Commission, with reference to the first aspect concerning "the deployment of the vast and growing array of digital technologies (apps, platforms, software)" notes that "Online, distance and blended learning are specific examples of how technology can be used to support teaching and learning processes". On the second aspect, the Commission emphasises the "need to equip all learners with digital competences (knowledge, skills and attitudes) to live, work, learn and thrive in a world increasingly mediated by digital technologies"[61].

To address these two aspects of digital education, the Commission considers it necessary to adopt "policies and actions on several fronts, including infrastructure, strategy and leadership, teacher skills, learner skills, content, curricula, assessment and national legal framework"[62]. However, the targets do not seem very ambitious, when (for digital competences) the aim of the Action Plan is to ensure that "70% of 16 to 74 years old should have at least basic digital skills by 2025"[63].

A more active role for the public sector also seems necessary with regard to the IT platforms that schools must rely on to deliver distance learning. In terms of administrative organization, the State and the public authorities are called upon to create their own platform – possibly to be implemented as part of the "country's operating system" for the new digital administration, as outlined in the NRRP (Carloni, 2021: 24 ff.) – to be placed at the exclusive service of the educational institutions, so as to guarantee similar training opportunities at a national level (on the need to prepare and provide a state platform, see also Carloni, 2020: 10 and 12). After all, this is a precise duty based on the Constitutional Grapher (Articles 33, paragraph 2, 34, paragraph 1, and 117, paragraph 2, letter m), of the Constitution), which requires the State to ensure the determination of the essential levels of services concerning civil and social rights, including education[64], throughout the national territory.

60 DESI 2020, *Use of internet services*, cit., p. 6.
61 See the first paragraph of the document, in particular p. 2.
62 *Ibidem*.
63 *Ibidem*, p. 4.
64 See Constitutional Court, judgment dated 2 July 2009, No. 200, paragraph 27 of the legal grounds ("*considerato in diritto*").

Indeed, as clarified by constitutional case law, it is up to the State to ensure, throughout the national territory, a homogeneous educational offer to users, substantial equality of treatment among users of the educational service, as well as "*un adeguato livello di fruizione delle prestazioni formative sulla base di standard uniformi applicabili sull'intero territorio nazionale*"[65].

It cannot be left to the market and to contractual instruments (as is the case in the current regulatory framework) to choose the IT platform for teaching purposes and for regulating the related discipline.

It does not seem correct to place the contractual power of the parties (educational institutions and IT platforms) on the same level, given the obvious information asymmetries that, in our opinion, only a more direct and incisive public intervention can overcome. As authoritative doctrine observes, "*la programmazione postula un ordine dell'economia nel quale lo Stato non venga a trovarsi con le forze economiche del paese in rapporti di tipo esclusivamente contrattuale, ma occupi effettivamente quella posizione preminente che istituzionalmente gli compete per l'adempimento della sua essenziale funzione di coordinamento e di mediazione propulsiva delle forze economiche*" (Mengoni, 1996: 17)[66].

Therefore, and in conclusion, in this perspective, the State and the public authorities are called upon to create their own platform to be placed at the exclusive service of the scholastic institutes, also to avoid the many risks connected to the processing of data.

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65 *Verbatim*: "An adequate level of enjoyment of educational services on the basis of uniform standards applicable throughout the national territory", see Constitutional Court, *ibidem*.

66 The textual translation is: "Planning presupposes an economic order in which the State does not find itself in an exclusively contractual relationship with the country's economic forces, but actually occupies the pre-eminent position that it is institutionally entitled to in order to fulfil its essential function of coordinating and mediating economic forces".

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CHAPTER 4

Online Formation of Limited Liability Companies

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Abstract

Digitalization of the registration procedure enables lower initial costs for formation of companies in EU Member States. It is especially important for small and medium-sized enterprises (SMEs) which perform their business activities on national and cross-border level. Potential abuses of the registration procedure are prevented by the notary certification or by the registration authority checking of the authenticity and validity of the company information. Some Member States already introduced online formation of limited liability companies (LLCs), which are the most common form of companies in business practice. The European Parliament and the Council enacted Directive (EU) 2019/1151 which amends Directive (EU) 2017/1132 as regards the use of digital tools and processes in company law in June 2019 (Digitalization Directive). Its purpose is harmonisation of Member States national provisions on online formation of companies, on online registration of branches and on online filing of documents and information by companies and branches. Member States must harmonise their national provisions with the Digitalization Directive by 1 August 2021. This period may be extended up to one year if a Member State encounters particular difficulties in transposition of the Directive. In Croatian Law the online formation of LLCs is introduced in 2019. Such formation is limited to LLCs and simple LLCs with share capital entirely paid in cash.

Key words: *online formation, limited liability company, European Union, Croatia*

JEL classification: *K20, K22, K40*

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1. Introduction

Small and medium-sized enterprises (SMEs)[3] represent 99% of all businesses in the EU. They employ around 100 million people and account for more than half of Europe's GDP. SMEs are predominantly organized as limited liability companies (LLCs) (European Commission, 2018: 5).[4] **With regard to SMEs› number they have important role in economic growth, job creation and attracting investments in the EU. National provisions of Member States have different approaches on starting up of business activities and cross-border expanding of existing business activities of the LLCs. The LLCs formation may be costly and time consuming for national and foreign entrepreneurs. These problems are especially pronounced in relation to foreign founders of LLCs (European Commission, 2014: 14-15).**[5] Member States reformed their national provisions to reduce these costs and simplify LLCs formation procedures by introduction of the online registrations (European Commission, 2018: 14)[6] and by decrease of minimum capital requirements for LLCs (European Commission, 2014: 20-22, 27, 34, 44).[7] Reforms in different Member States have had similar objectives, but the end results still differ significantly. Denmark and Estonia allow only online registration of LLCs. Some Member States only allow face-to-face

3 The category of micro, small and medium-sized enterprises (SMEs) consists of enterprises which employ fewer than 250 persons and have either an annual turnover not exceeding 50 million euros or an annual balance sheet total not exceeding 43 million euros.

4 There are around 24 million companies in the EU, out of which approximately 80% are limited liability companies. Around 98-99% of limited liability companies are SMEs.

5 The costs can be direct and indirect. The direct costs are set-up costs primarily being generated by mandatory national legal and administrative requirements when forming a company in a given country. These costs usually include administrative costs, notary fees and minimum capital requirements. The direct costs apply equally to national and foreign founders of LLCs, but vary across Member States. Therefore these costs can be barriers for cross-border investments, if they are significantly higher than what the founders of LLCs pay in their own country. The indirect costs are those which are predominantly connected with the differences between Member States provisions with regard to set-up and operational requirements on the articles of association, organization and structure of LLCs, compulsory annual meetings, reporting requirements, etc. These issues often necessitate legal advice and translation and would usually have more impact on foreign than national founders of LLCs. Lengthy registration procedures also result in costs for the LLCs foreign founders, especially if they travel from foreign countries to comply with formalities in Member States of registration.

6 There are 17 Member States which provide a procedure for the fully online registration of LLCs (Bulgaria, Denmark, Estonia, Finland, France, Italy, Ireland, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, Croatia).

7 There are 16 Member States in which it is possible to establish a LLC with minimum capital/share value of €1 or less (Belgium, Bulgaria, Czech Republic, Denmark, Germany, Greece, Estonia, Ireland, France, Italy, Cyprus, Latvia, Netherlands, Portugal, Croatia, Slovakia).

registration procedure (e.g. Belgium, Germany, Spain)[8] and others allow both face-to-face and online registration procedure (e.g. Cyprus, Finland, Croatia). Those Member States which allow online formations of LLCs have different solutions for electronic identification (eID) of LLCs founders and availability of digital portals for cross-border registrations (European Commission, 2017: 27-29).[9] This creates inefficiencies and an uneven playing field for companies (European Commission, 2018: 14). There is a need for harmonization of Member States' national provisions on online formation of LLCs on the EU level. This will ease realization of the freedom of establishment for SMEs on the Single Market.

2. EU legislative initiatives for online formation of LLCs

The European Commission prepared proposal for a Regulation on the Statute of the European Private Company (SPE) in 2008. This proposal was intended to offer SMEs an instrument facilitating their cross-border activities, which would be simple, flexible and uniform in all Member States. The SPE would be a supranational form of a LLC with minimum capital requirement of 1 euro and with availability of online registration of the SPE. Its registered office and its central administration or principal place of business would be in the territory of the Member States. However, it was possible to split the SPE's registered office and central administration or principal place of business in different Member States. Despite strong support from the business community it has not been, however, possible to find a compromise allowing for the unanimous adoption of the Regulation among Member States. The Commission decided that it would withdraw the SPE proposal in 2013 and instead announced to come up with the proposal of an alternative measure designed to address at least some of the problems addressed by the SPE (Jurić and Marinac, 2015: 437, 442-443).

In 2014 the Commission prepared proposal for a new Directive on single-member LLCs which introduced Societas Unius Personae (SUP) as a subtype of the single-member LLC. The proposal would facilitate cross-border activities of companies, by asking Member States to provide in their legal systems for a national company law form that would follow the same rules in all Member States and would have an EU-wide abbreviation SUP. It would be formed and operate in compliance with the harmonized rules in all Member States which should diminish formation and operational costs. These costs would be reduced by the harmonized registration procedure, a possibility of on-line registration with a uniform template of the instrument of constitution of a company and a low capital requirement for the SUP formation. The

8 Face-to-face registration means involvement of intermediaries in the registration procedure (e.g. notaries, legal professionals).

9 A national digital platform for online formation of LLCs is only available with use of eID cards and certificates issued by competent authorities of a relevant Member State. Estonia, Portugal and Spain offer limited availability of their national digital platforms for cross-border registrations of LLCs in accordance with bilateral agreements.

creditors would be protected by the duty imposed on the SUP directors (and in some cases on the SUP single-member) to control distributions. Member States should not require that an SUP's registered office and its central administration be necessarily located in the same Member State. Unfortunately, the Commission has met with opposition of Member States to the proposal and decided to withdraw it in 2018 (Jurić and Marinac, 2015: 437-438).

3. Digitalization Directive

The Commission took different approach on this topic, taking in account its failure to introduce new legal forms of companies for cross-border activities of SMEs. It decided to harmonize existing national provisions of Member States with regard to online formation of LLCs by promotion of further digitalization of the company law. At the same time the company law traditions of the individual Member States are preserved by such approach.

The Commission in its Communication on the Start-up and Scale-up Initiative from 2016 stressed the need to remove obstacles for start-ups to develop in the Single Market and repeated the call for measures in the area of company law. Furthermore, both in the Digital Single Market Strategy from 2015 and in the e-Government Action Plan from 2016 stressed the role of public administrations in helping entrepreneurs to easily start business, operate online and expand across borders. The e-Government Action Plan specifically recognised the importance of improving the use of digital tools when complying with company law related requirements. In addition, the Single Digital Gateway included a commitment to come forward with online registration of LLCs in the context of the digitalization of company law. Against this background, the Commission Work Programme from 2017 included a legislative initiative to facilitate the use of digital tools throughout a company's lifecycle. These activities were supported by relevant resolutions of the European Parliament and conclusions of the Council (European Commission, 2018: 7-8).

The Commission prepared a Proposal for a Directive of the European Parliament and of the Council amending Directive (EU) 2017/1132 as regards the use of digital tools and processes in company law (Digitalization Directive) in April 2018. The European Economic and Social Committee gave opinion on the Proposal for a Digitalization Directive in October 2018. The European Parliament took position at first reading on the Proposal in April 2019. The Council discussed on the Proposal since May 2018 to June 2019. Finally, the European Parliament and European Council enacted the Directive (EU) 2019/1151 amending Directive (EU) 2017/1132 as regards the use of digital tools and processes in company law[10] on 20 June 2019. The Digitalization

10 Directive (EU) 2019/1151 of the European Parliament and of the Council of 20 June 2019 amending Directive (EU) 2017/1132 as regards the use of digital tools and processes in company law (Text with EEA relevance), *OJ L 186, 11.7.2019, p. 80–104.*

Directive has entered into force on 31 July 2019.

The Digitalization Directive amends existing Directive relating to certain aspects of company law from 2017 (Codification Directive). The Codification Directive regulates the establishment and functioning of joint stock corporations and limited liability companies[11] and their mergers and divisions. Aims of the Digitalization Directive are to ensure a simpler, faster and more efficient company formation, to provide comprehensive information without obstacles and to effectively prevent abuses. At the same time, the traditional company law principles of the Member States shall be taken into account. The Directive covers four topics: a) online formation of companies, b) online registration of branches, c) online filing of documents and information by companies and branches and d) disclosure in the register and access to disclosed information.

Member States must ensure that applicants who are EU citizens in the online procedures can use electronic identification means issued by their own Member State and electronic identification means issued in another Member State and recognised for the purpose of cross-border authentication in accordance with the eIDAS Regulation.[12] This will ease cross-border use of the online formations of companies in the EU. Member States may refuse to recognise electronic identification means where the assurance levels of those electronic identification means do not comply with the conditions set out in the eIDAS Regulation.[13] All identification means recognised by Member States shall be made publicly available.[14] Member States may, for the purposes of verifying an applicant's identity, require his physical presence before any national authority or person competent for the online procedures in preventing identity misuse or alteration. They shall ensure that the physical presence of an applicant may only be required on a case-by-case basis where there are reasons to suspect identity falsification, and that any other steps of the procedure can be completed online.[15]

Member States must ensure that the rules on fees applicable to the online procedures are transparent and are applied in a non-discriminatory manner.[16] They shall make available concise and user-friendly information, provided free of charge and at least in a language broadly understood by the largest possible number of cross-border users on registration portals or websites that are accessible by means of the Single Digital Gateway to assist in the formation of companies. The information shall cover at least: a) the rules on the formation of companies, including online procedures, and requirements relating to the use of templates and to other formation documents, identification of persons, the use of languages and to applicable fees, b) an outline of the applicable

11 E.g. incorporation and nullity of the company and validity of its obligations, disclosure and interconnection of central, commercial and companies' registers and capital maintenance and alteration.
12 Article 13b paragraph 1of the Codification Directive.
13 Article 13b paragraph 2of the Codification Directive.
14 Article 13b paragraph 3of the Codification Directive.
15 Article 13b paragraph 4of the Codification Directive.
16 Article 13d paragraph 1of the Codification Directive.

rules on becoming a member of the management body or the supervisory body of a company, including of the rules on disqualification of directors, and on the authorities or bodies responsible for keeping information about disqualified directors and c) an outline of the powers and responsibilities of the management body and the supervisory body of a company, including the authority to represent a company in dealings with third parties.[17]

Member States shall ensure that the online formation of companies may be carried out by applicants fully online without their physical presence before any national authority or person competent for the online formation of companies, including drawing up the instrument of constitution of a company (end-to-end formation).[18] Such online procedure is mandatory for LLCs.[19]

Member States must lay down detailed rules for the online formation of companies, including rules on the use of templates, and on the documents and information required for the formation of a company. They must enable that these documents and information may be submitted in electronic form, including electronic copies of the documents and information provided by registers.[20]

Member States shall not make the online formation of a company conditional on obtaining a licence or authorisation before the company is registered, unless such a condition is required for the proper oversight laid down in national law of certain activities (e.g. providers of financial services).[21]

Member States must ensure that where the payment of share capital is required as part of the procedure to form a company, such payment can be made online to a bank account of a bank operating in the EU. In addition, they shall ensure that proof of such payments can also be provided online.[22] Online formation of company is possible with payment of cash contributions and contributions in kind in the share capital of a company according to the Directive.

Member States must ensure that the online formation is completed within five working days where a company is formed exclusively by natural persons who use the templates, or within ten working days in other cases. Where it is not possible to complete the procedure within the aforementioned deadlines, the applicant must be notified of the reasons for the delay.[23]

Any national authority or person competent for the online formation of a

17 Article 13f of the Codification Directive.
18 Member States may decide not to provide for online formation procedures for certain types of companies.
19 Article 13g Paragraph 1 of the Codification Directive.
20 Article 13g paragraph 2-4 of the Codification Directive. The Directive sets mandatory and optional content of these rules.
21 Article 13g paragraph 5 of the Codification Directive.
22 Article 13g paragraph 6 of the Codification Directive.
23 Article 13g paragraph 7 of the Codification Directive. These deadlines are counted from the date of the completion of all formalities required for the online formation and payment of a registration fee and capital contributions, as provided for under national law.

company may request the physical presence of the applicant in ensuring compliance with the rules on legal capacity and on the authority of applicants to represent a company. Member States must ensure that, in such cases, the physical presence of an applicant may only be required on a case-by-case basis where there are reasons to suspect non-compliance with aforementioned rules. Any other steps of the procedure can nonetheless be completed online.[24]

Member States shall make templates available on registration portals or websites that are accessible by means of the Single Digital Gateway for the formation of LLCs.[25] They shall ensure that those templates may be used by applicants as part of the online formation procedure of companies. The templates should be available at least in one official EU language broadly understood by the largest possible number of cross-border users.[26]

Member States must ensure that they have rules on disqualification of directors. Member State may take into account any disqualification that is in force or information relevant for disqualification, in another Member State.[27] Member States may require that persons applying to become directors declare whether they are aware of any circumstances which could lead to a disqualification in the Member State concerned. They may refuse the appointment of a person as a director of a company where that person is currently disqualified from acting as a director in another Member State.[28] Member States shall ensure that they are able to reply to a request from another Member State for information relevant for the disqualification of directors under the law of the Member State replying to the request.[29] They should establish databases on disqualified directors for this purpose.

Member States must enact the laws, regulations and administrative provisions necessary to comply with the Digitalization Directive by 1 August 2021. Member States which encounter particular difficulties in transposing this Directive may require extension of the deadline for one year. They must provide objective reasons for that and notify the Commission of their intention

24 Article 13g paragraph 8 of the Codification Directive.
25 Member States may also make templates available online for the formation of other types of companies.
26 Article 13h of the Codification Directive.
27 Article 13i paragraph 1 of the Codification Directive.
28 Article 13j paragraph 2of the Codification Directive.
29 Article 13i paragraph 3 of the Codification Directive. In order to reply to a request, Member States shall at least make the necessary arrangements to ensure that they are able to provide without delay information on whether a given person is disqualified or is recorded in any of their registers that contain information relevant for disqualification of directors, by means of the Business Registers Interconnection System (BRIS) (Article 13i paragraph 4 of the Codification Directive). They may also exchange further information, such as on the period and grounds of disqualification. Such exchange shall be governed by national law. The personal data of persons applying to become directors shall be processed in accordance with General Data Protection Regulation (GDPR) and national law (Article 13i paragraph 7 of the Codification Directive).

to avail the extension by 1 February 2021.[30]

4. Online formation of LLC in Croatian Law

After the amendments to the Companies Act from 2019, LLC in Croatia can be established in three ways: in person, by information system START and by use of services of HITRO.HR offices. It has to be emphasised that only LLC and simple LLC[31] with share capital entirely paid in cash can be established by START system and through HITRO.HR offices.

The LLC formation procedure may be carried out by use of services of HITRO.HR offices that operate in FINA branches. However, these offices only mediate between the founders of the company and the Court Register, and the founders must take certain actions in person in front of a notary (Jakupak and Bregeš, 2020: 212).[32]

Amendments to the Companies Act from 2019 introduced the possibility of establishing LLC and simple LLC without a proxy and a notary (online formation).[33] The introduction of a new way of formation of these two types of companies eliminated the need to take actions of the founder in front of a notary. These companies can be established through the Court Register website or the Court Register website within the START system by using an authentication system that guarantees significant or high security regarding

30 Article 2 of the Digitalization Directive.

31 In response to regulatory competition between Member States in 2012, a simple LLC was introduced into Croatian Company Law. The simple LLC can only be formed under a simplified procedure if it has less than five shareholders and one director. The introduction of a simple LLC has significantly reduced formation costs. Minimum amount of share capital is only 10,00 HRK (ca. 1.32 EUR) and the nominal value of each share must not be lower than 1,00 HRK (ca. 0.14 EUR). Capital contributions must be cash only and paid in full prior to filing the application to register the company. Contributions in kind are not allowed pursuant to Art. 390a of the CA. (Jurić, 2020: 390-400; Barbić, 2010: 7; Jurić, Braut Filipović, 2020: 70-71; Jakšić, Petrović, 2016: 1111-1112). According to the official statistics in March 2021 LLCs were markedly predominant in the structure of trade companies by legal organizational forms, with a share of 72.7% of registered and 72.9% of active ones. Simple LLCs held the second place by their number, with a share of 26.0% of registered and 25.9% of active companies. Other legal forms of companies constituted the remaining share of 1.4% (Croatian Bureau of Statistics, May 2021).

32 Rules on the method of entry in the Court Register, Official Gazette, No 22/2012. The documents must be signed and certified by a notary who files an electronic application through e-Company service (if a notary uses one). After that, all necessary documents can be submitted to HITRO.HR office through e-Company service or can be brought personally. In the case of a LLC establishment through HITRO.HR office all founders and other persons whose signatures are to be verified must be present.

33 In order to establish a company without a proxy and a notary, the provisions of the Court Register Act have also been amended by adding Articles 52.a to 52.f. Furthermore, Rules on taking actions in the procedure of establishing companies without proxies was adopted and entered into force on 13 July 2019.

the identity of the person accessing the system.[34] START is an information system providing services as a one-stop-shop. The founders access the START system in person with authentication certificates (eID card or FinaCertRDC certificate).[35] It has to be emphasised that it is not important whether someone will help them professionally. This lack of professional assistance stands out as one of the shortcomings of the new regulatory regime.

In the process of online formation of LLC by using the START system, one of templates of the articles of association or the statement of incorporation in electronic form is used, which are attached to the Companies Act. Therefore, if the company is founded by more than one person it will be established by accepting the completed template of articles of association, and if the company is founded by one person the company is established by accepting the completed template of the statement of incorporation. These templates list only a few data that must be filled in and options among which the founder or founders can choose solutions only in certain matters. Opting for one solution excludes the possibility of choosing another. This prevents misunderstandings and contradictions. Also, attachments to the application for entry in the court register (documents or its copies) should also be attached in electronic form.[36] Furthermore, the articles of association and the statement of incorporation does not have to be concluded in a notarial form (Jurić, 2020: 405). According to the Article 397.c paragraph 3 of the Companies Act the articles of association are concluded when the Court Register system records that all founders have confirmed its acceptance, and the day of conclusion is considered to be the day when the last confirmation of acceptance was recorded.[37] It follows that when establishing a company by the START system, the autonomy of the founders for regulating their internal relations in the company is practically excluded (Barbić, 2019: 50). If they want to regulate the internal relations by deviating from legal solutions when possible, or to include formal elements in the articles of association, they will have to establish the LLC by concluding the articles of association with the participation of a notary.

The founders of the LLC can only be those persons who have a valid credential

34 Authentication certificates of the fourth level of the National Identification and Authentication System (Article 52.a of the Court Register Act, Article 3 of the Rules on taking actions in the procedure of establishing companies without proxies)

35 Companies Act prescribes criminal liability of persons who unauthorized access or take actions in the Court Register system in accordance with the Criminal Code.

36 For giving incomplete or untrue information or documents in the procedure of online formation of a company the founder is liable for criminal offence of giving a false statement in the court procedure in accordance with the Criminal Code (Article 397.b paragraph 3 of the Companies Act).

37 The CA prescribes the presumption that the founder who confirmed the completed template of the articles of association agrees with its content, that the articles of association was composed in accordance with his right will and that he understands the meaning and consequences of its acceptance (Article 397.c paragraph 4 of the Companies Act).

which can be used to access the Court Register system, if they confirm that the data with which they applied to the system are accurate and complete, or that they have not been subsequently changed (Article 397.d paragraph 1 of the Companies Act). The name of the company in the articles of association is entered by one of the founders, and accepted by other founders. Also, the indication of the company's business activities may not exceed twenty words (Article 397.d paragraph 2 of the Companies Act). According to the regulatory regime in force, in a company established by the START system, it is not possible to provide a procurator in the prescribed form of the articles of association or the statement of incorporation. Furthermore, it is not possible to have branches in a company established in such way.

According to the Article 397.e paragraph 1 and 2 of the Companies Act contributions for shares can be paid only in cash and are paid on escrow account of the State Budget. Each founder can take only one share. When establishing a simple LLC, the contributions for shares must be paid in cash only and paid in full prior the company is entered into the Court Register. If establishing LLC with share capital paid only in cash, contributions for shares shall be paid in the amount of at least one quarter of the cash contributions (5.000,00 HRK) before the entry of the company in the court register, while the rest (up to 20.000,00 HRK) needs to be paid in full within a year after the company has been registered. The contributions must be paid in a way that the company can freely dispose of it. The founder who has not paid the contribution for a share shall be jointly and severally liable with all other founders who have not paid the contributions for the company's obligations up to the amount of unpaid share capital (Article 390 paragraph 2 of the Companies Act).

The law prescribes the content of the application for the online registration of the establishment of the LLC.[38] As pointed out above, it is submitted exclusively in electronic form via the Court Register's website, and the prescribed documents or its copies are attached to it in the same form.[39] These data and attachments are generated in the Court Register system (Jurić, Braut Filipović, 2020: 83). The application for registration of the company must be confirmed by all founders and directors (Article 397.e paragraph 6 of the Companies Act). It is confirmed when the Court Register system records that the said persons have confirmed the application for registration of the company, and the day of confirmation is the day when the last confirmation of acceptance was recorded (Article 397.e paragraph 7 of the Companies Act) (Jurić, 2020: 407). If the application is complete, the court will issue a decision and enter the company in the Court Register within five working days.

There are different views in Croatian legal doctrine regarding the possibility of establishing LLC and simple LLC without a proxy and a notary. Proponents of disapproval of the adoption of this new regulatory regime point out that "the establishment of a company without a proxy does not gain anything significant at the promptness of the establishment" (Barbić, 2019: 48). The

38 Article 397.e paragraph 3 of the Companies Act.
39 Article 397.e paragraph 4 of the Companies Act.

issues of the possibility of illegal use of personal data, possible identity abuse and money laundering are further emphasized (Jurić, Braut Filipović, 2020: 83). Regarding the question of whether it is money laundering issue, it should be noted that now there will be no verifies that must be performed by notaries who in case of doubt must notify the competent authority, so it is possible to circumvent the purpose of the regulation (Barbić, 2019: 49). It is pointed out that it would be beneficial for the founders to use professional assistance in case of such establishment. It even goes so far as to point out that the application of such model of the LLC founding could lead to the emergence of financial terrorism and thus endanger national security (Grbac and Grbac, 2017: 19-31). Therefore, the provisions on verifying the identity of the company's founders are particularly important (Petrović et al., 2015: 18-27).

It is further argued that due to mandatory use of templates, the autonomy of the founders is practically reduced to filling out the electronic form in which the mandatory elements of the articles of association or statements of incorporation are material nature, while formal elements are excluded. It is possible to subsequently include a formal element in the articles of association and to deviate from dispositive legal solutions only with the participation of a notary (Ivkošić, 2020: 574). If the business venture is to be adjusted to needs of founders by adopting into the articles of association certain material elements that specifically regulate the internal relations in a company, the online formation of a company is excluded. The reason is complete standardization and duty to use only predefined templates and attachments. Thus, modification of any provision of the articles of association is possible only with the participation of a notary (Ivkošić, 2020: 575).

On the other hand, authors who advocate this way of LLCs formation point out its advantages. It is emphasized that such formation of a company simplifies the procedure, shortens its duration and significantly reduces formation costs (Jakšić and Petrović, 2016: 1112-1114). All necessary operations for formation of a company are taken at one place. There are no more costs for services of notaries and proxies, neither fee payments nor use of seals. The court fee is 50% lower if it is paid electronically. There is no separate fee for using of the START system and no fees to the banks or institutions for different approvals that are required for other ways of LLCs formation. The company may start its business activities within a few days. The founders may be dislocated and everyone may fill out templates from their own address and city (Jakupak and Bregeš, 2020: 213-214).

In 2020, 866 companies were established through the EOS/START system, 7270 companies were established through the HITRO.HR offices and 4116 companies were founded in person. However, it should be noted that a START portal is available so far only for Croatian citizens. Therefore, all other persons (EU/EEA citizens and third country citizens) need to register a LLC via HITRO.HR offices or with assistance of a notary. Furthermore, before LLC registration through the HITRO.HR office or directly to the commercial court, notary authentication of the registration application is still required. Croatian citizens need to possess an eID card and must activate personal user box within the e-Citizens system for use of the START portal.

5. Conclusions

National provisions of Member States of the EU have different approaches on starting up of business activities and cross-border expanding of existing business activities of the LLCs. The LLCs formation may be costly and time consuming for national and foreign entrepreneurs. Member States reformed their national provisions to reduce these costs and simplify LLCs formation procedures by introduction of the online registrations and by decrease of minimum capital requirements for LLCs. There are still significant differences between national provisions on this subject. Online formation of LLCs became even more important due to COVID-19 pandemic and imposed restrictions on movement of persons. Digitalization Directive from 2019 introduces wide application of digital tools and processes in formation of companies, registration of branches, filing of documents and information by companies and branches and disclosure in the register and access to disclosed information. Its goal is to harmonize existing national provisions of Member States on these topics.

According to Digitalization Directive, Member States must introduce online formation of LLCs without physical presence of applicants before any national authority or person competent for the formation of companies. Physical presence of applicants may be requested only for prevention of identity falsification or in ensuring compliance with the rules on legal capacity and on the authority of applicants to represent a company. Such exceptions may be used only on case-by-case basis and that any other steps of the procedure can be completed online. National registration portals or websites for online formation of LLCs must be available to applicants who are EU citizens with use of electronic identification means issued by their own Member State and recognised for the purpose of cross-border authentication. The Directive standardises the content of the national registration portals or websites for online formation of companies (publication of prescribed information, templates and rules for online formation which are provided free of charge and translated in a language broadly understood by cross-border users to assist in the formation of LLCs). Documents and information required for the formation of a company may be submitted in electronic form. Where the payment of share capital is required as part of the procedure to form a company, such payment can be made online to a bank account of a bank operating in the EU. Proof of such payments can also be provided online. Online formation must be completed within five working days where a company is formed by natural persons who use the templates, or within ten working days in other cases. Member States must ensure that they have rules on disqualification of directors. Member State may take into account any disqualification that is in force or information relevant for disqualification, in another Member State. Member States must cooperate in sharing of information on disqualification of directors and establish databases on disqualified directors for this purpose.

In Croatia online formation of LLCs is introduced in April 2019. Such registration is limited to formation of LLCs and simple LLCs with share capital entirely paid in cash through national registration portal START. START is an information system which provides services for starting up of business

activities as a one-stop-shop. It is available for applicants who use Croatian eID cards or FinaCertRDC certificates on QSCD crypto devices. They must activate their personal user box within the e-Citizens system. START system cannot be used by persons who use electronic identification means issued by other Member States or third countries. Through START system applicants submit the application for registration of a LLC and prescribed documents, draw up the instrument of constitution of a LLC by use of templates, pay fees and cash contributions in the share capital of a LLC and communicate with the Court Register. Use of START portal lowers formation costs and shortens time for registration of a LLC on five days. In 2020 there were 866 LLCs formed through START portal which constitutes 7 % of all LLCs formations in that year.

Croatian Parliament must harmonize existing national provisions on the online formation of a LCC with provisions of the Directive. For that purpose Croatian Government prepared a proposal on amendments of the Companies Act and the Act on the Court Register in April 2021. According to the proposal following amendments will be introduced: a) translation of templates of the instrument of constitution of a LLC in English language, b) physical presence of applicants in front of notaries for prevention of identity falsification or in ensuring compliance with the rules on legal capacity and on the authority of applicants to represent a company on request of the Court Register, c) introduction of the online formation of a LLC with participation of notaries, d) establishment of the database on disqualified directors and e) Court Register takes into account any disqualification that is in force or information relevant for disqualification, in another Member State (BRIS system will be used for sharing of such information).

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CHAPTER 5

The emergence of smart touristic destinations and further development in the post-covid period

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ABSTRACT

The Covid 19 pandemic has hit the tourism industry hard. The consequences are visible in both the social and economic spheres. The tourism industry needs to realign all existing practices and implement more sustainable tourism practices in the post-pandemic period, but technology will also play an important role. To determine the importance and impact of modern technological solutions on the development of smart tourist destinations in the post-pandemic era, the authors used the Leximancer 5.0 tool to analyse 32 scientific articles and prepare examples of good implementation of augmented reality apps. The pandemic brought new technological solutions in tourism hospitality such as robotics and artistic intelligence and accelerated implementation in Big Data analytics tools, the Internet of Things, cloud computing, virtual and augmented reality, and mobile data applications. In summary, the pandemic stimulated both the growth of human interactions with technology and the promotion of reflection on the very complexity of interactions. In tourism emerged the paradigm of attentive tourists who could self-reflectively interact with technology to get the technology touristic experience.

Key words: *Automated Content analysis, artificial intelligence, decision making, smart touristic destinations*

JEL classification: *C88, D83, O14, O18, Z32*

1. Introduction

Technological development is considered one of the factors that have the greatest influence on changes in tourism. Just as the entire tourism industry and its infrastructure underwent a digital transformation in the Fourth Industrial Revolution, so did tourist destinations, which are transformed into Smart Tourist Destinations (STD) as a result. However, it is important to recognise that the main drivers of digital transformation are not the new technologies per se, but their interconnectivity, coherence and sharing, as technologies influence changes in marketing strategies (from advertising to the way people buy, consume or aware) and the attitude of tourists as product or service users and one of the STD stakeholders. It is important that guests accept smart technologies and that destination management also includes smart tourism destination components (the same as smart cities), such are smart business ecosystem and smart experience (Ivars-Baidal et al., 2019). The implementation of Internet of Things (IoT), cloud computing, Near Field Communication (NFC), Radio Frequency Identification (RFID), artificial intelligence, robots, and data-driven mobile applications present as key factors for establishing the STD as they are based on technological innovations and Big Data help to analyse the enormous data from different sources.

As the STD is a relatively new concept and plays an important role in further developing the tourism industry, especially in the Covid-19 period and in the post-Covid-19 period, globally are outgoing productions of the academic publications and practical cases. To better understand the data-driven mobile solutions, the authors discuss some concrete examples that can also serve as managerial implications. Solutions allow tourists to get a better experience about the destination and reduce the needs for organised tours. The solution goal is to provide a traveller with a more safe and personal experience of tourist attractions and events in the post-Covid 19 periods.

Thus, the paper is important for researchers, students, and project managers of smart destination development, experts and decision-makers from city governments.

In addition to an automated content analysis (ACA) focusing on STD, this study presents a future research agenda. According to STD theory, this study's research question is: *what are the main drivers of smart tourism destinations development in post-Covid-19?*

The research is based on a data collection approach based on three steps of preparing the research and analysing the scientific articles published in the Web of Science. The 32 articles identified related to STD were submitted to ACA.

The article consists of the following parts: After the introduction, the second section includes the literature review, and the third section describes the research methods. In the fourth section are presented the results. The fifth section includes a discussion about post-Covid-19 technological solutions in STD. The last section is the conclusion, which presents the main features and limitations of the research.

2. Literature review

With the transition to Fourth Industrial Revolution (2011-), the buzzword "Smart Tourism" (ST) emerged. The term "smart" underlines the digital transformation of the processes in the tourism industry and is not to be understood as e-tourism. It is a process of digitalisation and informatisation of the entire tourism industry and its infrastructure. The vital role can be seen in sustainable tourism development, improving the tourist experience and interaction, and enabling the collection and preservation of locals' well-being in tourist destinations currently transforming into STD. The phrase STD does not mean only locationally separated touristic places closed for the locals but also urban centres (e.g. smart cities) and the rural environment (e.g. smart villages). According to the different authors (Corrêa and Gosling, 2020; de Costa et al., 2018; Pencarelli, 2020), the meaning of STD can be presented as an innovative strategical investment of a tourist destination in a high-tech infrastructure that enables the digital transformation of the destination. The goal of digital transformation is to (i) enable different digital interconnection solutions for communication between the STD stakeholders, too (ii) capture and analyse data from the STD ecosystem and transform it into valuable information for stakeholders and to increase the quality and security (special health security in post-Covid-19) of destination experience with emerging of the data-driven solutions, robots and artificial solutions. The digital transformation has an important impact on increasing quests well-being. The process is based on the introduction of technological solutions within which data is collected from the physical or real-world (via apps, cameras, IoT, sensor) and transferred to cyberspace, where the data is stored and processed and prepared in the form of final information, which is available to users in a physical environment (Oaks et al., 2017). Cyberspace is a digital space where data is collected, analysed and transformed into information based on which solutions are provided to various stakeholders of SDT. It is going for virtual space based on the cyber-physical infrastructure (Roblek and Meško, 2020). The cyber-physical infrastructure has incorporated Big Data analytics, an important role in collecting and analysing information about Covid 19 transmission and thus enabling, based on the information received, the adoption of measures to spread the virus (Gupta et al., 2021). We can conclude that it is for the SDT decision-makers important to understand that cyberspace has more than just the task of enabling the exchange of vast amounts of data.

Nevertheless, within the connections between the computer networks that make it up, it allows for analysing problems and modelling practical, real-world solutions. In doing so, it must use a structure that reflects the actual state of the real physical world (Deguchi et al., 2020). The preparations for a »new era« of post-covid-19 tourism requests from the SDT to implement virtualisation and augmented reality solutions (Graziano and Privitera, 2020) and the emergence of artificial intelligence (AI) and robotic solutions. When including robots, it is necessary to pay attention to tourists' attitudes towards interacting with robots. Research in the Covid-19 period shows that hotel guests had a much greater understanding of interaction with robots. However,

research conducted before the pandemic showed a reluctance on guests to interact with robots. The study‘s authors conclude that the pandemic caused a change in people’s thinking about their perceptions of interacting with robots (Kim et al., 2021).

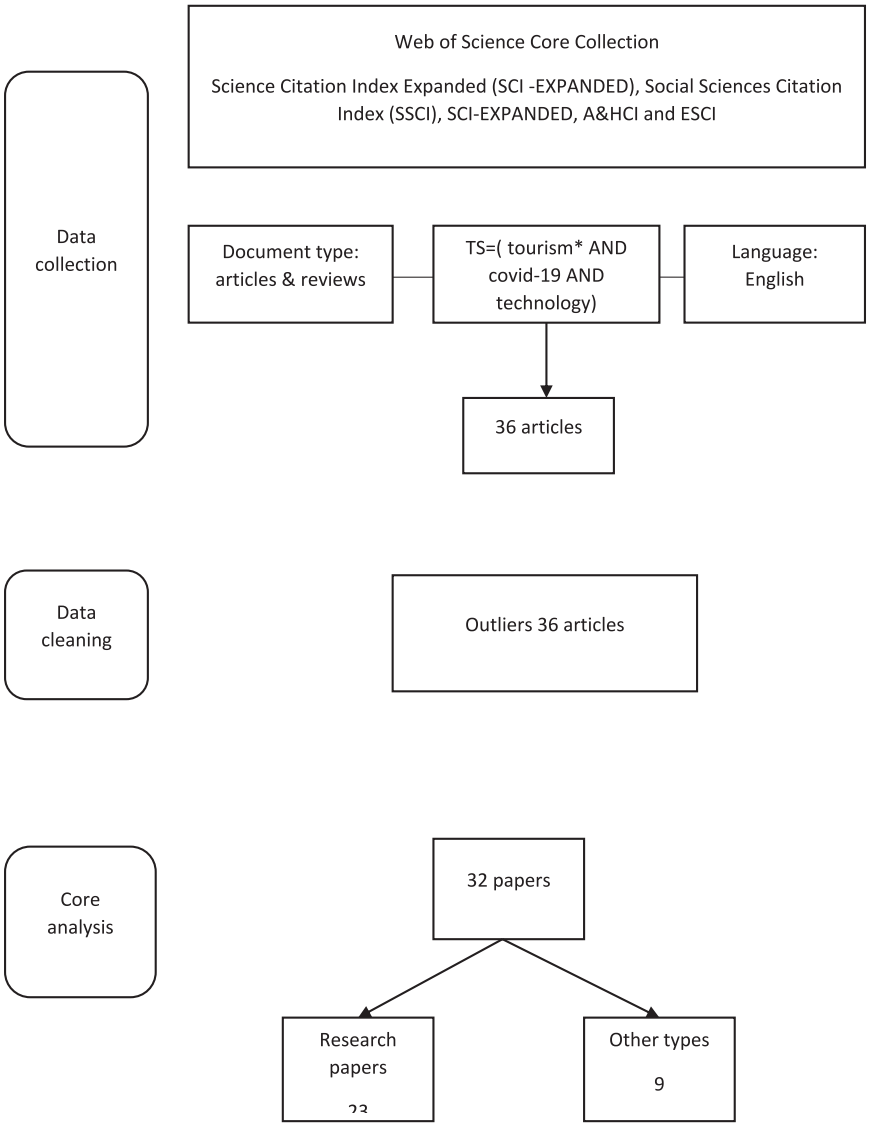
3. Methodology

3.1.Data collection

The study uses a mixed methodology that includes an automated content analysis. The literature selection was prepared in the three-step screening process (Alkier et al., 2021). presented in Table 1. The first phases include the data collection process. The search for articles was done in the Web of Science database. The Boolean keyword combination was used to search for the relevant papers (TS = (tourism* AND covid-19 AND technology)AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article, Review)Indexes = SCI-EXPANDED, SSCI, A&HCI and ESCI). It was no temporal restrictions. The search results were limited to the research and review articles published in the refereed journals only. The peer review was limited to scientific journals written in English and was therefore not intended to provide a comprehensive assessment of the state’s totality.

In the second phase (data cleaning), only the papers important for the research field include its topics. The second phase includes manual review and selection of peer review papers based on their titles, abstracts, and conclusions. In the third phase (core analyses), the 33 papers were exported from the publishing firms digital libraries. The search was performed on 1. May 2021.

Figure 1: The three steps study protocol



Source: Author's research

Table 1: Research papers used for ACA

Authors	Title	Document type	Journal/publishing year
Allam Z. & Jones S. D.	Future (post-Covid) digital, smart and sustainable cities in the wake of 6G: Digital twins, immersive realities and new urban economies	Research paper	Land Use Policy
Alzola-Melian L., Monroy-Fernandez M., & Penate-Hidalgo M.	Hotels in context of uncertainty: Measuring organisational resilience	Research paper	Tourism Management Perspectives, 2020
Azis N. et al.	How smart tourism technologies affect tourist destination loyalty	Research paper	Journal of Hospitality and Tourism Technology, 2020
Barna, M. & Semak, B.	Main trends of marketing innovations development of international tour operating	Research paper	Baltic Journal of Economic Studies, 2020
Bilsland C., Nagy H., & Smith P.	Virtual internships and work-integrated learning in hospitality and tourism in a post-Covid-19 world	Research paper	International Journal of Work-Integrated Learning, 2020
El-Said O. & Aziz H.	Virtual tours a means to an end: An analysis of virtual tours role in tourism recovery post Covid-19	Research paper	Journal of Travel Research, 2021
Fennell A.D.	Technology and the sustainable tourist in the new age of disruption	Research paper	Journal of Sustainable Tourism
Frey S.B. & Briviba A.	A policy proposal to deal with excessive cultural tourism	Research paper	European Planning Studies, 2021
Gretzel, U. et al.	e-Tourism beyond Covid 19 a call for transformative research	Viewpoints	Information Technology & Tourism, 2020
Graziano T.	Smart technologies, back to the village rhetoric and tactical urbanism: Post Covid planning scenarios in Italy	Research paper	International Journal of E-Planning Research

Grundner L. & Neuhofer B.	The bright and dark sides of artificial intelligence: A future perspectives on tourist destination experiences	Research paper	Journal of Destination Marketing & Management, 2021
Ilkanizadedeh S. et al.	The potential use of drones for tourism in crises: A facility location analysis perspective	Research paper	Journal of Risk and Financial Management
Ivanov Hristov, S., Webster C., & Stoilova E.	Biosecurity, crisis, management, automation technologies and economic performance of travel, tourism and hospitality companies- A conceptual framework	Conceptual paper	Tourism Economics, 2020
Kim S. et al.	Preference for robot service or human service in hotels? Impacts of the Covid-19 pandemic	Research paper	International Journal of Hospitality Management, 2021
Kunzmann R.K.	Smart cities after Covid-19: Ten narratives	Research paper	disp – The Planning Review, 2020
Kwok J.O.A. & Koh M.G.S.	Covid-19 and extended reality (XR)	Research letter	Current Issues in Tourism, 2020
Lee Jun-W. & Kim Hee Y.	Does VR tourism enhance user's experience?	Research paper	Sustainability, 2021
Lee P., Hunter Cannon W., & Chung, N.	Smart tourism city: Developments and transformations	Concept paper	Sustainability, 2020
Mohanty P., Hassan A., & Ekis, E.	Augmented reality for relaunching tourism post-Covid 19: socially distant, virtually connected	Literature review	Worldwide Hospitality and Tourism Themes, 2020
Prokopis C., Simillidou A., & Stylianou M.C.	Tourist's perceptions regarding the use of anthropomorphic robots in tourism and hospitality	Research paper	International Journal of Contemporary Hospitality Management, 2020
Önder I. & Gunter, U.	Blockchain: Is the future for the tourism and hospitality industry?	Commentary paper	Tourism Economics, 2020

Radojević B., Lazić L., & Cimbaljević M.	Rescaling smart destinations – the growing importance of smart geospatial services during and after Covid-19 pandemic	Research paper	Geographica Pannonica, 2020
Reis et al.	Service robots in the hospitality industry: The case of Henn-na hotel, Japan	Research paper	Technology in Society, 2020
Seyitoglu F. & Ivanov, S.	A conceptual framework of the service delivery system design for hospitality firms in the (post-) viral word: The role of service robots	Research paper	International Journal of Hospitality Management, 2020
Seyitoglu, F. & Ivanov, S.	Service robots as a tool for physical distancing in tourism	Research note	Current Issues in Tourism, 2020
Sharma Deep G., Thomas A., & Paul J.	Reviving tourism industry post-Covid-19: A resilience-based framework	Research paper	Tourism Management Perspectives, 2021
Shin H. & Kang, J.	Reducing perceived health risk to attract hotel customers in the COVID-19 pandemic era: Focused on technology innovation for social distancing and cleanliness	Research paper	International Journal of Hospitality Management, 2020
Stankov U., Filmonau V., & Vujičić M,	A mindful shift: an opportunity for mindfulness-driven tourism in a post-pandemic world	Article's commentaries	Tourism Geographies, 2020
Stankov U. & Gretzel U.	Digital well-being in the tourism domain: mapping new roles and responsibilities	Viewpoints	Information Technology & Tourism, 2021
van Tatenhove M.P.J.	Covid-19 and European maritime futures: different pathways to deal with the pandemic	Research paper	Maritime Studies, 2021

Van Thanh Thi N. et al.	The role of human-machine interactive devices for post-COVID-19 innovative sustainable tourism in Ho Chi Minh City, Vietnam	Research paper	Sustainability
Qumariyah N.N. et al.	Sonia: An integrated Indonesia online tourism system in new normal era	Research paper	International Journal of Innovative Computing, Information and Control, 2020

3.2. Data analysis

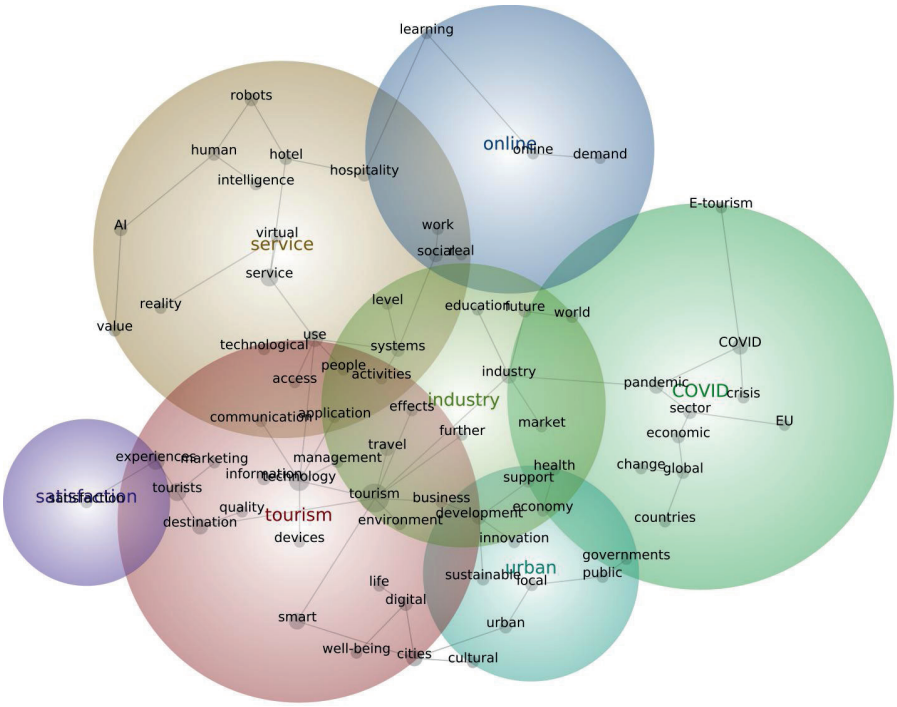
In the case of ACA, it is going for a definitive study where we want to define, analyse and present the textual consistency of patterns, clusters and the meanings of qualitative data using a text-mining tool such as Leximancer. It is an application of a mixed-method that we use to analyse qualitative data. The program uses statistical algorithms to define and describe textual concepts or themes (McNamara and Duffy-Deno, 2019). The use of Leximancer software, unlike programs such as NVivo, reduces the researcher‘s bias as it does not require manual data coding. Leximancer is considered a more objective tool in studying a large amount of qualitative data, mainly because it is studied by the program rather than the researcher. Indeed, Leximancer allows the automatic generation of results, which it classifies into a theme and a concept map (Leximancer, 2020). Thus, the epistemological influence of a researcher that could cloud the analysis is minimal (Wilk et al., 2018).

Table 2 presents the themes and concepts obtained with the ACA of papers listed in table 1. Figure 2 presents the concept map for selected, analysed papers in Table 2.

Table 2: Themes and concepts

Theme	Concepts	Hit
tourism	tourism, technology, tourists, experiences, smart, cities, destination, digital, information, management, quality, life, environment, well-being, communication, marketing, devices, application	2773
service	service, use, social, hospitality, robots, AI, human, hotel, technological, virtual, value, intelligence, work, reality, level, access	1821
industry	industry, development, travel, future, systems, world, support, people, business, activities, market, effects, further, education	1589
COVID	COVID, pandemic, sector, economic, global, crisis, change, E-tourism, countries, EU	1124
urban	urban, sustainable, local, public, innovation, economy, health, cultural, governments	800
online	online, demand, learning, real	339
satisfaction	satisfaction	107

Figure 2: Concept map for selected papers in table 1



Source: Author's work

4. Results and discussion

According to the Leximancer analysis of research on the thematic emergence of smart tourist destinations and their further development in the post-Covid period emerged the seven themes: Tourism, Service, Industry, Covid, Urban, Online and Satisfaction (see table 1). The discussion includes the main presentation of themes and includes authors' solutions to using augmented reality apps in STD.

In the case of tourism (Topics: Covid and Tourism), the global SARS-CoV-2 pandemic triggered by Covid-19 brought mass tourism to an almost immediate halt. Data from the World Tourism Organization show that world tourism experienced the worst records in 2020. Thus, international arrivals fell by 74% due to restrictions on movement and declining demand. Globally, all destinations recorded as much as a billion fewer arrivals last year than in 2019. This figure is comparable to the 4% drop caused by the global economic crisis in 2009. The halt in international travel resulted in an estimated loss of $1.3 trillion in export revenue - more than 11 times the loss caused during the global economic crisis in 2009. The Covid crisis threatened between $100

million and $120 million in direct tourism jobs, many of them in small and medium-sized enterprises (UNWTO, 2021).

The Covid-19 left social and economic consequences on the tourism industry, and the tourism industry has now to consider reorienting current unsustainable business practices based on global mass tourism (Sharma et al., 2021). The revitalisation of the tourism industry requires tourists to change their behaviour toward their expectations regarding destination experiences and offer. Tourists must become more discerning consumers, aware of the real seriousness of the consequences of the Covid-19 pandemic and possibly other future pandemics, socio-economic factors and environmental impacts (Kaushal and Srivastava, 2021). The practice of socio-cognitive mindfulness is coming to the fore, drawing attention to the importance of human existence and the search for solutions to deal with the problems of modern life based on experience (Pearce, 2020). In Western societies, mindfulness is already considered a major driving force in lifestyle change, which can be seen in increasingly conscious consumers and producers of products and service providers increasingly based on mindfulness (Sheth et al., 2011). Therefore, in tourism, the vision of Western businesses is expected to be one of vigilance, and tourism development policymakers (from state to local levels, both in the profit and non-profit sectors and in public administration) are expected to direct the further development of the tourism industry towards long-term sustainability and promote the creation of more compassionate urban and rural tourism (theme: urban) (Pearce, 2020). Managers in the tourism industry, as well as political leaders and CEOs of tourism destinations, must therefore redefine the vision of mindfulness tourism, provide organisational solutions and, due to the current decline in business in 2020 and 2021, focus on informing tourists about the innovative solutions needed to the reformulated concept of tourism services in the “new normal conditions”. Vigilance in tourism is recognisable for its positive impact on tourist well-being and transformative effects on the tourism experience (Stankov et al., 2020a; Wang et al., 2020), as well as its potential impact on a sustainable touristic industry plan and employee performance (Johnson and Park, 2020).

In the wake of the Covid-19 pandemic (Themes: Covid, Industry and Service), smart technologies are also increasing in the tourism industry. For example, hotels have begun implementing robots more quickly to reduce the social distance (Seyitoğlu and Ivanov, 2020a).

Based on previous research (Kim et al., 2021; Reis et al., 2020), in the case of service robots within high customer contact settings, due to their analytical and mechanical nature, they often already surpass humans in performing standardised work processes. However, in individual cases, service robots are not yet in the phase of desired technological maturity and cannot replace humans. Soon, it can be expected that robotic technology, with the help of AI, will replace the empathic intelligence of employees. Cristou et al. (2020) found in a study that tourists prefer anthropomorphic robots. The authors believe that the use of anthropomorphic robots in tourism can impact the overall improved experience. However, respondents in their survey also indicated frustration, sadness, and disappointment with robots in the tourism

industry. Seyitoğlu and Ivanov (2020b) prepared a conceptual framework for using service robots in the hospitality industry (post-)viral world. Authors have been identified three service delivery system designs: robotic, human-based, and mixed. The authors advise hospitality managers to research tourist expectations before implementing any of the models. Also, Reis et al. (2020) point out that a new challenge for organisations will be to decide whether it makes sense to replace humans with service robots completely or whether it is better to implement mixed methods with humans' anthropomorphic robots.

As we have already mentioned, Big data also plays an important role in tourism (Themes: Tourism, Industry and Service). For SDT is important to analyse data: i). People generate information in their communication, known as user-generated content (UGC). People are using different social media applications and social networking tools which are all encompassed by the UGC (Instagram, Facebook, TikTok, Twitter, Youtube), online reviews platforms (TripAdvisor), booking systems (Booking.com, Hotels.com), travel tickets reservation systems (Skyscanner), blogs, chat rooms, discussion boards, comments (travellers stories), collaborative maps (OpenStreetMap) and others (Lukyanenko et al., 2019); ii) data captured different data-driven mobile applications, IoT, cameras and different sensors in SDT environment. The using of analytical big data systems have a positive impact in the tourism industry on increase sales by attracting new customers and retaining existing ones by improving it, creating new product and services, customising the type, identifying current trends and reducing operating costs or generating prices in real-time (Côrte-Real et al., 2019). Big data also influence decreasing the risk of uncertain situations (Williams and Baláž, 2015) and improves tourism effectiveness (Pee and Kankanhalli, 2016). It is also important to note the role of Big Data in restoring the confidence of tourists, which has declined in 2020 and 2021 due to the outbreak of the Corona 19 virus, which also leaves psychological consequences on people, and in this case, the velocity has a vital role in restoring confidence as one of the characteristics of Big Data. It is predicted that in post-pandemic time, Big Data's role will also increase in analysing changes in tourists' behavior and preferences (Sheresheva, 2020).

The next technological solution in STD present data-driven mobile apps. For the tourism industry, as for other areas of human activity, the most important are the technological and application solutions that enable connections between people, reporting about the situation and replace physical interactions (Themes: Tourism and Service). When STD decides to implement such technological solutions, it is necessary to gain the trust of the end-users. It is also necessary to regulate it with legislation that prohibits unauthorised use of information or users control.

Technological solutions for tourists' awareness of a real event or place enable virtual and augmented services (topic: virtual, service) to represent an important transformative experience for tourists. The tourism industry is gradually becoming aware of this attention potential, and commercial applications emerge to take advantage of meta-perception in the tourist experience (Stankov et al., 2020b). We know two approaches: i.) virtuality, which takes place through online platforms and usually requires 3D glasses,

allowing virtual visits to natural and cultural sights of the destination, virtual walks through museums and galleries, or easy booking of a destination. 3D view, a “real walk” through the image, can more easily decide and choose an accommodation (bungalow, room, hotel) and immediately see what they get. There are no surprises, which means higher guest satisfaction and less bad mood, negative reviews and loss of money. A great advantage is to offer virtual tours for those who, for some reason, cannot get to the place but would like to see the resort (El-Said and Aziz, 2021). ii) the Second approach is augmented reality (AR) that is defined as an interactive experience of a real-world environment where the objects in the real world are enhanced by computer-generated perceptual information. This format is more convenient for travel service providers because it allows mobile augmented applications (Mohanty et al., 2020).

In practice case SDT can use mobile applications as it is shown in the Opatija case:

- historical 3D reconstruction,
- augmented reality-driven exploration,
- a gamification approach to sightseeing.

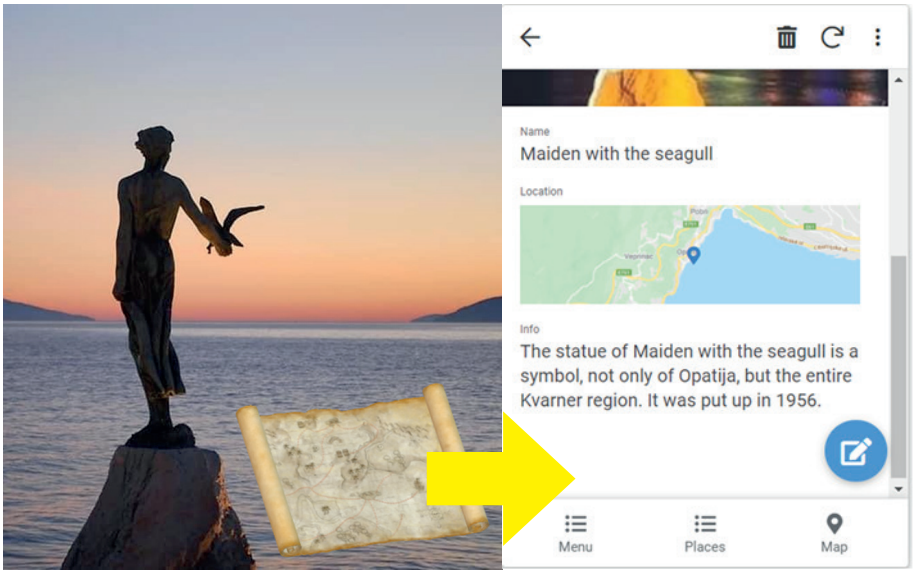
Historical 3D reconstruction is presented in Figure 2. It is going for the possibility of displaying a specific historical event in the form of animated 3D models (objects and characters) over camera image in real-time.

Figure 2: Augmented reality – historical 3D reconstruction



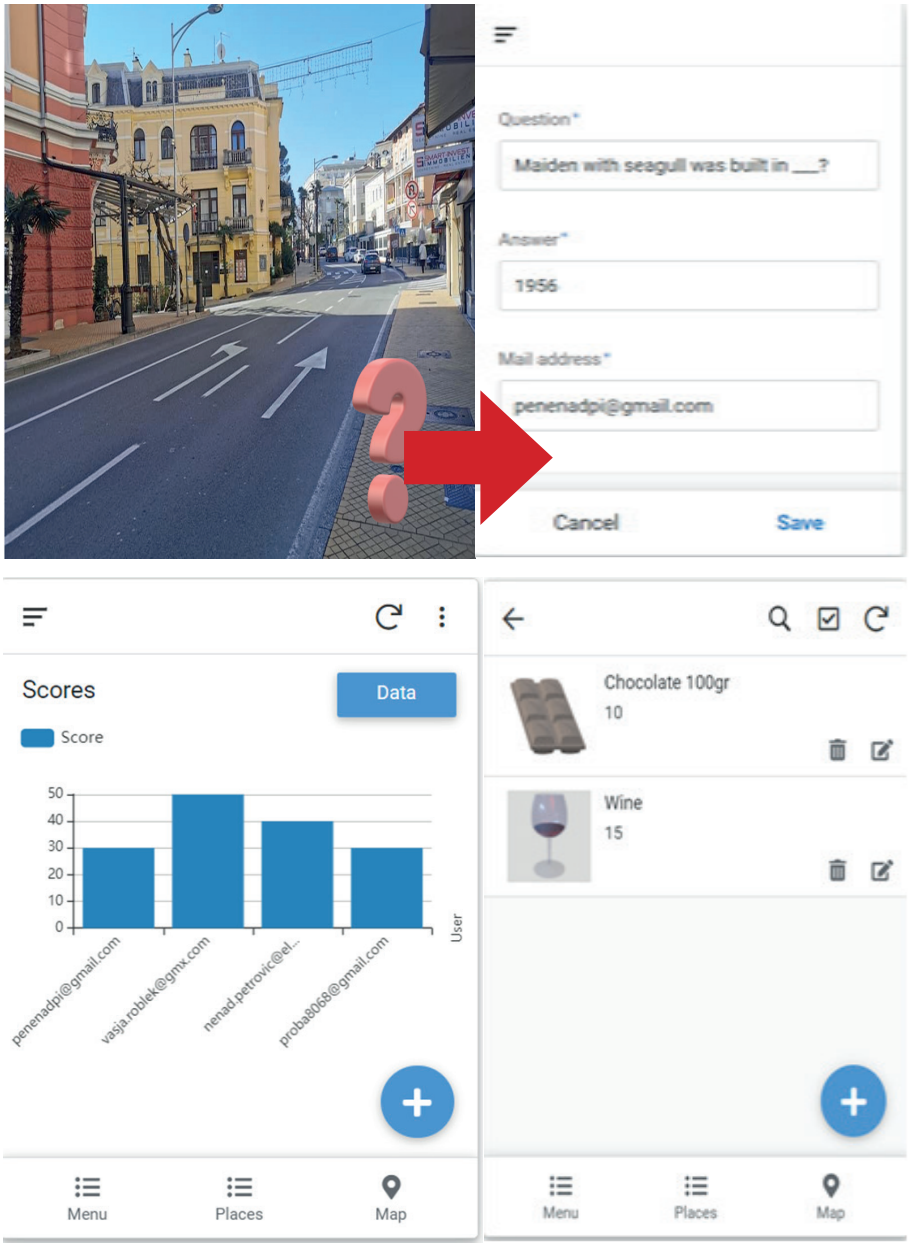
In Figure 3 is presented a case of the augmented reality-driven exploration. It is going for when the 3D object appears near famous locations, and function of the touching the object redirects to the info page.

Figure 3: Augmented reality-driven exploration



As shown in Figure 4, the gamification approach can put the questions at the photos of different destination locations. The right answers to the questions bring points. The application user receives a certain reward within the destination (e.g., a discount on a tourist service, a product specific to the destination, digital products, promotions). Digital coupons can be sent to an e-mail. The gamification apps aim is also to present the sponsors and supporters of the SDT.

Figure 4: Gamification



For the implementation of such applications, we adopted AppSheet, Google Apps Script and AR.js. The role of AppSheet is to render rich info pages (including images, graphs, maps) about tourist locations, starting from Google Sheets tables. Moreover, Google Apps Script gives the ability

to implement backend logic where necessary, such as score calculation and coupon generation in the gamification approach. Finally, AR.js is a lightweight web-based framework that enables high-performance location- and marker-based augmented reality in real-time, even on older devices. According to our previous results (Petrović et al. 2020; Petrović et al., 2021), this technology combination leads to much faster multiplatform AR-enabled mobile application development, even by domain experts (such as personnel working in tourism).

The post-covid period will be important for STD that smart mobile solutions will help decrease the risk of infection. Such technological solutions reduce the need for social contact, as the individual can access all the important resources about a particular sight by himself. Thus, the person does not need to be in a group with a tour guide, nor does he need to borrow a tablet or headphones on-site, as all information flows directly to his mobile phone (tablet) via the augmented reality app (Fennell, 2021).

When implementing virtual and augmented solutions, it is necessary to pay attention to tourists' knowledge about digital technologies. For example, Paulo et al. (2018) expose the need for a deeper understanding of adoption in the tourism industry the mobile augmented reality in a consumer context. We still do not have enough knowledge about tourists' behaviour using virtual or augmented solutions. However, understanding the concept of attentive tourist can help us the definition of Loureiro et al. (2020) that "attentive tourist is a person who focuses its attention on the present moment (not on the past or the future), dedicated to the actual somatic feelings lived in the destination openly, non-reactively and without judgment, rather than tourists accepting their current emotions and thoughts". Stankov et al. (2020a) prepared a new paradigm for creating a new categorisation of tourism typologies and will also enable new and post-covid-19 customised tourist profiles. The tourism industry's goal must thus become the provision of tourist services of mindfulness as a gesture for the benefit of tourists, which will be reflected in ensuring the well-being of guests and respect for guests' needs in the post-covid period. It is going for the main reversal offer of domestic and natural culinary, presentations of local cultural and natural sights, and a focus on green, health, and sustainable tourism (Sharma et al., 2021). Such a tourist offer is that the guest can stay in the destination outside the main season, whereby the destinations' offer also moves into continental areas (thematic: urban) (Graziano, 2021). The redefined offer, also supported by technological solutions, requires creating and adapting to a new and differently designed tourist etiquette and creating a space to improve guest loyalty (theme: Satisfaction) (Azis et al., 2020).

5. Conclusion

The article focuses on technological factors that will significantly impact the continued successful operation of STDs in the post-Covid era. For example, the development of technologies on STD increasingly focuses on technologically enhanced experiences and insists on using cutting-edge

technologies to increase competitiveness in the fourth industrial revolution. However, the everyday use of technology and different technologies during the journey lead to different problems. Kabat-Zinn (2018) thus emphasises that the human habit of needing to fill every moment with mental content persists during the journey, ultimately leaving travellers dissatisfied.

Covid-19 influenced changes in the marketing of travel services and also brought technological changes to the hospitality industry. For example, hotels began to invest more in robotics and artificial intelligence and were encouraged to implement and enhance existing virtual solutions. Visual and immersive technologies are becoming a part of the tourist offer, which is not intended to replace the trip but to allow guests to get more information about STD with the help of the apps before arrival and visit unique places upon arrival and be informed about them. Such apps aim to limit social contact as much as possible while providing all the information that a traveller would otherwise receive in a guided group or through information solutions within the offer on-site. It should be noted that the pandemic highlighted the complexity of human-technological interactions, confirming some recent calls for attentive tourists capable of more self-reflection when interacting with technology in the context of collecting tourist experiences (Stankov et al., 2020a).

The pandemic has led society to start demanding responsible behaviour from everyone, which is also important for the sustainable development of STDs, which need better to protect the environment and natural and cultural resources. The future implementation of smart technologies will be important for STDs in the post-pandemics period. The STD will have to adapt its marketing strategies to get more attentive tourists who will demand a more attentive and sustainable tourism experience from tourism service providers. To this end, STDs will need to invest in further technological development in the post-pandemic period, particularly in AI, advanced solutions for interacting with tourists and analytical tools to analyse and transform data into value-added information. All this to provide the guest with the most authentic and, at the same time, safest tourist experience.

A major limitation of the article is that it is based on an analysis of scientific articles published during the Covid 19 outbreak. However, no research was conducted to reflect both managers and users of STD services on the opportunities and threats of implementing modern technological solutions in the post-pandemic period. The authors presented an augmented reality app solution within a tourist destination that can serve as an example of good practice.

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CHAPTER 6

"Long term care (LTC) in Croatia; Current state, Covid19 impact and development strategy"

***Maja Matanić Vautmans*[1], *Filip Gelo*[2]**

Abstract

Based on the demographic indicators, it can be concluded that the population in the European Union is progressively ageing, and the conducted analyzes show that there is not a sufficient number of accommodation capacities in the market in relation to the demand. The conducted analysis, the social context and the way of care for the elderly population were studied, revealed numerous shortcomings: lack of knowledge about the possibility of financing homes, lack of realistic plans and programs, unsettled legal relations, lack of income for the elderly accommodation as well as the increasing entry of the private sector into the field. Scientific and empirical research shows it is possible to improve the care system for the elderly by creating a financing system that will encourage the construction of private homes for the elderly as well as various forms of public-private partnership, to overcome public sector budget constraints and to ensure the balance of supply and demand within the care sector for the elderly. A comparative analysis of the situation in the European Union and the Republic of Croatia shows that more developed EU member states left institutional care for the elderly to the private sector and non-profit organizations, while in the Republic of Croatia most of the institutional care is still provided by the state and local governments.

Key words: *Croatia, Elderly home, Long term care, Depopulation, Institution*

JEL classification: *I3, J0*

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1. Introduction

Based on the analysis, the social context and the way of caring for the elderly population were studied, which revealed numerous shortcomings: lack of existing capacities for interested users, lack of knowledge about the possibility of financing elderly homes, lack of real plans and programs, unsettled legal relations, lack of income of the elderly people, as well as the increasing entry of the private sector into the field of research.

From the above research problem arises the subject of research related to the analysis of supply and demand for elderly homes by the public and private sectors. In this sense, a number of questions are asked: What are the differences between a private and a public founder of an elderly home? What are the shortcomings of institutions for elderly and what extent are they subsidized by the state? On the other hand, what is the price of private bidders and why is it so different from public ones? Therefore, the basic hypothesis of the paper is that in more developed countries the share of the public sector, within the social welfare system, is significantly lower. The institutional form of elderly care is largely left to private companies and associations in the Member States of the European Union, while the role of the public sector is to provide support for informal forms such as home help. The hypothesis is supported by the assumption that scientific and empirical research can show that it is possible to improve the elderly care system by creating a funding system that will encourage the construction of private elderly homes as well as various forms of public-private cooperation.

2. Literature review

The starting point of the research is the growing proportion of elderly people in the overall population, which emphasized Bađun (2016: 2) as the key factor influencing the future state expenditures for long-term care is the number of elderly (65+) and special very old (80+) people, and demographic trends show that the Croatian population is aging rapidly. Due to the growing popularity of informal forms of care, it is assumed that in the future there will be increasing pressure on the offer of the state, private sector or other organizations that have the ability to provide such forms of service. A very important issue will be the development of appropriate models of public, private or public-private financing of the provision of these services, but also raising the cost efficiency of the provision of care services in order to rationalize rising costs (OECD, 2011). In addition to the accelerated aging trend in state and decentralized homes, the costs of state allocation for the social sector are also affected by other factors, such as: the number of dependents in care, the ratio of formal and informal care, the number of institutional care providers and care costs per beneficiary. The European Commission has predicted that the share of long-term care expenditure in Croatia's GDP by 2060 will increase from 0.4% to 1% or 1.7% if the coverage of care costs in formal or informal institutions or through cash benefits (Bađun, 2016: *3).*

3. Methodology/Method/Model/Conception of analysis

Data in the theoretical part, data in relation to the situation in the Member States of the EU and data in relation to Croatia, as well as the comments of the authors presented in the paper, were processed using various scientific research methods such as analysis and synthesis, compilations, classification method, historical method, statistical method, description method, induction and deduction method and comparative method.

Methods of analysis and synthesis are applied continuously during the work in the theoretical presentation and in the examples from comparative practice. The compilation method is expressed in the display of the basic definitions along with the method of classification where it was appropriate, especially in more complex labeling theoretical terms. The historical method was most commonly used to display statistical and demographic data presented in time series. The statistical method is used in the paper to present the relevant data needed for analysis and overall research. The method of description is applied when explaining the necessary theoretical concepts, comparative models as possible solutions and the current situation in Croatia. The methods of induction and deduction, each in its own meaning, are applied in the conclusions of the authors, which are stated after the presentation of relevant data and the theoretical part. The comparative method compares different system providers of services (public and private) and adequate comparable models in other member states of the EU and Croatia with the aspect of being funded.

4. Comparative analysis of the elderly care system in EU with focusing on Croatia

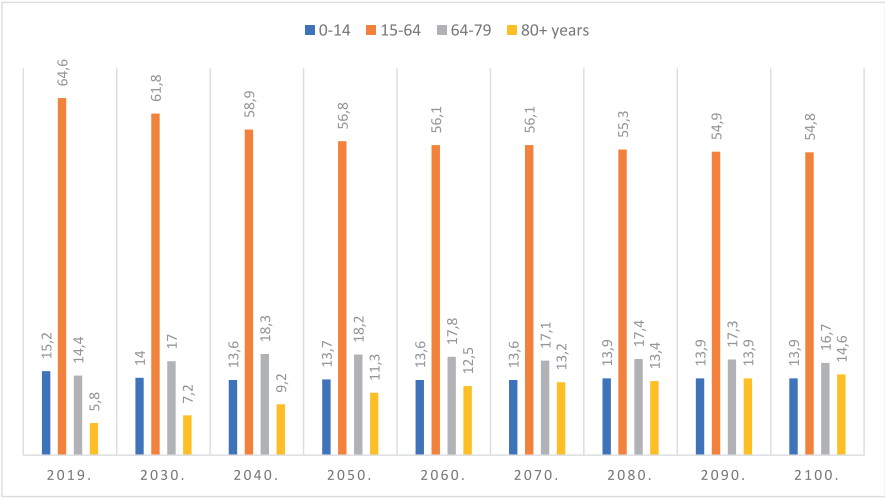
As for demographic projections at the level of the European Union, according to current trends, Europe is “becoming increasingly gray” in the coming decades, given the changes in the demographic structure. The European Commission and the European Social Council state need to address the impact of aging on social and economic models. Reliable and usable information is based on current knowledge of demographic changes and their projections into the future. This certainly indicates greater pressures in the economic, budgetary and social expenditures that the policies of the European Union countries will have to face. These projections recognize the challenges in the economic and social context where the balance between meeting the needs of the younger and middle generation with the needs of the older ones will play an important role. The same trend affected Croatia, which was not ready to respond to the challenge by building new elderly facilities, but left the market to the private sector, which imposed higher prices, unattainable for most elderly people.

4.1. EU demographics

Due to the low birth rate, longer life expectancy of the population and higher

migration, a drastic change in the demographic structure is expected. The total population size is projected to be slightly higher by 2060, but much older than it is now (Eurostat, 2019). The graph below shows the projection of Eurostat by main age groups in the period from 2019 to 2100, which aims to show the relationship between age structures and the worryingly growing change in the higher share of older people in the total population structure.

Graph 1: Estimated population structure by main age groups, EU-27, 2019-2100.



Source: The share of elderly people continues to increase https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Population_structure_and_ageing#The_share_of_elderly_people_continues_to_increase

In the observed period, the share of the young population (0-14 years of age) will decrease by 1.3 percentage points. The mature, able to work population, between the age of 15-64, by 2100, according to Eurostat projections (2019), will record a decline of 9.8 percentage points. The share of the elderly (64-79 years of age) will increase by 2.3 percentage points, and the share of the very old population (over 80 years of age) will increase by 8.8 percentage points. When we talk about the elderly population, especially in terms of care and nursing, we need to consider “older people” aged 80 and over who are functionally dependent and in greater need than other categories. It is very realistic to expect that by 2100 the share of older people aged 80 and over will be more than twice as high as in 2019. Then the share of older people will be almost equal to the number of older people (64-79 years of age), and together with this age category will make up almost a third of the total population of EU member states.

Future users of facilities for the elderly are over 65 years of age, and for this reason it is interesting to observe the growing pool of potential wards. Table 1 below shows demographic changes according to Eurostat estimates (2019).

Table 1: Projections of the people aged 65 in 2100

Geopolitical entity	Amount of seniors in 2100
Belgium	132.893
Bulgaria	55.350
Czech Republic	111.827
Denmark	70.199
Germany	925.731
Estonia	13.090
Ireland	74.254
Greece	92.933
Spain	533.796
France	777.359
Croatia	33.023
Italy	617.871
Cyprus	12.355
Latvia	12.196
Lithuania	19.290
Luxembourg	9.124
Hungary	101.616
Malta	8.298
Netherlands	205.843
Austria	105.160
Poland	321.979
Portugal	93.537
Rumania	148.924
Slovenia	21.620
Slovakia	48.411
Finland	55.471
Sweden	150.288
Island	6.938
EU-27 counties	4.752.438
Liechtenstein	579
Norway	80.989
Switzerland	135.457

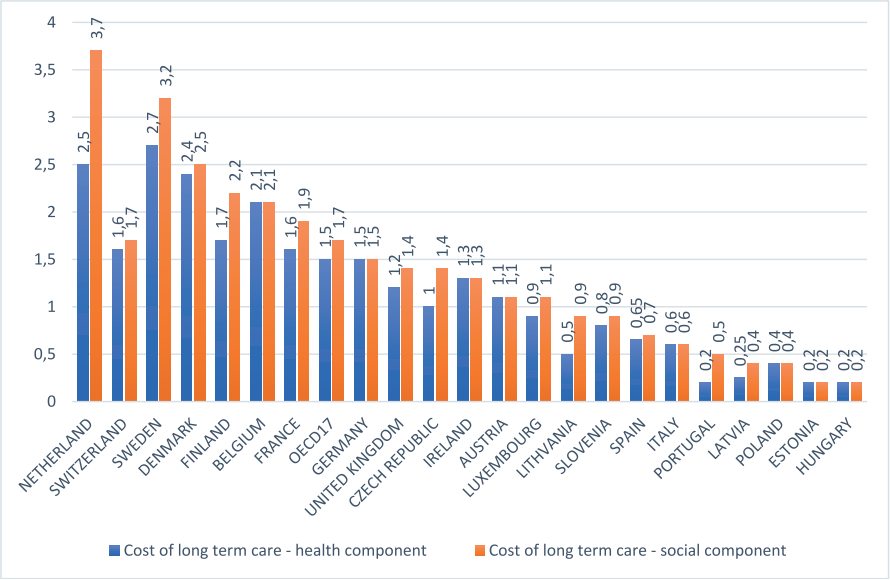
Source: Population on 1st January by age, sex and type of projection https://ec.europa.eu/eurostat/databrowser/view/PROJ_19NP__custom_959637/default/table?lang=en

By 2100, a third of the population of Poland, Italy and Germany is expected to be 65 years old. Belgium, Sweden and the United Kingdom are projected to have 25% of those over the age of 65 in the total population. The largest number in EU with people aged 65 has Germany with 925,731, as compared with the total number of sixty-five in the EU accounting for nearly a fifth of the observed population. Minimum population of 65 years, in 2100, according to Eurostat projections (2019) will have Liechtenstein, Island and Malta. Malta will have 8,298 older people, which is 0.17% of all older people aged 65 compared to the EU. Croatia will have a significant population aged 65, more than 33,000.

4.2. Financial support to the social sector in providing long-term care in EU countries

In order to fulfill its public role, each EU member state financially supports the social sector, depending on the number of people in need and the possibilities of the state budget. Within the long-term care (further LTC) of the elderly, there are two forms: traditional (accommodation in institutions, family accommodation) and alternative (home help, assisted housing). The most well-known form is certainly institutional. It is most prevalent in the older member states of the EU, while in the United Kingdom, for example, it is the most widespread part of care within family homes. A significant share of spending on long-term services is covered by state or compulsory insurance systems. Total state / mandatory spending on long-term training (including health and social components) amounted to 2017 an average of 1.7% of GDP in the countries of the Organization for Economic Cooperation and Development (OECD).

Graph 2: Cost of LTC (health and social component) by countries as a % of GDP, 2017

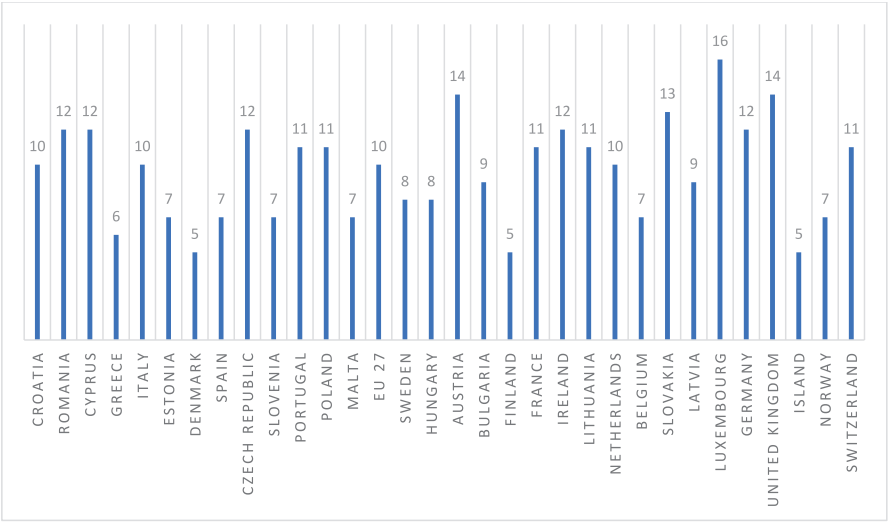


Source: OECD, Total LTC expenditure as share of GDP and per capita, 2017, https://www.oecd.org/health/health-systems/Spending-on-long-term-care-Brief-November-2020.pdf

With 3.7% of GDP, the Netherlands spent the most, followed by Norway (3.3%) and Sweden (3.2%). In these countries, public expenditure on LTC was approximately twice of the OECD average. At the other end of the scale, Hungary, Estonia, Poland and Latvia have allocated less than 0.5% of its GDP to provide LTC (OECD, 2017).

Within the % of GDP allocated by each member state of the EU for LTC, the institutions receive the majority of funding. The rest of the financial support goes to alternative / supplementary forms of care.

Graph 3: Financial support to institutions for the provision of LTC, in 2018, as % of total spending on health social care



Source: OECD Health Statistics 2020; Share of public spending for different LTC services, 2018 (or nearest year) Eurostat Database, https://www.oecd.org/health/health-systems/Spending-on-long-term-care-Brief-November-2020.pdf

Luxembourg stands out as a country that gives 16% of the total care-budget for LTC (graph 3). The average of the EU is 10% of the total health and social benefits, and Croatian cost of LTC is the average of the EU. According to the data presented in the following graph, Denmark and Finland record the lowest benefits for LTC support as EU member states.

A public facility for the elderly can be organized in a way that it provides traditional services and care, as well as secondary / alternative ones. This, for example, may include stationary (department for increased care), daily stay (care and supervision of the elderly for 4 up to 12 hours), assisted (organized) living (in private on sociated objects with medical support) and a nursing home.

The following table shows the relationship between the various public facilities that provide care and nursing for the elderly. This table wants to show both supply and demand for different types of services.

Table 2: Public expenditures by type of elderly service, 2018

Geopolitical entity	Stationary	Daily stay	Assisted living	Nursing home	Others
Germany	94	2	4		
Greece	93	2	6		
Bulgaria	92		8		
Slovakia	86	1	13		
Austria	82	2	16		
Poland	80	1	17	1	
Belgium	79	7	1	2	11
Lithuania	78	3	15	3	
Rumania	76	14	3	7	
Hungary	73	8	14	3	3
France	72	11	10	3	4
EU 27	66	7	22	2	3
Slovenia	65	4	27	1	2
Latvia	65	11	18	3	3
Italy	61	8	24	1	7
Luxemburg	60	10	24	1	4
Ireland	59	18	20	1	1
Cyprus	59	9	25		7
Spain	58	5	33	4	
Denmark	57		43		
Czech Republic	57	2	26	8	6
Malta	54	5	20	1	19
Sweden	52	5	42		1
Netherlands	49	11	35	4	2
Estonia	48	6	42	3	1
Finland	46	5	44	4	1
Croatia	45	17	36	3	
Portugal	39	15	45		
Switzerland	70	25		1	4
Island	69	9	15	7	
Norway	62	4	33		
United Kingdom	56	11	30	1	

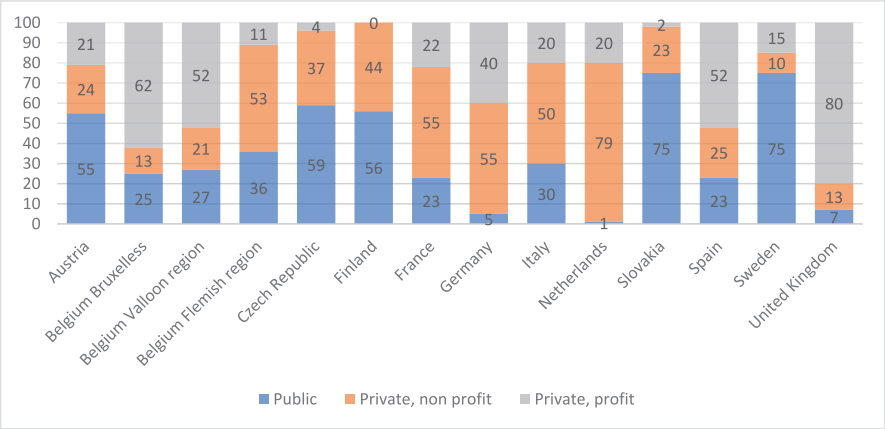
Source: OECD Health Statistics 2020; Eurostat Database, https://ec.europa.eu/info/sites/default/files/economy-finance/ip079_en.pdf, pristupljeno 20. lipnja 2021.

It is noticeable that Germany, Greece, Bulgaria and Slovakia have the largest number of organized inpatient forms for the elderly within the public sector. It is important to emphasize that other forms of care are mostly organized by the private sector (nursing homes, family homes). The day care service is most represented in Switzerland, Croatia, Ireland and Portugal. The day care represents the care and nursing of the elderly part-time (4-6 hours a day) or a full-day stay (8-12 hours). Assisted living in the form of housing units, which includes visits and control of medical staff, is mostly organized in Denmark, Sweden, Estonia and Finland, which have carried out the process of deinstitutionalization of the social welfare sector in this way. Conventional homes for the elderly, as the basic institutional form of the public sector, are most prevalent in the Czech Republic, Romania and Spain. In Croatia, the majority of services are provided in the form of stationary facilities and assisted living, which makes the largest public allocations in Croatia by type of public services provided within the facilities for the elderly.

4.2.1. The attitude of accommodation and care providers of the elderly towards the nature of ownership

In order to properly address the hypothesis, an important element of observation is the ownership of facilities that provide care and accommodation for the elderly. Facilities can be privately owned (private or legal persons), owned by the state or local (regional) self-government units or controlled by non-profit organizations. “Silver economy “ or the popularized name of the business in the sector of construction and management of elderly homes is highlighted by joining the private sector in the market. States will indulge the EU the largest market share of the sector to private founders of non / institutional form of elderly homes. The private sector shows a better organization of business, a higher quality of premium and more qualified human resources. Due to the lack of income for capital investments in new or existing homes, the public sector has imposed itself as an “extended arm” of assistance between users and private owners. Users are also subsidized for the cost of LTC in private homes and private owners of homes see the costs of the salaries of their medical staff also subsidized (in most countries in the EU). The following two graphs (4 and 5) provide insight into the relationship between service providers for the elderly according to the nature of ownership.

Graph 4: Share of elderly providers by ownership of facilities, 2019

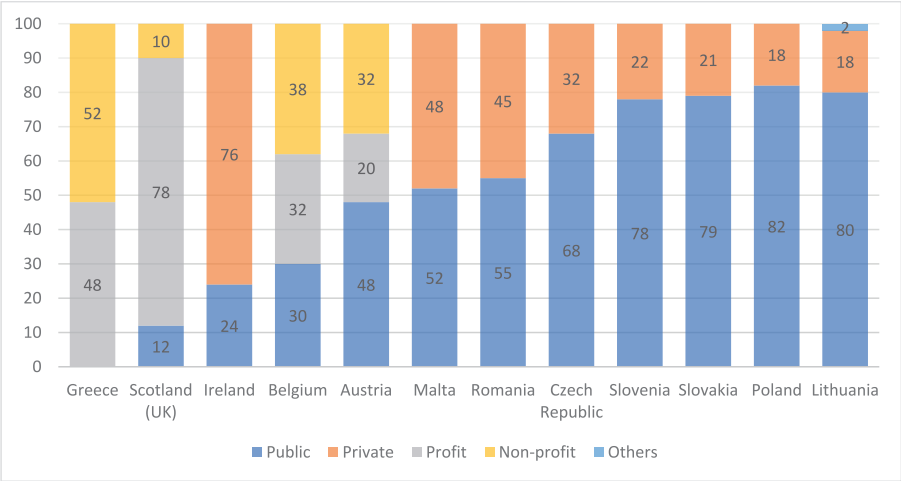


Source: Eurostat, 2019, https://ec.europa.eu/eurostat/documents/3217494/10166544/KS-02-19%E2%80%91681-EN-N.pdf/c701972f-6b4e-b432-57d2-91898ca94893

The largest share of public providers is represented in Poland, Lithuania and Slovakia. Non-profit organizations make up the majority of the offer on the elderly market in the Netherlands and Scotland, while in the UK and Belgium (Brussels region) the majority is provided by private providers.

We can conclude that in countries with a lower and average high GDP per capita, traditional forms still dominate, with two bidders within the private or public sector. The private sector in highest-income countries (eg. Austria, Belgium, Netherlands and France) is made up of private providers and non-profit organizations. The dominant reason for this is the local preference of the users (eg. an elderly home founded by the Catholic Church, which targets the parishioners of its micro-locations in its market coverage).

Graph 5: Share of elderly providers by ownership of facilities, 2019, continued



Source: Eurostat, 2019, https://ec.europa.eu/eurostat/documents/3217494/10166544/KS-02-19%E2%80%91681-EN-N.pdf/c701972f-6b4e-b432-57d2-91898ca94893

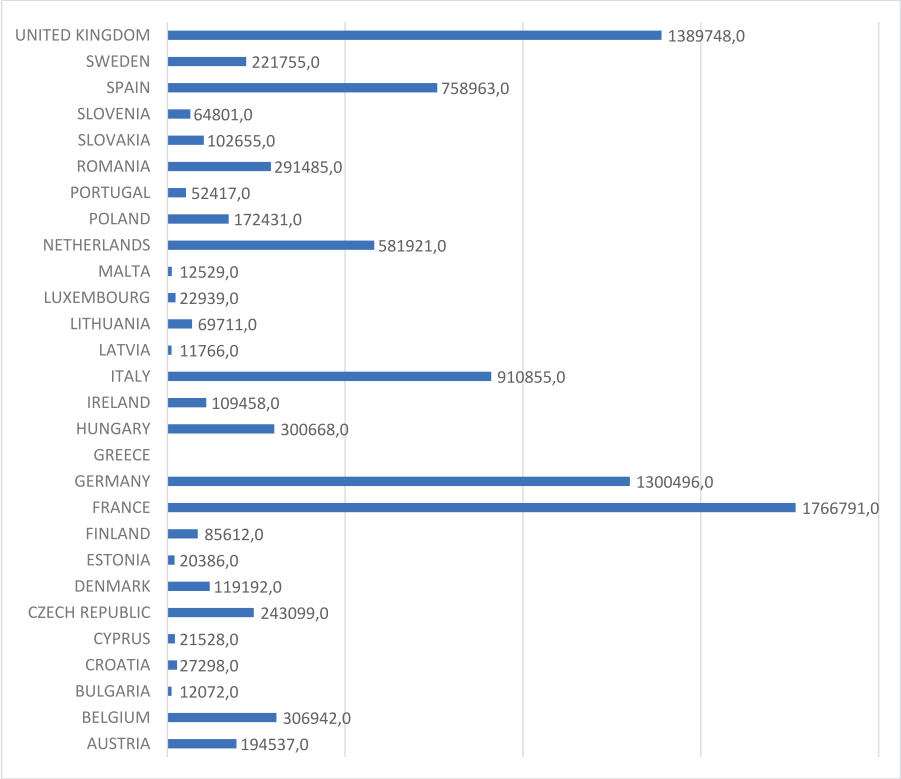
The cause of the mentioned differences among the first three countries (Poland, Lithuania and Slovakia) is that there is a greater representation of older government buildings and dilapidated infrastructure that in the future will require modernization. In the other two categories of states (Austria, Belgium, Netherlands and France), there is a greater share of private sector characterized by cost rationalization and efficiency in business. A large share of these private providers is contributed by the fact that a part of the services covered by the system is externalized through the private sector.

4.3. Potential beneficiaries of long-term care in EU institutions

Given the obvious dominance of private elderly facilities in the Union, it is important to notice the trend of increasing numbers of users in institutions, based on which each EU member state will be able to develop its own strategy for social action. According to the Eurostat projections from 2019, by 2070 the number of users of institutional accommodation will increase at the level of 28 EU member states, in line with the increase in the share of older people in the total population.

On the market are currently developed traditional (institutional / non institutional forms) and alternative (home care, assisted housing) elderly facilities. The graph below shows the growing need and preference of users for institutional accommodation, which is crucial for observing the necessary and desired facilities on the market, as well as the timely response of facility owners to this demand.

Graph 6: Beneficiaries of institutional care, projections until 2070, EU-28



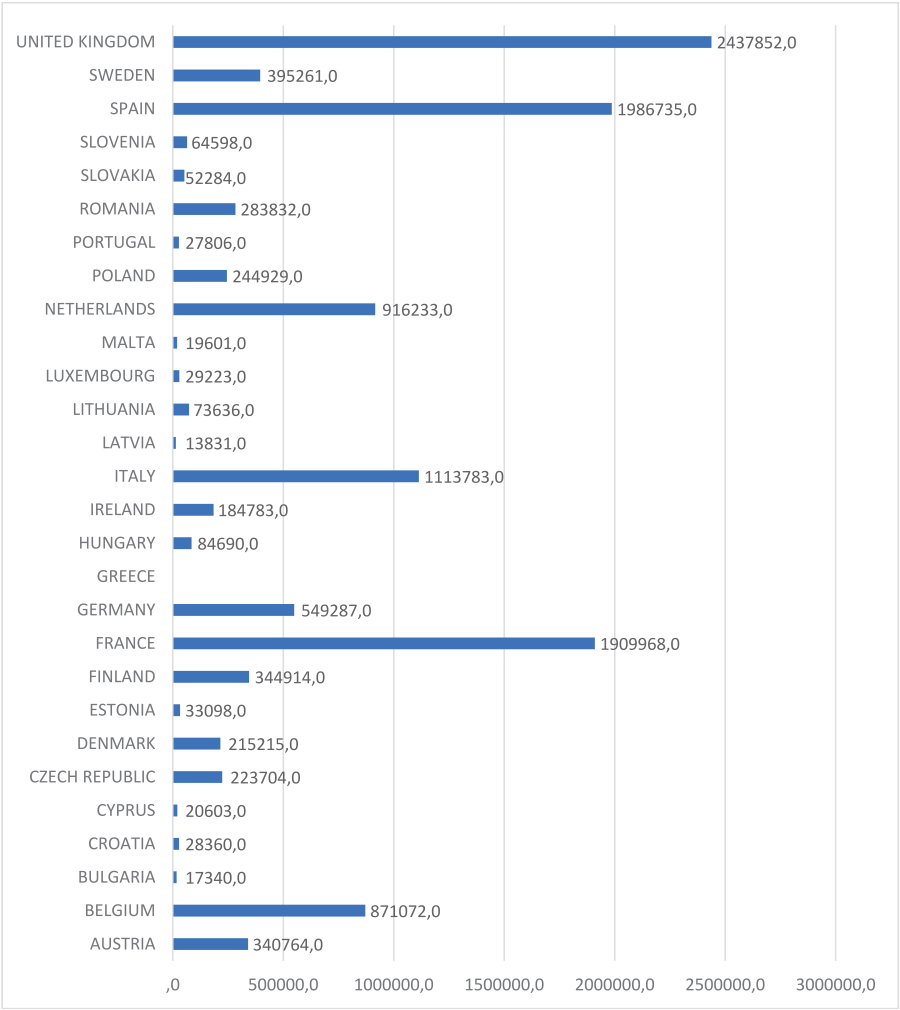
Source: OECD, Eurostat i WHO, https://ec.europa.eu/info/sites/default/files/economy-finance/ip079_en.pdf

Note: Missing data for Greece

According to Graph 6, it can be noticed that the largest number of users will be in France. In 2070, it is estimated that Croatia will have almost 28,000 people taken care of in institutions, so the country will have to increase the number of institutional-type facilities. This is a consequence of the larger share of the elderly expected by 2070 and the larger number of institutional facilities to be established by the private sector and non-profit organizations. The reason for this is the increase of the elderly population and changes in their preferences and life habits which will require a better quality of LTC in the elderly institutional forms.

However, it is noticeable that there is a growing interest in more alternative approach to LTC, which we attribute to the fact that the habits and desires of users are changing more and more.

Graph 7: Beneficiaries of home care, projections to 2070, at EU-28 level



Source: Eurostat, https://ec.europa.eu/info/sites/default/files/economy-finance / ip079_en.pdf

Note: data for Greece are missing

Graph 7 shows us projections of home care users by 2070. As far as Croatia is concerned, the number of beneficiaries will increase by approximately 10,000 people, compared to 17,000 recorded in 2015. It is noticed that in Croatia the number of beneficiaries in institutions and home care will be equalized by 2100, which supports the claim about different preferences and income opportunities of the elderly.

UK and Spain are already financially supporting users of home care. The reason for this is the dominant presence of the next phase in the development of the LTC system for the elderly, which essentially refers to greater reliance on the use of their own, family capacities with state assistance in terms of providing adequate care that can be given by private providers. This is due to the lack of planned locations for the construction of elderly homes due to the large construction according to the existing urban plans.

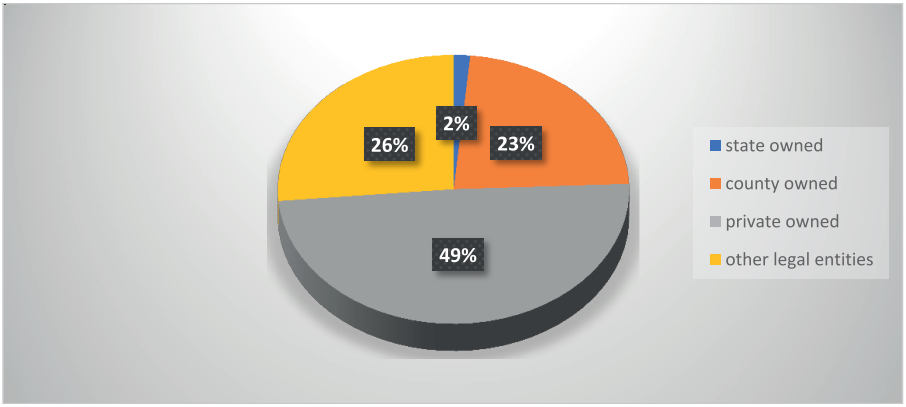
4.4. The care system for the elderly in Croatia

According to the Central Bureau of Statistics, there were 4,065,253 inhabitants in Croatia in 2019. The number of people over 65 years of age made up 20.78% of the population of Croatia, and it is evident that our country belongs to the countries with a large share of elderly people. Older people in Croatia traditionally stay within the family as long as their health condition allows it. If their health deteriorates, they prefer to stay in nursing homes for public founders. A clear reason for this is the lower price of public (state and decentralized) homes compared to private ones. Elderly public homes in Croatia are significantly subsidized in the operational part of the business, and in addition, they ignore the fact of capital investments and are therefore are able to offer a more favorable price for LTC.

4.4.1. Providers of social care services for the elderly in Croatia

In contrast to other countries and members of the Union, Croatia within the public sector is not supporting the operations of private home founders as well as customers located in such facilities (except users through Center of social welfare). According to the existing legal regulations there are four forms of elderly facilities: 1. foster family (maximum 4 users), 2. family home for the elderly (from 5 to 20 people), 3. home for the elderly without the establishment of an institution (provision of other social services) and 4. home for the elderly - social welfare institution. The institution can be owned by the private or public sector, while all other categories are mostly in the domain of the private founder. The graph below shows the market supply of social facilities by type of ownership in Croatia.

Graph 8: Share of social service providers in Croatia by founder in total accommodation capacities (institutional and non-institutional form)



Source: Ministry of Labor, Pension System, Family and Social Policy, https://stampar.hr/sites/default/files/Arhiva/st rategija_socijalne_skrbi_za_starije_osobe_u_rh_za_razdoblje_od_2017.-2020._g.pdf

The largest market share of elderly facilities is represented by private founders (mostly family homes), which occupy 49% of the market . This graph shows that Croatia is also actively following EU trends. The most price-competitive are decentralized homes and state-owned homes. Although they are the most acceptable to users, the demand for accommodation within public homes far exceeds the supply. However, the largest number of institutional beneficiaries in Croatia in 2019 was admitted to decentralized homes, which are under the jurisdiction of local (regional) self-government units.

The table below shows the number of beneficiaries accommodated in various public (state and decentralized) and private (other social care homes for the elderly) facilities. Due to the nature of ownership and the scope of beneficiaries, state and decentralized homes are categorized as institutions according to the criteria for classifying elderly homes.

Table 3: Types of homes and social welfare beneficiaries in Croatia in 2019

Kind of home	Number of homes	Home users
State homes for the elderly	2	168
Decentralized home for the elderly	45	10.947
Other social care homes for the elderly	106	6.458

Source: Annual statistical report on the applied rights of social welfare, legal protection of children, youth, marriage, families and persons deprived of legal capacity, and protection of physically or mentally disabled persons in the Republic of Croatia in 2019

The table shows twice as many facilities in the category of other social care homes for the elderly (private homes) compared to decentralized (county homes) in which it is inversely possible to accommodate a larger number of beneficiaries.

According to the latest available data of the Ministry of Labor, pension system, family and social policy on the day 31.12.2019 (Annual Statistical Reports for 2019), the total number of unrealized requests for accommodation (waiting list) with service providers for the elderly was 7,466, as follows:

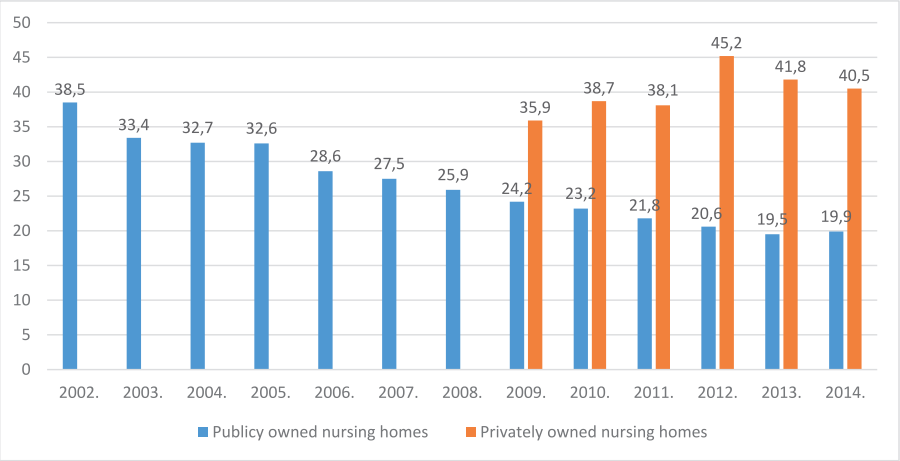
- in state homes: 156
- in decentralized homes: 6,426
- in non-state homes (excluding decentralized): 803
- with service providers without the establishment of a home (religious community, association, company, etc.): 81.

As for the number of people interested in accommodation in an elderly home, the number of people on the waiting list is not a good indicator of real needs. One of the reasons is certainly the fact that the same person can apply for accommodation with several providers of accommodation services for the elderly. Another reason is the practice that applications for accommodation are submitted long before the actual need for accommodation has arisen, so in many cases people refuse the offered accommodation several times during a certain period. The waiting time for accommodation in a home is different depending on whether it is a home founded by the Republic of Croatia, a home founded by local and regional self-government units or a home of other founders. The waiting list is longer for accommodation in homes founded by Croatia and local and regional self-governmental units.

4.4.2. Financial support of public home founders in Croatia

In order to understand the favor that the elderly state and decentralized home have in relation to the private, it is necessary to consider the amount of financial support for the facilities within the social system and consequently their impact on the price. Ministry of Labor, pension system, family and social policy provides financial support for the operational aspect in the public elderly care homes. Also, the country through its social program co-finances the users of the public elderly care homes. The state can also co-finance beneficiaries placed in private homes through the social program, who exercise their right through the Center for Social Welfare.

Graph 9: The amount by which the Ministry of Labor, pension system, family and social policy finance elderly homes (in million HRK), 2014

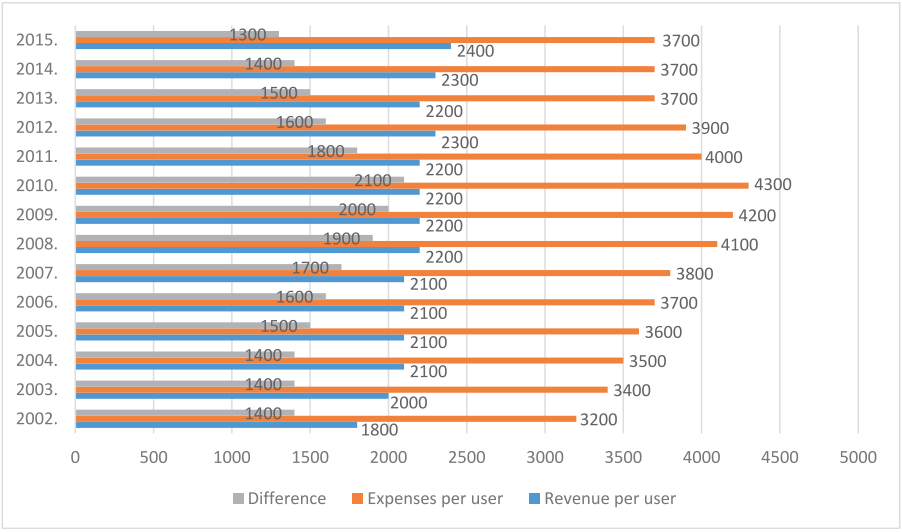


Source: Ministry of Labor, Pension and systems, family and social policy, https://stampar.hr/sites/default/files/Arhiva/strategija_socijalne_skrbi_za_starije_osobe_u_rh_za_razdoblje_od_2017.-2020._g.pdf

From 2002 to 2008, the Ministry of Labor, pension system, family and social policy only subsidized institutions from public founders (state and decentralized homes). Likewise, it is noticeable that the level of subsidy decreases from the first to the last analyzed year in public homes. Since 2009, Ministry of Labor, pension system, family and social policy has been actively subsidizing users of private homes (who exercise their rights in through Centre for Social Welfare).

Although they are very popular facilities for the elderly, public elderly care homes would not be able to continue operating without a subsidy, because the expenditure per user greatly exceeds the income generated.

Graph 10: Average monthly income and expenditure of decentralized elderly homes per user, in HRK, from 2002 to 2015



Source: Decision on minimum financial standards for decentralized financing of homes for the elderly and infirm (from 2002 to 2015), https://narodne-novine.nn.hr/clanci/sluzbeni/2015_02_15_282 .html

According to the data, the operations of decentralized homes does not bring revenue, but only fiscal expenditure of the central government, or Ministry of Labor, pension system, family and social policy. The largest financial expenditures were realized in 2010, after which the difference between revenues and expenditures began to decrease.

In addition to subsidizing the difference between the income and expenditure of users accommodated in public elderly homes, the income from the competent county budget also finances the operation of such facilities.

Table 4: Structure of co-financing elderly homes, 2018

Elderly home	Revenues from the competent budget for financing operations	Total income	Share (in %)
Buzet	2.147.681	5.062.614	42%
Centar Zagreb	3.969.598	18.300.335	22%
Čakovec	4.916.120	12.702.835	39%
Dubrovnik	4.300.021	12.366.159	35%
Koprivnica	5.682.858	13.572.952	42%
Ksaver	3.841.233	14.177.133	27%
Lošinj	2.308.695	6.380.988	36%
Mali Kartec	1.449.170	8.344.457	17%
Osijek	6.017.199	15.979.905	38%
Požega	3.688.769	10.107.023	36%
Rijeka Kantrida	5.298.684	25.293.903	21%
Total	43.620.028	142.288.304	31%

Source: Ministry of Labor, Pension System, Family and Social Policy, Annual Statistical Report on Homes and Beneficiaries of Social Welfare 2018, https://mrosp.gov.hr/UserDocsImages/dokumenti/MDOMSP%20dokumenti/Godi%C5%A1nje% 20statistical% 20report% 20o% 20home% 20i% 20users% 20social% 20 care% 20in% 202017.pdf

Table 4 calculates the level of subsidization of public homes, because of reduced efficiency of management resulting with low prices (compared to market), the absence of capital costs in calculating the price for the users and the difference in the quality of management and other characteristics of an individual home (capacity, age of the facility, etc.).

For 2021, each county plans financial injections in the public elderly homes since the operation of such homes without co-financing of local (regional) governments (Social Welfare Act, Articles 120., Paragraph 3) are unsustainable in the long run.

Table 5: Amount of county budget funds for co - financing the operation of decentralized elderly homes in 2021

County	Amount of fonds (in HRK)
Sisačko-moslavačka	9.135.664
Karlovačka	3.468.203
Varaždinska	4.410.766
Koprivničko-križevačka	6.227.245
Bjelovarsko-bilogorska	4.613.851
Primorsko-goranska	12.355.367
Ličko-senjska	6.643.565
Požeško-slavonska	8.331.798
Brodsko-posavska	6.860.716
Zadarska	7.311.034
Osječko-baranjska	17.510.888
Šibensko-kninska	8.848.748
Vukovarsko-srijemska	9.770.574
Splitsko-dalmatinska	23.194.075
Istarska	18.174.544
Dubrovačko-neretvanska	10.775.790
Međimurska	5.553.069
Grad Zagreb	15.923.095
Ukupno	179.108.992

Source: Official new ways no. 157/13, 152/14, 99/15, 52/16, 16/17, 130/17, 98/19, 64/20 and 138/20, http://www.propisi.hr/print.php? id = 11078

In the conditions of the Covid 19 pandemic, the state reacted by purchasing the necessary equipment (protective masks, gloves, disinfectants), of which the total cost will be reimbursed from the state budget. In order to use the planned funds from the European Social Fund, Croatia has prepared a National Recovery and Resilience Plan (2021) for the period from 2021 to 2026, which plans to build 7 elderly centers with a capacity of 700 beds and with a total budget of HRK 370 million. The construction of elderly centers is primarily aimed at local and regional self-government units. According to the plan, only 3.86% of beneficiaries are taken care of within decentralized institutional facilities. With seven new elderly centers Croatia will satisfy the EU average of 5% of users located within the same or similar objects. Despite the above, the real needs are far greater.

Based on the financially unprofitable operation of public homes, it might be wiser to focus on a planned recovery program in which the cooperation of public and private parties will play a key role in withdrawing funds for the public sector (state or local regional self-government units) and leave the

occupancy of the home and management to the private sector. This would avoid unnecessary financial losses and private business would not be jeopardized. The price for the end user would be very competitive because it would not include calculation of the capital construction costs (as before) cause it would be provided by the Social Fund; which would like all the other public sector neutralized this kind of costs.

5. Results and discussion

The progressive aging of the total population is evident with increasing pressures on the economic and fiscal system as a result of greater social needs.

Particular concern is the growing number of “old” elderly people over the age of 80 who are direct beneficiaries of social institutional forms (due to their psychophysical condition).

Countries with highest GDP in EU generally allocate a larger share of GDP per capita for LTC in the context of social policy. State sectoral policies allocate a larger share of GDP per capita for LTC relieve the burden on institutional structures and their substitution of alternative objects. For this reason, more informal elderly forms of care are becoming an increasingly popular solution in EU due to their lower capital costs, easier supervision and better organization of services and care for users.

In higher-income countries in EU, most of the senior market is represented by private profit and non-profit providers with an accent on alternative forms such as assisted living, daily care etc.

Countries with lower higher GDP in EU traditionally popularize LTC in institutional forms.

Croatia has a significantly higher negative tendency to increase the share of the elderly population compared to the average of all EU Member States.

Operation of public institutional care is unprofitable in Croatia. Almost 50% of operations are supported by the financial resources of the Ministry of Labor, pension system, family and social policy or the state, which significantly burdens the state budget on an annual basis.

In Croatia, the offer of the private sector in the form of non-institutional and institutional forms prevails, but the price of homes of the public founder imposes full occupancy and a waiting list, which makes the public facility the most sought after form of LTC. The prices of state-owned and decentralized homes are significantly lower and range, on average, from around 2,000 to 6,000 HRK (Bađun, 2016: 7), but these are mostly older capacities with a lower level of standards. In newer homes, of which there are few, one can find homes with a minimum price of 7,500 up to 12,000 HRK in apartment accommodation. Such prices are a little surprising, but it should be borne in mind that the prices of elderly homes are not market-based and do not reflect the cost of capital construction and maintenance, and in addition operating costs are financed in amounts of up to 50%. The cost of newer state-owned

and decentralized homes must be significantly higher as it includes capital construction and maintenance costs that are significant in the final price structure. Therefore, if the operating costs were not yet co-financed by the county or local government, the prices in such homes would be 30% to 40% higher and would reach the upper limit of HRK 15,000. This is exactly the situation in private homes whose prices generally range from 5,000 to 16,000 HRK, which mostly depends on the quality of accommodation, location, type of rooms and the specifics of users.

It is important to mention family homes, which in the last ten years, due to lack of capacity in state and decentralized homes, but also insufficient capacity of private homes, have become an informal solution to the problem of elderly care. In the further future, the effect of moving the elderly population from such family homes to facilities of a higher standard LTC can be expected. Accommodation prices in most family homes can be compared to state and decentralized homes, but there are immeasurable differences in care standards as well as the satisfaction of users and their families.

From the above it is concluded:

- The state subsidizes only the users of state and decentralized homes (regardless of the amount of these personal incomes). Users of private accommodation do not have this privilege, and as such need to pay the full price of accommodation and care.
- The operations of public institutions is subsidized with the amount up to 50%. Private institutions must compensate, for the difference of not received subsidy by adjusting the price of accommodation to a higher level.
- Public homes are characterized by the dilapidated appearance of a capital investment with a high need for renovation, but due to the reduced budget in the state treasury, there are no actual plans for their reconstruction.
- Owners of private homes in Croatia decide to build smaller family houses due to lower staff costs and the final price, which will be similar or slightly lower than public institutions.
- In addition, public homes do not show the cost of capital investments in compensation, which results in significantly lower prices for users.

By exploring the key features of the model of financing elderly homes (private and public founders), it is possible to choose the optimal model of construction that will provide the greatest value for money for users of LTC. Such a solution could be a model of public-private partnership, in such a way that the private partner bears the risks of construction, maintenance, management of the home, while the public partner, through subsidized accommodation, provides full home capacity. In this way, the private partner has a secure profit, and the public has fulfilled its basic role, the availability of public services to interested users.

6. Conclusions

In addition to its legislative role, the state subsidizes elderly homes founded by Croatia; homes whose founder is a unit of local self-government and the City of Zagreb; beneficiaries whose income (as well as the income of their family) is not sufficient to pay for accommodation within the homes. The price of accommodation in such homes is not market, which results in increased demand compared to the facilities offered on the market. Apart from the price, the criteria for accommodation of users are not very clear and should be reformed in accordance with the examples of other EU countries. It is crucial that the state supports accommodation only those users who are on the existential minimum in an institutional social welfare facility. In the existing public facilities all users are subsidized, without exception, regardless of their income opportunities. The priority item of each state in EU should be adjusting the revenues and expenditures of the elderly facilities on an annual basis, in order to have fiscally sustainable system. Since for the user the price is the most important argument, and for the institution the financial result at the end of the year, these problems could be solved by public-private partnership (PPP). Although the implementation of PPP in the social sector in Croatia has not yet been realized, it could offer new directions in the strategy. Namely, the state could make capital investments while a private individual could operationally run an elderly home. On that way the cost of capital investments in the calculation of prices for end users could be ignored and the private partner could show up with a better price than the one that currently exists in private elderly sector. The state would thus realize new facilities of a social nature (which is also a matter for the public body) and the private individual would ensure full capacity utilization without significant risks. Another type of PPP could be a higher risk for private individuals in the way that the design, supervision, construction, equipment and management of the facility is the responsibility of a private partner while the public could ensure reduction or abolition of contributions and tax levels and subsidize accommodation of users in need. The state would save the costs of construction and management of the facility and ensure that the market is acceptable for the users, while the private partner could make a profit which he could use in a new business venture.

It is noticed that in the EU countries with highest GDP per capita, created other forms of service within the private sector (for-profit, non-profit, organizations) so that users have a choice between a larger number of providers. It is evident that in more developed countries the share of the public sector in the provision of elderly institutional care is smaller. The role of LTC is more often taken over by private companies or associations in the institutional or non-institutional forms. This is certainly supported by the process of deinstitutionalization carried out by more developed EU countries, with the aim of creating smaller accommodation units in the form of family homes, which are usually owned by private individuals, which confirms the basic hypothesis of this paper. In countries with highest GDP per capita in EU, a longer stay in one's own home is encouraged with social care and protection services, while in Croatia the emphasis is on institutional accommodation. Based on the analysis of elderly

homes in Croatia, it can be seen that the issue of accommodation capacities is still not a burning issue, but only a series of more or less satisfactory reforms that cause short-term changes.

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CHAPTER 7

Impact of the Covid-19 pandemic on the operation of construction companies in the Czech Republic

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Abstract

The Covid-19 pandemic has significantly impacted national economies worldwide. In order to prevent the spread of the virus, governments were often forced to take action and impose certain restrictive measures. The extent of the particular measures adopted differs from country to country, as well as among the individual sectors of the economy with regard to the possibility of the spread of the virus. This paper contains a study of how the Covid-19 pandemic has affected the operation of Czech construction companies. Data from the construction industry were collected during February and March 2021 using a web-based questionnaire survey. Consequently, the data cover both the first and the second state of emergency (with the associated lockdowns) declared in the Czech Republic. A total of 120 construction contractors took part in the survey. Furthermore, interviews with 10 experts in the field were conducted. The results revealed a slight decrease in sales; however, in many other aspects, construction companies managed to adapt to the government restrictions quite successfully. These adaptations included very limited layoffs of employees and working from home for a limited number of administrative staff. A vast majority of companies did not have to suspend their operations at all. The measures had a greater impact on large companies employing foreign workers and on projects which were more demanding in terms of supply of special equipment, as well as on projects implemented outside the Czech Republic. As the pandemic did not affect the construction sector significantly, only a limited number of respondents reported participation in

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government aid programs aimed at companies whose business had been severely restricted by the governmental measures.

Key words: *construction, contractor, Covid-19, restrictive measures, lockdown, operation, pandemic*

JEL classification: *D22, E22, I15, J20*

1. Introduction

The Covid-19 pandemic has affected both the everyday life of individuals and the operations of companies in various segments of the national economy. Many countries opted for a hard lockdown in the first half of 2020, while some other countries applied a less restrictive approach, for instance Sweden (Yarmol-Matusiak et al., 2021). Yarmol-Matusiak et al. also pointed out that restrictive measures imposed in the early stages of the pandemic were made under a high degree of uncertainty and variations among them led to different trajectories of Covid-19. Following the scope of the restrictive measures taken by governments in individual countries, the degree of their impact on economic activity varied significantly. One of the main challenges the governments faced was finding a balance between the protection of human lives and maintenance of economic activity, since lockdowns of the economy resulted in decreased public budget income as well as higher expenses such as economic impact payments, stimulus programmes for businesses and unemployment benefits.

Restrictive measures were primarily directed at economic sectors where a higher risk of virus transmission could be expected. Therefore, the travel industry and tourism belong to sectors mostly affected by lockdown (Pan and Yue, 2021), while the manufacturing and construction industries could maintain operations in compliance with strict social distancing rules designed to combat the spread of the disease. In this relation, it was demonstrated that the impacts of lockdown were highly heterogeneous from geographical, economic sector, and socio-economic perspectives (Faber et al., 2020).

This study aims to reveal the impact of the Covid-19 pandemic on the construction sector in the Czech Republic. Taking into consideration that the Czech Republic has become one of the worst-hit countries in terms of daily new confirmed Covid-19 deaths per million people (Hovet, 2021), this paper aimed to clarify how the actions taken by the Czech Government influenced the operation of construction companies and the execution of construction projects.

The next section introduces the research background, while the following third section describes the data and methods. In the fourth section, the results are presented and discussed and the final section formulates the conclusions, limitations and future research directions.

2. Literature review

2.1 Covid-19 and its impact on the construction industry

The construction industry belongs among the important sectors in the European Union, contributing 5.7% to the Gross Added Value in 2020 (Eurostat, 2021). Since typical outputs of construction activities include buildings, transport infrastructure and various kinds of utility facilities (e.g., wastewater treatment plants), it is clear that such projects are time and cost demanding, complex and exposed to significant levels of risk (Burcar Dunovic,

Radujkovic and Vukomanovic, 2016; Leśniak and Janowiec, 2019; Car-Pusic et al., 2020; Car-Pušić et al., 2020). For this reason, it is difficult to slow down or even interrupt the course of work on these projects as they need to be implemented in accordance with their time schedules and by contractually agreed deadlines. Furthermore, construction activities need to continue as they bring important socio-economic benefits (Cetkovic et al., 2017; Hromádka et al., 2020). Consequently, project managers and construction contractors must seek solutions to ensure the continuation of construction regardless of internal problems or external influences. From an investor's point of view, cost-effective solutions must be taken into consideration (Rogulj and Jajac, 2018; Dahlin and Pesämaa, 2021; Marović, Perić and Hanak, 2021) because the amount of investment funds might be limited. However, with the spread of the new coronavirus, governments were forced to act and it was obvious that the pandemic would considerably affect the economy as a whole, including construction (Franzese, 2020).

The execution of construction projects during the pandemic became quite challenging for contractors. Strict lockdowns meant the contractors faced various difficulties such as disruption of the supply chains, immobility of the workforce and shutdown of transportation systems (Biswas et al., 2021). In this relation, Morris reported the following main critical challenges for construction projects: cancellation of planned projects and delays/suspension of existing projects, supply chain uncertainty, raised new risks related to delays, and workforce and financial issues (Morris, 2020) that should be identified and managed by both owners and contractors (Majumder and Biswas, 2021). These challenges further increase the level of uncertainty during the execution of a construction project. To tackle the uncertainty, contractors need to consider adopting innovative methods and technological advancements facilitating resilience, employing change management, remote operations, digitalisation and agile principles (Assaad and El-adaway, 2021; Leskova et al., 2021; O'Keeffe and Papadopoulos, 2021), which are often costly (Zima et al., 2020). For instance, reduced frequency of the reasons for project delays was observed on the example of wearable technologies (AL-Sahar et al., 2021).

A specific challenge relates to the workforce as a highly variable resource involved on the construction site (Sing et al., 2016); therefore, effective management of health and safety must be implemented (Damon, 2014). It has been reported that a high number of construction workers tested positive for Covid-19 (Alsharef et al., 2021) on construction site and, therefore, it is necessary to follow safety practices in order to prevent disruption of construction project activities, as reported by (Kapecki, 2020; Araya, 2021b). According to (Amoah and Simpeh, 2020; Araya, 2021a; Simpeh and Amoah, 2021), the most common measures included the wearing of face marks, wearing of hand groves, wearing of face shields, social distancing, hand sanitising and temperature screening.

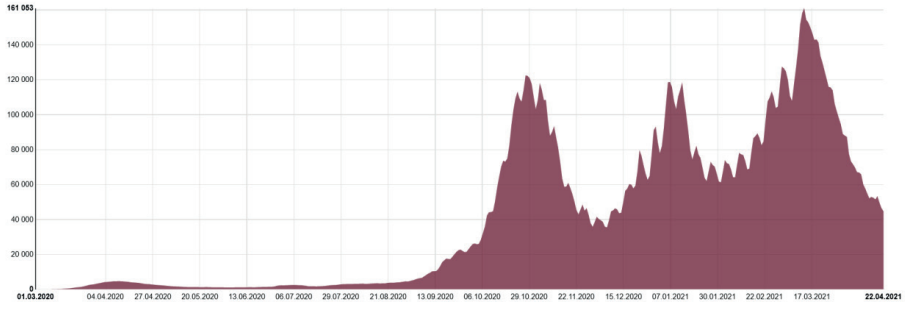
Pandemic effects such as delayed supply chain flows and reduced number of workers and their interaction on the site naturally resulted in a reduced productivity (Araya, 2021a; King et al., 2021). In order to help contractors

tackle these negative consequences, companies may apply for various kinds of financial aid.

2.2 The epidemic and the Government measures in the Czech Republic

The first 3 cases of the novel coronavirus in the Czech Republic were recorded on 1 March 2020, all related to travellers from Italy. In response to the outbreak and the threat to public health, a state of emergency was declared by the Government on 12 March 2020 at 14:00 hours for a period of 30 days. Due to the course of the epidemic in the Czech Republic, the state of emergency was subsequently extended until 17 May 2020. It was the longest state of emergency ever declared in the Czech Republic to date. The government can declare a state of emergency in cases of natural catastrophe, environmental or industrial accident or other threat which to a significant extent threatens life, health, property, public order and security (Czech Republic, 1997). During the first state of emergency, a strict lockdown was imposed resulting in a relatively low number of infected citizens. In this period, the Czech Republic was considered as a very successful country in terms of handling the pandemic (the maximum numbers of people concurrently infected with laboratory-proven Covid-19 was around 4,500, see Figure 1). However, after the measures were relaxed during the summer months, the epidemic gained momentum in the autumn of 2020, and by March 2021, the number of people concurrently infected with laboratory-proven Covid-19 had already exceeded 150,000 (The Ministry of Health, 2021) – an enormous number considering the population of the Czech Republic is around 10.7 million. The second state of emergency was declared on 30 September 2020 in connection with the onset of the second wave of the pandemic in the country and lasted until 11 April 2021. The need to declare an official state of emergency relates to the range of measures that the Government can order (for example, freedom of movement cannot be restricted without a state of emergency being put in place first).

Figure 1: A graph showing the number of people with laboratory-confirmed Covid-19 infection;



Source: The Ministry of Health, 2021

The measures that were adopted by the Czech Government against the spread of Covid-19 can be divided into three main groups: (1) general measures (concerning activities such as education, sports, cultural and other, mandatory face masks, retail restrictions and restrictions on assembly of persons); (2) measures concerning foreigners and border crossing; and (3) economic measures (e.g., restrictions on open market transactions, extension of the deadline for the filing of tax returns, adoption of business support programmes, etc.). Clearly, all three groups of measures affected construction companies to a certain extent. The real effect of the governmental measures on the operation of construction companies and on the execution of construction projects was the subject of this research and is presented in the following sections.

3. Data and methods

A web-based questionnaire survey was conducted in order to identify the ways in which the Covid-19 pandemic had affected Czech construction companies' operations. The survey consisted of 35 questions and was divided into 5 sections. The first section included general questions concerning the basic characteristics of respondents. The next set of questions related to the workforce, the third section focused on economic consequences and the fourth asked about the execution of construction projects. The last section focused on other relevant aspects relating to Covid-19 which could not have been thematically included in the previous sections.

Quantitative data were collected during February and March 2021 and the dataset thus covers both the first and the second state of emergency declared in the Czech Republic, which is sufficient to provide insights regarding almost the entire period of the pandemic. In total, 494 potential respondents were invited to take part in this survey on an anonymous basis. Since the survey focused, among other things, on the execution of construction projects, only construction contractors were considered as potential respondents. A total of 120 valid responses were received, corresponding to a 24.3% response rate. Such a relatively high response rate indicates that the topic investigated in this paper is of high importance for construction practitioners in the Czech Republic. The quantitative data was analysed using graphical and tabular representation, as well as with the support of relevant statistical methods: the chi-square test of independence to reveal potential relationships between categorical variables and the relative importance index (RII) to assess the importance of particular factors that had been examined.

For chi-square test of independence, the null hypothesis suggests that there is no relationship between examined categorical variables. The chi-square test of independence was tested on a 5% significance level. RII requires the use of ordinal grading scale and is in the interval $0 \div 1$. The higher the RII value, the higher importance of a particular factor is recorded. The RII is calculated according to the following equation (Ljevo et al., 2017):

$$RII = \frac{\sum w}{A \times n}$$

where *w* represents individual grade given to each factor, *A* stands for maximum assessment grade for each factor and *n* is the total number of respondents.

From the perspective of company size according to (*Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises, (2003/361/EC)*, 2003), 37.5% of respondents are classified as micro companies, 35.8%, 21,7% and 5.0% as small, medium-sized and large companies, respectively. Due to the low representation of large companies in the sample, medium-sized and large companies were merged into one joint category for the purpose of further analysis. An overwhelming majority of respondents were companies operating on the market for over 20 years (62.5%), 18.3% between 11 and 20 years and the rest (19.2%) for ten years or less.

As far as the specialisation of the respondents is concerned, most of them were active in the area of civil engineering (i.e., residential buildings, public and industrial buildings), but the sample also included companies focusing on transport structures, water management structures and special structures (e.g., masts and utility tunnels).

The quantitative part of the research was supplemented with qualitative data in order to identify potential causes, effects and consequences that could not be detected from the quantitative point of view. For this purpose, 10 interviews with experts in the field were conducted. A basic description of the interviewed is provided in Table 1.

Table 1: Basic characteristics of the interviewed experts

Position	Experience in years	Specialisation
Sales and technical preparation manager	8	Railway and road construction projects
Head of the sales department	6	Railway projects
Head of external affairs	20+	Buildings, transport infrastructure
Sales manager	5	Civic construction
Executive Director	20+	Civil engineering
Supervisory board member	10	Road construction projects
Economist	7	Civil and transport engineering
Senior developer	20	Developer projects
Construction coordinator	14	Civil engineering
Head of the HR department	10	Civil and utility engineering

Source: Author's research

4. Results and discussion

The quantitative data obtained through the questionnaire survey and the qualitative data from the interviews are presented and discussed together in the following sections. In particular, qualitative data were used to explore quantitative data in more detail. This sort of a combined method gives additional value to quantitative data and the findings are grounded in the respondent's experiences and opinions.

4.1 Workforce issues

The main goal of the companies was to prevent as much as possible the spread of the virus among their employees. A total of 87 respondents (i.e. 72.5%) reported that some of their employees had been infected with Covid-19. One of the measures that companies can apply to limit the spread of the virus is to organise work in teams that do not meet each other. That is, homogeneous groups where individual workers always work together and do not come into contact with workers from other groups. A total of 40 respondents (i.e. 33.2%) reported that they used a system of separate homogeneous teams. In the case of micro companies, this was only 8 respondents, while 18 and 14 respondents in small, and medium plus large companies, respectively, have implemented this system. The potential dependence of the categorical variables of company size and the frequency of using homogeneous work teams was tested using the chi-square test of independence. The p-value for the chi-square statistics of 7.869 with two degrees of freedom was 0.020. Since the p-value was lower than the significance level (5%), we rejected the claim about independence of the examined variables. Accordingly, the use of homogeneous work teams depends on the size of the company and it can thus be concluded that companies with more employees have more often organised work through separate work teams.

Another common measure, in addition to dividing workers into homogeneous teams, was working from home. In the sample studied, 36.6% of companies reported that they had not introduced working from home at all. The remaining companies did introduced it, mainly for staff members who were not directly involved in the construction work itself. Experts reported that these people included, for example, sales staff, preparatory workers or parents who had to look after their children when schools were closed due to the lockdown. One of the experts also mentioned the fact that many workers showed a significant drop in performance when working from home, and retrospectively assessed the introduction of a remote work in their company as disadvantageous.

In order to keep the construction companies running, it was essential to provide for sufficient personal protective equipment (PPE, including face masks etc.). A majority of companies did not report a problem in purchasing PPE (68.3%), while the remaining companies (31.7%) had trouble meeting their PPE demand. The experts reported that while some companies faced PPE shortages during the first state of emergency, during the second lockdown they rather struggled with the high cost of PPE. The construction industry had some advantage in this respect, as many companies regularly use FFP2

respirators as a standard on construction sites (for use in demolitions and other dust-generating activities), so they often had sufficient stocks of their own. It was mentioned during the interviews that some companies sewed their own cloth face mask (during the first state of emergency) or produced their own disinfectant in the company laboratory.

In the context of the Government's restrictive measures, there was a significant reduction in travel abroad, with 104 respondents indicating that no foreign trips were undertaken when the state of emergency was in place. In 16 companies, there were some international trips; in 4 cases, travel took place with significant complications caused by border closures, the hazard classification of the destination country and the associated restrictions upon return (mandatory self-quarantine, testing, etc.). Restrictions on cross-border travel significantly complicated projects abroad, which is why companies prepared plans for a possible conservation of buildings (IDNES.cz, 2020).

The issue of employment of foreign workers is shown in Table 2. The question of whether there was a significant outflow of workers back to their home countries is important because the Czech construction industry employs a significant number of foreign workers on construction sites, mainly from Ukraine and Slovakia.

Table 2: Foreign workers during the state of emergency.

Foreign workers in companies	Relative frequency
Everyone returned home	42.0%
A minority stayed	17.4%
A majority stayed	40.6%

Source: Author's research

The data in Table 2 show that a large proportion of companies struggled due to the departure of foreign workers; specifically, in 42% of companies employing foreign workers, all foreigners returned home, while in another 17.4% of companies only a minority remained in the Czech Republic. In this context, some construction companies decided to pay foreign workers a certain share of their wages even during their absence, in order not to lose employees during the pandemic because recruiting workers from outside the EU is an administratively demanding procedure (Kafka, 2020). Respondents reported that the most common occupations in respect of which they faced a shortage of workers were blue-collar jobs (e.g., bricklayers), designers, construction managers and drivers. Because the governmental measures did not prohibit the operation of construction companies, in 94.2% of cases there was no need to lay off workers. Only six companies experienced layoffs, which can be attributed to a decline in market demand for construction works.

4.2 Covid-19 related economic impacts on construction companies

A review of the literature points to the fact that the Covid-19 pandemic and the associated restrictive measures might have resulted in investors delaying project implementation. Therefore, the questionnaire sought to establish how the market situation had evolved in the context of supply and demand. According to 56.7% of respondents, the relationship between supply and demand has not changed. A total of 26.7% of the respondents among construction companies perceived a decrease in supply on the market while 16.6% stated that there was less demand (i.e. tenders for the supply of construction works) from investors. This difference in perception is likely to be due to a number of factors such as the size of the project, the particular segment of the construction industry and location. In the absence of more detailed data, it is not possible to provide a clear explanation for the different perception of the market situation. However, it can be concluded that the market situation has not changed radically because construction activity in the Czech Republic was not directly restricted by governmental measures and many investors, especially public procurers, cannot postpone projects in a situation where national and EU subsidies are allocated based on fixed deadlines for project completion.

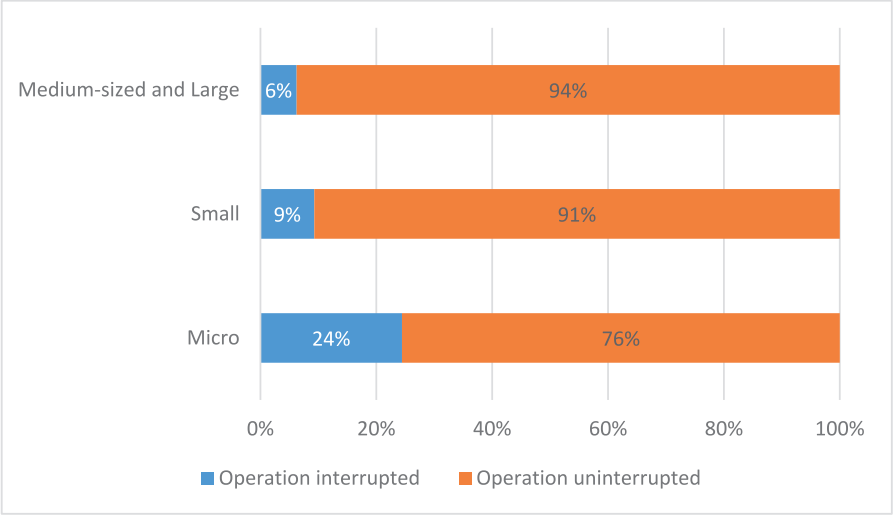
The situation on the construction market is also reflected in the answers regarding the turnover achieved. A total of 85.8% of respondents stated that their turnover during the state of emergency was comparable or only slightly lower than in previous years. Only 17 out of 120 companies reported a decrease in turnover of more than 25%. Such a significant decrease was due to the necessity to interrupt business operations in the case of 8 companies, while another significant factor was delaying the project by the investor.

Another aspect that was studied was the impact of the pandemic on wages in the companies. Since most of the companies achieved comparable turnover, it is not surprising that 75.8% of them did not adjust salaries during the state of emergency. Only 13 companies reduced wages and, conversely, wages increased in 16 companies. The experts' responses show that the Covid-19 pandemic did not affect wages because the construction industry as such was not directly restricted by governmental measures; most companies continued operating and implementing contracted construction projects.

In terms of business interruption, this occurred in 17 respondent companies (i.e. 14.2%). In the case of micro companies, business was interrupted in 11 companies, while only 4 and 2 respondents in small, and medium plus large companies, respectively, had to interrupt operations. The use of the chi-square test is inappropriate in this case as the expected frequency is less than 5 in more than 20% of the cells. However, it can be estimated based on the data that flexibility and ability to maintain operations during the pandemic increased with the size of the company as measured by the number of employees (see Figure 2). Most companies that had to suspend operations did so because some employees had been infected. In a situation where one employee in a micro company contracted the infection, other employees who had been in contact with that employee had to be quarantined as well and this, consequently, lead to an interruption in operation. Eurovia is an example

of a larger company that had to interrupt operation – it experienced a 14-day interruption of operations at the beginning of the pandemic (in March 2020), when the company faced a shortage of personal protective equipment (Lidovky, 2020).

Figure 2: Relative frequency of interruptions in construction companies' operations according to their size



Source: Author's research

A final question concerning the economic aspects was whether companies applied for governmental support programmes (e.g., as part of the "Antivirus" programme). Considering the fact that a large proportion of the companies did not have to interrupt their operations and had comparable revenues to the pre-pandemic period, it was not surprising that a total of 75.8% of them did not utilise any support programme. The chi-square test of independence was used to investigate, the scope in which support programmes were used according to company size. In micro, small, medium-sized plus large companies, the relative frequency of use of these programmes was 15.6%, 23.3% and 37.5%, respectively.

The p-value for the chi-square statistics of 11.922 with two degrees of freedom was 0.003. Since the p-value was lower than the significance level (5%), we rejected the claim about independence of the examined categorical variables. Accordingly, the use of support programmes depends on the size of the company and it can thus be concluded that companies with more employees have more often applied for government support.

4.3 Construction projects under the conditions of the Covid-19 pandemic

Information from practice as well as the literature suggested that the execution of construction projects could have been significantly affected. The set of the first three questions dealt with whether (1) dealings with public authorities regarding preparation and implementation of projects got longer; (2) project financing was put in jeopardy; and (3) there were problems with construction materials supply. These questions were evaluated using the 5-point Likert scale, where 1 meant the no/minimum disruption while 5 meant large/ significant disruption, and RII. The values obtained are indicated in Table 3 according to company size.

Table 3: RII values for dealing with public authorities, project financing and material supplies according to company size.

Factor	RII (micro companies)	RII (small companies)	RII (medium-sized and large companies)	RII (all)
Longer dealings with the authorities	0.742	0.735	0.781	0.750
Project financing	0.484	0.516	0.500	0.500
Supplies of material	0.498	0.470	0.481	0.483

Source: Author's research

The data in Table 3 show that dealings with the authorities got very prolonged (RII=0.750), which consequently led to project delays. In contrast, the assessment of the two remaining factors was more moderate, with both project financing (RII=0.500) and material supply (RII=0.483) represented only a moderately significant interference with projects. An interesting finding was the comparable assessment of the above 3 factors across all company size groups. The interviews revealed that the main reason for the longer dealings with the authorities was related to the introduction working from home and shorter office hours on the part of public administration. There were significant delays, ranging from weeks to months, in the processing of administrative steps. Some public offices were also unable to provide staff working from home with remote access to their systems.

There were no major problems with project financing, but one expert mentioned that he had noticed increased caution on the part of banks in approving new projects. Thus, from the perspective of construction companies, project financing was not at risk; however, some complications appeared on the part of the investors.

In terms of construction materials, complications occurred in more demanding projects that required supplies from abroad. In the interviews, experts mentioned, e.g., a delay in delivery of special cooling equipment from Turkey by several months, and a delayed delivery of cross-ties for a railway

reconstruction to Slovakia from Serbia (via Hungary), and the lack of plastic or steel products. The delivery of materials was complicated by limitations to truck traffic and delays at customs offices. Therefore, it can be concluded that supply chain problems were mainly related to larger construction projects with regard to sourcing materials/equipment from outside the EU.

A total of 70 (58.3%) construction company representatives reported that there had been a delay in one of their construction projects. In most cases, the cause of the delay was on the part of the investor (43.3%), while in 15.0% of the cases the delay was caused by the contractor. A fairly significant proportion of respondents (41.6%) indicated that there were no delays to projects during the emergency.

The next question concerned project interruptions. In 43 cases (35.8%), respondents indicated that the overall situation forced them to suspend the implementation of a construction project. When analysed in more detail, differences among companies of different sizes were found, namely 26.7%, 41.8% and 40.6% of micro, small, and medium plus large companies, respectively, had suspended work on one of their projects (see Table 4). Consequently, it was investigated whether there was a relationship between company size and the relative frequency of interruptions.

The p-value for the chi-square statistics of 2.643 with two degrees of freedom was 0.267. Since the p-value was higher than the significance level (5%), we could not reject the claim about the independence of the examined categorical variables. Accordingly, there is no relationship between the size of the company and the relative frequency of project interruptions. Experts add that project interruptions are more frequent due to reasons on the investor's part and that public investors sometimes cancel already agreed projects or postpone them to a later date.

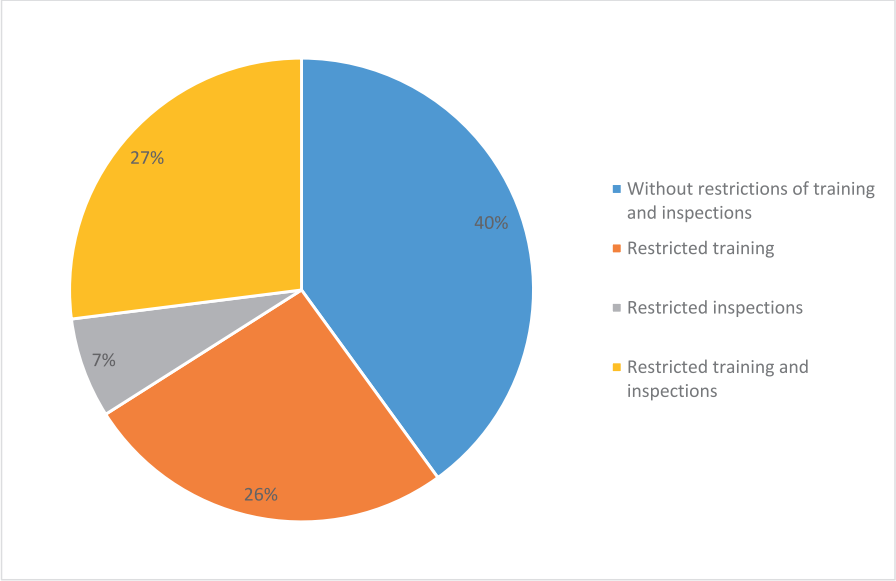
Table 4: Relative frequency of construction project interruptions in companies

Company size group	Some projects were interrupted	No projects were interrupted
Micro	26.6%	73.3%
Small	41.8%	58.1%
medium and large	40.6%	59.3%

Source: Author's research

Restrictions on the mobility and assembly of persons could also have an impact in terms of site inspections and mandatory employee training. The data in Figure 3 shows a larger proportion of the study population had to deal with complications in conducting site inspections and training. Again, these problems may have had a negative impact on the smoothness of the execution of construction work and, therefore, on the adherence to the planned schedule of works.

Figure 3: Analysis of complications in training and site inspections



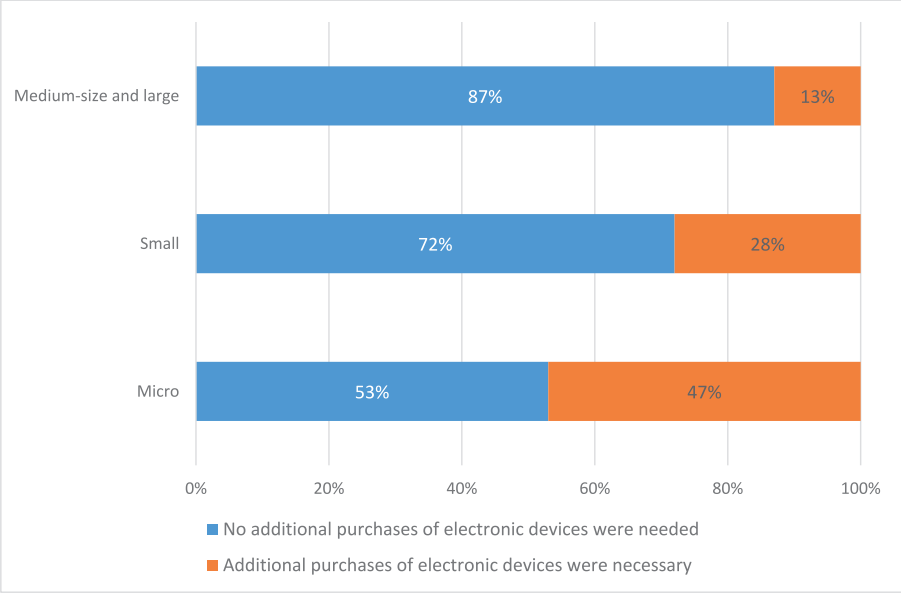
Source: Author's research

The limitations of face-to-face meetings also affected the preferred mode of negotiation between two or more entities. Since a high number of stakeholders is typical for construction projects, the limitations on assembly of persons necessitated replacing face-to-face meetings with other communication methods. The most commonly used communication methods included e-mail (39.2%), telephone (29.2%) and video conferencing (3.5%). In-person meetings were mentioned as the most common method of communication only by 1.3% of respondents. As the situation forced companies to use electronic means of communication to an increased extent (due to limitations of face-to-face meetings and working from home), the questionnaire also dealt with procurement of electronic devices.

Figure 4 shows significant differences among company size categories. A significantly higher proportion of medium and large companies (47%) needed to purchase additional electronic equipment compared to only 13% of respondents from among micro companies. The p-value for the chi-square statistics of 10.558 with two degrees of freedom was 0.005. Since the p-value was lower than the significance level (5%), we rejected the claim about independence of the examined categorical variables. Accordingly, the frequency of additional purchases of electronic devices is dependent on the size of the company, hence it can be argued that companies with a larger number of workers needed to purchase additional equipment more often. In the case of micro and small companies, i.e. companies with relatively low number of employees, it can be expected that the number of technical and

economic staff is small and they can manage with the existing equipment (PCs, telephones). However, in larger companies where the system of separate teams was more often used and where the absolute number of employees working from home was higher, there was a need to purchase additional devices so that all employees could work and communicate properly from home (this was very important, for example, in a situation where an employee was placed into quarantine, i.e., could not physically enter the office, but was still able to work from home).

Figure 4: Purchases of additional electronic devices in companies



Source: Author's research

4.4 Other issues related to the Covid-19 pandemic

Restrictions on face-to-face meetings also had an impact on the way company audits were conducted. In companies undergoing an audit, the following outcomes were reported: in 60% of cases the audit was conducted in a standard way; in 29% only by remote means; and in 11% by a combination of the auditors' personal presence at the audited company and video conferencing. As already mentioned, the state of emergency was declared twice in the Czech Republic. One of the questions included in the questionnaire asked which one had a more significant impact on construction companies. A total of 35% of the respondents reported that the first state of emergency had a more significant impact; 44% believed the second state of emergency had a greater impact, while 41% considered the impact of the two instances where the state of emergency was declared to be comparable.

In the case of the first state of emergency, businesses were mainly faced with a lack of personal protective equipment and restrictions on movement and assembly of persons; working from home was implemented to a large extent, while the number of infections was relatively low in the first half of 2020 (see Figure 1). In contrast, the second state of emergency was characterised mainly by the rapid spread of Covid-19 in the population, with the number of people infected or quarantined increasing nearly 30-fold. Although the impacts of the two instances when the state of emergency was declared on the construction industry were generally comparable, they differed in their causes. In the case of the first state of emergency, it was primarily the unpreparedness of the Government and enterprises (e.g., a lack of personal protective equipment, missing IT equipment), while in the case of the second state of emergency, the problem was primarily the high number of infected and quarantined persons.

In the interviews, experts were asked whether compliance with the Government's restrictive measures was a problem for their companies. Individual opinions varied, but in general it can be said that they did not usually cause serious complications; however, the measures were strongly criticised for their unpredictability and frequent and sudden changes. Experts also said it was difficult to comply with the measures in terms of, for example, the duty to conduct regular testing for Covid-19 during the second state of emergency, the mandatory wearing of face masks during the first state of emergency, and also due to people's general resistance to the restrictions motivated by doubts about their meaningfulness.

Following the end of the second state of emergency, the Pandemic Act was adopted by the Czech Parliament to provide a legal framework necessary to combat the ongoing pandemic. In this context, experts report that they do not perceive a difference between the impact of the state of emergency and that of the Pandemic Act on their company's activities. Most of the governmental measures remained in force even after the state of emergency ended and their scope is influenced by the current epidemiological situation rather than their legal basis.

5. Conclusion

This paper provides insight into the situation in the Czech construction sector during the Covid-19 pandemic. In particular, it demonstrated the ways in which the Government's restrictive measures adopted during the state of emergency affected construction contractors. This impact was studied from three perspectives: workforce issues, effects on the business operations of companies, and the execution of construction projects.

The results of this study show that the real impact of the Covid-19 epidemic was rather moderate. Since the Czech Government's lockdown did not apply to the industry in general, including construction, most companies could successfully deliver construction works with only minor complications. In this context, it should be noted that building material stores were closed for the general public; however, entrepreneurs (construction companies and

craftsmen) were able to purchase materials without any restrictions.

Construction is a process requiring a high level of flexibility, which is why companies were mostly able to cope with existing obstacles. Main challenges were related to the delivery of materials to the construction site, project delays, and the distribution of personal protective equipment, especially in the early stages of the pandemic and the state of emergency declared in the Czech Republic. However, some companies were forced to interrupt certain projects or even interrupt the operation of the whole business. The findings also suggest that restrictive measures have encouraged digitalisation in construction, especially with regard to communication between various project stakeholders.

This study was limited in several ways. Due to the sample size, it was not possible to analyse data in terms of the type of work (e.g., building construction, road construction etc.) and project size. It is possible that these aspects might reveal additional variation in the impact of the pandemic on the construction industry. Therefore, this is a key area to be explored further. Future research should also consider the potential effects of individual measures taken by contractors beyond the scope of governmental restrictions and their effect on the companies' resilience to Covid-19 related impacts.

Acknowledgment

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CHAPTER 8

Topic modelling of Croatian five-star hotel brands posts on Facebook using Latent Dirichlet Allocation

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Abstract

Official websites of hotel brands on Facebook are still an efficient way to interact with their customers, as the interaction between them covers different types of valuable information and benefits. The purpose of this study is to investigate the activities of hotel brands in social media and extract latent posting topics from Croatian five-star hotel brands. The authors used descriptive statistical analysis to analyse hotel brands' activity and the probabilistic generative topic model Latent Dirichlet Allocation (LDA) to extract latent topics from the large number of hotel brands' posts on Facebook. The results show that Croatian five-star hotel brands pursue the most common social media marketing objectives based on relationship building, publicity or message strategies, brand building, market research and sales promotion. The paper discusses the application of the Latent Dirichlet Allocation analysis and offers recommendations, challenges, and current insights into applied Croatian marketing strategies on the social media platform.

Key words: *tourism research, hospitality industry, social media, topic modelling, Latent Dirichlet Allocation (LDA)*

JEL classification: *L83, Z32*

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1. Introduction

The phenomena of the global accessibility of the internet and the “data gold rush” are continuously changing the world, the global economy, and the tourism industry, delighting customers, optimizing business processes, creating new and innovative products and services, understanding human interactions and improving conditions for people. The relevance of the focus on social media data created by hotel brands and their followers can be clearly seen out from statistics and facts provided by Statista in 2020. The power of the social network is reflected in the number of global users, which is expected to reach around 3.43 billion monthly active social media users by 2023.

Facebook is the first social network to break through the 1 billion monthly active users mark, reaching 2.6 billion users worldwide in first quarter of 2020 (Statista Research Department, 2021). Despite the omnipresence of social networks, the market potential continues to grow, as not only the number of users but also the commitment of users continues to increase. On average, Internet users worldwide spend around 144 minutes a day surfing social networks. This prompts global brands and their marketers to use this time and screen space to promote various products and services via social media marketing or social advertising (Statista Research Department, 2021). Hotel brands use Facebook pages as platforms for communication, interaction and networking with customers and potential guests, and for providing adequate content to consumers as an essential component of overall user satisfaction (Ferrer-Rosell et al., 2019), but also use Facebook as a social media marketing tool for relationship building, advertising, branding, market research and promotion (Gunelius, 2011). The authors believe that the analysis of produced big data has the potential to improve tourism policy and management, especially in the recovery from the pandemic that hit the tourism industry worldwide hard.

In many recent studies, tourism researchers have applied quantitative methods collected through field studies (Ali et al., 2018). As qualitative research paradigms and methods are less applicable in the field of hospitality and social media research (Nusair et al., 2019), this study aims to provide a descriptive analysis of the hotel brand’s Facebook posts and to identify the underlying topical structure of Facebook posts using Latent Dirichlet Allocation (LDA).

The purpose of this study is to use a text mining technique to perform topic modelling and sentiment analysis on posts and comments of Croatian hotel brands on Facebook. The following research question will be answered: What kind of content and information do Croatian five-star hotel brands share through their Facebook pages for self-promotion and communication with Facebook users?

The paper is divided into five sections. The first section contains a brief introduction focusing on the purpose of the study and the research question. The second section reviews the literature in the field of big data analysis and qualitative research methods in tourism research. The third and fourth

sections describe the research methodology used and the empirical findings of the study. The last section presents the discussion, main conclusions of the study, limitations, and suggestions for further research.

2. Literature review

In the last three decades, big data has become increasingly popular in both academic and non-academic media (Mariani et al., 2018). The analysis of big data analysis allows researchers to overcome problems with representative samples (George et al., 2016), it allows people's opinions, ideas, and behaviours to be captured more accurately (Mariani et al., 2018). Early definitions of big data summarised the characteristics of Big Data with a 3Vs model (volume, variety, and velocity) (Chen et al., 2014). It was Doug Laney, analyst at Gartner, who introduced the 3Vs concept in a 2001 MetaGroup research publication (Laney, 2001). According to this definition, *volume* refers to large amounts of data, *variety* refers to different types of structured and unstructured data, and *velocity* refers to the speed at which data is created and modified. Later two additional Vs – *veracity* (trustworthiness of data) and *value* (large value but very low density) – were added (Ishwarappa and Anuradha, 2015).

In the context of tourism, the use of big data is a valuable resource for the analysis of tourist behaviour, the decision-making process, the elaboration of marketing strategies, the production of more detailed statistics and the prediction of trends (Mariani et al., 2018). User-generated content (UGC) is a part of Big Data and has been described as creative work published on publicly available websites and created without a direct link to monetary gain or commercial interest (OECD, 2007). UGC research mostly focuses on various aspects of service quality, destination image and reputation, experience and behaviour, persuasiveness of UGC as eWOM, and tourism mobility (Lu and Stepchenkova, 2015).

In recent years, there has been a lot of research on online social media text data in the tourism literature (Kirilenko et al., 2017; Alaei et al., 2019). Thanks to advances in machine learning and data mining, sentiment analysis techniques offer the possibility to transform qualitative data into quantitative data and create opportunities for more innovative research designs (Ma et al., 2018). Sentiment analysis basically refers to the use of computational linguistics and natural language processing to analyse texts and identify their subjective information (Alaei et al., 2019). The main goal of sentiment analysis is to extract a sentiment expressed in a document towards a certain aspect based on the subjectivity and linguistic properties of the words within an unstructured text (García et al., 2012).

Sentiment analysis can be performed at the document level, sentence level, and feature or aspect level (Sharma et al., 2020). Sentiment analysis involves a multi-step process: (1) data retrieval, (2) data extraction and selection, (3) data preprocessing, (4) feature extraction, (5) topic detection, and (6) data mining process (Alaei et al., 2019). Tourism researchers have mostly conducted sentiment analysis using tourism reviews sourced from

professional websites (e.g., TripAdvisor, Booking, and Ctrip) and social media posts (e.g., Twitter, Facebook, Instagram). The datasets used in the literature refer to hotel accommodation (Gräbner et al., 2012; Markopoulos et al., 2015; Chiu et al., 2015; Calheirosa et al., 2017; Xiang et al., 2017; Guo et al., 2017; Sutherland et al., 2020), peer-to-peer accommodation (Kiatkawsin et al., 2020), restaurants (Gan et al., 2017; Laksono et al., 2019), airlines (Misopoulos et al., 2014; Kwon et al., 2021) and travel destinations (Ye et al., 2009; Pearce and Wu, 2018).

According to Iliev et al. (2015), there are three popular approaches used today to automate text analysis: (1) user-defined dictionaries; (2) extraction of language features that maximise prediction accuracy; and (3) patterns of word co-occurrence in a semantic space. In the first approach, user-defined dictionaries, the researcher pre-selects words, and phrases that could help in the output. Although this method is a very useful tool, the main drawback of this method is that sarcasm, metaphors, or idiomatic expressions cannot be captured (Iliev et al., 2015). The second approach, feature extraction, uses a machine learning algorithm to define features (Kiatkawsin et al., 2020). The machine learning approach includes two methods, the supervised learning method and the supervised learning method (Alaei et al., 2019). The supervised learning method is based on a large amount of labelled training documents, while the unsupervised learning method was adopted when there was difficulty in identifying labelled training (Ma et al., 2018). There are several supervised classification algorithms, but the most commonly used in the tourism literature are Support Vector Machine (SVM) (Ye et al., 2009; Zheng and Ye, 2009; Markopoulos et al., 2015; Sontayasara et al., 2021) and Naïve Bayes (Laksono et al, 2019; Sánchez-Franco et al., 2019).

The third and most recent approach is based on word co-occurrences (Iliev et al., 2015). This approach is also called topic modelling because the output is the latent topic structures within a dataset (Kiatkawsin et al., 2020). Topic modelling is a machine learning technique that converts unstructured data into structured data by using natural language processing (NLP) to extract intelligence from a given text (Min et al., 2020). In hotel industry studies, topic modelling is becoming very popular and is used for a variety of purposes: comparative analysis of multiple online review platforms (Xiang et al., 2017), hotel visitor satisfaction analysis (Guo et al., 2017) analysis of international tourists' experiences (Pearce and Wu, 2018).

Among topic modelling techniques, latent Dirichlet allocation (LDA) is the most popular (Liu, 2013). LDA is an unsupervised topic modelling technique that works on the principle of discovering the different topics from a large amount of text. Although this modelling technique has been applied in various fields, only a few recent studies in tourism and hospitality have applied this type of modelling (Calheirosa et al., 2017; Dickinger et al., 2017; Guo et al., 2017; Bi et al., 2019; Kim et al., 2019; Vu et al., 2019; Luo et al., 2020; Kiatkawsin et al., 2020; Sutherland et al., 2020). Guo et al. (2017) used the LDA to identify key dimensions of customer service expressed by hotel visitors. The dataset included 266,544 online reviews for 25,670 hotels in 16 countries and uncovered controllable dimensions that are critical for hotels to

manage their interactions with visitors. Sutherland et al. (2020) applied the topic modelling technique to online reviews of accommodations and provided managers with implications for improving customer satisfaction. Kiatkawsin et al. (2020) used LDA to analyse and compare Airbnb reviews from Hong Kong (85,695) and Singapore (93,571). The optimal number of topics differed between the two datasets, but both sets of results are identical in terms of scope. The results also revealed keywords used in rating the experience, which provide more insight than typical numerical ratings.

Most studies on sentiment analysis have focused on analysing online customer reviews, while there is little research on official posts and comments on the Facebook brand page. On Facebook, companies often post photos, videos, questions, and various content to engage their customers. Social media engagement is defined as active involvement or participation in media, it is consumer response to posts and the sum of sympathy activities (Chun et al., 2021). Recently, Chun et al. (2021) investigated the effects of posting types, topics, and sentiments on the Toyota Facebook fun site on social media engagement. They found that using videos instead of statuses increased engagement, that there was a difference in engagement depending on topics, and finally that the polarity of sentiment (positive and negative) affected engagement.

One of the first studies to examine the message strategy of hotels' Facebook marketing was by Leung et al. (2019). They examined message strategy and its effectiveness in a study of 1,837 messages from 12 hotel brand Facebook pages using content analysis. The authors found that product, brand, and involvement messages were more effective than information, reward, and promotional messages. They concluded that there are few researchers who evaluate the marketing effectiveness of social media, specifically from a message strategy perspective. Therefore, to fill the gap in the literature, this study will use the LDA method to extract latent topics from the large number of posts by hotel brands on Facebook. The extracted topics can help to find out which topics are important among hotel consumers.

3. Methodology

3.1. Data Collection

According to the official data published by the Ministry of Tourism of the Republic of Croatia in October 2019, a total of 43 five-star hotels are categorized. The data was collected in February 2020 on Facebook, the most popular social networking site for online self-expression, and covers a period of 12 months in 2019, using NCapture for NVivo and manually. The focus is on Facebook, as the adoption of other social media sites is still in its infancy when it comes to hotel brands in Croatia.

Given the large number of hotel brands in Croatia, several selection criteria had to be defined. In order to narrow and specify the sample, all hotel brands had to be searched and checked for an official Facebook site. Hotel brands that did not have an official hotel brand site, hotel brands that did not, in general, post in English and hotel brands that did not publish at least

three posts per month were excluded from the research. Finally, the sample included 10 hotel brands (2 rural hotels, and 8 coastal hotels).

3.2. Data Screening

The aim of the data screening process was to cleanse and standardize the text data (Facebook posts) for the LDA algorithm in natural language. For this purpose, the data screening process was performed using the R programming language. The text mining *tm* package and *googleLanugageR* were used to detect and remove non-English posts, convert characters to lowercase, remove http, www, hashtags, controls, special characters, punctuation, leading whitespaces, trailing whitespaces, numbers and emoticons, and stem words that were derived from removing derivatives of a word to retain only the stem form. As a result of the data screening process, 864 posts were retained for further analysis.

3.3. Method

A descriptive statistical analysis was used to describe the activity of the hotel brand on Facebook. The following variables were summarized: date of posts, number of posts, number of posts by time distribution, number of characters, number of likes, number of shares, number of photos, number of links, number of hashtags, number of emojis and number of comments.

Topic models are a type of statistical and unsupervised models that can quickly uncover latent topics within large corpora of documents (Blair and Bi, 2020). LDA is one of the most popular techniques of topic modelling and is a particular probabilistic (Bayasian) variant of topic modelling that starts from Dirichlet distributions on the topics and adapts a generative model to the world occurrences in the corpus (Babur et al., 2020). Notwithstanding the fact that LDA is an unsupervised approach, when LDA generates a topic model, several parameters that affect the output of topics must be set (Deveaud et al., 2014). Without prior knowledge of the corpus to be modeled, setting a small number of topics leads to very broad topics, usually containing common words and stop words (Blair and Bi, 2020). It is important to note that there is no generally accepted method or procedure for extracting the number of topics, but the most frequently cited authors and methods are Griffiths and Steyvers (2004), Cao et al. (2009), Arun et al. (2010), and Deveaud et al. (2014). The optimal number of topics for Facebook posts is thus reached when the general dissimilarity between the topics reaches its maximum value.

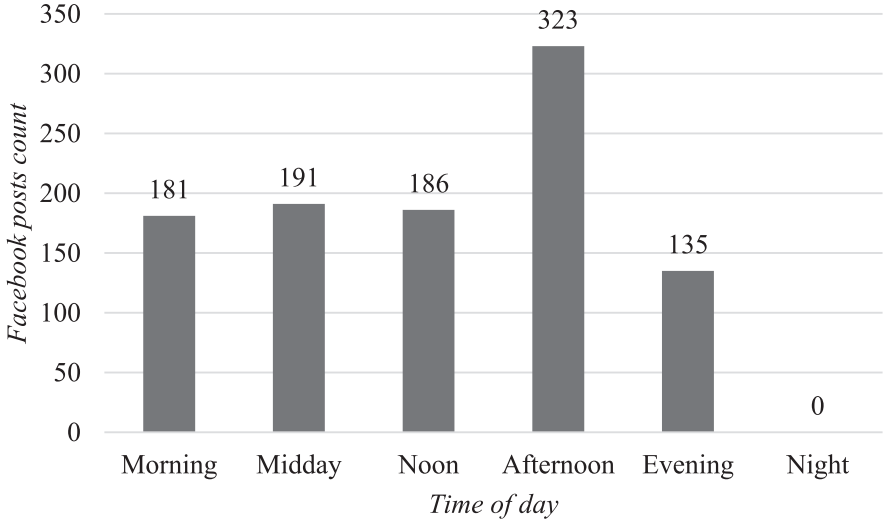
4. Findings

4.1. Descriptive analysis

According to the analysis of Croatian five-star hotel brands in 2019, a total of 1021 posts and 1743 comments were recorded on Facebook pages. Analysing the distribution of posts, 84.9 percent of hotel brands were posted on weekdays, while 15.1 percent were posted on weekends. Hotel posts were almost evenly distributed throughout the day, with most posts being made in

the afternoon (323) and none in the evening (Figure 1). In other words, hotel brands post most often when regular daily activity levels are lower.

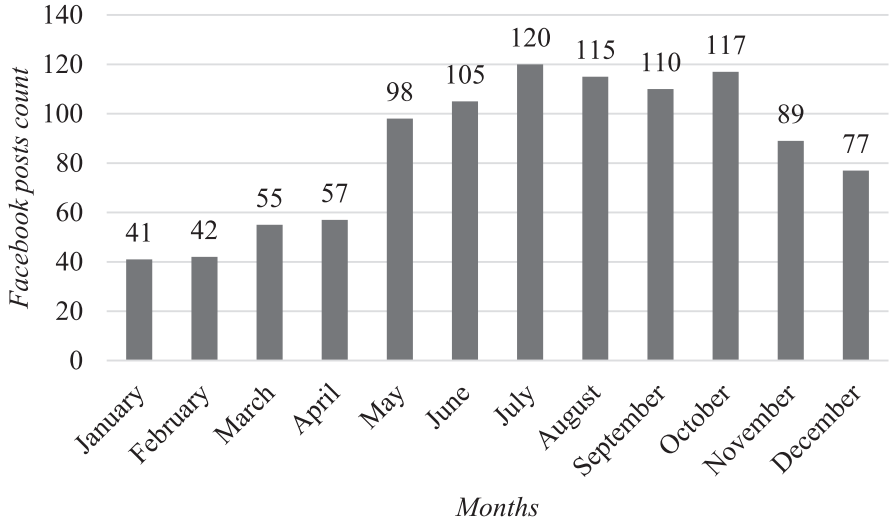
Figure 1: Facebook posts distribution by parts of the day (n = 10)



Source: Author's research

The empirical analysis also shows that the hotel brand's activity on Facebook is highest from May to October, reflecting the immediate low and high season in the most populous coastal region of Croatia. According to this, the hotel brand's activity is lowest from November to April (Figure 2).

Figure 2: Facebook post distribution by months in year 2019 (n = 10)



Source: Author's research

Most content posted by hotel brands consists of photos (93 percent), followed by links (5 percent) and videos (2 percent). Looking at the posts in their entirety, it is the photos that generate the most interaction between the hotel brands and their fans. The analysis also showed that the posts are on average 86 to 477 characters long and contain on average 0 to 11 hashtags. The most frequent used stemmed words are 'book' (213), 'day' (91), 'beauti' (76), 'hotel' (65), 'enjoy' (65), 'view' (63) and 'perfect' (58), whereby the most used hashtags are 'croatiafulloflife' (222), 'bookyourstaytoday' (210), 'Xadriatic" (46), 'Xzagreb' (46)', 'visitopatija' (39) and 'opatijaexperience' (23).

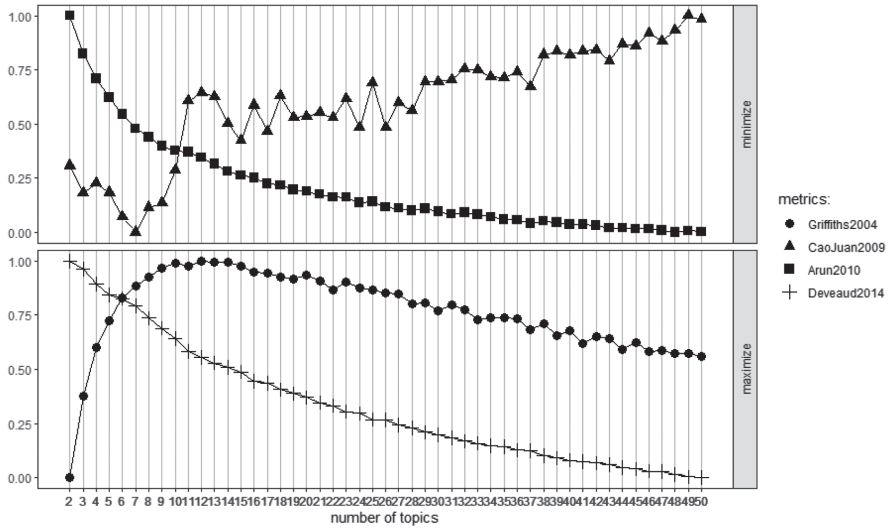
Furthermore, the index of interaction rate is calculated to indicate the number of interactions (reactions, comments, shares) relative to the size of the page (Lies and Fuß, 2019). A total of 144947 customer reactions (emojis), 1743 customer comments, 3321 customer shares and 88126 page fans were observed. According to this, the interaction rate is 170.22 and indicates the average number of interactions per 100 fans of the site, which is relatively low and is not considered really successful.

4.2. Optimal number of Topics

The authors evaluated the performance of different selections of K as the total number of topics for the LDA topic models and derived different results from this. Before the LDA models were executed, the results of each method were normalized on a scale of 0 to 1, while any possible number of topics between 2 and 50 was determined and evaluated by a grid search. The measure proposed by Arun et al. (2010) and Cao et al. (2009) aims to minimize the

proposed criteria, while Griffiths and Steyvers (2004) and Deveaud et al. (2014) aim to maximize the log-likelihood of the word topic probability in the documents. Ideally, one would expect these measures to converge to the same value of K. As Gao et al. (2017) mentioned, empirical studies unfortunately do not necessarily show such perfect convergence patterns.

Figure 3: Appropriate K value for the optimal number of topics



Looking at Figure 3, the metrics “Deveaud2014” and “CaoJuan2009” show that the optimal number of topics is between 2 and 7 topics. Therefore, the authors define K = 7 as the total number of topics and perform 1000 iterations of the Gibbs sampling procedure to derive the subsequent probabilistic distribution via topic assignment. After evaluating the extracted keywords per topic, the authors decided to define seven topics as the keywords perfectly matched the content of the posts.

4.3. Topic identification

The seven topics extracted using the LDA model are summarized in Table 1. As specified in Sutherland et al. (2020), the keywords were determined according to the words with the highest beta value within the topic, i.e., the words with the highest relative probability of belonging to the given topic are ranked in order from the most important to the least important keywords per topic. Since LDA is an admixture model, the same words may occur to more than one topic. However, as LDA does not explicitly specify the topic names, authors must interpret the overarching topics of the keywords in each topic and specify names (similar to the interpretation of exploratory factor analysis). To ensure that the topic labels accurately reflect the topic content, the validation of the topics was achieved by analysing the Facebook posts

of the hotel brands with the highest proportion of extracted keywords in the respective topic (Kiatkawsin and Sutherland, 2020). In the following, the authors briefly presented each topic and its meaning.

Table 1: Extracted latent topics with its related keywords

Topic 1 - Market research – invitation to submit user generated content
view, sunset, visit, season, special, holiday, resort, wish, city, photo
Topic 2 - Message Strategy – functional appeal
enjoy, view, book, spa, beauty, treatment, spend, amaz, pool, moment
Topic 3 - Message Strategy – emotional appeal
time, restaurant, wine, perfect, best, relax, check, day, feel, better
Topic 4 - Message Strategy – experiential appeal
experi, offer, visit, feel, restaur, special, guest, delici, best, place
Topic 5 - Sales Promotion – discount/price offs and contest
day, stay, love, offer, summer, wed, sea, relax, magic, festive
Topic 6 - Brand building - exclusivity
hotel, happi, luxury, guest, great, adria, world, know, park, info
Topic 7 - Relationship building - festive
beauty, book, experi, place, perfect, celebr, delici, summer, chef, christma

* Note: keywords *'amaz', 'experi', 'restaur', 'delici', 'happi', 'adria', 'celebr'* and '*christma'* are results of the stemming process.

Source: Author's research

Topic 1: Market research – invitation to submit user generated content

The first group of topics is related to market research and the invitation to submit user generated content, which is very popular and widely used in the tourism and hospitality industry. The first topic consists of following keywords: 'view', 'sunset', 'visit', 'season', 'special', 'holiday', 'resort', 'wish', 'city' and 'photo'. To confirm the consistency of the keywords with the topic, examples of Facebook posts are provided:

[1] *Is this the real life or just a fantasy? We assure you, it is real! Capture the most unique sunsets using #XSunset and share the magic with us!*

[2] *We simply love the views. What is your favourite view at our property?*

[3] *Share your X Sunset with the World & simply hashtag #X*

[4] *A picture perfect view over Zagreb! Share your Zagreb pictures with us in the comments.*

Topic 2: Message Strategy – functional appeals

Topics two, three and four relate to Facebook post message strategies and the way hotel brands promote the destination, their services and products.

The second topic describes the functionality of hotel facilities, products or services. The following keywords are extracted: 'enjoy', 'view', 'book', 'spa', 'beauty', 'treatment', 'spend', 'amaz', 'pool,' 'moment' and examples are given:

[5] *"What is fun if you don't share it with your friends?! Bring your besties to a Ladies Weekend and enjoy spa treatments, group exercises, drinks at the bar, Japanese specialties and karaoke parties!*

[6] *Treat yourself to an unforgettable vacation that's far from ordinary. Visit beautiful city of Dubrovnik and enjoy your stay in our hotel with breath taking view.*

[7] *Enjoying these late summer days at the pool.*

[8] *Hotel XXX is a perfect venue for hosting all kind of gatherings including banquets, presentations, business lunches, conferences and seminars. Meeting and function rooms of varying sizes can accommodate from 20 up to 600 people and are completely equipped with all necessary audio/visual technology.*

[9] *Visit our Bellevue Spa Clinic, the largest in the region with 7 treatment rooms, 2 couple's suites, 2 mani-pedi lounges, fitness studio and an exercise room, 2 outdoor treatment and relaxation areas, heated indoor pool and jacuzzi and an outdoor seawater pool and jacuzzi. Along with that we have a purely medical facility with reputable visiting doctors and a nutritionist on call.*

Topic 3: Message Strategy – emotional appeal

The keywords 'time', 'restaurant', 'wine', 'perfect', 'best', 'relax', 'check', 'day', 'feel' and 'better' are part of the type of creative message strategy and describe the emotional appeal of Facebook posts. This topic describes the psychological/social needs and indicates how guests will feel after they have experienced or consumed the service/product (topic three). The most appropriate examples are:

[10] *What could be better than a glass of wine by the sea?*

[11] *Relaxing before bedtime...*

[12] *Try our relaxing after- sun massage with special stones.*

[13] *Make a little time for yourself. Reward your senses. Shine. Relax.*

[14] *Stroll in the Old Town of Dubrovnik and let yourself discover what means losing the sense of time surrounded by the most bewitching beauty.*

Topic 4: Message Strategy– experiential appeal

In the analysis of the keywords 'offer', 'visit', 'feel', 'restaur', 'special', 'guest', 'delici', 'best', 'place', it was found that the fourth topic relates to the experience appeal of services and offers. To confirm that the keywords match the topic, examples of Facebook posts are provided:

[15] *Experience the traditional gourmet cuisine of Rovinj in the authentic trattorias hidden in the backstreets of the Old Town. Join on X Townscape tour and discover gourmet secrets known only to the locals!*

[16] *Pay a visit to X restaurant, choose from a dozen different dishes such as scampi, fresh fish or tasty meat steaks and enjoy the view to the beautiful Čikat bay!*

[17] *A sweet touch of our love and layers of smooth flavors: in everything we do for you we always put our heart. Taste more: …*

[18] *Hungry? Ante & his team are preparing the perfect dinner for an unforgetable evening at our restaurant.*

Topic 5: Sales Promotion – discount/rabats and contest

Using the extracted keywords 'day', 'stay', 'love', 'offer', 'summer', 'wed', 'sea', 'relax', 'magic', 'festive' and Facebook posts, the fifth topic is called promotion, as hotel brands offer valuable discounts, rebates and content via the social media platform Facebook. The following posts reflect the defined theme:

[19] *Set your Dream Day in Kvarner's most beautiful bay. Share your ideas with us, and let our team organize your wedding day. You will start your joint journey stress-free, happy and relaxed while enjoying the company of your loved ones.*

[20] *Take advantage of our special offer at XXX Hotel and save up to 20% when booking 3 nights or more! View our special offer: …*

[21] *[CONTEST REMINDER] Fancy a taste of gastronomical paradise at XXX Restaurant? Let us take you! Share a photo of your favorite view from the XXX Hotel and win a dinner for two! Read the rules here: …*

Topic 6: Brand building – exclusivity

Since the analysis includes Croatian five-star hotels it is not surprising that

the exclusivity of the hotel brands is emphasised. For this reason, topic six is defined as brand building, which emphasises exclusivity and contains the following ten keywords: 'hotel', 'happi', 'luxury', 'guest', 'great', 'adria', 'world', 'know', 'park', and 'info'. The corresponding Facebook posts are:

[22] *Did you know hotel X is a member of Virtuoso and prestigious Small Luxury Hotels of the World?*

[23] *A place where comfort meets luxury…*

[24] *Enjoy exquisite wines at X restaurant. The selection covers over 400 quality wine labels from around the world.*

[25] *We are so happy to announce that X won the award for World Luxury Spa hotel in 2019!*

[26] *Feel like royalty.*

Topic 7: Relationship building - festive

The last topic is related to the relationship building with customers in form of festive events, thanking, greetings and exchange of information:

[27] *We are excited to announce our first The Chef's table dinner - French Revolution gala dinner celebrating Bastille day and the Tour de France on 14th of July. Tickets to this exclusive event are limited so be sure to guarantee your place!*

[28] *Our guests are what bring out the true charm of our hotels. Thank you for sharing your special moments with us!*

[29] *Holiday Greetings from hotel X.*

[30] *If you ever wondered how it feels like to have the old town of Rovinj on the palm of your hand, you might consider staying at the XXX Hotel Rovinj this year.*

5. Discussion and conclusion

The tourism industry faces the constant challenge of following the rapid development and growth of social media. The industry successfully benefits from the advantages of social networks (online conversation about the business, brand, products, and promotions), relying largely on the reputation of the destination, consumer opinions, information sharing and positive word-of-mouth advertising. However, the impact of the global outbreak of the COVID-19 virus has been more devastating than any other crisis in recent history. Therefore, tourism stakeholders need to develop effective and creative marketing strategies to respond to and recover from this crisis and successfully contribute to international trade and travel. Comparing the numbers of tourist arrivals and overnight stays in Croatia before the crisis in 2019 and in the recovery phase in 2021, it can be seen that Croatian tourism stakeholders and hotel brands have been successful with their marketing and

promotional activities. Some of the key factors lie in offering a safe stay in the destination and understanding the needs, behaviour, and travel motivation of tourists.

The latent topic extraction represents the primary contribution of the study given that the topic modelling is still a relatively new method in hospitality and tourism management research. When analysing Facebook posts in a more general context, hotel brands highlight their comparative and competitive advantages in tourism at the micro and macro levels. Core resources and attractors such as physiography (landscape and climate of the destination), culture, history, activities, special events of the destination, supporting resources and services are very popular thematic posts of hotel brands.

By analysing Facebook posts in a more specific context and by thoroughly analysing the extracted latent topics with the corresponding keywords and individual Facebook posts of all hotel brands included in the study, it can be concluded that Croatian five-star hotel brands follow the marketing literature and the goals or purposes of companies that use Facebook as a self-promotion channel. The results show that Croatian five-star hotel brand hardly rely on relationship building, publicity or message strategies, brand building, market research and sales promotion, as previously presented by Gunelius (2011), Ashley and Tuten (2014) and Loo (2020).

Although the content of the posting itself is important, the technical factors mentioned above also influence the performance of the posting. For example, according to qintly.com's social media analysis, the "perfect" length of Facebook posts should be limited to about 50 characters, contain emojis and hashtags moderately, and post more on weekends. The tourism stakeholder should continuously follow the advice of the leading international companies for social media analytics and competitive benchmarking and their instructions for improving their self-promotion, interaction rate and business in social media.

The limitations of the study relate to the choice of a social networking site, the sample size of five-star hotels in Croatia and the chosen topic modelling method LDA, which should be combined with other methods that determine the sentiment of the posts. Despite the limitations of the study, the results do not diminish its value.

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CHAPTER 9

How the application of technological innovations supports the healthcare industry in the COVID-19 pandemic?

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Abstract

Today's world is pervaded with changes caused by the emergence of the COVID-19 pandemic. Due to this pandemic, world economies are confronted with many turbulent challenges and prompt adjustments in different industries. The key to solving challenges caused by the COVID-19 pandemic is healthcare, but at the same time, it is most affected by the unfavourable effects of the pandemic. Given that the technological innovation development and application simultaneously cause positive changes in societies and economies, this paper explores how technological innovation has supported global healthcare during the COVID-19 pandemic. For this purpose, a systematic review of the scientific literature in two world-renowned databases of scientific papers: Web of Science and Scopus, is conducted. The scientific articles considered for this literature review were articles published and indexed in the mentioned databases during the pandemic period, therefore, from the beginning of 2020 until now. The research results indicated technological changes and new technologies applied in healthcare, which resulted from the outbreak of the COVID-19 pandemic. Moreover, the results showed the outcomes that technological innovations application has attained in healthcare during the COVID-19 pandemic. Also, the results indicated shortcomings in the field of research on this topic, based on which recommendations for further research are defined.

Key words: *technological innovation, healthcare industry, Covid-19, literature review*

JEL classification: *D80, I10, I15, O32, O33*

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1. Introduction

Nowadays, the world is challenging with a global pandemic caused by the COVID-19 virus. It caused many problems in almost every business sector in various countries as countries around the world went into lockdown (Bahl et al., 2020). Most importantly, COVID-19 pandemic particularly impacted the healthcare system as the first sector in the defence line (Di Carlo et al., 2021). As one of the solutions for this pandemic, many countries worldwide recommended physical distance in many spheres of private and business life. Therefore, the world is turning more and more towards the usage of new information and communication technology (Carvalho et al., 2020).

During this pandemic time, technological innovation progress and utilization positively contributed to the improvement and growth of many economies worldwide. Therefore, the usage of technological innovations is becoming imperative in an era of physical and social distance. Namely, technological innovations assist people in ensuring their relationships with family and friends, doing their jobs, and carrying out daily necessities and obligations. For that reason, this paper aims to present an overview of the literature concerning how technological innovation has supported global healthcare during the COVID-19 pandemic.

The remainder of this paper is structured as follows. In Section 2, theoretical background on COVID-19 pandemic consequences on healthcare system worldwide and technological innovations used in healthcare system during this pandemic is given. Then, the conducted systematic literature review method is presented in Section 3. Section 4 provides results analysis-. The discussion of the research findings is represented in Section 5. The main conclusions, limitations of this study, and recommendations for future research are given at the end of the paper in Section 6.

2. Theoretical background

As it is worldwide known, in December 2019 novel SARS-COV-2, i.e. COVID-19 virus has been identified in the city of Wuhan in China. Soon afterwards, the virus began to spread all across the world at a dramatically fast pace, leading to World Health Organization declaring it as a pandemic on March 11, 2020 (World Health Organization, 2020). Since then, according to Worldometer (2021), COVID-19 virus has affected 221 countries and territories. The total number of positive COVID-19 cases in the world on August 31, 2021 has been reported as 218 267 932 and the total number of deaths as 4 529 306 (Worldometer, 2021). Declaration of the pandemic, and fast spreading of the virus, alongside with new variants arising, caused various forms of lockdowns all over the world, mainly shifting every-day activities into the virtual settings wherever possible and partially or totally shutting down non-essential activities. Public health strategy mainly focused on reducing social contact and encouraging people to stay at home, reminding them of the importance of proper hygiene measures and disinfection, leading to social distancing being adopted worldwide in order to slow the spread of the virus.

Following all that, it is safe to say that the COVID-19 pandemic seriously and drastically impacted the global economy changing life as humans know it.

One of the most affected industries by the advent of the novel coronavirus SARS-COV-2 is the healthcare system. In the current COVID-19 situation, healthcare workers and hospitals are highly overloaded all over the world, with both patients and professionals being very tense. As indicated in Demirhan et al. (2020), inadequate health-care systems and hospital organization are common features of severely impacted countries by the COVID-19 virus. Further, patients infected by the COVID-19 virus need to receive personalised treatment as they have different symptoms, and, thus, different complications and treatment processes. Additionally, Demirhan et al. (2020) argue that it is critical to swiftly remodel the hospital in preparation for a pandemic crisis in order to properly treat patients who require hospitalization or intensive care. By conducting an USA national pulse survey at the end of March 2020, Grimm (2020) identifies main challenges reported by the hospitals regarding facing with COVID-19, being: (i) severe shortages of testing supplies and extended waits for results, (ii) widespread shortages of personal protective equipment, (iii) difficulty maintaining adequate staffing and supporting staff, (iv) difficulty maintaining and expanding hospital capacity to treat patient, (v) shortages of critical supplies, materials, and logistic support, (vi) anticipated shortages of ventilators, (vii) increased costs and decreased revenue, and (viii) changing and sometimes inconsistent guidance. One of the possible solutions to some of the problems caused by the COVID-19 in healthcare in terms of providing better and innovative support, is to use and adapt existing technologies, as well as to develop new ones.

Living in the era of digital economy and constant digital transformations means also that there is a progressive development of various technological innovations. In that sense, Spremić (2017: 215) differs primary and secondary digital technologies, defining primary ones as “established and matured technologies which are already in regular use in almost every business”, and categorizing them into following five categories, being: (i) mobile technologies, (ii) social networks, (iii) cloud computing, (iv) big data and (5) sensors and Internet of Things (IoT). In addition, there are also secondary digital technologies, such as additive manufacturing, which is also known as 3D printing, robotics, wearable technologies, drones, virtual and augmented reality, holograms, cognitive technologies (i.e. artificial intelligence), deep learning algorithms, smart materials, facial and speech recognition and all other emerging technologies (Spremić, 2017). All of the named technologies have the potential to improve and aid healthcare system, especially in the times of the battle with COVID-19 pandemic. In that sense, there are various technologies already being adapted and used in order to help with the response to COVID-19. One of the examples of using such technologies is being called telehealth, which is defined by Grimm (2020: 29) as the “use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration”. This and similar digital health technologies have been proposed as an important strategy to reinforce heath systems during the COVID-19 pandemic outbreak. Moreover, lots of

steps and measures have been taken in order to minimize the impact of the virus, and in the middle of these tough times, it is expected that new technical approaches that could support wellbeing and health of the human kind could be developed and proposed.

3. Methodology

This paper used a systematic literature review method as a stand-alone quantitative method grounded on found scientific papers bibliometric analysis (Xiao and Watson, 2019). This research approach was chosen because it is acknowledged as the most suitable method for achieving the defined research objective of this paper. Hence, this method provides systematic identification, assessment, and critical analysis of the existing body of relevant scientific works dealing with the chosen research topic (Okoli and Schabram, 2010; Fink, 2005; Hart, 1999). The systematic literature review method was performed in June 2021. In this paper, with the help of the systematic literature review, two databases of scientific papers were searched: Web of Science and Scopus on the initially defined topic of the paper. The main reason for selecting the mentioned two databases of scientific papers is based on the legislation of the author's country. Namely, the legislation of the Republic of Croatia acknowledges chosen databases as the two databases with the largest number of diverse quality scientific papers (National Council for Science Higher Education and Technological Development, 2021).

The search process within the mentioned databases of scientific papers took place according to the following steps. In the first step, keywords and search limitations are defined in both selected databases of scientific papers. The search has been performed with the following combination keywords: "technological innovation AND healthcare AND COVID-19". Furthermore, only papers written in English have been considered. Also, the conducted search process has been limited only to studies published as articles in scientific journals or conference papers published in proceedings of scientific conferences. Since the coronavirus began its spread in early 2020, the search process has also been restricted to papers published during 2020 and 2021. The combinations of selected keywords and limitations used in the literature review process are presented in Table 1.

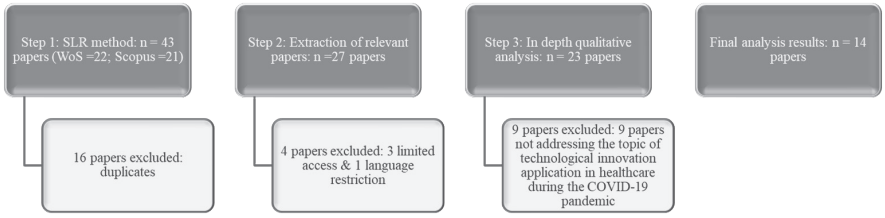
Table 1: Keywords and limitations in the literature search process

Database	*Keywords*	*Limitations*
Web of Science	TOPIC: (“technological innovation”) AND TOPIC: (“healthcare”) AND (“COVID-19”)	Document type: Articles and Conference papers Language: English Year: 2020 OR 2021
Scopus	TITLE-ABS-KEY (“technological innovation”) AND TITLE-ABS-KEY (“healthcare”) AND TITLE-ABS-KEY (“COVID-19”)	Document type: Articles and Conference papers Language: English Year: 2020 OR 2021

Source: Authors’ work (2021)

According to the defined search restrictions and set keywords, the search process initially resulted in 43 papers. Out of a total of 43 papers, 22 works have been found in the Web of Science database, while 21 papers appeared in the Scopus database. After the comparison of the obtained works in both databases, a total of 16 duplicate papers that appeared in both databases of scientific papers were discarded from further analysis. After detecting duplicates, a total of 27 papers remained. Furthermore, a total of four papers have also been excluded from further analysis as one paper has not been written in English, and three papers were not accessible. Therefore, a total of 23 papers remained for in-depth qualitative analysis of the papers. However, after the authors read all papers, notes on all papers have been read, compared, and commented by both authors. Hence, a total of nine papers have been excluded from further analysis. Consequently, a total of 14 papers remained for in-depth qualitative analysis. Figure 1 shows the entire systematic literature review process that has been conducted in this paper.

Figure 1: Systematic literature review procedure



Source: Authors work, 2021.

4. Results analysis

According to the given results, 64% of found papers were published in 2020. On the other hand, only 36% of papers were published by the middle of this year. Therefore, such results indicate that the publication rate of papers dealing with technological solutions in the healthcare system throughout the COVID-19 pandemic by the middle of this year is 28% smaller than the publication rate of papers throughout the whole last year. At this time, the most popular papers dealing with the technological innovation support on the healthcare system throughout the COVID-19 pandemic have been published in the Journal of industrial integration and management. According to World Scientific (2021), the Journal of industrial integration and management mostly comprises studies that work on the subject linked to the technological innovations, entrepreneurship present in the time of industrial integration, and informatization. Figure 2 presents the diversity of conferences and journals in which found results of systematic literature review have been published or demonstrated.

Figure 2: Journals and conferences of found articles and conference papers in last two years



Source: Authors' work, 2021.

The table below (Table 2) shows the final papers selected for in-depth qualitative analysis. A total of 14 papers were analysed. In accordance with the obtained results shown in the figure, it can be seen that all selected papers were published as scientific articles in internationally recognized scientific journals. This result can be explained by the COVID-19 situation, which imposed restrictions on the organization of different gatherings such as conferences. Therefore, the authors of scientific papers mainly focused on the publication of their papers in scientific journals, rather than on international scientific conferences.

Table 2: Results of systematic literature review

Paper ID	*Author*	*Title of the paper*	*PubT*	*Database*	
				WoS	*Scopus*
P1	Gatellier et al. (2021)	"The Impact of COVID-19 on Cancer Care in the Post Pandemic World: Five Major Lessons Learnt from Challenges and Countermeasures of Major Asian Cancer Centers"	A	√	√
P2	Yu et al. (2021)	"Role of big data analytics capability in developing integrated hospital supply chains and operational flexibility: An organizational information processing theory perspective"	A	√	√
P3	Di Carlo et al. (2021)	"Telepsychiatry and other cutting-edge technologies in COVID-19 pandemic: Bridging the distance in mental health assistance"	A	√	√
P4	Varvara et al. (2021)	"Dental education challenges during the COVID-19 pandemic period in Italy: Undergraduate student feedback, future perspectives, and the needs of teaching strategies for professional development"	A	√	√
P5	Alsaywid et al. (2020)	"Residents' training in COVID-19 pandemic times: An integrated survey of educational process, institutional support, anxiety and depression by the Saudi commission for health specialties"	A	√	√
P6	Javaid et al. (2020a)	"Industry 5.0: Potential applications in COVID-19"	A	√	√
P7	Bahl et al. (2020)	"Telemedicine technologies for confronting COVID-19 pandemic: A review"	A	√	√

P8	Javaid et al. (2020b)	"Exploring smart material applications for COVID-19 pandemic using 4D printing technology"	A	√	√
P9	Bhaskar et al. (2020)	"Designing Futuristic Telemedicine Using Artificial Intelligence and Robotics in the COVID-19 Era"	A	√	√
P10	Lee et al. (2020)	"Video consultations for older adults with multimorbidity during the COVID-19 pandemic: Protocol for an exploratory qualitative study"	A	√	√
P11	Sibiri et al. (2020)	"Coronavirus diseases 2019 (COVID-19) response: Highlights of Ghana's scientific and technological innovativeness and breakthroughs"	A	√	√
P12	Fernandes et al. (2020)	"The role of the future physician: Building on shifting sands"	A	√	√
P13	Guner et al. (2021)	"Technological Innovations in New Type Coronavirus and Health System"	A	√	×
P14	Roblyer, (2020)	"Perspective on the increasing role of optical wearables and remote patient monitoring in the COVID-19 era and beyond"	A	√	×

Source: Authors' work, 2021.

Note: *PubT – Publication Type, A – Article, CP – Conference paper*

Following the further analysis of papers, Figure 4 shows the most frequently mentioned technology within the found papers like Telemedicine is. Other technologies that are mostly used in analysed papers are Artificial intelligence (AI), Virtual reality (VR), Smartphone applications, Big data, robotics, drones, and many others. Furthermore, the font size of the words within the word cloud is linked with the usage frequency of a particular technological innovation mentioned within the chosen 14 papers, i.e. smaller font represents the less frequent occurrence of technology than the one with the larger font size.

Figure 4: The most frequently mentioned technologies within the found papers



Source: Author's work, 2021

5. Discussion

To achieve the set goal of the paper, i.e. to examine how technological innovations contributed to the healthcare system throughout the COVID-19 pandemic, a detailed analysis of found papers has been conducted. According to the obtained results, the outcomes of applied technologies throughout the COVID-19 in the healthcare system can be classified into five categories like (1) providing and enhancing education and training for medical students (2) supporting health professionals (e.g. enhancing professional education, reducing anxiety and providing mental relief) (3) improving existing medical care for patients (4) ensuring sufficient medical equipment to comply with epidemiological norms (5) improving the flexibility and cost-efficiency of the healthcare system.

As governments worldwide recommend physical distance due to the COVID-19 situation, many adaptations within learning processes have been supported by using different technologies. Therefore, intense support

of additional education and training of medical staff and students during COVID-19 pandemic has been recognized by many authors (e.g. Gatellier, et al, 2021; Varvara et. al, 2021; Alsaywid et al., 2020; Javaid et al., 2020a). According to Gatellier et al. (2021), telemedicine and virtual technology supported medical staff in participating in different conferences giving them new learning opportunities and skills gaining for a purpose to provide better medical help for oncology patients in their countries. On the other hand, virtual teams, classes, and video tutorials provided through the Microsoft Office 365 tool supported dental medicine students to continuously attending university courses during the COVID-19 pandemic (Varvara, 2021). Except for telemedicine and virtual learning, authors Alsaywid et al. (2020) stress in their paper how medical simulation software, VR and augmented reality (AR) industry, podcasts, and social media are one of the mainstream technologies needed for upholding the medical education quality on high levels. Moreover, authors Javaid et al. (2020a) accentuate how technologies involved within Industry 5.0 technologies like the Internet of Everything, big data, 3D scanning, 4D CT and 4D MRI, humanoid robots, smart inhalers, etc., can be important when it comes to the raising quality of medical training during COVID-19 pandemic.

Apart from the support in medical education and training quality increase, anxiety reduction and mental relief provision for medical staff by using technological innovations have also been recognized as an outcome of applied technology in healthcare during COVID-19. This is the consequence of highly overloaded hospitals with COVID-19 patients in a short period, which resulted in overwhelmed and mentally burdened health professionals (Javaid et al., 2020a). According to Di Carlo et al. (2021), technological innovations as telemedicine, AI, VR, big data, and various mobile applications can have a beneficiary impact on the mental health of medical professionals. The utilization of various technological equipment like laptops, tablets, smartphones etc. that allows remote work protects medical professionals from additional anxiety and stress of potential additional health risks associated with this virus (Bahl et al., 2020; Guner et al., 2020; Roblyer, 2020). Furthermore, technological innovations like 4D printers can avoid medical equipment downtime and therefore relieve healthcare professionals of additional pressure and worries about possible shutdowns in healthcare (Javaid et al., 2020a; Javaid et al., 2020b). Also, AI technology has been recognized as a valuable technology for reducing anxiety among health professionals during COVID-19 by enabling them to make precise and accurate decisions in a relatively short time (Javaid et al., 2020a; Fernandes et al., 2020).

Since COVID-19 pandemic occupied almost every inch of healthcare in short period, standard quality of medical care providence for non-COVID-19 patients became questionable and demanded quick solutions. Such need for fast reactions, quick solutions and adaptations in medical care also brought improvements to the existing medical care for patients. According to Di Carlo et al. (2021), VR and telemedicine positively impact medical care for patients with mental illnesses. Technologies encompassed in Industry 5.0 such as AI, sensors, holography, 4D-CT, 4D-MR, and others can help in early virus

recognition like COVID-19 and thereby help in its prevention (Javaid et al., 2020a). Furthermore, Javaid et al. (2020) accentuate the importance of smart materials as technology that can help in the fight against the COVID-19 virus spread. In their paper, Bhaskar et al. (2020) stress how AI technology in healthcare can help in reducing bureaucracy and thereby provide more time to do quality diagnoses and further necessary medical care. Moreover, Sibiri et al. (2020) point out the importance of drones which provide quick response time to the pandemic and therefore left more time for medical professionals to timely provide medical care to those who need it.

One of the main problems during COVID-19 pandemics was also the insurance of a sufficient quantity of medical equipment necessary to comply with epidemiological norms. Again, several solutions were found in applying new technologies. In their paper, Guner et al. (2021) discuss how new technology utilization in healthcare supported necessary medical equipment supply. According to Javaid et al. (2020a), technological innovations like 3D printers, the Internet of everything, 3D scanners, and 4D printers can assist the healthcare system in assuring a sufficient amount of medical equipment. Moreover, authors Javaid et al. (2020b) emphasize in their other paper how 4D printers can produce important smart medical equipment like smart shields for faces, smart ventilators machines, smart thermal glasses, and many others.

Finally, many authors have also recognized in their papers how using technological innovations during pandemic times caused improvement in the healthcare sector in a context of flexibility and cost-efficiency of healthcare. Therefore, authors Yu et al. (2020) stress the significance of big data analytics in healthcare since it can be helpful when it comes to the quality of processing information and making a timely and precise decision to achieve a flexible and agile structure. Similarly, Javaid et al. (2020a) argue big data technology is one of the main technological innovations that could reduce costs and enhance the overall quality of the healthcare system. Telemedicine is also one of the new technologies that impact healthcare in reducing costs and improving the flexibility of healthcare, as Di Carlo et al. (2021) noticed in their study. Likewise, Bahl et al. (2020), in their paper, discuss how telemedicine usage can reduce costs of healthcare, enhance efficiency, eliminate transportation costs, etc. According to Sibiri et al. (2020), drones are also one of the mainstream technologies that can facilitate processes in medical care, like reducing the cost of transporting COVID-19 samples.

Table 3: Papers' analysis resulting from systematic literature review

Paper ID (Ref. Table 2)	*Applied Technology*	*The outcomes of applied technologies during the COVID-19 in the healthcare system*				
		Providing and enhancing education and training for medical staff/students	*Supporting health professionals*	*Improving existing medical care for patients*	*Ensuring sufficient medical equipment to comply with epidemiological norms*	*Improving the flexibility and cost-efficiency of the healthcare system*
P1	Telemedicine, electronic communication, software for virtual tumour boards, virtual conferences	Applied	NA	Applied	NA	NA
P2	Big data analytics	NA	NA	NA	NA	Applied
P3	Telemedicine, smartphone applications, VR, AI, Machine Learning	NA	Applied	Applied	NA	Applied
P4	Microsoft Office 365	Applied	NA	NA	NA	NA
P5	Telemedicine, virtual (online) learning, medical simulation software, VR and AR industry	Applied	NA	NA	NA	NA
P6	Industry 5.0 technology - Internet of Everything, Big Data, 4D CT and 4D MRI, Smart Sensors, Holography and VR, Internet of medical things, AI, Humanoid robots, Smart inhalers, 3D printing, 3D scanning, Machine learning & computing, 4D printing, Drones, 5G technology, Telemedicine, Smartphone technology, Cloud storage platform, Robotics	Applied	Applied	Applied	Applied	Applied
P7	Telemedicine, laptop, tablet, smartphone	NA	Applied	Applied	NA	Applied
P8	4D printing, smart materials	NA	Applied	Applied	Applied	NA
P9	AI, Robotics, Telemedicine, Telehealth applications, Big data	NA	NA	Applied	NA	Applied
P10	Video consultation	NA	NA	Applied	NA	NA

P11	Drones	NA	NA	Applied	NA	Applied
P12	AI, Robotics	NA	Applied	NA	NA	NA
P13	Telemedicine, Web-based maps, smartphone applications: "TraceTogether", "Coronavirus Pandemic Epidemiology (COPE)", "Korona Önlem"; applications for supporting mental health: "Corona Psychosocial Support Line" and "Corona Information and Counseling Line", home evaluation teams, virtual maintenance centers, 3D printers	NA	Applied	Applied	Applied	NA
P14	Smartphone, wearables, telemedicine, home monitoring technologies, portable home health monitors	NA	Applied	Applied	NA	NA

Source: Authors work, 2021.

Note: *NA – Not applied*

6. Conclusions

This paper aimed to present an overview of the literature concerning how technological innovation has supported global healthcare during the COVID-19 pandemic. Therefore, the systematic literature review of papers within the Web of Science and Scopus database in selected field has been conducted. In the final phase of systematic literature review, a total of 14 papers have been included in in-depth qualitative analysis. This fairly small number of papers can be explained by the fairly short time span. The results have shown that more papers were published during last year than till the middle of this year. According to the obtained results, the most common new technologies amongst all selected papers are telemedicine, AI technology, robotics and VR technology. Except for the most common used technologies within the paper, most common outcomes of applied technologies during the COVID-19 in the healthcare system are supporting health professionals and improving existing medical care for patients.

However, limitations of this paper must be considered. The first limitation relates to access restrictions to certain papers found in the literature review process in both databases. The second limitation of this research considers the language barrier because some found papers have been excluded from further analysis. Also, by considering other databases of scientific papers or adding new ones, the research might result in different conclusions.

Recommendations for further research are related to the case study analysis to examine the technological innovations utilization during the COVID-19 pandemic in the health system of the Republic of Croatia.

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CHAPTER 10

The Role of Social Innovations in the Green Transition of Cities[1]

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Abstract

The development of green cities can be defined as a process of transition in the management of urban resources, with the aim of achieving a higher level of quality of life for citizens by protecting the environment and promoting sustainable urban development. Cities and their ability to adapt to new ways of functioning and solving current problems are of particular importance in achieving the objectives of the European Green Deal, which is a new overarching EU action plan to make the EU's economy sustainable and climate-neutral by 2050. In this context, social innovations are recognised as important triggers, drivers and integral parts of the implementation of the European Green Deal. The main objective of this paper is to explore the importance of social innovations for the green transformation of cities. Therefore, the paper explores the theoretical and conceptual framework of social innovations in the context of green cities and critically analyses relevant examples of good practice. In this regard, the possibilities for promoting the development of green cities in the Republic of Croatia through the application of social innovations are also considered. The paper concludes that bottom-up driven social innovations have a significant impact on the development

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of green cities because they contribute to the sustainability, resilience, and quality of life of urban communities. It is therefore particularly important to ensure a stimulating environment in which creative urban communities can improve their well-being through the development and application of appropriate social innovations.

Keywords: *European Green Deal, green cities, social innovations*

JEL classification: *JEL_O35, JEL_P25, JEL_Q01*

1. Introduction

The times we live in are fraught with numerous global climate and environmental problems, so much so that many scientific and professional researches, and specific strategies and policies are focused on trying to solve them. It is therefore necessary to change the prevailing development paradigm, which is based on the linear model of economic growth and introduce a new development model based on the concept of sustainable growth and development. The current situation of this transition also stems from the content of the European Green Deal adopted by the European Commission at the end of 2019. By adopting the European Green Deal, the EU has committed itself to a new development pattern that implies the transition of all European national economies to a sustainable and climate-neutral economy by 2050. In other words, through a comprehensive action plan, the EU has committed itself to economic growth while significantly reducing negative environmental externalities. In this context, cities and their ability to adapt to new ways of functioning and solving current problems are recognised as being particularly important in achieving the objectives of this change, so that we can rightly speak of a green transformation of cities, in which social innovation will play a special role. Therefore, the main objective of this research is to point out the importance of social innovations in the green transition of cities or the development of green cities, especially based on the so-called “bottom-up initiatives”.

The second chapter presents a conceptual framework of social innovation, with an emphasis on its connection to the model of sustainable development and green transition. The selected literature review points to the content, significance, and importance of social innovations for designing the green cities, and their progress based on various innovative social solutions. How all social innovations can play the role of drivers of the green transition of cities is analysed in chapter three. The fourth chapter presents some innovative solutions based on an empirical study of good practices in the city of Rijeka and shows the possibility of implementing the concept of social innovations for green change in Croatian cities. This chapter also highlights the possible role of social innovations in the green transition of Croatian cities.

2. Conceptual framework

Social innovations can be perceived as new ideas, institutions or work methods that meet social needs more effectively compared to existing ones. They contain a relational component, that is, they refer not only to specific activities but also to processes of mobilisation and participation, and the result of this process leads to improvement in certain areas of social relations, the structure of governance, greater collective empowerment (Moulaert et al., 2013; Howaldt et al., 2014). In general, innovations should contribute to finding solutions to complex and interrelated socio-economic challenges. In contrast to technological innovations, which offer practical and immediately applicable solutions that are often not sustainable enough, the task of social innovations is to take into account both environmental and social aspects and

to reconcile technological and non-technological solutions through a holistic approach.

Social innovations were first mentioned in writing at the beginning of the 20th century. Political economist Joseph Alois Schumpeter (1883-1950) argued that in responding to the complex sustainability challenges, it would be essential for the public sector to proactively assume the role of drivers, creating preconditions for the development of social innovations and social entrepreneurship (McNeill, 2012).

Peter Drucker, in his book "*The Frontiers of Management: Where Tomorrow's Decisions Are Being Shaped Today*," published in 1987, devotes the last chapter to social innovations, calling them a new dimension of management. Drucker emphasizes the importance of non-technological innovations for the economy and society, citing General Electric's research laboratories as an example of a social innovation in which multidisciplinary teams came together to combine science and technology, something that had not been common in corporations until then.

According to Logue (2019), ten years after Drucker's work, Rosabeth Moss Kanter linked social innovations to the corporate sector and argued that companies need to engage in solving social problems, go one step further than corporate social responsibility (mitigating negative externalities) and see solving social problems as a business opportunity, i.e., valorize social responsibility with social innovation. As an example, she cites the change in business model of a large commercial bank that opened its branches in poorer neighbourhoods and offered loans tailored to the needs of the poorer population, thus helping to meet local needs while expanding its customer base.

In his early works covering this topic, Mulgan (2011) cites Florence Nightingale (founder of modern nursing by establishing the first school of nursing in London) as an example of social innovation, as well as new forms of social organisation – cooperatives and unions – aimed at improving working conditions and ownership, or social movements such as feminism.

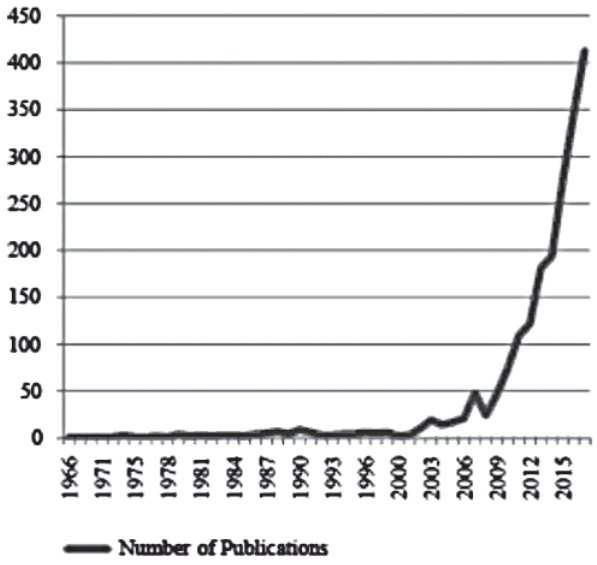
As shown in the above examples, the prefix 'social' denotes the potential of applying innovations to any area of everyday life focusing on people and their needs. Simply put, social innovations are new ideas, forms of work or institutions that successfully recognize problems and create solutions that meet social needs (Murray et al., 2010).

The following definition of social innovations was supported by the European Commission (2011: 33) through the publication "Empowering people, driving change: Social Innovation in the European Union": *"Social innovations are innovations that are social in both their ends and their means. Specifically, we define social innovations as new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. In other words, they are innovations that are not only good for society but also enhance society's capacity to act."*

According to the interpretation of Social Innovation Laboratory, the first legal entity in the Republic of Croatia specifically designated for actions in the field of social innovation, established in 2011, *"social innovations include new strategies, concepts, ideas, processes, services, objectives, business models, tools, and methodologies, and their combination which contributes to meeting social needs*

According to the analysis conducted by Logue (2019), in the past ten years, a growing interest in social innovations has been recorded, which is evident from the number of references to the term in the title, abstracts or keywords of scientific papers.

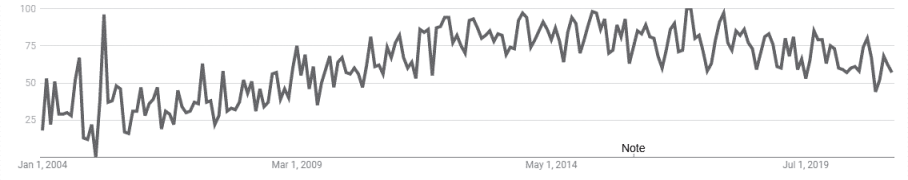
Figure 1: Display of the number of references to the term "social innovation" in scientific literature, 1996-2017



Source: Logue, 2019

The growing interest in social innovations is also evident in the number of Google searches, as shown in the following diagram.

Figure 2: Display of the frequency of searches for the term “social innovation” on Google search engine (2004-2021)[5]



Source: Google Trends – keyword: social innovation

The concept of social innovations is characteristic because it not only implies new ideas but also reshapes and reuses existing ideas for some new applications. In addition to goods and services, social innovations also take the form of ideas, values, tools, and habits. They include values of solidarity and equality by supporting research and actions aimed at building a more inclusive society (Maluert et al., 2013). In general, it can be said that such innovations are open-ended when it comes to knowledge sharing and knowledge ownership. These innovations are multidisciplinary and more integrated in problem solving than the one-dimensional solutions of a single department or profession, as was the case in the past. They are participatory and empower citizens and users, instead of being guided by the top-down approach. They are often locally rooted and driven by demand, not supply, whereby they are tailored to individuals instead of mass-manufactured because most solutions have to adapt to local circumstances and individuals (Bežovan et al., 2016).

Europe 2020 has stressed that that only investing in technology is not a solution for smart, sustainable, and inclusive development. It is necessary to make a shift towards social innovations and social experimentation as a broader concept of innovation, i.e., a shift from technology-based innovations to innovations with social value-added. Green transitions should be considered socio-technical transitions, as they affect technological regimes and the organisation of social systems, as they consist of technologies, policies, and other artefacts (Selvakkumaran and Ahlgren, 2021).

It is also important to note that technological innovations are not developed in a societal vacuum and that social innovations are the foundations for creating a sustainable innovation culture. Growth of the so-called “digital social innovations” has been particularly noticeable recently, i.e., innovations based on modern technologies, such as numerous mobile applications that respond to a certain social problem or need by informing, educating, networking, or increasing the quality of life of users.

5 Numbers represent search interest relative to the highest point on the graph for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means there were not enough data for this term. Source: Google Trends

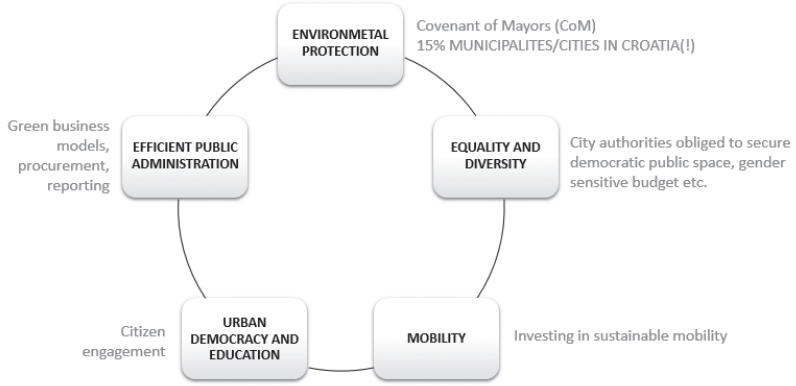
According to the manual "*Citizen Participation Leading to Social Innovations*" innovations can be considered social when they (Novosel et al. 2017: 7):

1. *"Meet social needs and demands,*
2. *Contribute to the efficient and effective use of resources (human, financial and other),*
3. *Improve the quality of life of citizens/target groups,*
4. *Reduce inequalities,*
5. *Contribute to the change of relations,*
6. *Change existing paradigms and practices (the way we think about things) and usual patterns of action,*
7. *Encourage citizens – individuals and communities – to act as co-creators and solve their problems. "*

Social innovation is closely linked to the concept of co-creation, a process in which actors come together despite their organisational and institutional boundaries, to jointly create innovations of mutual benefit (Selvackumaran and Ahlgren, 2021; Gjørtler Elkjær et al., 2021). The green transition should thus be observed as socio-technical and participatory, rather than just technological which confirms the importance of social innovations in the local green transition processes.

Taking into consideration the current process of green transition, especially of urban environments, social innovations are becoming an increasingly important tool in the development of "green cities" and in the achievement of sustainable development goals in EU Countries. Thus, the implementation of the concept of social innovation contributes to the transformation of urban, city environments towards green cites (Figure 3).

Figure 3: Characteristics of Green Cities



Source: Author's research

The most important features of green cities relate to improvement of the urban environment and development of sustainable areas for living, and the improvement of the quality of life by raising standards in environmental protection and energy efficiency. At the same time, the development of green cities implies progress in other dimensions important for the quality of life of residents, such as equality, democracy, and efficient public administration. “Green” in a green city should therefore not be equated exclusively with environmental solutions, which was a mistake made at the time with the initial interpretation of the concept of sustainable development, that was predominantly identified with the ecological component while ignoring the economic and social components. The concept of a green city is one of the newer ones and represents the interest of many researchers. Most of the offered definitions and concepts evaluate this type of an urban system on the basis of success achieved in the area of three key pillars of sustainability, with the dominant feature of a green city referring to the quality of the ecological dimension while maximising social and economic benefits (Brilhante and Klass, 2018).

3. Social innovations as drivers of the green transition of cities

The literature frequently mentions the cities of Great Britain as pioneers of social innovation. According to Mulgan (2011), a strong wave of 19th-century industrialisation and urbanisation in the United Kingdom has caused a sudden development of social entrepreneurship and social innovations (various forms of mutual assistance, micro-loans, housing savings models, cooperatives, philanthropic initiatives unions). Civil society was especially dominant in this process, which initiated numerous forms of social assistance, childcare, publicly supported housing and the development of local communities at the end of the 19th and the beginning of the 20th century. In the post-World War II era, *“democratic governments have developed a “welfare state”, “education system” and institutions through various approaches and methods such as credit banks for farmers and networks of adult education institutions”* (Mulgan, 2011).

Today, Great Britain is considered as a leader in designing, implementing, and supporting social innovations and innovators at all levels. In 2008, one of the leading British foundations, Young Foundation, launched the Social Innovation Exchange (SIX) network[6], which today acts as the world’s leading independent network for social innovators. SIX conducted the first major study on social innovation in 2010 and lobbied to help societal innovations find their place in the EU innovation strategy. Furthermore, it launched the first Innovation Union project in 2011 and became a member of the project consortium Social Innovation Community (SIC) in 2014, the first project on social innovation funded through Horizon 2020. In 2018, SIX initiated the publication of the *Declaration on Social Innovation*, to lobby towards including

6 Avaliable at http://www.socialinnovationexchange.org

this topic in the EU Framework Programmes.

Great Britain has developed a vast number of socio-innovation models that can be adapted and applied in other countries, such as *elderpreneurship* (integration of active retired experts into society through mentoring younger entrepreneurs) or *mumpreneurship* (movement of young mothers who have started their online companies so that they can balance between work and family in a flexible yet profitable way). Also, the largest number of research on social innovation comes from Great Britain, and this country is also leading in the number of accredited educational programs in the field of social innovations.

In carrying out its activities, the public sector in Great Britain tries to use the user-led approach. Heales (2018) cites several examples:

- an example of a municipal council which, when selecting service providers in the field of education for people with learning difficulties, included several members of the target group, i.e. people with learning difficulties, on the selection panel,
- an example of child and family department which promoted a "Buy Social" campaign at the state level in the programme of meeting public needs in the business field to facilitate the development of innovations, of course, with strict supervision and evaluation.

These and many other initiatives have made Great Britain an internationally recognised fertile ground for the development of social innovations, and social entrepreneurship as important aspect of social innovation.

The implementation of the concept of social innovations is becoming increasingly important at the level of cities as local communities, and has recently been recognized as a key factor in the process of green city transition. The European Commission defines three possible approaches to the use of social innovations as a driving force for growth and development, which can broadly be applied to the development of green cities:

1. *The social demand approach* – creating an innovative environment, designing schemes and incentives to develop social innovations at lower levels, which are not supported by other state or market mechanisms. Examples of such innovations are projects of non-profit organizations dealing with the problems of the so-called NEET group – young people between 18 and 24 years of age who are not in employment, education or training.
2. *The societal challenge approach* – creating innovations that respond to wider social issues – sustainability, intergenerational fairness, social well-being, etc. Example of such innovations is the formation of an international Red Cross, UNICEF, or free online learning platforms.
3. *The systemic changes approach* – re-definition of the way the public sector has worked so far, as well as empowerment and stronger involvement of citizens. The drivers of these changes are institutions,

and examples include participatory planning and budgeting, or state-level initiatives that, in partnership with other sectors, lead to strengthening the state in a certain segment. In this context, commonly cited example is Ireland, which has strongly stimulated its economic growth by changing tax policy, taking measures to increase exports, attracting foreign investment, and strengthening the education system.

According to the European Commission, the greatest obstacles and risks of using social innovations as drivers of growth and development of green cities are as follows:

- Surface rebranding of current (poorly functional) programmes and methods, instead of generating new innovative approaches,
- The involvement of the private sector in an inadequate way could lead to the privatisation of public services (in health care, education, etc.) in the negative sense of the word,
- The handover of social innovations to the so-called "third sector", with insufficient involvement and transformation of the public sector, which is necessary,
- The view of social innovations as a "panacea for solving all problems" – it is not about making changes for the sake of changes; therefore, before their implementation, it is necessary to make a quality evaluation of new social innovations.

Various research, as well as incentive measures by all stakeholders and development actors, especially local levels of government aimed at encouraging green transition by implementing the concept of social innovations, are based on the understanding that the existing socio-economic model is not sustainable in the long run. The world population is growing, the life span has increased, the gap between the rich and the poor is growing, as well as the percentage of the population living below the poverty line. At the same time, the negative consequences of climate change are increasingly evident, even at the most banal level – the number of extreme weather phenomena, with standard temperature rises, which consequently could rise expected sea-level and seriously endanger many coastal towns.

All the previously mentioned global development problems point to the necessity of changing the way of functioning, or rather to the "reset" of past practices. Naturally, social innovations do not only mark major changes at the global level, but also a series of daily changes at the local level. More disciplinary public spending, more efficient public administration, better transport regulation with reduced emissions, low-carbon construction, more efficient user-oriented health care, successfully implemented energy transition, or modern education system are just some of the examples that would contribute to green development in general, and especially to the development of green cities.

The prefix "green" does not only mean environmental practices. The new European Green Deal shows this clearly by covering a far broader range of topics: climate, environment, agriculture, energy, mobility, industry, the

circular economy, finance, cohesion, society, and international relations. All these areas require new, green thinking and innovations.

Social innovations and the process of active involvement of all actors have an extremely beneficial effect on the sustainable development of cities in terms of less CO_2 emissions, more efficient transport, better waste management, etc. In this regard, there are numerous examples of good practice (Kahn et al., 2009):

- *Examples of fighting traffic pollution*: days without cars where the use of public transport or walking is encouraged for a day or a few days; promotion of alternative forms of transport (e.g. the NextBike public bicycle system in Croatia, CicloRuta in Bogota or Bicing in Barcelona); Bus Rapid Transport systems (i.e. high-speed bus transport systems); the American SmartTrips campaign to raise awareness of citizens and visitors about alternative modes of transport and incentive measures; and many others.
- *Examples in the field of waste management*: an eco-voucher programme in the city of Oswiecim in Poland that motivates children and young people to collect recycling paper by which they develop environmental awareness at an early age; encouraging waste collection as one of the ways of earning (by recovering packaging, primary raw materials, etc.).
- *Examples in the field of care for the elderly population*: Aquarius (Eindhoven, Netherlands) is a housing community for users over 55 years of age based on the sharing philosophy which is an alternative to nursing homes (i.e. institutionalised care). In this community the beneficiaries live in about thirty separate buildings within the same residential block, with a common dining room and living room, helping each other in accordance with the possibilities and with the help of volunteers; the joint residence of pensioners and students. Abitare Insieme (Como, Italy), is a project through which students are offered cheaper accommodation in pensioners' homes and pensioners get company and help in the house, which creates benefits for both sides.

A group of experts gathered around the online platform Social Innovation Academy has also identified examples of mostly digital social innovations in the fight against the pressing problems of contemporary life caused by the coronavirus (SARS-CoV-2) (Balamatsias, 2020):

- EpidemiXs - Spanish mobile application where physicians provide validated medical information about the virus and citizens can provide advice and personal experiences),
- WirVersusVirus - biggest European hackathon on the subject of the virus, which in two days gathered 28,361 participants and offered 1,500 solutions,
- Babbel - popular global language learning software which became free during the pandemic,
- WIM HOF Method - the mobile application that helps fight anxiety,

contains meditation practice and breathing techniques aiming to strengthen the immune system,

- Numerous applications for easier handling of social distancing measures - for example, Netflix Party, an extension of Google Chrome search engine that enables users to transfer media content to their contacts, thus enabling, for example, joint virtual movie watching,
- Various blockchain applications have also emerged to monitor the cases of the COVID-19, which sparked a vigorous discussion in the media since they imply the collection and processing of particularly sensitive data, as well locating citizens.

All these examples show that social innovations as a form of an innovative approach to socio-economic problems, including environmental, transport, health problems, and other specific development problems, are an important instrument towards the development of sustainable and green cities, i.e., towards their green transition.

4. Possibilities for cities in the Republic of Croatia

In general, the concept of social innovations in the Republic of Croatia is still relatively unknown and insufficiently developed, especially as a possible tool for the green transition of cities. Therefore, all examples of successful implementation of social innovations can be used to design a systematic approach that involves, among other things, the development of key factors of the innovation climate in urban areas. For the purpose of this paper, empirical research was conducted on the example of the City of Rijeka in order to identify the examples of good practice. The following are selected examples of implemented social innovations awarded in the INpuls contests of the Association of Cities, with several additional examples of social innovations:[7]

- *The "penzici.rijeka.hr" website* – the site is developed within the framework of the EU project "EGOV4U", and it is conceived as a central place for informing the elderly. It is edited by the representatives of the City of Rijeka and the Pensioners' Convention of the City of Rijeka. Although the design of the site requires improvements to be clearer for the target group, there is plenty of content, and the overview of active 65+ Clubs in Rijeka's neighbourhoods appears to be useful.
- *Swimming school for "Rijeka Pliva" students* **–** the project has been implemented in cooperation between Rijeka and the *Primorje – Croatia osiguranje* Swimming Club since 2008. The project also includes free swimming school for students of second classes of Rijeka elementary schools.
- *The Startup Incubator of the City of Rijeka* – it is a project of the City Department for Entrepreneurship, launched in 2013 to support the

7 Information on described social innovations were obtained from the official INpuls programme website. Avaliable at https://www.udruga-gradova.hr/projekti/inpuls/

development of entrepreneurial business ideas. As stated on the official website of the incubator, incubator services have so far been used by 149 teams, i.e., 383 users mostly under 29 years of age (the previously valid age limit was abolished in 2018).

- *The introduction of Civic Education as an extracurricular activity in Rijeka elementary schools* – from the school year 2016/2017, the City of Rijeka was the first in Croatia that has enabled students of higher classes of elementary school to attend the optional subject Civic Education. The handbook and other materials for conducting civic education lessons have been made available free of charge to all other interested cities.

From the examples of social innovations whose driving force is not necessarily the City of Rijeka, but are implemented or were implemented in the territory of the City of Rijeka, the following initiatives can be singled out:

- *ZAKRPAJ.to*[8] – to increase the quality of solving utility problems with citizen participation, Geodetski zavod Rijeka d.o.o. designed a web page and a mobile application through which citizens can report recorded utility problems (road damage, lighting defects, damaged public infrastructure, etc.) and the information is submitted to the competent authorities. The service is available in over 70 Croatian cities and municipalities.
- *Pripovjedač/ica priča za laku noć: Tete i barbe pričalice (eng. A storyteller tells a good-night story: Aunts and barbs talkers)*[9] – the project that was launched in Rijeka, managed by the Portić Association, spread to several cities, and at the beginning of 2020 received the "Pride of Croatia" award. It has been implemented in the Clinical Hospital Centre Rijeka since 2009 - a number of volunteers read stories to hospitalised children every day to make their stay at the hospital easier.
- *Moje mjesto pod suncem (eng. My Place Under the Sun)*[10] – a project of the Centre for the Culture of Dialogue and the Šarolija Association which enables children of lower socioeconomic status to participate in activities that their parents are not able to provide (from private lessons, creative activities, through visits to cinemas, theatres, etc.). It is also innovative because the initiative was joined by partner companies from Rijeka which donate a part of their revenues (e.g., a certain amount per product sold, etc.) to the programme.

All these social innovations are a good example of collaboration between all participants in local economic development, i.e., the public, civil, and private sectors to meet specific social needs, which ultimately represents the essence of social innovations.

8 Avaliable at https://www.zakrpaj.to/
9 Avaliable at https://www.udruga-portic.hr/index.php/projekti/pripovjedac-ica-prica-za-laku-noc
10 Avaliable at https://mojemjestopodsuncem.com/

5. Conclusion

At the beginning of the 20th century, the famous phrase “Think globally, act locally” was created by the Scottish regional planner Patrick Geddes. The phrase gained global recognition at the end of the same century during the UN Conference on Environment and Development in Rio de Janeiro, and has since been used in various discourses related to globalisation and sustainable development. In the context of green transition and adaptation to climate change, a commemorative version of the mentioned phrase was created: “Act locally, transition globally” (Adesanya et al., 2020), where local action seeks to rely on the principles of inclusive and bottom-up governance.

“Bottom-up approaches to energy transition are anchored in decentralized, community-based solutions, innovative tailor-made municipal models promoting broad citizen participation, and community co-creation and co-ownership” (Young and Brans, 2020). In other words, the key aspect of green transition is not technological processes and innovations, but social processes, with an indispensable element of active involvement of citizens. The Innovation Strategy and Europe 2020 are among the first strategic documents that have placed greater emphasis on social innovation, stressing its importance for smart, sustainable, and inclusive development.

From the aspect of the issue of green transition of Croatian cities, social innovations have definitely not been sufficiently recognized, but are nevertheless a powerful instrument of balanced resolution of ecological, economic, and social problems of the urban population. The implementation of the concept of social innovations in the future development of Croatian cities will enable their balanced, sustainable, and smart growth and development. The necessary prerequisites for the realisation of such development relate to encouraging bottom-up initiatives that have the innovative capacity and can contribute to improving the quality of life in cities, development of appropriate supporting institutions, regulations facilitating the development of innovations, available financial aids, as well as general creation of a positive environment and affirmative public promotion.

This paper presents several examples of social innovations implemented in the area of the City of Rijeka, as well as several foreign good-practice examples, whose purpose contributes to the green transition of the city, whereby it is important to understand that the prefix “green” does not only identify activities related to ecology and environmental protection but also the developmental framework in which the themes of equality and diversity, mobility, urban democracy and education, efficient and economical public administration, etc. are equally important.

The transition towards more effective socio-economic models should take place at the local level, where social innovations can be a useful tool to address current societal challenges, at several levels, from individual social innovations, through system innovations, to urban game-changers.

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CHAPTER 11

Meeting the low-carbon challenge: the role of EU energy policy

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Abstract

Accelerating the transition to a low-carbon economy is an urgent need in the fight against global climate change. However, there is a lack of knowledge about a low-carbon economy that takes care to keep consumption of energy and other resources, as well as emissions and pollution, at low levels. The European Union is a world leader in combating climate change; but at the same time, it is still one of the largest emitters of greenhouse gasses. This paper aims to review the efforts of the European Union to make the transition to a low-carbon economy efficient and effective. In particular, the paper focuses on the role of energy policy in promoting efficient energy use, increasing renewable energy use and energy independence. Drawing on this overview, the paper identifies the challenges facing the European energy sector in the transition to a low-carbon economy.

Key words: *low-carbon economy, energy, energy policy, European Union*

JEL classification: *N74, Q48, Q54*

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1. Introduction

Global warming and the rise of the green economy have increased pressure on economies to decarbonise their economic activities. Long before the Covid-19 pandemic, there was an urgent need to shift the energy system away from one dominated by fossil fuels to one in which low-carbon sources play the leading role. However, the Covid-19 crisis has put more pressure on the European Union (EU) than ever before, both economically and socially (European Parliament, 2021c), and prompted policymakers to critically rethink the current economic growth model.

A low-carbon economy, described by low energy consumption, low material consumption, low pollution, and low emissions (Hongzhang and Lan, 2017) is now the most promising strategic development choice of an economy in combating the climate challenge. As observed by Hongzhang and Lan (2017), the term "low-carbon economy" is related to the green ecological economy, whose ultimate goal is to achieve sustainable development. Since it is based on low energy sources that emit minimal greenhouse gas (GHG) emissions, it is known as a decarbonized economy (Barker and Crawford-Brown, 2014). Indeed, energy consumption and generation are widely recognized as the main sources of GHG emissions (IPCC, 2014). Therefore, a low-carbon economy cannot be achieved without significant changes in the behaviour of all economic actors and technological innovations in the energy sector (Hu et al., 2011).

The energy transition is a route to transform the energy sector from fossil-based to low-carbon. Its main goal is to cut energy-related GHG emissions to a minimum and achieve a low-carbon future by mid-century. The EU is strongly committed to become a first carbon neutral continent (European Commission, EC, 2019). Consequently, and in line with its commitments under the United Nations Sustainable Development Goals (United Nations, 2015) and the Paris Agreement (United Nations, 2015), it has set targets that take into account energy efficiency, renewable energy sources and GHG emissions. The targets simply reflect its main priorities. Although EU Member States share the same goal, the transition path from a high-carbon to a low carbon economy is occurring in different environments, at different paces, and therefore with different outcomes. Several studies warn that the set targets will not be achieved with the desired momentum, at least in many Member States (Dupont and Oberthür, 2012; Kanellakis et al., 2013; Michalena and Hills, 2016; Haifner and Raimondi, 2020; Strunz et al., 2021). An important reason therefor is the lack of knowledge about the transition itself, as well as about the policy activities and measures, including the challenges that stand in the way of their realization. Recently, research has focused on these issues, but mainly on some aspects of energy policy.

This paper has two main aims. First, it provides an overview of EU policy efforts undertaken to make the transition to a low-carbon economy efficient and effective. In particular, the paper focuses on the role of energy policy in promoting efficient energy use, increasing renewable energy use and energy independence as well as reducing GHG emissions. Second, drawing on this

overview, the paper identifies the challenges facing the European energy sector in the transition to a low-carbon economy. A brief systematization of the main energy and climate policy milestones together with the resulting challenges and activities undertaken by the EU to accelerate the transition to a low-carbon economy is the main contribution of the paper.

The present paper is divided into three sections. Section 2 identifies the main energy and climate policy milestones and reviews the main targets and initiatives created by the European institutions when it comes to energy issues and the transition to a low-carbon economy. Section 3 addresses challenges facing the EU energy sector on the path to carbon neutrality by mid-century, while Section 4 presents the main conclusions.

2. The role of EU energy policy in driving the transition to a low-carbon economy

As many scholars and policymakers observed, the transition to a low-carbon economy represents both a significant opportunity and an enormous challenge. There is an opportunity to implement more clean energy sources such as renewable energy and clean technologies that can further boost the transformation of the energy sector. At the same time, the transition is enormously challenging due to a lack of knowledge, the presence of economic uncertainty, and the need for significant capital to transform economies, especially those whose energy system is heavily reliant on fossil-fuels. A successful transition requires a balance between politics, capital and technology, with partnership between countries.

According to Haifner and Raimondi (2020), the transformation of the European energy sector, can be divided into three phases. At the beginning, the focus was mainly on energy security; in the late 1980s it moved to free and fair competition in the internal energy market; and finally, since the mid-2000s, sustainability and climate policy have become key elements of European energy policy. After the “Earth Summit” (United Nations, 1992) in Rio de Janeiro and the Kyoto Protocol (United Nations, 1997) the need for decarbonisation and global energy transition has become clear worldwide. Given that two-thirds of anthropogenic GHG emissions originate from the energy sector, there is an urgent need for innovation in the world’s energy system, particularly in two directions: increasing the share of renewables in total energy consumption and steadily increasing energy efficiency (IPCC, 2018).

Many legal policy documents have already been adopted at the EU level with the aim of transforming the European economy into one based on lower GHG emissions and better use of all resources, including energy. However, the biggest legislative intervention undertaken with the same aim was the adoption of the so-called first energy and climate package. This important decision of the EU on energy-climate policy was taken in 2007. The strategy “An Energy Policy for Europe” (EC, 2007), which introduced the first energy package, was a complete set of European energy policies

that defined the three major energy challenges: sustainability, security of supply, and competitiveness. To achieve these goals, the famous 20/20/20 targets up to 2020 were accepted. They were aimed at: (*i*) reducing GHG emission by 20% compared to 1990 levels; (*ii*) achieving a 20% share of renewable energy sources in final energy consumption, and (*iii*) increasing energy efficiency by 20% compared to 1990 levels (EC, 2007). Adopting the activities and measures to achieve the targets, the EU has become the first major economy that has brought clear and precise measures to reduce GHG emissions and preserve the planet (EC, 2019). Although the action plan was developed in 2007, it was not finalized until 2009 due to the extended debate among Member States (Haifner and Raimondi, 2020). Indeed, some Central and Eastern European Member States, which are heavily reliant on the coal industry, were concerned about the consequences of such policy on their economic growth and development (Haifner and Raimondi, 2020). Additionally, in 2011, a document called "Energy Roadmap 2050" (EC, 2011) was adopted, whose main goal has been to cut GHG emissions by 80–95% by 2050 in comparison to 1990 levels.

The introduction of a specific legislative framework in the broader field of energy, the Lisbon Treaty (2007) was the important turning point for European energy policy. Kanellakis et al. (2013) summarized its main aims: building and ensuring the functioning of the EU energy market and supply, promoting energy efficiency and energy saving, developing renewable energy infrastructure and interconnecting existing energy networks. Although the measures necessary to achieve these aims have been defined by the European Parliament and the Council, each Member State has retained the right to decide independently on the main issues related to energy supply and consumption, such as the structure of its own energy supply (Avis, 2016).

The negative effects of global warming have been re-emphasized in two international documents: the Paris Agreement (United Nations, 2015) and the Special Report on Global Warming of 1.5°C (IPCC, 2018). The Paris Agreement (United Nations, 2015) pointed to the urgent need to "hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase 1.5°C above pre-industrial level." The main goal set by the Paris Agreement is to cut GHG emissions to zero. A further call for decarbonisation action was made by the Special Report (IPCC, 2018), which stated that the emissions of carbon dioxide (CO_2) would need to be reduced by about 45% from 2010 levels by 2030, to reach 'net zero' by 2050. The EU has reiterated its serious political commitment to the fight against global warming and climate change by setting numerous targets that address GHG emissions, energy efficiency and renewable energy sources. These targets point to key priorities for the EU.

In January 2014, the European Commission presented the upgraded 2030 climate and energy goals. This integrated climate and energy policy, named "The 2030 Climate and Energy Framework" (EC, 2014), set the following targets to be achieved by 2030: (*i*) a reduction in GHG emissions of at least 40% compared to 1990 levels; (*ii*) an increase in the share of renewable energy in energy consumption to 32%; (*iii*) an improvement in energy

efficiency of 32.5% compared to a 2007 baseline; (*iv*) the interconnection of at least 15% of the EU's electricity systems. It should be noted that the framework is an upgrade to the existing targets of the climate and energy package for 2020 and the plans of European Commission for energy and a low-carbon economy for 2050. So, in short, the aim of the new climate-energy strategy is to promote the progress towards a low-carbon economy and the creation of a competitive and secure energy system. It aims to ensure favourable energy for all consumers, minimize dependence on imported energy and create new opportunities for growth and jobs.

However, national constraints on the protection of national energy markets and the uneven development of energy markets have become an obstacle to the achievement of goals and target values. To mitigate them, the EU has adopted four legislative energy packages: on market access, transparency and regulation, consumer protection and interconnection, and adequate levels of supply. The first and second legislative packages, adopted in the second half of the 1990s (the first one) and in 2003 (the second one), focused on developing market access and introducing the freedom of choice for electricity and gas suppliers. By allowing new gas and electricity suppliers to become new players in Member States markets, and domestic and industrial consumers to choose their own suppliers, the packages ensured a greater degree of market liberalization. The third energy package, which entered into force in 2009, focused on further liberalisation of the internal electricity and gas markets.

Energy, as a basic requirement for the functioning of any economy and a factor that significantly affects the price of most goods, is an important pillar of an economy's competitiveness. The availability of energy resources is the backbone of any economic and social development. However, energy and its availability represent one of the most critical issues that the EU has to deal with. Therefore, in 2015, the EU adopted the Energy Union Strategy (EC, 2015a) to ensure competitive, secure and sustainable energy for Europe and its citizens. Guided by interlinked principles (security of supply, a fully integrated internal energy market, energy efficiency, climate action - emissions reduction and research, innovation and competitiveness), its objectives are to coordinate the transition of the Union's energy system towards one where energy freely crosses borders (EC, 2015a). The strategy stands for competition, optimal use of resources and efficient regulation of energy markets. The Energy Union is not only about energy and climate, but aims to drive the modernization of the entire European economy and make it low-carbon.

Certainly, any new energy package is a response to the main pronounced challenges in achieving a low-carbon economy. It is also another step in the harmonization and liberalization of the European internal energy system. With the fourth energy package, under the name "Clean Energy for all Europeans" (EC, 2016), which was launched in 2016 but finalised in 2019, the EU introduced new rules for electricity markets in response to the need to increase energy efficiency, make the energy industry more attractive for innovation and investment, particularly in renewable energy sources, and

enhance the competitiveness and resilience of energy systems (EC, 2016). All this should benefit consumers.

The launch of the European Green Deal (EC, 2019) provided further impetus to decarbonise the EU energy system. In December 2020, EU leaders endorsed a revised target to cut GHG emissions by at least 55% by 2030 compared to 1990 levels. This renewed political commitment requires a revision of energy legislation and targets to reflect increased climate ambition. The Green Deal is the EU's ambitious climate policy aimed at making Europe the first climate neutral continent by 2050. However, the plan faces significant obstacles. According to Haifner and Raimondi (2020), the North-South and West-East division that exists among Member States might be an obstacle to achieving European energy transition, because of multiple and divergent interests. Another challenge might be the resistance of people who see the energy transition as a potential threat to their jobs and well-being.

Each EU Member State is a key player in achieving the 2030 and 2050 energy and climate targets. As its economies differ greatly, each EU target has been implemented at different paces in each of them. According to Primova (2018), there is a transition in energy policy from a phase of fragmentation to a phase of gradual harmonization and synchronization between Member States and the EU. She pointed out the importance of the transition from fossil fuels to renewable energy sources as it is simultaneously a transition towards more decentralization and democratization of energy supply and consumption as well as the creation of new ownership models in the field of energy. Given that the EU is one of the top GHG emitters, it has taken responsibility to lead the low-carbon energy transition and green innovation, and to fight climate change. However, it faces a number of challenges along the way.

3. Current challenges facing the EU energy sector

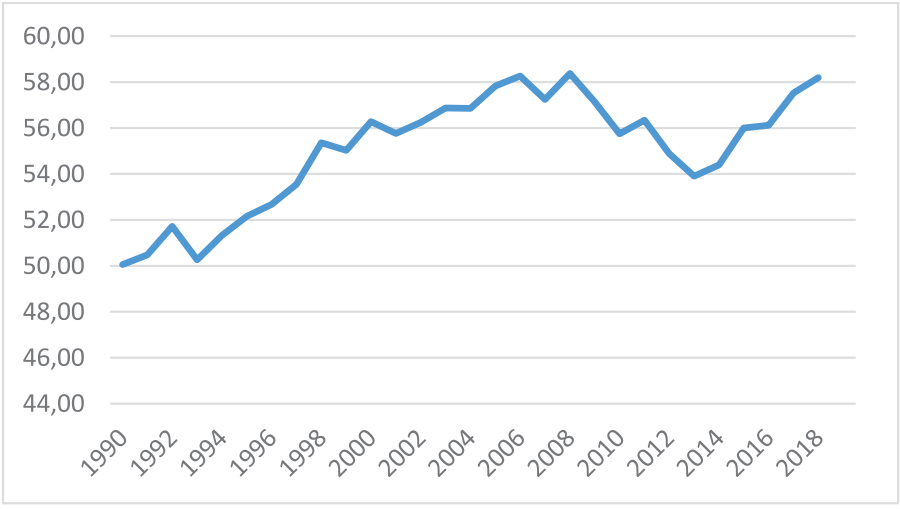
The burning of fossil fuels is strongly associated with the increase of GHG emissions in the atmosphere and is one of the main contributors to climate change (IPCC, 2014). As already mentioned, the EU is strongly determined to play a leading role in combating climate change and accelerating the clean energy transition by decarbonizing its economy. Although it has already made significant progress in this process, further action is required to achieve climate neutrality by 2050. For these to be effective and efficient, it is necessary to detect the challenges it faces in the field of energy. The challenges are numerous, diverse, interconnected and interdependent, as indicated by several authors who studied them (Kanellakis et al., 2013; Faure-Schuyer et al., 2017; Bertoldi, 2020). Energy-related challenges facing the EU include issues such as growing energy demand, increasing dependence on imports, security risks affecting producer and transit countries, limited diversification, high and volatile energy prices, slow progress on energy efficiency, the growing threat of climate change, failure to reach targets on the share of renewables, the need for greater transparency and further integration and interconnection of energy markets (European Parliament, 2021a). At the core of the European energy policy is a wide range of policies and policy

instruments aimed at ensuring security of energy supply, competitive energy prices and sustainability of the energy sector, as well as strengthening an integrated energy market (European Parliament, 2021a).

The oil crisis in the late 1980s shed light on Europe's vulnerability in terms of security of energy supply, its stability and price competitiveness, and the impact of energy on the overall European economy and development. The EU's dependence on imported energy, especially crude oil and more recently gas, calls into question the security of Europe's energy supply.

According to the Eurostat database on energy (2021), energy import dependence is quite high and exhibits an increasing trend (Figure 1). In 1990 and 2005 it was 50.1%, and 57.83%, respectively, while in 2019, it increased to 60.7%.

Figure 1: Evolution of energy import dependence of the EU-27, in %

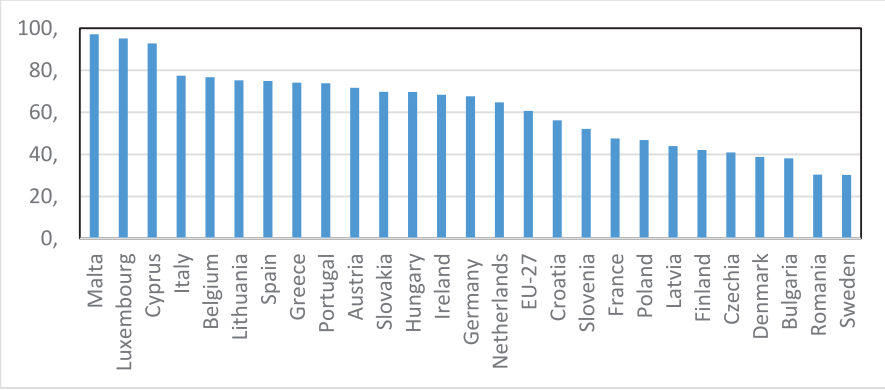


Source of the data: Eurostat database on energy, accessed on August 20, 2021

Several Member States such as Denmark, the Netherlands and Poland have become increasingly dependent on energy imports to meet their gross consumption. This is largely linked to the decrease in primary energy production because of the depletion of domestic energy resources. An increase in import dependence, albeit less pronounced, was also recorded in the Czech Republic, Greece and Germany. In contrast, several EU Member States recorded a decline in the energy dependence rates between 2005 and 2019, with the fastest change observed in Estonia, where the rate fell from 28.04% in 2005 to 4.83% in 2019. Latvia, Ireland, Bulgaria, Portugal and Finland also saw rates fall by more than 10% thanks to a combination of

higher energy efficiency and increased primary production from renewable energy consumption. The lowest energy dependence rates in 2019 were observed in Estonia, Sweden and Romania (the dependence rates below 25%), while Malta, Luxembourg and Cyprus were almost completely dependent on primary energy imports, with dependence rates above 90%. Figure 2 displays the energy import dependence of each EU Member State in 2019.

Figure 2: Energy import dependence in EU Member States in 2019 (in %)



Source of the data: Eurostat database on energy, accessed on August 20, 2021

Another problem related to the high dependence on energy imports arises from the fact that a high share of imports is accounted for by relatively few external suppliers. Recently, the origin of energy imports has changed, although Russia has kept its position as the main supplier of crude oil and natural gas (Eurostat, 2021). In 2019, 27% of extra-EU crude oil imports, 41.1% of natural gas imports and 46.7% of solid fuel (mostly coal) imports came from Russia (Eurostat, 2021). Many EU Member States are heavily dependent on a limited number of suppliers, especially for gas, which makes them highly sensitive to energy supply disruptions. Moreover, six Member States (Finland, Latvia, Bulgaria, Estonia, Austria and Hungary) import more than half of their total gas needs through a single external supplier, namely Russia. In order to protect the EU from unpredictable economic and political situations, imports should be distributed among as many reliable suppliers as possible. Certainly, each Member State should also increase its own production of energy or reduce its consumption as much as possible. Hence, a diversification of energy suppliers and energy mix is urgently needed. Moreover, it is expected that greater integration of climate policy into European energy policy will cause new demands and changes in the main energy suppliers of fossil fuels (Overland, 2018).

The high energy dependence of EU Member States is partly a consequence of unevenly distributed energy supply and the lack of adequate energy distribution infrastructure to alleviate this growing issue. Harvey (2015) provided a brief overview of energy supply in the EU: “oil and gas are predominantly in the North Sea; coal fields are in Germany and eastern Europe; hydro-power plants supply power in Nordic countries, but are seasonally influenced; renewables are spread across Europe, with a high proportion of solar power in Germany and wind in Spain; France gets the vast majority of its power from nuclear reactors.” Due to a lack of well-developed and integrated energy infrastructure, energy surplus cannot be efficiently distributed at a reasonable cost to where there is a pronounced demand. There is an urgent need for the construction of key energy infrastructure (interconnectors, pipelines, and updated grid technology), particularly in terms of meeting future demand for energy, ensuring security of supply or supporting large-scale development of renewable energy as Harvey (2015) pointed out. Enormous investment is urgently needed to modernize the infrastructure and adapt it to meet the demands of a low-carbon economy. For example, European Commission (2021) estimated that about €140 billion in electricity and at least €70 billion in gas are needed to serve that purpose. It is clear that there is still a need to focus on the further upgrade of electricity and gas infrastructure. The development of innovative technologies and infrastructures such as smart grids, hydrogen grids or integrated offshore grids are just examples of what needs to be developed, particularly because they can simultaneously support the transition towards sustainable and smart mobility in the EU.

European energy infrastructure is outdated, energy markets are insufficiently integrated and national energy policies are not sufficiently coordinated. Indeed, different national energy sources, transport routes and the historical evolution of market structures have led to different national interests. Consequently, Member States have wanted to retain control over their energy system, including their energy mix. While privatization and liberalization increased in other industrial sectors, the energy sector resisted for a long time. Nevertheless, energy markets in the EU have become more integrated since 2008 as trade exchanges have increased (Batalla-Bejerano et al., 2019). The gas market in Western Europe has achieved greater liquidity thanks to increases in gas supply, new gas storage capacity and shorter contracts. However, the EU has yet to create a fully integrated energy network and energy market.

Another challenge refers to the transformation of the energy system in order to increase the share of variable renewable energy sources. In the electricity sector, it is difficult to align trading and grid operation rules as the system is limited by national grids. Furthermore, retail prices are rising despite the increase in cross-border trade and the reduction in wholesale prices (EC, 2020c). According to the report “Energy Prices and Costs in Europe” (EC, 2020c), electricity prices for households rose on average by 2.3% per year from 2010 to 2019, while overall consumer prices increased by 1.4% per year. The opening of the wholesale market did not favour the development of the retail market, as the decrease in wholesale prices was largely compensated

by higher fees, taxes and network costs (EC, 2020c). The completion of the internal energy market demands the joint implementation of new technical rules, the corresponding cross-border infrastructure and the harmonization of national support schemes for different energy technologies, as well as the harmonization of economic policy instruments and pricing policies in general. A fully integrated and efficient energy market would allow easier access to cross-border energy markets, lower energy prices and reduced dependence on energy imports (European Parliament, 2021b).

The creation of an integrated and efficient internal energy market is closely linked to the development of the Energy Union. Indeed, the aim is to create an integrated energy system across the continent, where energy freely crosses borders, based on competition, optimal use of resources and efficient regulation of the energy market. The goal is thus to move away from the fossil fuel-based economy, the economy in which energy supply is based on a centralized approach, and the economy based on obsolete technologies and business models. However, Szulecki et al. (2016) pointed out that the Energy Union, although a promising concept, is still an empty box. An important reason therefore is that the large parts of the internal energy market in the Eastern and Southern Europe are still isolated. The EU is trying to solve this challenge by harmonizing network rules and increasing investment in priority energy infrastructure projects, so-called “projects of common interest” (EC, 2015b). Moreover, there is a need to move away from a fragmented system characterized by non-compliant national policies, market barriers and energy-isolated areas (EC, 2015a) as well as to create a decentralized energy system in which citizens are active participants as producers and consumers of renewable energy (Horstink et al., 2021).

Energy and climate change are closely linked; consequently, energy generation, mainly through the conversion and combustion of fossil fuels, and energy use, for example in industry, transport and households, account for 77% of EU GHG emissions (EEA, 2021). According to the “Net Zero by 2050” report (IEA, 2021b), new oil and gas exploration must stop immediately, while electricity should become the core of the energy system. Also there must be no new coal-fired power plants without carbon capture and storage (CCS) processes if the world is to achieve zero CO_2 emissions by 2050 (IEA, 2021b). The same source indicated that this would require an annual addition of 630 gigawatts (GW) of solar photovoltaics (PV) and 390 GW of wind by 2030, quadrupling the record levels of 2020.

An important challenge for the EU is the transformation of the energy system, allowing an increase in the share of variable renewable energy sources. Although renewable energy is still a substitute for non-renewable energy sources, it is of particular importance for the EU. It contributes to a diversified energy supply, a reduction in GHG emissions and dependence on unreliable and unstable markets for non-renewable energy sources, especially oil and gas. Growing awareness of the harmfulness of certain fossil fuels to the environment and human health is an additional reason for its increasing use. Despite the policy efforts made in this regard (for an overview, see Solorio and Bocquilon, 2017), it seems that the EU-28 will not reach its long-term

targets of renewable energy set for 2020, as Table 2 suggests. Indeed, several Member States will certainly not meet their targets. It turns out that not only Member States should be more active to reach the targets, but also the EU itself should be more ambitious to influence them (see Michalena and Hills, 2016; Strunz et al., 2021).

Table 1: Share of renewable energy in gross final energy consumption in 2019 and the target gap (in %)

EU Member States	Share	Target value, 2020,	Target gap	EU Member States	Share	Target value, 2020	Target gap
EU - 28	18.88	20	-1.12	Latvia	40.98	40	0.98
Belgium	9.92	13	-3.08	Lithuania	25.46	23	2.46
Bulgaria	21.56	16	5.56	Luxembourg	7.05	11	-3.95
Czechia	16.24	13	3.24	Hungary	12.61	13	-0.39
Denmark	37.20	30	7.20	Malta	8.49	10	-1.51
Germany	17.35	18	-0.65	Netherlands	8.77	14	-5.23
Estonia	31.89	25	6.89	Austria	33.63	34	-0.37
Ireland	11.98	16	-4.02	Poland	12.16	15	-2.84
Greece	19.68	18	1.68	Portugal	30.62	31	-0.38
Spain	18.36	20	-1.64	Romania	24.29	24	0.29
France	17.22	23	-5.78	Slovenia	21.97	25	-3.03
Croatia	28.47	20	8.47	Slovakia	16.89	14	2.89
Italy	18.18	17	1.18	Finland	43.08	38	5.08
Cyprus	13.80	13	0.80	Sweden	56.39	49	7.39
				United Kingdom	12.34	15	2.66

Source: Eurostat database on energy, accessed on August 18, 2021

Across the EU-27, the share of renewables in energy consumption increased to 19.73% in 2019, while coal-fired power generation decreased by 20%. Consequently, annual CO_2 emissions decreased by 10% compared to 2019 (IEA, 2021a). As mentioned above, with commitments for 2030 and targets for 2050, the EU has opted for a clean energy transition based on efficient energy use and progressive decarbonisation of energy supply. According to Eurostat, the EU-27 GHG emissions fell by 24% in 2019 compared to 1990 levels, driven by lower energy demand due to the Great Recession, falling prices for renewable energy generation and fuel substitution. For Papież et al. (2021), the relocation of emission-intensive industries to non-EU countries is also a reason therefore. GHG emissions have additionally dropped drastically in 2020/2021 due to the Covid-19 economic crisis, i.e., a drastic decrease in economic activity and thus in energy consumption. This decline has been

particularly noticeable in consumption of fossil fuels. However, taking into account past experience, as highlighted by the International Energy Agency (IEA, 2021a), a rapid economic recovery rebounds, i.e., leads to increased energy consumption. Consequently, an increase in emissions can be expected. To avoid that scenario, considerable structural changes in energy behaviour practices are required together with technological advances.

Knodt (2018) underlined that a common energy policy is one of the earliest European issues, while Langsdorf (2011) considered it as the most important policy issue. Indeed, the EU has an energy policy set at European level, which mainly deals with three issues: security (of energy supply), competitiveness (creating efficient and effective markets) and sustainability (mitigating climate-change), but in practice there are 27 national legislative frameworks. For an overview of competencies in energy policy that are in the domain of the EU and its Member States, see Talus and Aalto (2017). A common energy policy and an integrated energy market are necessary to create fair and efficient competition that would boost greater market efficiency through better use of energy generation assets and competitive and affordable energy prices for consumers. This is especially important for the European energy industry and the EU as a whole as they face the efficiency issue (Borozan and Pekanov Starcevic, 2019; Borozan, 2021).

National energy policies differ quite significantly, depending, among other things, on natural conditions, the level of development of the energy system, and previous experience with the implemented energy policy mix. However, the energy policy of a Member State has a multiplier and spill-over effect on other EU Member States. The IEA (2020), citing the example of the nuclear and coal phase-out in France and Germany, highlighted the need to create a truly integrated energy market that enables cross-border trade and develops stronger carbon price signals. This will make the energy transition in the EU a success.

EU Member States do not seem to be meeting long-term climate policy targets, which calls for better integration of climate into energy policy (see Dupont and Oberthuer, 2012). The Climate Action Network Europe (2018) report detected that no EU country is doing enough to make progress on reducing carbon emissions and meeting the Paris Agreement. This is especially true for most of Central and Eastern EU Member States, which have already set moderate climate targets, regardless of their potential in this regard. It should be noted that despite their high share of electricity generated by an aging fleet of coal-fired power plants (lignite and hard-coal), they consume less energy and have lower GHG emissions. This is mainly due to their lower average income and generally worse economic situation. At the same time, most of them have considerable potential for renewable energy deployment and real opportunities to increase energy efficiency.

According to the IEA report (2020), many EU Member States have developed an appropriate policy mix to gradually reduce the use of coal and increase the use of renewable energy. On the other hand, the EU is about the phase out half of its nuclear power generation capacity. Paillere and Donovan (2021) revealed that between 2011 and 2020, about 48 GWe of nuclear

capacity was lost worldwide because a total of 65 reactors were shut down or their operating lives were not extended. More than two-thirds of operating reactors are over 30 years old and will either be shut down or have their lives extended in the coming decades. Achieving the ambitious 2050 targets will therefore require more effective and coordinated energy policies than currently exist. The scientists come to promising conclusions; efficient use of energy, reductions of carbon emission and other environmental factors drive economic growth in the EU and the energy and climate targets set by 2030 are achievable (Saint Akadiri et al., 2019).

4. Conclusion

Creating a low-carbon economy is the EU's strategic response to increasingly pronounced climate change. However, achieving this commitment is not an easy challenge, as energy production and consumption are the main source of anthropogenic harmful GHG emissions contributing to climate change. Therefore, changes in energy production and consumption, particularly in GHG emissions, and their decoupling from economic growth are inevitable. Recognizing the need for these changes, the EU has created a complex energy policy mix.

This paper provided a historical overview of the main energy and climate policy milestones and reviewed the main objectives, targets and initiatives created by the European institutions when addressing energy issues and the transition to a low-carbon economy. Starting from the mid-1990s and the energy packages, it tracked the EU policy efforts to ensure competitive, secure and sustainable energy for European citizens, which emerged as the critical issues that the EU must address. A review of these efforts highlighted the complexity of European energy policy. Developing the proper energy policy is a process in which each successive energy package responds to the challenges identified and moves one step closer to achieving the EU objectives.

As our overview of energy policy illustrated, the scale and complexity of today's energy-related challenges are increasing such as the high dependence on energy imports and fossil fuels, the limited number of external suppliers, the uneven distribution of energy supply, the ageing infrastructure particularly in Central and Eastern European Member States, the inefficiency of internal energy markets or the lack of a broader framework for common energy policy. These challenges make the EU vulnerable to disruptions of all kinds, as is the case with the Covid-19 crisis. Although the EU is working hard to overcome the challenges, they are still present. Consequently, targets may be missed, especially those relating to climate change.

Today's socio-economic-environmental situation creates a new realism that looks for new policy responses in the domain of energy and climate. Future research should examine the efficiency and effectiveness of the current European energy policy mix and, based on the targets, possible transitional trajectories and expected evolution, propose changes.

Acknowledgements

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CHAPTER 12

Digitalization of city services through smart applications and e-services

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Abstract

The aim of the research is to determine whether there is a statistically significant positive correlation between the number of smart city applications and e-services on the one hand, and active users of the citizens of Velika Gorica and Sveta Nedjelja, on the other. Furthermore, the efforts were made to establish a positive correlation between the use of smart city applications and e-services according to the gender and age of citizens in both observed cities. The research was conducted by the method of survey during the month of September 2020 on a sample of 200 respondents from the area of the city of Velika Gorica and from the area of the city of Sveta Nedelja. Descriptive statistics, correlation and regression analysis were used to prove the hypotheses. The results confirm a statistically significant positive correlation between the number of smart city applications, e-services and active users in both cities. The positive association between the use of smart city applications and e-services according to the gender and age of the inhabitants of both cities was not confirmed. The results contribute to a better understanding of digital city services and their users. The results also help city governments to create better smart city strategic goals based on digitization and networking with citizens.

Key words: *citizens, smart applications, e-services, digitalization, city*

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1. Introduction

City authorities have set their priorities on focusing on the development of smart cities with special emphasis on the implementation of digital technology policies enabling citizens to use e-services and thus better accommodate their needs. The “Smart City” concept can be seen as an urban development using information and communication technologies (ICT) and the internet of things (IoT) to improve the efficiency of city services. (Gubbi et al., 2013). The aim of this research is to determine the citizens’ utilization of urban smart applications and e-services provided by the cities of Velika Gorica and Sveta Nedelja in Croatia. The city authorities have to create new values, focusing primarily on the transformation of standard public services into digitalized services for citizens. The following research questions are asked in this paper: Q1: Is there a correlation between the number of smart city applications and e-services and active users among the citizens of Velika Gorica and Sveta Nedelja. Q2: Is there a correlation between the use of “Covid” applications and the citizens of Velika Gorica and Sveta Nedjelja. This paper provides an analysis of smart applications and e-services related to transport mobility and utilities solutions, administrative departments management systems, spatial planning management systems, energy and water supply network management systems, waste disposal system and sustainable community development. Based on the defined goal, the main hypothesis has been set: H0: There is a statistically significant positive correlation between the number of smart city applications and e-services and active users among the citizens of Velika Gorica and Sveta Nedjelja. This paper is structured as follows: the first part gives an overview of literature dealing with the concept of smart city, followed by a description of methodology, presentation of results, conclusion and proposals for future research.

2. Literature review

2.1. Smart city concept

A smart city can be envisaged as a place where traditional networks and services become more efficient through digital technologies, addressing economic, social and environmental problems for the benefit of its citizens. The smart city “is defined as a new urban environment designed with the help of information communication technology” (Stimmel, 2016:234). The EU’s goal by 2030 is to create a state-of-the-art, reliable and secure digital infrastructure for the EU’s objective for 2030*:* “Top-notch trustworthy and secure Digital Infrastructures” in four dimensions: 1. Connectivity - All European households will be covered by a Gigabit network, with all populated areas covered by 5G; 2. Semiconductors - The production of cutting-edge and sustainable semiconductors in Europe including processors is at least 20% of world production in value; 3. Edge/cloud - 10,000 climate neutral highly secure edge nodes are deployed in the EU, distributed in a way that will guarantee access to data services with low latency (few milliseconds) wherever businesses are located; 4. Quantum computing - By 2025, Europe will have its first computer with quantum acceleration paving the way for Europe to be at the cutting

edge of quantum capabilities by 2030. (COM/2021/118 final). The concept of smart cities is based on a development paradigm that recognizes the rapid growth of urban population and makes an important contribution by forming an urban plan. (Dameri, 2017; Šlogar et al., 2020).

The smart city consists of six structural components: smart people, smart economy, smart mobility, smart life, smart governance and smart environment (Kumar Kar et al., 2017). Smart cities need a population with digital skills to utilize the advantages of digital transformation, namely greater involvement of citizens and other stakeholders in the design and implementation of public policies (Paskaleva, 2011). Although a heavy increase in internet use has been recorded during the pandemic, the trend was also present before the crisis, as 85% of people used internet connections at least once a week, compared to 75% in 2014 (DESI, 2020). The trend of digital public services usage in the field of e-administration is on the rise, enabling transparency, efficiency and greater participation of citizens in public life. However, further advancement is needed in digital skills, especially as the COVID-19 pandemic crisis has shown that adequate digital skills are essential for citizens to access information and city services. (DESI, 2020). In fact, the COVID-19 pandemic showed how dependent citizens are on digital tools in the field of education, work, shopping and social life. (DESI, 2020).

The smart economy indicators include public expenditures on education, e-government development, average annual household income, unemployment rate, business activities where city administration has to provide for a flexible and productive labour market (Lombardi et al., 2012).

The smart mobility systems enable the implementation of information communication technology during the development of the transport, physical security and city supervisory system (Kumar Kar et al., 2017; Vitunskaite et al., 2019). For instance, the Dutch and English road authorities, Rijkswaterstaat and Highways England, wanted to switch to an open modular software platform for their next generation traffic management centres. This resulted in new modules for: (1) the advanced management of distributed networks that reduce traffic jams and CO_2 emissions; (2) the prediction and prevention of traffic accidents that increase traffic safety, and (3) the cooperative intelligent transport systems facilitating the deployment of technological innovations, such as smart cars (2021/C 267/01). A further example is the Port of Tallinn Authority in Estonia that addressed the challenge of managing their growing traffic with a new electronic passenger and freight vehicle registration system. This is an innovative solution that resolves the whole travel process for vehicles, from Internet booking to registration and fully automated traffic management. (2021/C 267/01).

The smart life implies providing of various cultural and sports contents for citizens (Lombardi et al., 2012). The trend of using digital public services in the field of e-health is on the increase, which in turn leads to a decrease in health care costs (Caragliu et al., 2011). The Commission proposes that by 2030 all key public services should be available online, all EU citizens should have access to their electronic health cards and 80% of citizens should have an electronic ID card (COM/2021/118 final).

The smart city governance implies transparency in decision-making, efficient planning and improvements in communication with citizens in order to achieve digital transition (Schuurman et al., 2012; Marsal-Llacuna et al., 2015; Kumar Kar et al., 2017; Santos, 2019). According to the results of research on the Digital Economy and Society Index in 2019, 67% of internet users used internet channels to submit forms to their public administration, which shows the practicality of using ICT enabled services (DESI, 2020).

City authorities address issues related to environmental sustainability by developing transport models which reduce the quantity of harmful gases, by smart water and energy management, by hazardous and solid waste management, by pollution and urban noise control (Ertugrul and Kaya, 2016; Ringeson et al., 2017; Haarstad and Wathne, 2019) and by green space management (Lombardi et al., 2012). For example, the Dutch city of Eindhoven wanted to improve the quality of life in the city and its reputation as a "city of light". In order to achieve this goal, the city invested into a smartly designed "open" lighting system in public space. (2021/C 267/01).

The digital transformation process requires a wide range of structural changes to enable fast, affordable and quality services to citizens, based on broadband internet with high data transfer rates (Carty, 2002). IoT, the internet of things, includes connecting devices, sensors and applications with a certain computer component within the existing internet infrastructure (López-Quiles and Rodríguez Bolívar, 2018). For example, the internet of things (IoT) serves to exchange information in smart waste management, traffic management and also enables public space control (Maheswaran and Badidi, 2018).

Collecting data on various social activities of individuals may pose a considerable threat, therefore data protection and privacy are among the crucial obligations smart city administrations have to cope with (Tene and Polonetsky, 2012).

The city of Vienna is considered the smartest city in the world and the city authorities have successfully implemented projects in the areas of digitalization, mobility and environmental protection. The city is well-known for its public transport network, water supply network and smart energy supply (Häupl and Vassilakou, 2014). The Vienna smart City platform has been developed. The city offers free WiFi, mobile and responsive websites, as well as various visitor applications (https://www.wien.info/en/all-of-Vienna/smart-City-Vienna/smart-Technology-359168).

The city of Barcelona successfully develops the smart city concept, using the benefits of digital technology and the internet of things (IoT) to improve municipal processes for the benefit of its citizens (Ferrer, 2017). The "Barcelona Digital City" has been developed with the aim to utilise the digital public infrastructure in order to introduce better e-services, for example, reduce energy costs, create better mobility, introduce smart public transport networks and create more green spaces for the citizens. (https://ajuntament.barcelona.cat/digital/en).

The city of Copenhagen is considered one of the most famous cities in the

world for its highly developed network of cycling tracks, with almost two thirds of its inhabitants using bicycles for daily commuting (Šlogar and Čakanić, 2021). A new intelligent bicycle sharing system has been developed, enabling a person travelling by train to book a bicycle at the station of arrival and use it to get to any other destination in the city (Copenhagen City Hall, 2014).

According to the research by Vinod Kumar (2017), Dubai is distinguished by the use of smart sensors in traffic and public lighting. The “Smart Dubai” platform collects data with the aim of creating an efficient, safe, flawless and personalised city, which will contribute to the improvement of services in all dimensions for its citizens. (https://www.smartdubai.ae/, 2021).

2.2. Development of digital services in Croatian cities

In Croatia, the City of Dubrovnik is considered to be the leader in the development of the Smart City concept. Numerous projects have been developed based on strategic application of ICT solutions, aimed at ensuring the best experience of tourist destination for visitors and increasing the quality of life of native citizens. For example, a mobile application is available, “Dubrovnik Visitor”, estimating the number of people in the historical city centre on a certain day. Another mobile application “Smart Parking” uses a total of 1,909 sensors connected to the NB-IoT network placed in the parking lots system. Then the interactive web platform “Dubrovnik Eye” designed to enable efficient solutions of communal problems. (https://dura.hr/pametan-grad-2/#1613225917137-badebfb6-19cd). Furthermore, the city of Rijeka develops projects related to mobility and digitalization of city administration. It was the first city in Croatia that presented smart bus stops and mobile application “Smart Bus Stop Rijeka” providing real-time monitoring of buses along their routes in the public city transport (www.rijeka.hr). In the city of Zagreb, the priority measures and activities have been defined that need to be implemented for the development of the smart city concept. So far, several mobile applications have been developed, and here we should single out the “mZIPP” which enables citizens to view spatial data and locations of city institutions according to thematic groups such as the City Administration, Health, Culture, etc. (https://www.zagreb.hr/prva-mobilna-aplikacija-prostornih-podataka-grada-/105512). Furthermore, electronic tickets for city parking lots can be purchased via ZgPark application. (https://eko.zagreb.hr/en).

This paper will analyse the implementation of e-services and mobile applications in the city of Velika Gorica, which has over 35,000 inhabitants (www.gorica.hr) and the city of Sveta Nedelja, which has 18,059 inhabitants (wwww.grad-svetanedelja.hr). Both cities possess a developed broadband network with free wireless internet and bit rates ranging from 30 to 100 Mbit/s, providing their citizens with a wide range of e-services. (www.hakom.hr). City administrations should achieve a transition to high-speed internet of 100Mbit/s minimum in the future, to be able to offer better quality e-services.

Table 1: Presentation of mobile applications and e-services using examples of city administrations and companies of the cities of Velika Gorica Sveta Nedjelja

City administration Velika Gorica	City administration Sveta Nedjelja	VG Goričanka d.o.o. (Ltd.)	Svenkom d.o.o. (Ltd.)
1. Next bike 2. Popravimo.hr 3. e-Urbanizam 4. Web Geographic information system 5. e-registry 6. e-enrolment 7. ISGE-information system for energy management	1. SOM (system of notification by e-mail) 2. Popravimo.hr („*let's fix*“) 3. Web Geographic information system 4. e-market 5. e-referendum 6. Electromagnetic radiation	**VG KOMUNALAC** (utility company) 1. Gis-Geographic information system 2. Swarco-smart traffic lights 3. e- deceased persons browser 4. e- charging stations 5. e- public procurement 6. e- taxes 7. GPS- Global Positioning System 8. Web Park 9. Pay Do **VG VODOOPSKRBA** (water supply company) 10. Kom Net Vodoopskrba 11. Gis module Vodoopskrba **VG ČISTOĆA** (waste management company) 12. e- waste 13. VG Čistoća **GSG VEL. GORICA** 14. TI-ERP – Time integrator-enterprise resource planning	1. e- deceased persons browser 2. Gis- Geographic information system

Source: Author's systematization according to the data available at City of Velika Gorica: http://www.gorica.hr/ [Accessed: May 4, 2021]; and City of Sveta Nedjelja https://grad-svetanedelja.hr/ https://grad-svetanedelja.hr/ [Accessed: May 5, 2021]

Table 1 shows that the city of Velika Gorica provides seven smart applications and e-services, whereas the city company VG Goričanka d.o.o. (Ltd.) provides fourteen, thus increasing business efficiency. The city of Sveta Nedjelja provides six smart applications and e-services, and the city company Svenkom d.o.o. (Ltd.) only two. In both cities, utility applications Web GIS and Popravimo.hr (*Let's fix*) are dominant by the frequency of use, being used by the citizens to inform relevant instances about various malfunctions such as: faulty street light, fallen traffic sign, damaged pavement, etc. They are followed by e-enrolment applications that enable internet submission of applications for kindergartens and e-market applications, enabling the purchase of homemade products via the internet and their delivery to home address. The city company VG Goričanka d.o.o. (Ltd.) has the highest number of implemented smart applications and e-services. Citizens use Web Park and Pay Do applications, the main purpose of which is to sell electronic parking tickets and to provide a simple view of user parking bills for private and business users. The VG Čistoća (*waste management company*) application makes it easier for citizens to find locations for the disposal of various types of waste and users can receive updated notifications from the relevant utility company. The Swarco-smart traffic lights application provides significant assistance to employees of the utility company VG Komunalac d.o.o. (Ltd.), which operates traffic lights in the city area and receives notifications of malfunction.

2.3. Development of smart applications during the COVID 19 crisis

In July 2020, the Ministry of Health of the Republic of Croatia presented the application "Stop COVID-19" (Politiscope, 2021). According to the recommendations of the European Union, the application is temporary, voluntary, transparent, cybernetically safe and uses only temporary and pseudo-anonymous data. In February 2021, the official website "Stop COVID-19" states that over 85 thousand citizens downloaded the application, which is a very low level of use in Croatia (Politiscope, 2021). The results of research by Noronha et al., (2020) highlight the poor networking of existing applications related to the Covid-19 crisis. The authors point out that sharing relevant information in a timely manner requires better connections between health institutions and mobile applications and users (Noronha et al., 2020). At the end of 2020, the European Commission established a Europe-wide system ensuring the functionality of applications related to the Covid-19 crisis (www.ec.europa.eu). The official Austrian mobile application "Stop Corona" is considered the smartest tool for dissemination of information on coronavirus, helping both the society and the economy (www.stopp-corona.at). Establishing the cross-border operation of the application is of paramount importance for preventing the spread of infection and easier control of infected people, as it enables quick exchange of information and data between different "covid" applications. At the end of October 2020, a bit less than 1.1 million inhabitants of Austria downloaded the Stop Corona application, which is about 10% of the Austrian population. The low level of application usage is the result of citizens' concerns about user data protection (www.viecer.univie.ac.at). According to the official website of the European Union, eleven EU

Member States have not yet established the cross-border mobile application (www.ec.europa.eu).

3. Hypothesis

The main hypothesis of this paper is the following: H0: There is a statistically significant positive correlation between the number of smart city applications and e-services and active users among the citizens of Velika Gorica and Sveta Nedjelja.

The main hypothesis will be checked through the following auxiliary hypotheses:

H1: There is a statistically significant positive correlation between the use of smart city applications and e-services and the age of citizens of the cities of Velika Gorica and Sveta Nedjelja.

H2: There is a statistically significant positive correlation between the use of smart city applications and e-services and the gender of citizens of Velika Gorica and Sveta Nedjelja.

4. Research methods

The data obtained from the conducted surveys were processed using MS Office 365 Excel. The following statistical procedures were used: descriptive data analysis, correlation analysis, regression analysis, F-test and t-test. The analyses were performed with a 95% confidence level. The results of the research are presented in tables and graphs. Within the scope of descriptive statistics, response frequencies were calculated based on which it is possible to get a clear insight into examinees' evaluations of satisfaction level in the use of mobile city applications and e-services. The correlation and regression analyses establish the connection between the number of mobile city applications and e-services and active users. The F-test and t-test helped to determine the significance of difference between the use of mobile city applications and e-services, as well as the age and gender of respondents.

4.1. Sample

The survey was conducted in September 2020 on a sample of 200 respondents from the area of the cities of Velika Gorica and Sveta Nedjelja. The respondents were employees of city administrations and municipal utility companies of both cities and the citizens using the social network "Facebook". The sample consists of 118 (59%) male and 82 (41%) female respondents. By the age of respondents, there were 4 (2%) between the age of 11 and 14, 60 (30%) of them between 15 and 25, 64 (32%) between 26 and 36, 30 (15%) of them between 37 and 47, 35 (17.5%) of them between 48 and 58, and 7 (3.5%) of them over 58. According to the level of education of respondents, there were 4 (2%) with primary education, 155 with secondary education (77.5%), 30 (15%) with college education and 11 (5.5%) with university degree.

4.2. Measuring instrument

The study was conducted using a survey questionnaire consisting of three interrelated parts. The first part of the questionnaire comprises an independent set of variables constituting basic socio-demographic characteristics of the respondents. The first part contains three questions with the possibility of choosing multiple responses regarding the age, gender and previous education of the respondents.

The second part of the questionnaire examines the level and satisfaction of respondents in the use of mobile city applications and e-services in both cities. The respondents expressed their views using the 5-degree Likert rating scale. Three statements were used to examine the attitudes about the usage level of mobile city applications and e-services: frequency of use on the daily, weekly and monthly basis. The rating scale from 1 to 5 examines the satisfaction with the use of applications and e-services. The third part of the questionnaire consists of two closed ended questions examining the usage level of "Covid" applications by the respondents of both cities during the pandemic.

5. Research results and discussion

This chapter will present an analysis of research results. Complex data will be analysed in tables or graphs.

Table 2: Descriptive statistics for the evaluation of smart applications and e-services

EVALUATION OF SMART APPLICATIONS AND E-SERVICES	
Mean	3.855
Standard Error	0.034289266
Median	4
Mode	4
Standard Deviation	0.484923451
Sample Variance	0.235150754
Kurtosis	4.723091202
Skewness	-1.693048139
Range	3
Minimum	2
Maximum	5
Sum	771
Count	200
Confidence Level (95.0%)	0.067616943

Source: Authors

Table 2 shows the results of descriptive statistics, an average evaluation of satisfaction with the use of smart city applications and e-services by the respondents in both cities. The results show that the average respondents' assessment of their satisfaction with the use of mobile applications and e-services is 3.85. This research aimed at determining whether there was a positive correlation between the number of smart city applications and e-services and their active users in the cities of Velika Gorica and Sveta Nedelja.

Table 3: Regression analysis – correlation between the number of smart city applications, e-services and active users

Regression Statistics								
Multiple R	0.9700							
R Square	0.9410							
Adjusted R Square	0.9263							
Standard Error	7.1391							
Observations	6							
ANOVA	df	SS	MS	F	Significance F			
Regression	1	3256.962	3256.9	63.902	0.00133			
Residual	4	203.8718	50.968					
Total	5	3460.833						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Intercept	-9.4102	5.11247	-1.840	0.1394	-23.60	4.7842	-23.60	4.7842
Number of smart applications and e-services	11.1923	1.40010	7.9938	0.00133	7.3049	15.07	7.304	15.079

Source: Authors

Table 3 shows regression analysis results between the observed variables, the number of smart city applications and e-services, and active users. The results show that the correlation between the observed variables is strong, as indicated by the value of Pearson's linear correlation coefficient (Multiple R = 0.97). Similarly, the results show a statistically significant difference between the number of smart city applications and e-services and active users, p-value amounts to 0.00133 ($p < 0.05$). This confirmed the main hypothesis H0: There is a statistically significant positive correlation between the number of smart city applications and e-services and active users among the citizens

of Velika Gorica and Sveta Nedjelja.

The research aimed at determining whether there is a statistically significant positive correlation between the use of smart city applications and e-services and the age of citizens of Velika Gorica and Sveta Nedelja. The relationship between the evaluation variances of smart applications and e-services of formed age groups of surveyed citizens was analysed using the F-test. According to the F-test score = 4.22, a t-test was used assuming equal variances. The results are presented in Table 4 below.

Table 4: Comparison of arithmetic means (t-test assuming equal variances)

t-test: Two-Sample Assuming Equal Variances	11 to 36 years	37 years and older
Mean	4.01	3.7
Variance	0.090808081	0.333333333
Observations	100	100
Pooled Variance	0.212070707	
Hypothesized Mean Difference	0	
df	198	
t Stat	4.759993436	
P(T<=t) one-tail	1.86515E-06	
t Critical one-tail	1.652585784	
P(T<=t) two-tail	3.7303E-06	
t Critical two-tail	1.972017478	

Source: Authors

Table 4 shows a comparison of arithmetical means of evaluations of smart applications and e-services by the citizens of Velika Gorica and Sveta Nedelja up to 36 years of age, with scores of citizens aged 37 and over. The results show that the average assessment of smart applications and e-services of surveyed citizens of Velika Gorica and Sveta Nedelja of younger age is higher than that of the older group of respondents (4.01 versus 3.7). The results of t-test show that there is no statistically significant correlation between the use of smart city applications and e-services and the age of citizens of Velika Gorica and Sveta Nedjelja, whereas the p-value amounts to 1.865 ($p > 0.05$). This result dismissed the auxiliary hypothesis H1: There is a statistically significant positive correlation between the usage of smart city applications and e-services and the age of citizens of the cities of Velika Gorica and Sveta Nedjelja.

Furthermore, the research aimed at determining whether there was a positive correlation between the use of smart city applications and e-services and the

gender of citizens of Velika Gorica and Sveta Nedelja. Using the F-test, the relationship between variances in the evaluation of smart applications and e-services between the gender was analysed. Based on the F-test score = 5.44, a t-test was used to compare the ratio of arithmetic means with the assumption of equal variances. The results are presented in Table 5 below.

Table 5: Comparison of arithmetic means (t-test assuming equal variances)

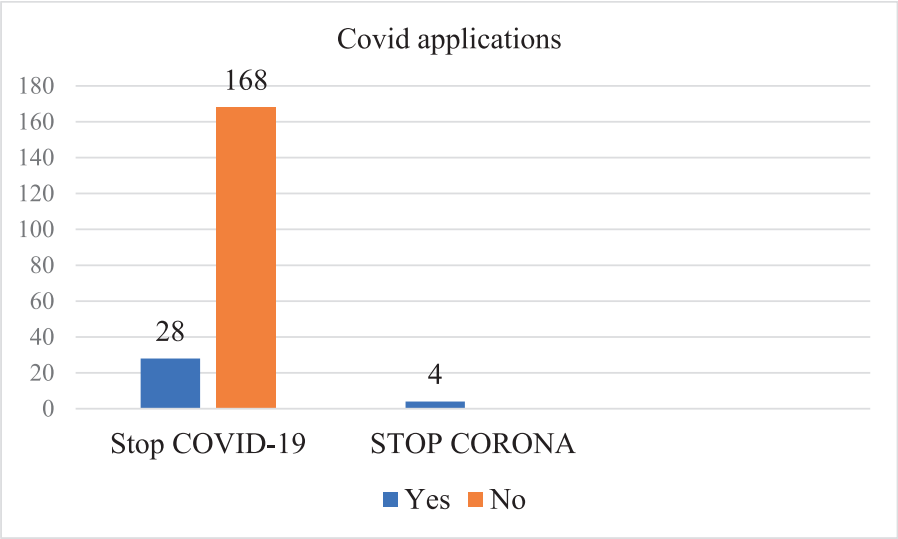
t-test: Two-Sample Assuming Equal Variances	Male	Female
Mean	3.737288136	4.024390244
Variance	0.315007968	0.073471846
Observations	118	82
Pooled Variance	0.216197736	
Hypothesized Mean Difference	0	
df	198	
t Stat	-4.294807896	
P(T<=t) one-tail	1.36873E-05	
t Critical one-tail	1.652585784	
P(T<=t) two-tail	2.73746E-05	
t Critical two-tail	1.972017478	

Source: Authors

Table 5 shows a comparison of arithmetical means of evaluations of smart applications and e-services between male and female respondents. The results show that the average assessment of smart applications and e-services of male respondents is 3.74, while in female respondents it is 4.02. The t-test results show that there is no statistically significant correlation between the use of smart urban applications and e-services and the gender of the citizens of Velika Gorica and Sveta Nedjelja, p-value is 1.368 ($p > 0.05$). This dismissed the auxiliary hypothesis H2: There is a statistically significant positive correlation between the usage of smart city applications and e-services and the gender of citizens of Velika Gorica and Sveta Nedjelja.

The research aimed at determining the usage level of “Covid” applications by the citizens of Velika Gorica and Sveta Nedjelja. It was established that during the COVID 19 pandemic, the city authorities of neither of the cities had developed their own mobile applications related to citizens’ health conditions. During the pandemic, citizens could use the application “Stop COVID-19” of the Ministry of Health of the Republic of Croatia and the application “Stop Corona” intended for the territory of the European Union, for monitoring contacts and examining the health status of citizens.

Graph 1: Use of applications during the coronavirus pandemic



Source: Authors

Graph 1 shows the results of an extremely low usage level of "Covid" applications by citizens of both cities. In the cities of Velika Gorica and Sveta Nedelja, 168 respondents did not use these applications. The "Stop CID-19" application was used by 28 respondents only, while the "Stop Corona" application was used by 4 respondents only.

Mobile applications and e-services enable citizens to communicate better with city authorities and facilitate their daily activities. E-services and mobile applications are related to transport mobility solutions, waste disposal systems, energy, spatial planning management, water supply network management and sustainable community development management. Research results show that increasing the number of implemented mobile applications and e-services increases the number of active users in both surveyed towns. By defining the relationship between the use of smart city applications and e-services and the age and gender of the respondents, it has been established that there is no statistical correlation. Analysis of smart cities in the global environment shows that information communication technology is crucial in their further development in order to increase their citizens' quality of life. This is in accordance with the results of the research conducted in the cities of Velika Gorica and Sveta Nedjelja. Furthermore, the low usage level of "Covid" applications in both surveyed cities is the result of the citizens' lack of trust in a full protection of users' privacy, as well as the government's low interest in the promotion of applications, as confirmed by previous research (Noronha et al., 2020; Politiscope, 2021). The research results should offer practical benefits to city authorities and businesses,

where new findings can help in the planning of strategic objectives related to further digitalization of cities.

6. Conclusions

Based on the research goals, the results show that there is a statistically significant positive correlation between the number of smart city applications and e-services and active users among the citizens of Velika Gorica and Sveta Nedjelja. It has also been confirmed that there is no statistically significant positive correlation between the use of smart city applications and e-services and the age and gender of citizens of citizens in both cities. This research gives a clear picture of the current state of digital services development in city administrations and companies of the cities of Velika Gorica and Sveta Nedjelja. Conceptually, the contribution is reflected in the development of scientific thought about the existence of a positive correlation between the number of smart urban applications, e-services and the number of active users among the citizens in the surveyed cities. However, the small sample of surveyed citizens is pointed out as a limitation of research, so that the results cannot be generalized for all cities in Croatia. Future research should involve more cities and rural areas to compare the availability of digital services in a wider area.

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CHAPTER 13

THE POTENTIAL FOR THE DIGITAL TRANSFORMATION OF THE CENTRAL STATE OFFICE FOR CROATS ABROAD

Viktorija Kunštek[1]

Abstract

The Central State Office for Croats Abroad (the Office) is the central state administration body responsible for the area of relations between the Republic of Croatia (RoC) and Croats abroad. This paper discusses the potential for the digital transformation of the Office, intending to stress key features of digitalization of the scope of this Office's activities that includes the above-mentioned relations. The very research was conducted by bearing in mind that the Office implements a variety of non-digital processes, but also by contemplating new challenges of digital transformation of the public sector in the RoC set by the modern macroeconomic trends and policies.

The objective of the research conducted is featured by processes, standards, and procedures of the Office, which are being challenged within the scope of the new macroeconomic, digital era. Namely, a one-year observation of 3 of the mentioned Office's organizational units was conducted. This was implemented with the main hypothesis that the Central State Office for Croats Abroad, started acquiring and adopting macroeconomic policies of digital transformation set by a new legal and strategical framework, of both EU and the RoC.

The used method resulted in the main finding that the above-mentioned Office, although having a non-digital general mindset policy, has already started its digital transformation in all the main processes within its scope of action. Bearing this in mind the conclusion of the research is that new macroeconomic policies of digital transformation can be applied to

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traditionally-oriented organizational structures of state administration bodies in the RoC.

Key words: *Digital Process, Digital Transformation, E-service, Public Administration, Public Sector*

JEL classification: *H0*

1. Introduction

1.1. Introduction to the Central State Office for Croats Abroad

The Central State Office for Croats Abroad (the Office) is the central state administration body responsible for the area of relations between the Republic of Croatia (RoC) and Croatians abroad. Its scope of activities is determined mainly by the Law on Relations of the Republic of Croatia with Croatians Abroad (Official Gazette nr. 124/11, 16/12), and the Strategy of the Relations of the Republic of Croatia with Croatians Abroad, issued in 2012. In this manner, the intention of the Office is to be an administrative and strategic correlation component of the connection of Croats abroad to their homeland. This has been particularly challenging at the period of COVID-19 pandemic, as all physical connections of Croats abroad to the Republic of Croatia has, basically, been shut off. In correlation to this challenge, a new way of doing business has started to be of a great importance to the Office. Namely, the Office has started to rapidly acquire all of the key determinants of the digital transformation. This paper presents a research conducted with the objective, which is featured, by processes, standards, and procedures of the Office, that are being challenged within the scope of the new macroeconomic, digital era. In this manner, the above-mentioned key determinants of the digital transformation are being put in the scope of the observation, discussed by this paper.

1.2. The Research Plan

1.2.1. The Problem and the Subject Matter

The subject of the research presented in this paper is the potential for the digital transformation of the Office. This wider subject of the research is featured by key determinants of the digital transformation of the mentioned Office. In that manner, it can be said that the subject matter of the research represents a new scope of doing business in the domain of the Office. Therefore, the subject matter is consisted of the next determinant: a digital scope of action of the Office referring to the non-digital mind-set policy, acquired by the same Office.

In correlation to the mentioned subject matter, the problem of the research is featured by the next determinants:

- classifying digital vs. non-digital processes, standards, and procedures of the Office – refers to all of the processes, standards, and procedures that are being implemented by the Office on a daily basis, that are being categorized as digital/non-digital;
- assessing digital vs. non-digital mind-set acquired by the Office – refers to the specific organizational culture of the Office, primarily acquired and implemented by the top management;
- defining key points of the potential of the digital transformation of the Office within the scope of doing business during the COVID-19 pandemic.

Therefore, it can be said the problem of the research is a narrower thematic concentrate of the very key determinants of the digitalization process of the Office (specifically during the COVID-19 pandemic). This is observed within the wider scope of the subject matter, which contemplates general postulates of the digital transformation of the Office (as an important stakeholder of the public sector in the RoC).

1.2.2. Recent Bibliography and Findings

Although digital transformation is not a new phrase in the domain of doing business in the RoC, it is, bibliographically speaking, a rather new politics in the public sector of the RoC. A new legal and strategical framework (national and international – in correlation to the framework of the European Union) defines the digital transformation as a must-have process and mind-set in the scope of doing business in the public sector of the RoC. In addition to this, next key findings can be produced:

- digital transformation of the public sector of the RoC has a great potential for development and it is an unavoidable necessity for the public administration bodies to adapt to a new, digital framework of doing business;
- apart from smart cities, when looking at the bibliography related to the public administration bodies in the RoC, it can be concluded that the digital transformation within the scope of its activates is still being conducted *ad hoc,* rather than systematically;
- digital era of public administrative bodies in the RoC is at its beginning, while in other parts of the European Union (EU) it has reached its peak.

1.2.3. Hypotheses

Bearing in mind the objective, the problem and the subject matter of the research, a main (primary) hypothesis is being set: the Office has already started acquiring and adopting macroeconomic policies of digital transformation set by a new legal and strategical framework, of both EU and the RoC. Alternative (secondary) hypotheses is being formed in a manner that the Office, although has already started acquiring macroeconomic policies of digital transformation, has been doing it unsystematically and rather unplanned (*ad hoc* to be precise), even though COVID-19 pandemic has boosted the necessity for the digitalization of e-services of the Office. Both hypotheses target the very basis of the potential for the digital transformation of the Office in a manner that stresses out the time frame, as well as the above-mentioned acquiring and adopting of macroeconomic policies of digital transformation.

The hypotheses generated the following research questions:

- how many processes and procedures are fully digitalized at the Office;
- how many standards at the Office are digitally-oriented;
- are there any e-services of the Office, in correlation to new strategical and legal framework for the scope of the action of the Office in the observed period of time;

- did the Office implement digitalization determinants into it's new strategical documents (i.e. Strategic Plan of the Central State Office for Croats Abroad for the Period 2020-2022, Implementation Program of the Central State Office for Croats Abroad for the Period 2021-2024);
- has COVID-19 pandemic had an impact on digitalization of the Office (i.e. the was the necessity for the development of e-services boosted during the COVID-19 pandemic).

1.3. Organization of the Text

This paper is organized in a manner that shows the logical framework of the research conducted. Apart from the Abstract, that shows the main postulates of the research and the paper as a whole, it can be said that the text organization has a chronological meaning. Namely, the introductory part shows the main determinants of the Office (as a sample) and the altogether research plan.

The second part of the content gives a brief literature review with the aim of providing the reader with a context of the referential literature dealing crucial points of current knowledge based on the relevant results of the current research. Following, the third part presents a methodology that was used during the scientific research, and the fourth part of the content gives the documentation background and the results of the analysis. Finally, the fifth part of the content explains results of the research and the final part, the conclusion, is drafted as a part that presents authors original thoughts and evaluation of the obtained results.

2. Literature Review

When observing the Office, as a public administration body of the RoC, a rather unconventional literature should be stressed out in the domain of the digital transformation, within the framework of the research presented in this paper. And that is the legal and strategical framework of the RoC and the EU. Both frameworks have direct impact on the digital transformation of the public administrative bodies in the RoC, as they represent a must-have guidelines to be integrated by the Office. These guidelines (i.e. rules and regulations), integrated in the documents such as the Law on State Information Infrastructure of the RoC, The European Digital Strategy etc., stress the importance of digitalization of all service of the public administration bodies, such as the Office.

As for scientific articles, cutting edge research detects a crucial scientific question: Is Public Sector Following the Enterprise 2.0 Paradigm? (Kokkinakos et al., 2016). In correlation to this, the United Nations conducted a survey in 2014, as the only report in the world that assesses the e-government development status of the 193 United Nations Member States (including the RoC). The very survey stresses that through innovation and e-government, public administrations around the world can be more efficient, provide better services and respond to demands for transparency and

accountability. Furthermore, the Republic of Korea has obtained the top spot in 2014 with its continued leadership and focus on e-government innovation. Also, the 2014 Survey shows that Europe continues to lead with the highest regional E-Government Development Index (EGDI). The leading nations in Europe include France, the Netherlands, and the United Kingdom. It is also worth noting that the same Survey indicated that *the RoC has a high EGDI.* Therefore, it can be concluded that, when talking about digital transformation, the public sector in the EU, including the RoC is, on a general scale, following the Enterprise 2.0 Paradigm.

Furthermore, the literature review is set by the following determinants:

- digitizing public services is, at the moment, an essential necessity for numerous governments around the world (Alvarenga et al., 2020). An improved government through digitization will not only have a growing effect on businesses, but it will also be able to intensify citizen engagement and push for economic growth. During the last 10 years more countries have progressively begun to provide digital services to their citizens. The success of digitalizing government could be related with the quality of the organizations' knowledge management, complementing each other for significant improvements in the public sector;
- digital transformation in the public sector is an inevitable requirement for governments due to the growing complexity and interconnections of information systems, and to the demands of citizens, who are becoming better informed and are increasingly looking to more agile and innovative services (Rosa and Almeid, 2018). Portugal has developed a unique business model of a public procurement that reflects all of the key issues of digital transformation necessities that target end user's needs. The success of this model is much owed to the strong political determination, the experience gained from pilot projects, and to the involvement of many stakeholders, who contributed, in a consistent and innovative way, to the definition of the system;
- it can be determined that the empirical studies, opinion pieces and publications from practitioner outlets present recorded benefits of digitalisation from well-known traditional businesses that chose to adopt the use of IT to radically change the way they do their businesses (Gideon Mekonnen, 2020). One of the crucial finding is that the success from digital transformation endeavour is realised when public administration bodies manage to make necessary adjustments to their business and IT strategies, organisational structure as well as their processes.

It can be concluded that the literature review debates how all of the governments and public administration bodies (i.e. the Office) should asses the specific needs of its target groups and include all the relevant stakeholders into the process of planning a systematic digital transformation. This is to be done in order to be successful in the process of digitalization of public administration bodies' organizational structures and way of doing business. A core change of the mind-set, in the direction of a digitalization is also an imperative. All of these mentioned determinants are crucial to be integrated into the organization structure of the public administration body,

when implementing the digital transformation. This is especially of a great importance during the COVID-19 pandemic, as the literature, as well as the practice has shown the pandemic has boosted the necessity for a rapid digital transformation of all public administration bodies worldwide.

3. Methodology

The author of the paper/research chose an observation as the most appropriate scientific method to be used when conducting this very research. Namely, a one-year observation of three of the Office's organizational units was conducted. It included the Department for Economic Cooperation, the Department for the Implementation and Monitoring of Tenders and Projects of Croats Abroad and the Welcoming Office. The research was conducted from April 2020 to April 2021. It should be noted that this is the period of time in which COVID-19 pandemic was at its peak several times.

The *primary research method* used has included a *(direct) naturalistic observation* of *the processes, standards, and procedures of the Office,* i.e. the mentioned organizational units of the Office. In this manner, a *map of business processes*[2] of the Office was analysed and challenged, in the segment of the processes, standards, and procedures of the mentioned organizational units. Direct observation in this research included next variables:

1. *independent variables*
    - 1.1. number/rate of digitalized processes and procedures,
    - 1.2. number/rate of digitalized e-services,
    - 1.3. number/rate of non-digitalized processes and procedures,
    - 1.4. number/rate of non-digitalized services,
2. *dependent variables*
    - 2.1. the change of the rate of digitalized e-services in the observed period of time,
    - 2.2. the level of usage of the digitalized e-services in the observed period of time, by the Office's target group (Croats abroad),
    - 2.3. the level of integration of the digitalized e-services into Office's new strategical documents (i.e. Strategic Plan of the Central State Office for Croats Abroad for the Period 2020-2022, Implementation Program of the Central State Office for Croats Abroad for the Period 2021-2024).

2 The map of the business processes of the Office is an internal document adopted by the Office in 2018, which was set in accordance with the recommendations of the Internal Audit Office of the Government of the Republic of Croatia.

Therefore, it can be concluded that the type of data produced by the above-mentioned research method is both qualitative and quantitative.

The used method involved observing studying the spontaneous behaviour of the Office as an organizational structure in natural surroundings – a naturalistic observation method. The author simply recorded what she saw in a textual form of notes. The observation made, was of an unstructured nature. This means the researcher (the author) recorded all relevant behaviour of the Office (in the manner of processes, procedures and standards) without system. By being able to observe the flow of behaviour of the Office as an organizational structure in its own setting studies have greater ecological validity. This type of observation was used to generate new ideas (when talking about the potential for the digital transformation of the Office). Because it gives the researcher the opportunity to study the total situation, this suggests avenues of inquiry not thought of before.

By using the mentioned research method, the author has contemplated all the processes set by the map of business processes of the Office. In that manner, variables were observed in the domain of the three of the above-mentioned Office's organization units, and discussed within the framework of the mentioned map of business processes of the Office. It can be concluded that, by using the above-mentioned research method a new mapping of Office's processes, standards, and procedures was made and contemplated within the scope of the existing document – the map of the business processes of the Office.

In addition, an analysis of the Office's new strategical documents (i.e. Strategic Plan of the Central State Office for Croats Abroad for the Period 2020-2022 and Implementation Program of the Central State Office for Croats Abroad for the Period 2021-2024) was made. This was done in a quantitative manner, by counting fully digitalized e-services integrated and mentioned in the above-mentioned strategical documents of the Office. *The analysis was made as a secondary research method,* specifically in order to target the research question set previously in the paper – did the Office implement digitalization determinants into its new strategical documents.

Both research methods used (primary and secondary), generated the results, according to the above-mentioned variables and other specific determinants of the research plan. After generating the empirical data, as the results of the research set in the next chapter of this paper, a qualitative a quantitative analysis of the results was made, with the aim of explaining the results. The analysis of the results is being done in order to set the economic significance of the mentioned results (generated by the above-mentioned research methods). In addition, this method of contemplating the results shows the readers of the paper, how the results generated can be interpreted, bearing in mind the objective of the very research – challenging processes, standards, and procedures of the Office, within the scope of the new macroeconomic, digital era.

4. Empirical Data and Analysis

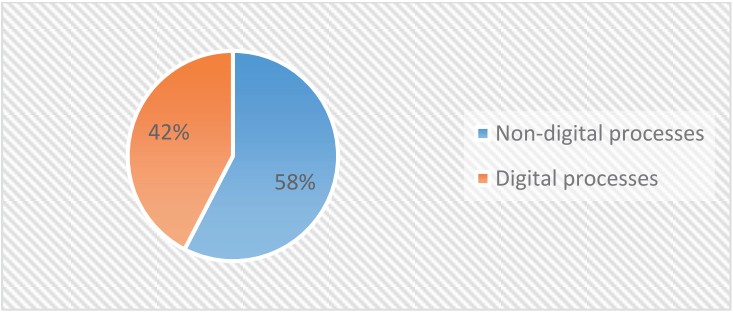
The results of the above-mentioned method are set in the manner of the following tables and figures.

Table 1: Number of (non)digital processes, procedures and standards

Key entry	*Non-digital*	*Digital*
Processes	53	39
Procedures	46	19
Standards	approximately 50	approximately 25

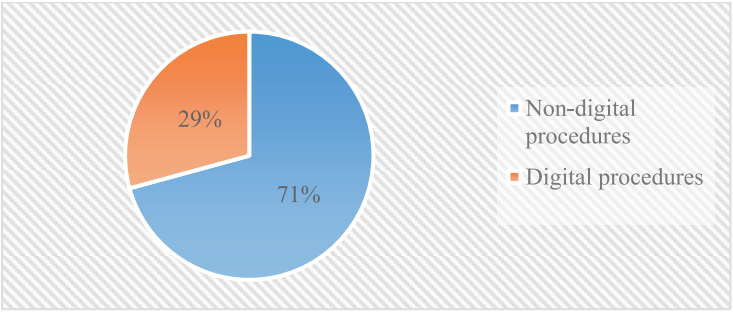
Source: Author's observation of the Office, analysis of the map of the business processes of the office

Figure 1: The rate of (non)digital processes at the Office



Source: Author's observation of the Office, analysis of the map of the business processes of the office

Figure 2: The rate of (non)digital procedures at the Office



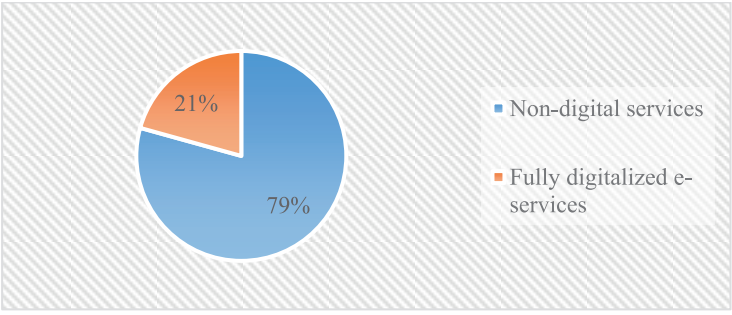
Source: Author's observation of the Office, analysis of the map of the business processes of the office

Table 2: Classification of main standards at the Office

The standard	*Digital*	*Non-digital*	*Comment*
To promote a continuous connection of the RoC to Croats Abroad	+	+	The Office nurtures a continuous connection of the RoC to Croats Abroad; this is being done in both digital (i.e. through e-services) and non-digital (through direct contact with all of the stakeholders of the mentioned connection) manner
A continuous improvement of all of the Office's resources (i.e. human resources etc.)	+	+	The Office is dedicated to a continuous improvement of all of its resources; this is done in both digital (for example in a manner of development of new e-services) and non-digital (educations for employees) manner
A prompt, clear, interactive communication with Croats abroad and all relevant stakeholders	+	+	All communication can be both in a digital and non-digital form, but is mostly in an e-form

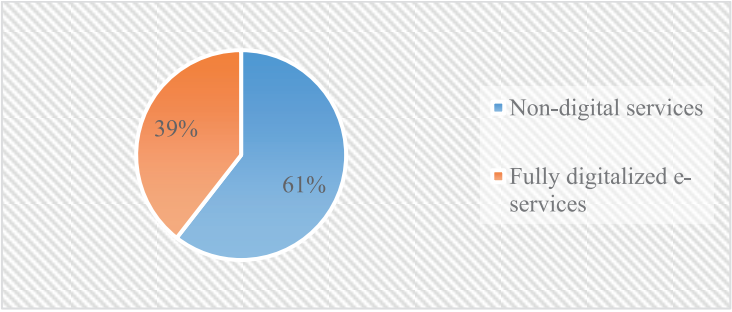
Source: Author's observation of the Office

Figure 3: The approximate rate of fully digitalized e-services in 2020



Source: Author's observation of the Office, analysis of the map of the business processes of the office

Figure 4: The approximate rate of fully digitalized e-services in 2021



Source: Author's observation of the Office, analysis of the map of the business processes of the office

Table 3: The level of usage of fully digitalized e-services in the observed period of time, by the Office's target group (Croats abroad)

Main target group/Main e-service	The Registry of Croatian Entities Abroad[1]	e-Građani[2]	Application for PCM[3]
Croats in Bosnia and Herzegovina	no available data	no available data	approximately 400
Croatian minority in 12 European countries	no available data	no available data	approximately 130
Croatian emigrants	no available data	no available data	approximately 100
Returnees	no available data	no available data	no available data

Source: Author's observation of the Office

3 An online data base, and communication platform set for entities (both legal and natural) connected to the Croats abroad.
4 An online platform for providing Croatian citizens and Croats aboard with the services of Croatian public administration bodies.
5 An online platform for providing Croatian citizens and Croats aboard with the services of Croatian public administration bodies.

Table 4: The level of integration of the digitalized e-services into Office's new strategical documents

Strategical document/Integration level measurement instrument	*Number of fully digitalized e-services integrated*	*Number of fully digitalized e-services mentioned*
Strategic Plan of the Central State Office for Croats Abroad for the Period 2020-2022	11	14
Implementation Program of the Central State Office for Croats Abroad for the Period 2021-2024	5	11

Source: Strategic Plan of the Central State Office for Croats Abroad for the Period 2020-2022

Implementation Program of the Central State Office for Croats Abroad for the Period 2021-2024

5. Results and Discussion

The results are being discussed in the following manner, which answers the research questions set by the 1st chapter of this paper:

- almost 50% of processes in the observed organizational units are categorized as digital, which is considered to be a high rate in a traditionally-oriented organizational structure of the public administration (state) body in the RoC. Nevertheless, there is still a rather high percentage of non-digital procedures (72%). This discrepancy is considered to be a result of a general non-digital mindset of a traditionally-oriented organizational structure of the Office, as a public administration body. Nevertheless, the percentage of digital processes in the observed organizational units, indicates that the Office has already started acquiring digital policies set by both national and European legal and strategical framework, which indicates the importance of digitalization of services of public (state) administration bodies in the RoC (as well as in the EU);
- all of the main standards of the Office detected, that are being set as a result of this research, can be related to both digital and non-digital policies. This means that the Office has actively started adopting a new, digital mind-set. Nevertheless, the main standards that are targeted as a result of the research, also indicate that the Office already started acquiring digital policies set by both national and European legal and strategical framework, which indicates the importance of digitalization of services of public (state) administration bodies in the RoC (as well as in the EU). In correlation to this, it can be concluded that the Office, although being of a generally non-digitally oriented mindset (which is indicated by the percentage of non-digital procedures), has set a both

non-digital, as well as digital policy when it comes to its main standards set by this research;

- key e-services of the Office determined by the research are set as: the Registry of Croatian Entities Abroad, e-Građani and Application for PCM. These e-services emerged during the analysis of the Office's new strategical documents, as well as new mapping of Office's processes, standards, and procedures that was made and contemplated within the scope of the existing document – the map of the business processes of the office. These three e-services represent fully digitalized utilities that are targeted by the research conducted as key potential determinants for the digital transformation of the Office. In addition, these e-services are considered to be in a correlation to new (both national and set by the EU) strategical and legal framework set for the scope of the action of the Office. Namely, both frameworks, as it was already mentioned in the 2nd chapter of this paper, stress the importance of digitalization of all of the services of public (state) administration bodies in the RoC (as well as in the EU), by the end of 2030. In this manner, through the development of 3 key e-services of the Office, the postulates of the achievement of the policies and regulations set by this framework are starting to being met. Also, there is only available data on the number of end users (by the Office's target group (Croats abroad)) within the scope of the level of usage of fully digitalized e-services in the observed period of time, for one of the three key e-services of the Office – Application for PCM. Nevertheless, further development of other 2 key services can produce a so-called back office which will allow a systematic track record of this figures;
- the Office has implemented a certain number of fully digitalizes e-services into its new strategical documents. Nevertheless, the analysis of the documents has showed that this was not done in a systematic manner, which explain the wider postulates and determinants of the digitalization potential of the Office. There is a lack in this postulates and determinants in its key strategical documents. This indicates a rather ad hoc approach to digital transformation, in comparison to systematic manner;
- when comparing the rate of fully digitalized e-services of the Office in 2020 to the same rate, a significant increase of 18% is noted. This is correlated to the introduction of e-Građani service of the Office in 2021. It can be suggested that the necessity to boost the digitalization of the Office's services is correlated to the COVID-19 pandemic. Namely, a vast majority of the connections of Croats abroad to their homeland (the RoC) were shut during this pandemic, and a necessity for a systematic approach to the development of a new service for the Croats abroad emerged. By developing the e-Građani service of the Office (i.e. by integrating the services of the Office for Croats abroad to the mentioned platform), the Office has made a significant step towards the realization of its full potential for the digital transformation, which was additionally boosted by the COVID-19 pandemic.

The economic significance and messages to this discussion of the results are set in the next manner:

- both hypotheses set in the 1st chapter of this paper were confirmed. Namely, the Office has already started acquiring and adopting macroeconomic policies of digital transformation set by a new legal and strategical framework, of both EU and the RoC, but it has been doing this unsystematically and rather unplanned (ad hoc to be precise), even though COVID-19 pandemic has boosted the necessity for the digitalization of e-services of the Office);
- traditionally-oriented organizational structures, such as the Office, have a general non-digital mindset in the RoC. But the potential for the development is evident and the Office has started acquiring and adopting macroeconomic policies of digital transformation. This means that there is an economic potential for traditionally-oriented organizational structures in the RoC (i.e. public administration (state) bodies, apart from the cities) to adopt and acquire a new way of doing business and adapt its scope of action to new macroeconomic trends.

As for the relation of the economic significance and messages set by this research to previous research contributions, implications and recommendations, it is worth nothing that:

- previous research has shown that there is an essential necessity for numerous governments around the world to digitalize its public services. The research presented in this paper shows that the same principles and recommendations should be and can be applied to the public (state) administration bodies in the RoC;
- demands of the citizens around the world have evolved in the direction that means that they are being more and more informed and demand more agile, innovative services provided by public (state) administration bodies. This research has shown that this is crucial for the Croats abroad, as their connection to their homeland (the RoC) has been cut off during the COVID-19 pandemic. Therefore, the Office, although in the ad hoc manner, has started acquiring a new way of (digital) doing business;
- the necessity for digitalization of public administration bodies is evident from the previous research findings. The research presented in this paper has shown that, even though implemented in an ad hoc manner, this necessity has started to be met by the Office, as a sample of the public administration body in the RoC. This necessity is, as it was already previously mentioned, additionally boosted by the COVID-19 pandemic.

The novelty of this paper and scientific contribution lies in the fact that a conclusion can be drafted that traditionally-oriented organizational structures of public administration bodies in the RoC, although of a general, non-digital mindset can acquire and adapt to a new macroeconomic digitally-oriented trends. The potential for this adaptation lies in the fact that COVID-19 has boosted the necessity for digitalization and the general information level of citizens of the RoC, but also Croats abroad. This means that the public

administration bodies in the RoC, no matter how traditionally-oriented and having a strict non-digital mindset implement ad hoc digital transformation.

To state potential policy, next recommendations are to be addressed:

- rather than ad hoc approach, public (state) administration bodies in the RoC should acquire a systematic approach to digital transformation;
- digital transformation is a process to be acquired by all the public (state) administration bodies in the RoC, that should implement all the postulates of this transformation into its strategical plans and everyday activities. This is especially correlated to the Office, as its main target group is consisted of Croats abroad, that are cut off their homeland due to the COVID-19 pandemic;
- a new macroeconomic trend set by both national and the EU strategical framework, in correlation to the digital transformation of the public (state) administration sector, should be decentralized to micro-surrounding of each particular public (state) administration body in the RoC, such as the Office;
- COVID-19 has boosted the necessity for the digital transformation of the public (state) administration bodies in the RoC. Due to this, it is of a great importance for these bodies to completely, but gradually acquire all the recommendations and principles, as well as regulations set by the new macroeconomic trends that are integrated into the majority of national, as well as in the EU legal and strategical framework.

Finally, it can be concluded that the used method resulted in the main finding that the above-mentioned Office, although having a non-digital general mindset policy, has already started its digital transformation in all the main processes within its scope of action. Bearing this in mind the conclusion of the research is that new macroeconomic policies of digital transformation can be applied to traditionally-oriented organizational structures of state (public) administration bodies in the RoC.

6. Conclusions

For the general conclusion of the research presented in this paper, first it should be noted that (as it was already mentioned in the former chapter) both primary and secondary hypotheses have been proved by the research conducted. Namely, the Office has already started acquiring and adopting macroeconomic policies of digital transformation set by a new legal and strategical framework, of both EU and the RoC. Although being done in an ad hoc manner, digital transformation has already started at the Office, with the key potential being detected in three main e-services: The Registry of Croatian Entities Abroad, e-Građani (platform integration) and Application for PCM. By setting, as well as further developing the mentioned e-services, the Office drafts its digital transformation potential, within the scope of new legal and strategical (both national and the EU) framework. This is done in a manner that reflects new macroeconomic policies of digital transformation set by the mentioned framework.

Second, alternative (secondary) hypothesis has also been proved. Namely, the Office, although has already started acquiring macroeconomic policies of digital transformation, has been doing it unsystematically and rather unplanned (ad hoc to be precise), even though COVID-19 pandemic has boosted the necessity for the digitalization of e-services of the Office). This means that, in the manner of timeframe of the digital transformation, this process has already started at the Office. Furthermore, the research has shown that this process has been boosted by COVID-19 pandemic, as a new, modified service of the Office – e-Građani – has been introduced in 2021. However, the digital transformation process at the Office, as a whole, cannot be observed as a systematic, planned process. This means there is a great potential for the Office to acquire new macroeconomic policies of digital transformation set by a new legal and strategical framework, of both EU and the RoC in a manner that reflects careful and strategical planning.

Third, as for the contribution of the research conducted to the economic science, it is worth noting that this lies in a fact that it has been detected that traditionally-oriented organizational structures, with a strict non-digital mindset, can acquire the principles of digital transformation. This means that, even though the above-mentioned organizational structures are slow and not very eager to make changes in the way of their doing business, economically speaking, these organizational structures can make adaptations to new macroeconomic policies of digital transformation.

Fourth, when talking about the future research of the potential for digital transformation of the Office, but also of the whole public (state) administration bodies sector in the RoC, it should be stressed that the key to do this research successfully is to have a multiple research methods approach. The observation can generate crucial data on the subject matter, but it takes a long period of time to be conducted. Therefore, the analysis of the strategical and program documents of the public (state) administration bodies sector in the RoC is of a necessity, as well as the analysis of the online available e-services of the mentioned bodies. These three components should be taken into consideration when planning a new research of the potential for digital transformation of the Office, but also of the whole public (state) administration bodies sector in the RoC.

Finally, it should be noted that the new macroeconomic trends in the domain of digital transformation policies of public (state) administration bodies sector (in the RoC and in the EU), should be stressing out practical policies, rather than general principles of the digital transformation. This is especially necessary in the framework of doing business in the public (state) sector, during the COVID-19 pandemic. In that manner public (state) administration bodies would have a more systematic approach to this framework, rather than ad hoc one.

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CHAPTER 14

STUDENT'S PERCEPTION OF ROBOTS IN THE WORKPLACE[1]

Darwin Beletić[2], Nenad Vretenar[3]

Abstract

Robots and artificial intelligence are no longer just something that the future might bring. Future generations of workers will certainly work with robots in their work environments. The trend toward automation has been present for decades, especially in industrial production. However, the increasing affordability of computers and other high-tech solutions, as well as the outbreak of Covid-19, which has created additional pressures toward less social interaction between humans, may accelerate these processes. The aim of this study is to understand the attitudes and opinions of students at the University of Rijeka towards robots in the workplace and workplace automation in general. The instrument used for the research is a thirteen-question survey conducted through Google Forms. A total of 234 students completed the questionnaire. The results show that respondents are not receptive to robots, that they doubt the ability of robots to replace humans in the workplace, and that they would consider it unfair for an employer to choose a solution offered by a robot over their own. Most of the respondents in the sample also believe that one needs one to three years of work experience, while they claim that a university degree is sufficient for the job. It has been shown that the opinions of the respondents within the categories themselves are very different, which means that the respondents commit themselves to certain questions or scenarios.

Key words: *automation, robot, workplace, students, disruptive technologies*

JEL*: D24, M54, J01*

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1. Introduction

Mankind has reached an unprecedented level of development, largely with the help of technology, which has penetrated the deepest pores of society and culture. New inventions and discoveries have contributed to new methods of business and production, and the perception of the importance of entrepreneurship to society and social interests has changed. Among the latest technologies that have developed their roots in the past centuries, a new tool has emerged that brings a whole range of opportunities and threats: the robot.

There are many definitions of robots. For example, according to Merriam-Webster, a robot is a machine that takes an animal or human form and is capable of performing complex functions, such as sensing or interacting with the environment (Merriam-Webster, Robot). Just a paragraph after the first definition, another one follows, in which the robot is “often” a machine that takes not only the forms mentioned above, but also their behaviors. The problem with these definitions is their lack of roots in the real world and their over-orientation towards science fiction, which distorts the image of robots.

Assuming that the definition includes certain actions otherwise attributed to living beings, the robot could be described as a device that thinks, acts, feels, and communicates. It is obvious that it is difficult, if not impossible, to formulate a comprehensive definition, which is why robots are usually divided into industrial, military, medical, and other categories, as each group has its own specifications. Industrial robots rarely take a human-like form. Due to the needs that arise in production, they often need to manipulate objects in order to perform the task. Therefore, they are most similar to the human hand. Therefore, the definition of an industrial robot could be “a machine in the form of a human hand that uses computer commands to manipulate objects in the environment”. The International Organization for Standardization (ISO) has its own definition of an industrial robot: “a programmable, multifunctional manipulator that can stand still or move and can be used in industrial automation (ISO 8373)”. Thus, the purpose of the robot depends precisely on the movements it can perform.

The first robot in the modern sense, that is, a machine designed for production with minimal or no human involvement, will not appear until the 1930s (Nocks, 2006). They will be called “manipulators”, i.e. machines that will imitate human movements such as pushing, suppressing or catching (manipulation of objects). Although “primitive” by today’s technology standards, it should be remembered that these were devices whose joints were adopted as a design by humans, in an era when laptops did not yet exist, and as such they brought a revolution in manufacturing, as did all other inventions in the field. In 1939, Konrad Zuse would create the first programmable electromechanical computer, which would later serve as the basis for the modern understanding of robots.

Somewhat more radical innovations in robotics have occurred since the beginning of the 21st century. Most of them are related to business or the market and can be found in industry, hospitals, and even homes. In 2002,

iRobot created a market for its Roomba, a robotic vacuum cleaner that works completely on its own. The year before that, the International Space Station (ISS) gets SSRMS, a robotic system that is state of the art, of course with updated versions and upgrades. At this point we should also mention the first self-driving cars, but only in their most primitive stage. A decade later, we have the first robot in history to be granted citizenship and named Sophia (Hatmaker, 2017).

The role of robots in industrial production is undeniable. In an environment where companies are required to be flexible and adaptable to frequent and relatively unpredictable market changes, to competition that can even take on global proportions, and to the constant need to innovate in order to develop competitive advantages and increase added value, the use of high technology is entirely justified. However, this has its consequences. One consequence is the need for specific knowledge, i.e. manpower that knows how to operate a single robotic system, which can be a problem if there are no such human resources, as the ability to implement such technology is drastically reduced. Another consequence is the high maintenance costs in case of failure, which can negatively affect the decision to implement robots in production. Regardless of high price and maintenance costs, robots present a clear case of disruptive technology, i.e. the kind of technology that has repercussions to workers (Ford, 2015) and business model in general (Christensen, 1997),

Although today the evidence of the dominance of technology over humans in the workplace is growing almost exponentially, history is full of skeptics who would deny the reality that is unfolding around them. A famous anecdote about Nobel laureate Milton Friedman conveys one of his quotes (paraphrased here) that was actually intended for a project manager who claimed his program provided jobs for people: “If you want jobs so bad, give the workers spoons, not shovels” (Tabarrok, 2019). This is just one example that so successfully conveyed the opinion of economists and also people in general about automation and the fear of unemployment. The steps of automation can be considered as historical milestones. Many economic thoughts emerged that were very different from their predecessors. The question of balancing the benefits between man and machine arose. While wealthy owners enjoyed the benefits and profit potential of their factories, workers feared for their jobs so much that one man, Ned Ludd, started an anti-technology movement called Ludism (Andrews, 2015), which pointed to fears that humanity was just beginning to face. Never before in human history had a tool been able to function without an owner.

Since labor is attributed to humans as the sole source of this factor of production, when we introduce the topic of robotization, it raises the question of the very meaning of labor when it comes to the absolute automation of production. Ecology assumes that land and labor are the source of production itself and that capital is a synthetic by-product created by their combination. It is suggested that the meaning of capital has been translated to such an extent that it has distorted the reality of the relationship between the economy and nature as a system, leading to the mass exploitation not only of natural resources but also of labor (Črnjar & Črnjar, 2009). This is not necessarily

true. The modern understanding of capital includes not only the stereotype of the same in the form of buildings or money, but also human capabilities, but also technology, more specifically robots. If the robot is able to program itself to reach a state of complete independence from human input, it will have the power to become another source of labor. It will be a mixture of capital and labor (which is not human).

The fact is that new technologies create unemployment, especially among unskilled workers. Take the same example of the logging industry: if a robot appears that can cut wood, many unskilled loggers will lose their jobs. Moreover, the new unemployed may live in a particular geographic location that does not allow them to change jobs quickly (or at all). If we include market inflexibility, there is a problem at the social level. In accordance to fears of many, because of new technology living standards might not improve, but deteriorate.

In line with the above concerns and aware that further automation is inevitable, the main objective of this research is to analyze what tomorrow's workers think about their future interaction with robots that serve not only as computers and technical assistance, but as a kind of co-workers.

2. Literature review

Robotics is understandably a big topic for members of academia. The challenges of robots in the workplace have been researched in several directions and are well documented. Among recent research, some has been conducted with goals similar to ours. Gaines (2019) argues that the rapid development of ICT-enabled computing can be a help to everyone, and that in this era of hyperconnectivity, a major concern of human-computer studies is to maintain and improve functionality, usability, and likability for legitimate users while protecting them from the dangers that hyperconnectivity can bring. Bellock, Burdin, and Landini (2020) examine the interaction between labor institutions and automation technologies and conclude that employee representation is positively associated with the use of robots. Haddadin (2014) dedicated a book chapter to the concept of the robotic co-worker and showed that with commercially available technology, it is possible to use robots to autonomously and effectively complete tasks in a way that is safe for humans. Fast-Berglund (2018) has presented research that addresses human-centered assembly systems, i.e., systems designed to interact intelligently with humans. He concludes that collaborative workplaces can be designed if the split between humans and automation is fixed, and he sees cobots (collaborative robots) as one of the solutions to increase automation. Collaborative robots, are aimed at better cooperation with humans and should, at least in future, possess some kind on intuition (Briš Alić et al., 2022). Colim at al. (2018) propose a framework to guide the safe design and conceptualization of ergonomically oriented collaborative robotic workplaces. Their results show that the application of this methodology can accelerate the design and development of human-centered robotic workstations. In 2021, Colim and collaborators analyzed the implementation of a collaborative robotic

workplace for assembly tasks performed by workers with musculoskeletal conditions based on human-centered principles. Alves et al. (2022) conducted an experiment with the implementation of 4 courtesy cues (stop, slow down, retreat, and retreat and move aside) and a control courtesy cue (no stop) on autonomous mobile robots. The goal was to investigate how these different kinetic courtesy cues are understood from the perspective of two participants with different perspectives on the robot. The result showed no significant differences between the participants' perspectives. Bauxbaum, Sen, and Kremer (2019) described the idea of using collaborative human-machine robots in healthcare, which is under increasing pressure due to growing staff shortages and workloads in nursing. Assistant robots in healthcare would be used in moving, grasping, fetching, and bringing in a similar manner as they are already used in industrial handling. Bauer and Vocke (2020) have addressed human-machine interaction in the age of artificial intelligence, which is also our main interest. They have pointed out that new forms of interaction will place humans in a new central role. However, this requires not only a technological evolution but also a cultural one. Lauer and associates (2020) have conducted a behavioral analysis on human-machine interactions and concluded that a different level of human-machine interaction has an impact on human acceptance of algorithms.

Two studies that we found important have led us to conduct this research. The first consider study was "Robots worldwide: the impact of automation on employment and trade" (Carbonero et al., 2018). This study differs from the other two by applying the so-called index of technological progress, which measures the use of robots. It points not only to the negative impact of automation on employment in emerging countries, but also to a decrease in offshoring activities in developed countries where robots exist. Labor costs are rising, but the need for supply flexibility in the market is also increasing. As companies try to cut costs, it has been concluded that it would be cheaper to hand over production to robots instead of moving production facilities to poorly developed countries. This will lead to a decrease in employment in these countries, causing even more damage. Moreover, robots have a negative impact on employment growth in these countries, more than eleven times higher than in developed economies. Due to the 24% growth in the use of robots between 2005 and 2014, there is a 1.3% long-term decline in employment globally (0.5% in developed economies). The authors offer data for 43 countries and seven economic sectors, in addition to 13 manufacturing occupations

Another issue the study addresses is finding a link between the internationalization of manufacturing through offshoring and the adoption of robots. When the case occurs that a company automates its production, eliminating the need to move production to other countries, these countries lose competitiveness and their employment declines. UNCTAD argues that countries that have historically had an advantage in the form of low labor prices will lose the most as a result of robots, although this effect will be exacerbated by increases in the quality and cost of that labor. This does not mean that offshoring will disappear abruptly, but that it will gradually decline as robots become an increasingly rational substitute for the worker. The authors

mention China as a country that still has a high flow of investment, only to say that developing countries are creating new demand and need despite rising labor prices (building on the study authors above, before relying on an econometric record, they argue that by 2020 the Chinese middle class will be even larger than the entire population of USA, implying the possibility that countries will compensate for the loss resulting from a reduction in offshoring projects through domestic demand and production).

“The impact of robots on employment, productivity and jobs” (IFR, 2017) is another study closely related to this work. As with previous research, the International Federation of Robotics notes an annual increase in robot purchases, which was 15% in 2015. It is predicted here that there will be more than 2.5 million robots in use in 2019. Once again, fears are being raised about the impact automation will have on the job market and the economy in general. There are also some interesting differences between these two studies, especially in outlook. While the International Labour Organization (ILO) highlights the negative effects (Carbonero at al., 2018), the position taken by the IFR can be summarized in the following points: 1. The introduction of robots will increase competitiveness and productivity. Higher productivity will increase demand, which will lead to an increase in demand for labor. Comparing the above conclusions in the context of offshoring, one might wonder where exactly this demand for labor will increase, 2. The IFR believes that robots are not only complementary objects in the workplace, but also enhance it, i.e. that the future of work lies in collaboration between robots and humans, 3. It makes no sense to impose taxes on robots, as this would affect the competitive advantage of companies.

The IFR also cites data to support its arguments, pointing to research showing that investment in robots in OECD countries has led to 10% growth in GDP per capita since 1993. Shortly after, it points to McKinsey Global Institute projections that half of productivity growth should come from automation to ensure 2.8% GDP growth. The study cites the example of Whirlpool, Caterpillar and other companies. Automation and the latest technologies have led to a restructuring of their supply chains, causing them to shift production back to their emerging markets. Here is a link to a previous study that adds to this topic by showing the same effect and its impact in several countries, i.e., those that have had manufacturing facilities moved into their territory, only to later pull them out.

The last study to be considered, “The impact of industrial robots on employment and pay in the EU: an approach based on local labor markets” (Chiacchio et al., 2018) was published by Bruegel, reduces its scope of action to six Member States, which account for almost three quarters of the EU industrial robot market. At the outset, it mentions two types of effects that robots can bring about when they are introduced in a company. The first effect is labor substitution (displacement effect), while the other increases labor demand and productivity (productivity effect). Chiacchio and others conclude that one additional robot per thousand workers reduces the employment rate by up to 0.20%, suggesting that the first effect is stronger than the second. The authors believe that the replacement of workers that results from the

introduction of a robot can be explained as a short-run market shock and accepting the role of the robot and the revolution that this technology will come to a point where the second effect comes to stability. They then point to an assessment of the impact of artificial intelligence where the social disruption effect occurs ten times faster than for technology in the Industrial Revolution era. This bias is also stronger and of far-reaching influence, suggesting that society's adjustment to the market will take place over a longer period than thought. But until then, indescribable damage may be done.

Those who would feel the impact of automation the most would be the younger segments of the population, as shown by the example of German companies creating fewer and fewer jobs for young people while employing fewer skilled workers in all positions after the introduction of robotics. This means that young people will struggle to get a foothold in the job market. It also decreases the demand for people who would do routine jobs. Since routine work has a set of rules and procedures that must be followed and repeated, it is understandable that this very work becomes an easier target for contract programming than something that requires creativity and out-of-the-box thinking.

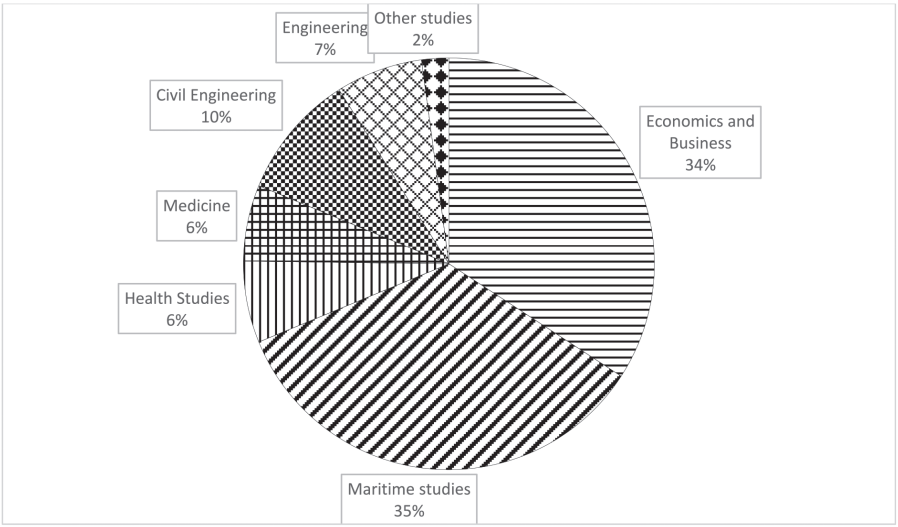
3. Sample and data

The data obtained can be used for statistical purposes and shed light on potential problems that may arise due to automation. The following data shows the perspectives of respondents in Primorsko-goranska County in the spring of 2020. The sample on which the study was conducted consists of students enrolled in degree programs at the University of Rijeka (UNIRI). The research conducted for this paper is mostly qualitative in nature. The survey was conducted online via Google Forms in May 2021. The questionnaire was offered to the students of the University of Rijeka and was mainly completed by students of Engineering, Economics and Business, Maritime Studies, Health Studies or Medicine (Figure 1). As the primary data collection instrument, the questionnaire consisted of thirteen questions, three of which were on a Likert scale. Data from 234 respondents were collected in May 2021. Respondents were then divided into three science areas for analysis: Technical Sciences (responses from the Faculty of Maritime and the Faculty of Engineering and two responses from students in the Faculty of Civil Engineering and the University Department of Mathematics), Natural Sciences (respondents from the Faculty of Medicine, the Faculty of Health Sciences and with three students from Veterinary Medicine, Physiotherapy and the Department of Biology and Chemistry) and Social Sciences (respondents from the Faculty of Economics and Business). During the analysis, series of non-parametric statistical tests (Mann-Whitney and Kruskal-Wallis) were conducted with the aim to strengthen observations, and especially to enable us to compare the answers between different subgroups of the sample.

The first question of the survey was related to the gender of the respondents with the aim of finding a correlation between gender and other observed

variables. The response showed that 144 (61.5%) of the respondents were females while 90 (38.5%) of the respondents were males. In this study, most of the respondents belonged to the technical sciences group (121) while social sciences came second (81). Natural sciences have the least number of respondents (32). Among the fields with more than one respondent, Maritime Studies and Engineering were the only male-dominated fields.

Figure 1: Sample structure

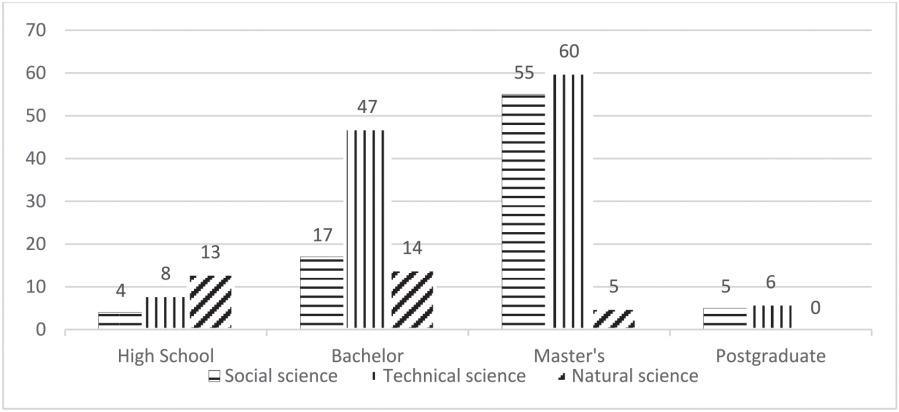


Source: Author's research

4. Results and discussion

The intent of the question, "What level of education is required for your (future) job?" was to determine the perceived link between education and their current (or future) job. The majority of respondents believe that graduate level of university education is appropriate for their current or future job (Figure 2). Respondents from the natural sciences indicated that an undergraduate degree or even a high school education was sufficient for their job, while respondents from the social sciences considered the graduate level of a university degree to be most appropriate. None of the respondents from the social sciences felt that they would need post-graduate education.

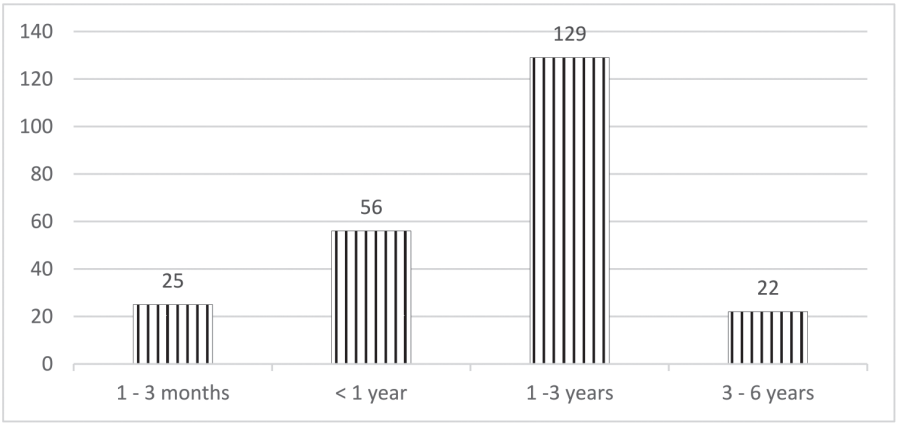
Figure 2: Distribution of responses by field of science



Source: Author's research

When asked how much experience is required for their current or future job, most respondents answered that the required experience can be acquired in a period of one to three years (Figure 3). The second largest group believes that less than one year is necessary.

Figure 3: Time needed to gain experience for their job

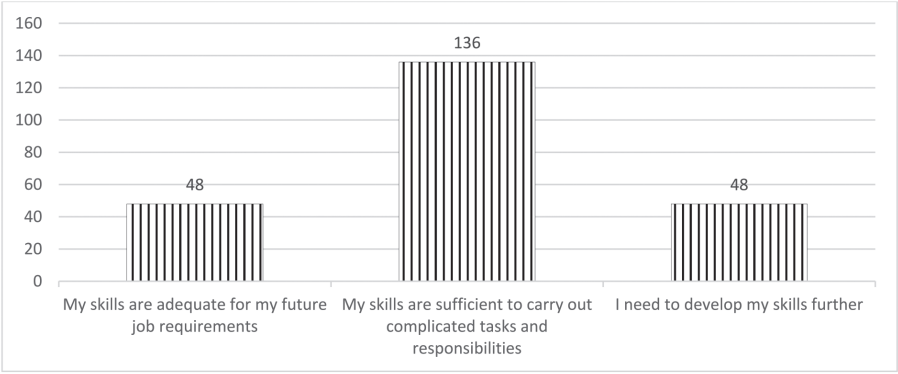


Source: Author's research

In a question aimed at understanding the respondents' perceived skills (Figure 4), it can be seen that more than 80% of the respondents believe that their ability level is adequate and sufficient. Although the first two offered responses are similar, they are intended to show two different dimensions of respondents' self-criticism. The first (left bar) indicates a certain level of

self-awareness, where respondents objectively know how they assess their abilities and how they can improve them, i.e. they know their strengths and weaknesses. The second (middle bar) is meant to illustrate that respondents believe in their abilities and believe that they can do more complex tasks related to a job. The fact that only 20% of respondents know that they need to develop their skills could indicate that the rest of the respondents do not fully grasp what disruptive technologies will bring in the future.

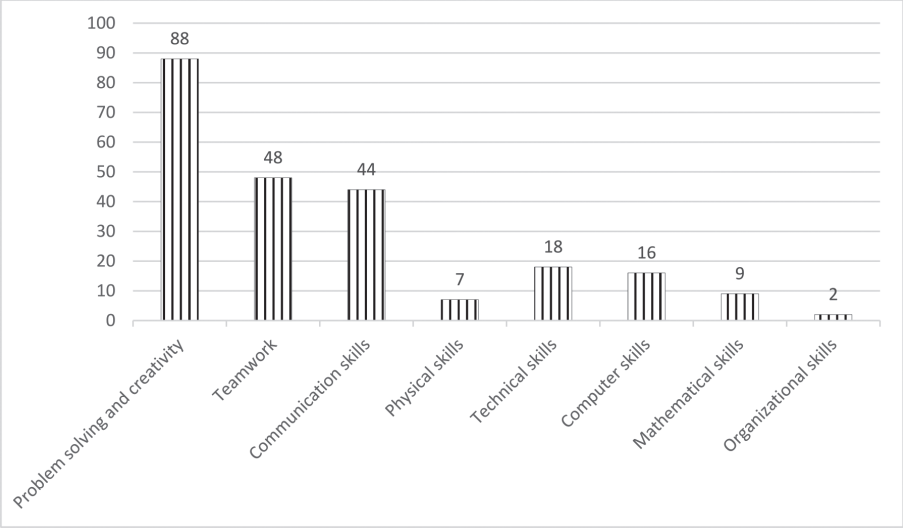
Figure 4: Perceived skills in relation to the skills required by job



Source: Author's research

The perception noted in the previous response is even more interesting when compared to the responses to the question that asked respondents to indicate which skills are most important to their jobs (Figure 5). The intention of this question was to explore in more detail the respondents' views on their skills. It can be seen that most respondents think that problem solving skills and creativity are the most important skills for a job, while technical and computer skills are among the neglected skills.

Figure 5: Answers retrieved from the sixth question



Source: Author's research

The purpose of the following three questions was to assess respondents' perceptions of the threat posed by robots to (their) jobs, both in the present and in the future. The questions, which required respondents to give their opinion on individual scenarios or assertions by choosing levels of stacking with them, aimed to gain insight into the mindset. The answers to these questions can be found in Tables 1, 3 and 4.

Table 1: Opinions on the future work of robots

Do you think robots will do your work in the future	n
1. I think it's unlikely	59
2. I doubt it, but it's possible	128
3. I think it, but I am not sure	40
4. I am fully considering it	7
TOTAL	234

Source: Author's research

To analyze the data from Table 1 in more detail, two statistical tests were used: Mann-Whitney and Kruskal-Wallis. The non-parametric Mann-Whitney U test was used to detect differences between male and female respondents, but it did not show statistical significance. Then the Kruskal-Wallis test was

used to determine if there were statistically significant differences between respondents from different fields of study. The null hypothesis had to be ruled out (p=0.0008) as the test showed that there were differences. The alternative hypothesis that there are differences was then made and tested. Statistically significant differences were found between the groups of:

1. engineering students and business students

2. engineering students and maritime students.

Table 2: Differences between respondents from different fields of study

	Kruskal-Wallis test: H (7, N= 234) =24.80028 p =,0008							
	1 (R:110.51)	2 (R:103.11)	3 (R:109.00)	4 (R:140.79)	5 (R:126.98)	6 (R:171.94)	7 (R:145.25)	8 (R:161.40)
1		0.69364387	0.06354998	1.5436626	1.02806569	*3.31331935*	1.21232404	1.630724
2	0.69364387		0.24758517	1.92283569	1.49224138	*3.71638228*	1.47126313	1.868585
3	0.06354998	0.24758517		1.09901114	0.67547087	2.23135923	1.01603349	1.387785
4	1.5436626	1.92283569	1.09901114		0.60171304	1.25746264	0.13515291	0.584506
5	1.02806569	1.49224138	0.67547087	0.60171304		2.04013695	0.58880189	1.030508
6	*3.31331935*	*3.71638228*	2.23135923	1.25746264	2.04013695		0.82353286	0.303824
7	1.21232404	1.47126313	1.01603349	0.13515291	0.58880189	0.82353286		0.39399
8	1.63072381	1.86858486	1.38778532	0.5845064	1.03050826	0.30382373	0.39399034	

Source: Author's research

The differences in the figures show that engineering students (69%) disagree at all with the idea that robots can do our work in the future, while maritime and business students are skeptical but believe that there is a possibility for it (58 and 65 %, respectively). Other pairs showed no differences.

Table 3: Opinions on new job creation

The use of robots in your profession will create new jobs and new types of jobs in the future.	n
1. I do not agree at all	30
2. I do not agree	69
3. I have doubts	59
4. It could be possible	64
5. I agree	10
6. I totally agree	2
TOTAL	234

Source: Author's research

The nonparametric Mann-Whitney U test was used to determine the differences between male and female respondents, but it did not show statistical significance. The Kruskal-Wallis test on this question also did not show statistically significant differences between respondents from different fields of study.

Table 4: Opinions on robots on the workplace

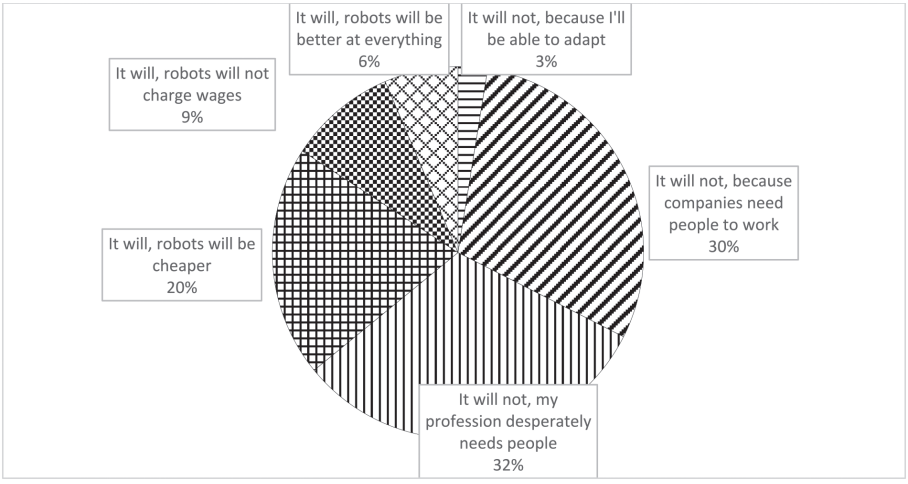
I am comfortable where I can have more human relationships than robot relationships	n
1. I disagree	7
2. I partially disagree	9
3. I do not care	27
4. I partially agree	34
5. I agree	156
TOTAL	233

Source: Author's research

The following questions sought to better understand the dynamic between students and the perceived superiority (or lack thereof) of the robots they would have to compete with in a work environment.

The question presented in Table 6 is in some ways the inverse of the question in Table 3 (The use of robots in your profession will create new jobs and new types of jobs in the future?). Assuming that students have negative attitudes towards robots and their capabilities, the intention was to further clarify these opinions.

Figure 6: Opinions on the claim that the introduction and wider use of robots in business also means fewer opportunities for workers

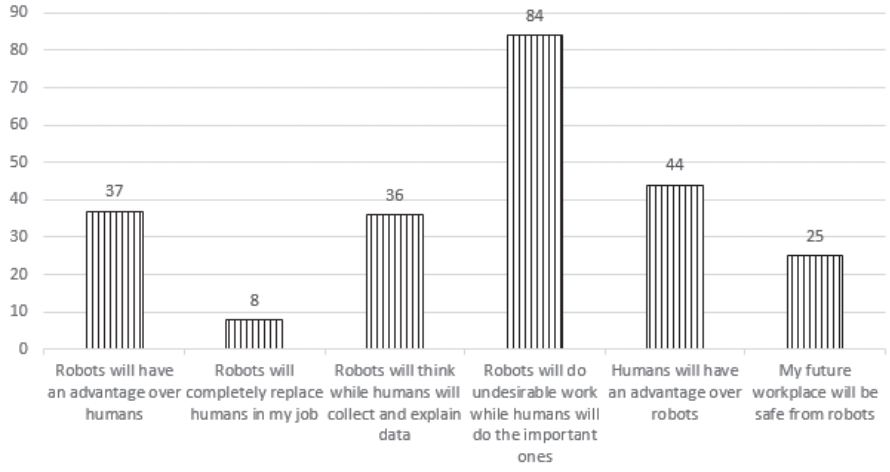


Source: Author's research

The majority (62%) of respondents believe that their chosen profession absolutely needs people. Some of them even believe that the job will not be possible without humans. In the previous questions, respondents were more in favor of humans than robots. It is possible that the answers to this question reflect the preference mentioned above. Some of them probably simply do not see robots replacing humans in the foreseeable future. However, there are also some respondents who believe that the introduction of robots will reduce employment opportunities. These are fewer than in the first group, but they show that not everyone has the same opinion.

The results of the collected opinions on the question of the future of robots are shown in the next figure (Figure 7). Most respondents clearly believe that robots will continue to be mechanical and computational helpers for humans and that workers will still be needed for important jobs. To determine if there were significant differences in opinion between the sexes about which of the assertions in this question was true, Pearson's chi-square was used, but the differences did not show statistical significance (p=0.0574). However, the same test showed significant differences in opinion between the groups with different opinions on the skills most important to their jobs (Table 5).

Figure 7: Opinions on the future of robots



Source: Author's research

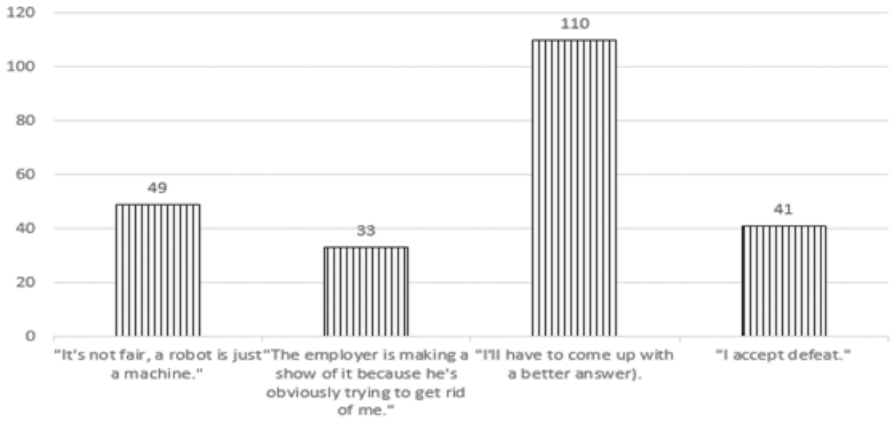
Table 5: Opinions on the future of robots by respondents with different skills

	Statistics: What claim do you find to be accurate? (6) x Which of the following skills is most important for your job? (8)		
Statistic	Chi-square	df	p
Pearson Chi-square	52.86077	df=35	p=.02688
M-L Chi-square	54.96272	df=35	p=.01709

Source: Author's research

In the last question (answers in Figure 8), respondents were asked to choose one of the suggested answers to a scenario where their boss asks them and the robot for their opinion on a matter and after they give their answers, he (the boss) prefers the robot's answer.

Figure 8: Answers on following imagined scenario: "Imagine that your employer asks you and a robot to give an opinion on a certain topic. After you give your opinion, he likes the robot's opinion better. What would you think of it?"



Source: Author's research

The majority of responses indicate that respondents would not find this situation unfair or unduly threatening. It can be speculated that this is due to the fact that robots are seen as technical and calculating tools, which is consistent with previous responses.

The aim of this work was to collect and analyze the attitudes and opinions of the younger generations of students attending the components of the University of Rijeka. The incentive for this research came from previous research, but also from understanding that Covid-19 outbreak and its consequences will serve as a catalyst toward even faster automation.

The number of respondents who say that a high school diploma is sufficient for their (future) career is worrisome, especially considering that most of these responses come from fields related to medicine and health. Ironically, one possible explanation might just be found in robotics. Professional robots that are independent of humans can easily perform tasks, leaving humans with a less complex part of the daily work that would require less training. However, assuming that the market offers the most advanced robot that can be purchased, the same argument can be seen in a different way. The machine cannot be operated by someone who does not have sufficient knowledge, which means that an additional level of training is required to be able to handle such a device in the first place.

There is widespread agreement in the sciences, and by extension in business, that it takes a relatively long time to gain enough experience to become competent in the relevant fields. Certainly there were some who claimed that less was needed, again indicating subjectivity, but only a “handful” of respondents felt that it took at least three years. Assuming respondents are employed by a company, the employer is legally required to pay employees a monthly salary, including all associated costs. The question of whether companies would choose to replace people with an appropriate technological solution is not a real dilemma, as there is ample evidence that this is already happening.

5. Conclusion

This paper provides a somewhat better understanding of how current students view their possible professional positions in the future. Most responses indicate that they are likely to underestimate further technological developments and their impact on their jobs and careers.

The future is always difficult to predict, but the impact of robots on work and industrial relations in the 21st century seems very clear. What will happen when those same robots become so independent that they not only no longer need humans is still the domain of science fiction. However, these questions seem closer and more imaginable than ever today, with leading AI and automotive companies already announcing self-driving vehicles and, as outlined in the literature review, there are not many technological barriers to the adoption of robots as patient assistants in hospitals. While tomorrow’s workers may not compete with science fiction-style robots, they should not neglect the fact that the wave of further automation is coming. At the very least, understanding the automated future should be helpful in making career decisions. The results of this study could motivate scholars to extend it to other universities, but it could also convince teachers to consider this topic more not only in engineering but also in other fields of study.

For future research, it is recommended that this survey be expanded to include responses from students at other universities in other European countries. This would provide data to analyze whether tomorrow’s workers generally neglect the impact of automation or whether people in countries with different levels of technological development see it differently.

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CHAPTER 15

Critical success factors for implementation of ERP system in a public institution

Marko Brkić[1], Danijela Sokolić[2], Iva Zdrilić[3]

Abstract

The introduction of information and communication technologies (ICT) in organizations is a financially, time wise and operationally demanding process. We examine the factors that affect the implementation of ERP (Enterprise Resource Planning) systems in organizations, as well as the specifics of its implementation in the context of a public institution. We describe the context for ERP introduction and outline the process of ERP implementation. Furthermore, we identify the important organizational and project determinants as well as the critical success factors that influenced the implementation of EPR in the public institution. For the purposes of the used case study, semi-structured interviews were conducted with employees involved in the implementation of the ERP system, and documents related to the implementation were analyzed. Finally, problems concerning the implementation of ERP were identified and analyzed, and recommendations were made in order to alleviate obstacles and increase the success of the implementation of ERP systems.

Key words: *Enterprise resource planning system (ERP), ICT, digitalization, public institution*

JEL classification*: L32, M15*

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1. Introduction

Nowadays, business success of many organizations highly depends on their quality and ability to process the available information. Thereby, information systems represent the way business is supported by the technology. Enterprise Resource Planning (ERP) systems are one of those information systems. Their purpose is to plan resources and integrate various organizational units and functions, while improving the organizational information flow. Although their foundations are in the production organizations where they serve for optimizing the production process, today's highly modular ERP systems are widely used in different types of organizations and serve to support various business processes, including finance and accounting, human resources, procurement, sales, planning, etc. Nevertheless, despite the high expectations of the implemented ERP system, existing research shows that on average almost 40% of organizations manage to achieve less than 50% of its expected benefits (Panorama Consulting, 2017). One of the possible explanations of such figures might lie in the non-existence of some harmonized approach that would uniformly measure all the benefits of ERP system's implementation (Gable et al., 2008), which leaves them to one's voluntary interpretation. However, despite the lack of such approach, some authors still managed to get a bit further and proved these benefits and overall efficiency of ERP systems are strongly related to the manners and success of their implementation process (Wright and Wright, 2002). Such process also implies managing the risk that might arise due to the strong interdependence of organizational functions, data, and business process reengineering (Wright and Wright, 2002). Therefore, the main goal of this paper is to examine and identify the key factors which affect the implementation of ERP system in an organization, thereby encouraging or preventing the use of its full potential.

ERP systems were initially conceived and designed with the functionalities and the logic for the private sector organizations only. Thereby, their usage in the public sector organizations has still not been as developed or available (Santos et al., 2018). This is also confirmed by the existing literature that mostly examines them in the private sector context only. However, despite such fact and due to their raising information needs, organizations from the public sector have increasingly started to recognize the great potential of the ERP systems (Spano, 2009). Thus, the focus of this paper is exclusively directed to the success factors of the ERP implementation in the context of the public institution.

Accordingly, the paper is divided into two main parts. First part covers the theoretical background of the information systems management, including the basic approaches to the research on the implementation of ERP systems. By overviewing the relevant literature, the focus has been put on all the factors influencing the ERP system implementation. Second part describes the used case study in one Croatian public health institution and analyzes the whole planning process, as well as the circumstances of the ERP system implementation. Furthermore, different organizational and project determinants, as well as the critical success factors for ERP system implementation are identified. Finally, the crucial obstacles to the whole

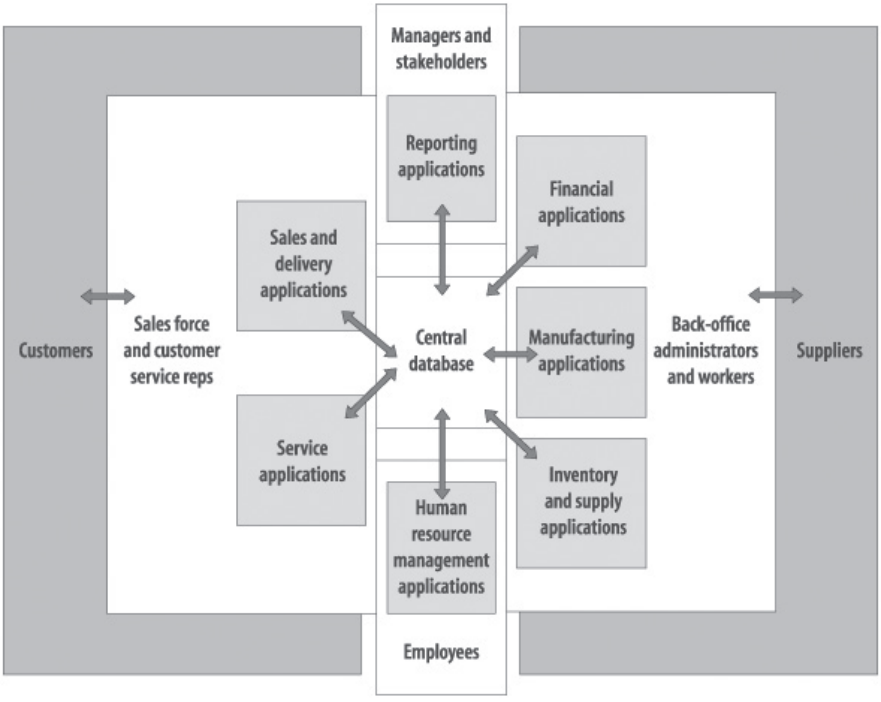
process in the public sector context are summarized and discussed.

2. Theoretical Background

With its strong desire to include more business processes and functions, ERP was created by advancing and expanding the Material Requirements Planning (MRP) system, developed in the 1970s and the later Manufacturing Resource Planning (MRP II) system (Vuković et al., 2007). ERP is a comprehensive software solution, designed to integrate the full range of business processes, organizational units and their functions, in order to plan resources and monitor task execution. In other words, it aims the holistic business insight, through a unique information architecture (Klaus et al., 2001; Wang and Nah, 2002).

ERP information system in the form of a software package reduces or eliminates the need for multiple entries of the same data in different information systems. Thus, all data is (preferably) entered only once, while related data is updated in other ERP applications (modules). That way, uniquely connected database disposes all the information within the ERP system (Figure 1).

Figure 1: ERP system anatomy



Source: Davenport, T. H. (1998) “Putting the Enterprise into the Enterprise System”, *Harvard Business Review*, Vol. 76, No. 4, pp. 121-131.

The theoretical basis for the implementation of ERP is found in the organizational information processing theory (OIPT), introduced by Galbraith (1973). It simply assumes organizations must resolve uncertainties in order to thrive. From the organization's perspective, OIPT sees investment in vertical information systems (i.e., ERP systems) "as a way to increase information processing capacity to avoid overload of the traditional channels in the organizational hierarchy; provide new additional channels; and implement new decision-making mechanisms" (Haußmann et al., 2011). In other words, OIPT sees uncertainty as the central task in designing organizations, while it conceptualizes it as a lack of information about the environment, the status of tasks, etc. (Gattiker and Goodhue, 2004). Further on, it states that the amount and types of uncertainty vary between organizations, by implying "the stability of the external environment, the predictability of the basic processes, the division of tasks and the degree of interdependence between these divisions" (Gattiker and Goodhue, 2005). Thus, to reduce uncertainties, organization uses appropriate and available mechanisms of information processing (e.g., hierarchies, grouping activities into organizational units, IT systems, etc.) (Gattiker and Goodhue, 2005).

OIPT also serves several mechanisms for processing information in a form of organizational coordination. They differ by the degree of their suitability for resolving different types and strengths/intensities of uncertainties. Gattiker (2007) states there are three general strategies for reducing uncertainty in production organizations. One of them implies increasing the capacity of reserve stocks, while another is about simplifying the production and other processes. Last strategy, the one ERP systems belong to, relates to increasing the integration within the organization. Moreover, according to the OIPT, the ERP system is one of the information processing mechanisms, which is available for organizations to use. Or, in other words, the ERP system is "a form of organizational coordination that reduces specific uncertainties" (Gattiker and Goodhue, 2004).

Generally, scholars consider OIPT as a useful theory for understanding ERP systems. Gattiker and Goodhue (2004) find standardization and integration between business functions as the two main characteristics of ERP systems. Therefore, when observing the impact of ERP systems on a subunit in an organization, they are focused on two internal sources of uncertainty that are mostly related to these ERP characteristics: (1) interdependence and (2) differentiation (Gattiker and Goodhue, 2004). Namely, to successfully perform the tasks they have, subunits need to exchange the information between themselves. Interdependence, as a degree of such information exchange, represents uncertainty, increases the need for mutual coordination and reduces the ability to plan activities in advance (Gattiker and Goodhue, 2004). Furthermore, high interdependence implies the need to improve the organization's information flow (i.e., information between organizational subunits), which is one of the basic purposes of the ERP systems and the reason why organizations implement them (Gattiker and Goodhue, 2004). In other words, if systems are not integrated, interdependent subunits share information inefficiently (e.g., via telephone or e-mail). On the other hand, usage of the ERP systems makes information instantly available and

consequently increases employees' efficiency (Gattiker and Goodhue, 2005). However, in situations where the interdependence between subunits is rather low, the need for ERP system is also low, as it wouldn't contribute to any efficiency.

Subunits differ in the specificity of tasks, environment, technology, goals, etc. OIPT theory predicts that greater differentiation between subunits relates to higher costs of a standardized system such as ERP (Gattiker and Goodhue, 2004). Due to such relations, it presents two types of costs: (1) design costs and (2) compromise costs. Design costs include time and money needed for developing a common ERP system which would meet variety of needs that differentiate between subunits (Gattiker and Goodhue, 2004). In other words, these costs are result of the information system adjustments, which are potentially too complex and radically change the source code. On the other hand, when subunits highly differentiate without design costs (i.e., system is not adjusting to the different needs of subunits), compromise costs arise. These costs imply poor performance and data inconsistency between the subunits. This happens because subunits are obliged to use a system, which is not sufficiently appropriate, nor aligned to support their regular tasks and processes they are about to perform (Gattiker and Goodhue, 2004). Thus, OIPT indicates that differentiation of the subunits affects the ERP's system suitability for the organizational needs. Gattiker and Goodhue (2004) give an example of a research on the small enterprises, which found that diversity of functions in the company negatively influences the effects of adoption of IT (including ERP) systems on the quantity and quality of available organizational information. Potential explanation of such relationship lies in the fact that greater diversity of functions creates greater diversity of information needs between subunits, thus creating higher compromise costs once ERP system is implemented (Gattiker and Goodhue, 2004).

By simply relating the interdependence and differentiation of subunits to the organizational benefits of implementing the ERP system, OIPT enriches the theoretical knowledge of why and what for organizations should do so.

From an OIPT perspective, the impact of ERP system varies between organizations, because ERP is considered as only one of the possible and available information processing mechanisms. In other words, the chosen mechanism should correspond to the present uncertainty, which is quite specific and differs between the organizations (Gattiker, 2007).

Furthermore, there are two dominant theoretical approaches that deal with general effects of the IT systems implementation, also including ERPs: (1) process research and (2) variance research (Mohr, 1982). Although both approaches provide insight into organizational changes as consequences of the information technology (Robey et al., 2002), there are still some basic differences between them.

Process research seeks explaining the outcomes by studying the sequence of events over time. In other words, it provides an explanation of how something happens and what key steps create that outcome. This type of research uses life cycle models when approaching the implementation of IT

systems, including ERPs (Robey et al., 2002). Accordingly, different authors have developed the ERP life cycle models with different phases. For example, Markus and Tanis (2000) developed one of the first models which distinguishes contracting (chartering), design (the project), production (shakedown), and evolution (onward and upward) as 4 main phases. Esteves and Pastor (1999) presented a model composed of 6 phases: decision planning, acquisition, implementation, use & maintenance, evolution and retirement. However, regardless of the phases' number and their exact names, each ERP life cycle model from the literature contains some sort of planning, implementation and stabilization, including the phase for maintaining and upgrading the new ERP system (Robey et al., 2002). In other words, process research of ERP system implementation uses life cycle model to set and describe necessary activities in each phase. These activities help decision makers to anticipate and react on future challenges. However, the main disadvantage of this approach is partial or full omission of the key factors, such as organizational characteristics, environment in which it operates and dynamics between ERP system as a newly introduced technology and process of its usage in an organization (Robey et al., 2002).

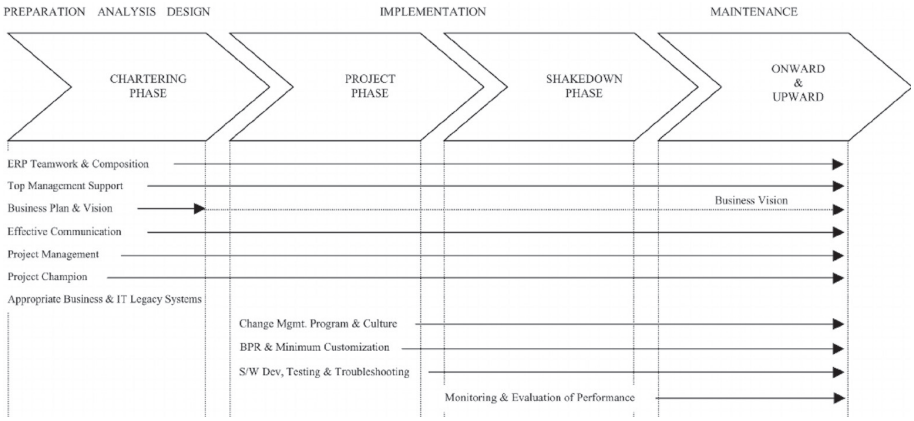
In contrast to process, variance research seeks to explain variation in outcome variables by connecting outcomes to previous conditions and predictor variables (Robey et al., 2002). In other words, this theoretical approach provides an explanation of why something happens, and which variables moderate that outcome. Accordingly, one of its key directions is related to the studies on critical success factors (Robey et al., 2002). Due to the already mentioned purpose of this paper, these factors have been examined in detail.

The concept of critical success factors (CSF) was developed by Rockart (1979) in his research on information systems management. He highlighted the problem of large amount of information circulating at the management level, and he also emphasized the need to filter the relevant and key data to support decision making processes. Therefore, CSFs are addressed as key areas where "things must turn out well for a business to thrive and for manager's goals to achieve" (Bullen and Rockart, 1981). In the ERP system implementation process, CSFs are important aspects which affect such process outcomes, or, in other words, they are the guidelines that need to be followed (Leidecker and Bruno, 1984). Thereby, to ensure the ERP system's success or, precisely, to shorten its period of implementation and consequently gain some organizational competitive advantage (Al-Mashari et al., 2003), it is highly important to effectively manage CSFs (Robey et al., 2002).

Many of the scholars in the filed have focused on identifying, relevance testing, and defining or listing CSFs through ERP implementation process (Bingi et al., 1999; Holland and Light, 1999; Soh et al., 2000; Parr and Shanks, 2000; Nah et al., 2001; Somers and Nelson, 2001; Akkermans and Van Helden, 2002; Hong and Kim, 2002; Al-Mashari et al., 2003; Umble et al., 2003; Loh and Koh, 2004; Motwani et al., 2005; Nah and Delgado, 2006; Alaskari et al., 2012). For example, by comprehensively overviewing the literature, Finney and Corbett (2007) developed an exhaustive list composed of 26 CSFs,

divided into strategic and tactical category. But, certainly the most applicable and most cited list of CSFs is that of Nah et al. (2001) which combines the process and variance approach, and divides CSFs due to the phases of ERP system implementation. Thus, by using the already mentioned ERP life cycle model developed by Markus and Tanis (2000), its final list contains 11 CSFs (Figure 2) which are also used for the analysis and interpretation of this paper's case study.

Figure 2: CSFs of ERP implementation into Markus and Tanis' (2000) ERP life cycle model



Source: Nah, F. F-H., Lau, J. L-S. and Kuang, J. (2001), "Critical Factors for Successful Implementation of Enterprise Systems", *Business Process Management Journal*, Vol. 7, No. 3, pp. 285–296.

Finally, the primary purpose of CSFs identification is to help organization's management to influence areas of importance for implementing the ERP system. However, the problems and failures of ERP projects in practice have shown that including only CSFs in the whole equation is not sufficient for having the best possible implementation's outcomes. Thus, some authors have even questioned the usefulness of their identification. For example, Robey et al. (2002) state that studies on CSFs do not offer concrete insight and that most of them lack the theoretical framework which might adequately explain the business outcomes of ERP projects. Thereby, such limitations in understanding CSFs connection to the implementation of ERP systems certainly leave an additional space for some future research.

3. Data Collection And Methodology

Our research on the key factors affecting the implementation of the ERP system was conducted by a case study on one Croatian public health institution, employing around 330 employees. Due to such purpose

and the fact that case studies have often been used in research related to ERP systems (Schlichter and Kraemmergaard, 2010), this method seemed quite appropriate. Data were collected through the interviews with crucial employees and the institution's official documentation review. The interviewees were selected according to their position in the institution, their involvement in the process of ERP system implementation and its use in their everyday work. In other words, the operating manager including his subordinates, the IT manager and the end users of the ERP system were interviewed. The conducted interviews (July 2019 - April 2020) were semi-structured, guided by the questions based on theoretical knowledge of the ERP system implementation, including its critical success factors (CSFs). Interviewed employees were encouraged to express their own opinions and views on all these aspects.

Besides the interviews, two types of official documents were also used to provide additional information about the institution, and the whole content and course of its ERP system implementation project: (1) documents containing general information about the institution, such as statute, laws and internal rules and regulations; (2) documents related to ERP software and ERP system implementation, such as project and tender documentation, contracts and plans.

By the latent content or, more accurately, the thematic analysis of the collected data, coding of the underlying meaning and the assessment of the overall message were provided. Thereby, the first iteration describes the process and circumstances of the ERP system implementation in the selected public health institution. The second iteration identifies the organizational and project determinants influencing its success, while the third iteration analyzes the general CSFs of the ERP implementation in the public sector context.

4. Analysis And Discussion

New circumstances appeared in running the business of a public institution. They required reducing the number of actions, forming a central master database, interconnecting the business processes and obtaining the real-time data. In other words, they called for the implementation of a new business system, whose creation in the observed institution started with the project plan. Such plan analyzed all the organizational needs and processes, thus an additional schedule of different organizational functions' (i.e., procurement, warehousing, accounting, reporting, master data, etc.) activities was also created. The result of the schedule was a gap/fit analysis which compared functionalities of the existing and the potential ERP system. Such analysis usually serves as a key step for refining the existing or developing completely new segments/modules, necessary for the overall business support.

Further on, the project plan proposed the new business system design which contained a list of all the necessary features for supporting the business of the public health institution. Based on such design and according to the institutional approval, development and adaptation of the specific ERP system began. Furthermore, the concrete implementation team was formed, and

various project roles were assigned to its members to perform key activities for the ERP system implementation (Table 1).

Table 1: Planned activities for the ERP system implementation process and their required time execution

Activities' order number	Activity	Time execution (months)
1.	Analysis of the business processes and the user needs	3
2.	Master dana migration	5
3.	ERP software installation	1
4.	Education of employees	2
5.	Production base delivery	1
6.	Handover due to the contract	1
7.	Beginning with the ERP system operations	active

Source: authors' analyses of the official documentation of the public health institution

The majority organizational and project determinants, influencing the course and execution of ERP system implementation in the observed health institution, were based on the specifics of the public sector the institution belongs to. In other words, most of these determinants were obstacles to the ERP system implementation, which is complementary to some findings in the existing literature (Fowke and Fowke, 1991; Hong and Kim, 2002; Wagner and Antonucci, 2009; Alves and Matos, 2011). After the latent content analysis of the data obtained from interviewing observed institution's employees, mentioned obstacles were divided into 3 basic groups: bureaucratic organizational culture, functional organizational structure and process complexity.

Bureaucratic organizational culture proved reluctant to the inevitable changes due to the implementation of a new business system. Such finding was quite expected, since the public sector organizations are generally risk-averse, especially when investing in new technological changes (Uwizeyemungu and Raymond, 2005). Employees from the observed public health institution were lacking the interest for adopting the new way of working. They were resisting the new system as they were quite suspicious of its advanced features. This applied both to the end users and the leaders of certain organizational units involved in the ERP implementation process.

Complex functional organizational structure, with its formalized business approach and slow decision-making processes, also negatively influenced the ERP implementation process in the observed public health institution. Its effects were mostly manifested through the strict division of tasks and responsibilities between employees and/or organizational units. In other words, lack of communication, cooperation and teamwork of employees from

different organizational units made the process of implementing ERP system even more difficult. The big part of the problem was required business process reengineering, as it imposed too much pressure and burden of change on the rigid and unadaptable existing functional structure.

The last group of the organizational and project determinants were related to the process complexity. Such complexity is the result of the mentioned rigidity of bureaucratic culture and excessive formalization of the functional structure. It was primarily manifested in the legislative complexity of implementing organizational changes. Thus, such complexity made it difficult to adopt the ERP system, primarily because its standard system of best business practice and normal process flow could not have been applied to the business organization and processes of the observed public health institution. In other words, complex processes and certain specifics (e.g., different sources of funding and applicable tax rates, vast number of different activities, etc.), characteristic for a public institution, are quite difficult to transfer and fully integrate through the ERP system.

Finally, after identifying crucial organizational and project determinants, critical success factors (CSFs) were analyzed in detail. That way, a comprehensive overview of the key factors affecting the implementation of the ERP systems in a public organization was completed.

For their presence and their effects' analysis, we used the already mentioned Nah et al.'s (2001) list of the CSFs, based on the ERP life cycle model. Accordingly, the realization of each CSF in the observed public health institution was identified. After applying the latent content analysis, each CSF was related to some organizational determinant(s). For CSFs whose realization was assessed as poor and mediocre, crucial obstacles to the ERP system implementation were additionally detected and a recommendation for their alleviation was given (Table 2).

We found the results of this part of the analysis were in line with the previously identified organizational and project determinants of the ERP system implementation. Thus, one of the key obstacles to implementing the ERP system in a public institution relates to the insufficient support from the top management, so the key recommendation in this context is aimed at its strengthening. In other words, the top management should set the ERP project as the highest priority and actively and directly participate in it. Such support would enable timely decision-makings, comply the set deadlines and operationally support the organizational units. Also, by doing so, management would take the needed responsibility and lead the organization through business and organizational culture changes. This would consequently contribute to a greater engagement of the entire organization, both at the initial stage of ERP's implementation and through its subsequent long-term and efficient usage.

Inefficient communication was also proved as a major obstacle in public sector institutions. This indicates the need for the ERP project manager to design a concrete communication plan, which would inform all the ERP system users about its goals, expectations and limitations. This way, all the employees

would be regularly informed and involved during the ERP implementation project, while an open communication between different organizational units would be encouraged. Thereby, the users of the ERP system could better realize its benefits, opportunities, but also risks, which would consequently reduce their resistance to change and increase the success of the ERP implementation. Successful communication also affects users' expectations of the ERP system and, thus, can prevent the impression of ERP as a universal solution to all the organizational problems and, consequently, mitigate users' disappointment. Furthermore, due to the bureaucratic organizational culture and functional organizational structure, the successful communication about the ERP and other business processes increases the information flow in any public institution and, thereby, takes even the greater strategic role.

Table 2: CSFs, organizational determinants and summarized obstacles to the public institution's ERP system implementation

Critical Success Factor (CSF)	Organizational determinant(s)	CSF's realization	Obstacle to the ERP system implementation
ERP Teamwork & Composition	• Professional team presence • Engagement in implementation only with regular tasks • Lack of communication and teamwork between different functional/organizational units	Mediocre	• Insufficient teamwork resulting in unfulfilled ERP system's needs
Top Management Support	• Unfulfilled project role • Lack of initiative and insufficient interest in the course, details and problems of ERP system implementation	Poor	• Unstable top management support
Business Plan & Vision	• ERP's compliance with short- and long-term goals of business digitalization • Lack of prioritization in defining the scope and functionality of the ERP system	Mediocre	• Undefined specific business solutions and lack of support for the implemented ERP system

Effective Communication	• Lack of communication between different functional/ organizational units • Non-existence of the communication plan for informing about the goals, expectations and limitations of the ERP system • Inconsistent expectations of ERP system and requirements from different organizational units	Poor	• Invalid information about the ERP system and lack of cooperation between different organizational units' employees
Project Management	• Defined project plan and associated roles, as well as their deviations in the ERP's mplementation	Mediocre	• Unrealized targeted project plan
Project Champion	• Designated project manager with the basic task of coordinating activities • Intensive collaboration with an external contractor • Problem with the task realization and resistance of users whom the project manager is not superior	Mediocre	• Lack of cooperation with the contractor and resistance of the individual users
Appropriate Business & IT Legacy Systems	• Great time commitment • Satisfactory level of data conversion and migration from an old to the new ERP system	Strong	
Change Management Program & Culture	• Bureaucratic organizational culture and its specifics: strong resistance to changes and difficulties in knowledge sharing • Conducted ERP users training with a lack of information about the concept, philosophy and benefits of ERP system • Lack of targeted change management activities	Poor	• Unaccepting the changes due to the ERP system implementation

Business Process Reengineering (BPR) & Minimum Customization	• Poorly defined key business processes • Questionable compatibility of business processes integrated into the ERP system with the needs and operations of the public health institution • Adapting the ERP solutions to the organization and mapping its business processes with questionable success	Poor	• Ineffective implementation of business process reengineering with limited ERP system adjustments
Software Development, Testing & Troubleshooting	• Intensive testing with lots of feedback for resolving the errors and (re)defining the ERP system's functionalities	Strong	
Monitoring & Evaluation of Performance	• Project management activities without its official evaluation (one-time or continuous) • Channel for users' feedback during their regular business operations	Mediocre	• Missing the official evaluation and feedback for ERP users

Source: authors' latent content analysis of the data obtained by interviewing the employees of Croatian public health institution

Furthermore, public sector organizations, usually unaccustomed to the process approach, unwilling to change, with poorly defined key business processes, are at relatively higher risk of the ERP system implementation failure. To prevent such scenario and implement ERP system without difficulties, it is necessary to include the preparation phase. This phase primarily implies the analysis of business processes, i.e., the model of the existing (as-is) and future (to-be) state of business processes. Such activities often require hiring an ERP consultant (i.e., an external contractor of the ERP system) who helps in defining a concrete scope of the ERP project or what might be expected from it. In other words, he/she helps to define a precise list of desired ERP functionalities.

Teamwork encouragement is also one of the recommendations for alleviating this obstacle. It might be achieved through engaging smaller operational implementation teams, composed of the end users, their managers and representatives of the external contractor, who operate under the watchful eye of institution's top management. Their main task would contain a business process reengineering which would cover functionally different organizational units, by offering them compatible support through a unique ERP system.

Finally, the illusory nature of ERP as a universal system that brings best business practice to all organizations is another thing worth of mentioning when summarizing the used case study method. In other words, as some authors claim (Swan et al., 1999), it is of the utmost importance to adapt ERP solutions to a specific context of each organization. Logically, this also applies to the public sector institutions and their specific organizational and project determinants, as well as the adopted critical success factors. An ideal balance between business process reengineering on one hand and adapting ERP solutions on the other hand, might be achieved by mutually adapting the ERP systems and key factors affecting the organization. By doing so, the software adapts to the organizational changes and leads to harmonizing the ERP with the remaining business processes. Finally, if desired balance between the two parties is achieved, the positive impact on the success of the ERP system implementation will be inevitable.

5. Conclusion

This paper provides an overview of the relevant theoretical approaches to ERP system implementation. Special emphasis was placed on the public institution context and its specific characteristics, which should be considered when implementing the ERP system and assessing its success.

Although widely popular and with many potential organizational benefits, the ERP system implementations are quite complicated and often end in questionable success or complete failure. Therefore, to examine and identify the key factors affecting the ERPs' implementation in the public sector, this paper observes a concrete example of one Croatian public health institution. By using the case study method, data were collected through conducting the interviews with employees involved in the ERP project (managers and end users) and analyzing the official documentation of the institution. Further on, the latent content (i.e., thematic) analysis was applied.

The results of the analysis confirmed the presence of various organizational obstacles that mostly relate to specific characteristics of the sector an institution belongs to. Such findings are in accordance with the theory of ERP system implementation in the public sector. Bureaucratic organizational culture, functional organizational structure and process complexity, partly conditioned by legislative responsibility, hinder the cooperation between functionally unrelated organizational units, thus creating the additional resistance to change and negatively affecting the implementation of the ERP system.

Furthermore, the underrepresentation of the certain critical success factors such as insufficient management support and poor communication among employees, deviates the original ERP project plan and consequently negatively affects the implementation of the ERP systems in the public sector institutions.

Although qualitative methods of data collection and analysis have provided a deep and detailed insight into circumstances, course, specifics and critical

factors of ERP system implementation in public institution, this paper's findings should be applied with caution to the rest of the public sector organizations. Therefore, the future research should expand the sample and include quantitative methods to more comprehensively cover the key factors of ERP implementation, as some of them still remained unexplored. This would make an advancement in overcoming or at least mitigating the obstacles to the ERP systems implementation.

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CHAPTER 16

Evaluation criteria for ˝Portfolio Greenness˝ within financial retail products

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Abstract

The variety and content of financial retail products (FRPs) on the market is highly associated with contemporary social issues, especially environmental and health protection. It is common for most products to be ecolabelled or certified to indicate the impact of the products in relation to the global sustainable development agenda. Although eco-labelling is very common for tangible products, financial products in the retail sector in the EU are also in the process of developing "green" criteria. The aim of this paper is to analyse how to manage criteria for green labelling of FRPs, based on the proposed guidelines. The research analyses investments made in environmentally sustainable economic activities based on the total portfolio value of assets under "green" management. The research results indicate reasonable criteria and portfolio thresholds for defining ˝portfolio greenness˝. Environmental criteria for different FRPs such as UCITS, bonds and insurance funds are designed into the research and econometric analysis to determine whether investments in stocks, bonds or loans are being used for financing activities that prevent negative impacts related to climate change or reduce negative environmental and social effects. The general findings of the research indicate a useful application of the green criterion to identify FRPs that are invested exclusively in environmentally sustainable activities. The market objective is to provide consumers of FRPs with realistic information about the opportunities of "green" investments, their sustainable returns and future trends.

Key words: *sustainability, finance, ecology, funds, bonds, criteria*

JEL classification: *B27, D14, G41, M14, Q56*

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1. Introduction

Availability of a green financial portfolio became a market reality following global climate changes and environmental sustainability agenda. The ″green″ prefix relates exclusively to financial products like shares, bonds, loans and investment funds that are used as ″tools to support climate change mitigation via the transition to a low-carbon economy″ (Gabor, 2020: 71). Just as is the case with green non-financial products (for instance, organically grown vegetables), customers should be able to evaluate financial retail products (FRPs) based on some sort of product environmental label or criteria. Green FRPs include any financial products that may have positive impacts on environment protection or improvement of ecological efficiency. As financial markets abound with various financial products, a general solution may be based on a set of criteria that may generate an eco-labelled FRP or green portfolio.

International sustainability policy of mitigating climate change effects, reflected in deploying new business strategies, is mainly based on Corporate Social Responsibility (CSR) platform. CSR platform strongly engages companies and organizations to research ecological safety and energy efficiency, the development of eco-efficient products and services, IT innovation and digital solutions, all of them carbon-neutral or environmentally sane. This is also the case with the financial sector, where business operators focused on green products and services, challenging customers to embrace green consciousness. It is a significant challenge, not only for the customers, but also for the providers of FRPs and regulators as no general financial market guidelines or institutional criteria define truly ″green″ or environmentally friendly FRPs. These circumstances prompted regulators, especially in the EU, to elaborate on possible green FRP criteria. ″Green finance″ and ″green investments″ gained momentum with including vital international stakeholders in the proclamation of the ″green business″. OECD and European Commission were among strong participants who addressed the issues of greening the public expenditures, development policies and green lending, all to establish investments in climate-resilient projects. However, the most significant issue on green finances was a criterial one; how to declare and select truly green investments or projects and further evaluate their sustainable contribution. From past practices, it is known that no green financial risks were included to comprehend Sustainable Value Added (SVA) in finances related to ecologically sane projects. However, there are business models analysing sustainable value from green finances.

The socio-economic system is on a peculiar verge in the recent COVID-19 pandemic. Funds of national economies were re-directed from planned budgets to health protection and pharmaceutical research to achieve short-term anti-covid objectives. Like an environmental pandemic, returns on health or ecological investments are valued as objectively possible. EU Ecolabel by the European Commission (2020a) is already established ″label of environmental excellence that is awarded to products and services meeting high environmental standards throughout their life-cycle: from raw material extraction to production, distribution and disposal.″ European Commission

(2021a) expanded Ecolabel by proposing EU Ecolabel Criteria to be used on financial retail products (FRPs), which was connected and previously arranged by *Distribution systems of retail investment products across the European Union* (European Commission, 2018). The main objective was to follow green market trends and develop the criteria that objectively detect the FRPs like shares or bonds that directly contribute to positive trends in saving climate, providing equality and implementing a circular economy on higher levels. This research elaborates potential criteria for green FRPs encouraged by EU sustainability directives and developing standards where green investment criterion is for the first time trying to be institutionalized. Furthermore, the objective is to overview development stages within the evaluation of green finances and represent applicable analytical models regarding sustainability investments.

2. Literature review

Green business models are not a new attraction to global management practices. This is mainly the case as derivatives coming out of the Corporate Social Responsibility platforms (CSR), such as the Triple Bottom Line – TBL (Elkington, 1998), Sustainable Value (Hart, Milstein, 2002) or Stakeholder Management (Post et al., 2002). Today, no earnestly proclaimed business or institutional strategies exclude sustainability issues or green investment policies. In the same way, the Global Green Finance Index ranking is established, where GGFI 7 evaluates *˝green finance˝* activity (Mills et al., 2021). The 7th edition of the GGFI provides two-dimensional evaluations of green finance based on the depth of green finance performance in a specific financial centre (for instance, Amsterdam, London etc.) and the quality of the green finance offerings in 78 major financial centres around the world (Mills et al., 2021: 2-8). According to GGFI 7 (2021), *Green Finance* is any financial instrument or financial services activity – including insurance, equity, bonds, commodity and derivatives trading, analytical or risk management tools – which results in *positive change for the environment and society over the long term (sustainability)*. The most conventional "greenness" criterion of a company or project is that it contributes in the reduction of the Green House Gases emissions. Results show that green portfolios take a high place in finance centres of Western Europe (Amsterdam, Zurich, London), however, it also goes in favour of rising rankings of financial centres from North America (San Francisco, Los Angeles) and the Asia/Pacific regions (Tokyo, Beijing, Sydney).

Green investments indeed took a swing in a global economy based on sustainable strategic goals, where various terms and practices occur in this area, such as eco-investing, sustainable finance and socially responsible investing. Also, there is a high demand for green or socially responsible investing due to critical challenges like carbon neutrality, environment degradation, waste recycling, social injustice (child labour) and inequality. Therefore, investments financing clear sustainability goals have a higher echo in the investors' community. Research and development of technologies that support the transition from fossil fuels to renewable energy sources

or reducing CO2 footprint encourage sustainable investments and green financing in general. In these terms, sustainable financing should provide more environmentally sane products, and above all, business practices that lead to more sustainable market solutions, eco-efficient logistics and advantages for consumer health.

Cunha et al. (2021:1) conducted a meta-analysis of Sustainable finance and investment (SFI). They have concluded *˝that SFI players have worked together to promote positive social and environmental impacts through their financial and investment activities. However, the under-theorisation of the SFI concept, the traditional short-term nature of financial logic, and the lack of evidence on the SFI impacts on society and the environment are the greatest challenges facing the field.˝* Within the green portfolio, the greatest challenge is its entanglement with social and environmental outcomes that go along with financial expectations. As soon as the social and environmental approach derives financial outcomes, like in the case of a green portfolio, management of such investments has to be based on the Triple Bottom Line (TBL). Green portfolio in its roots is evaluated throughout investments in renewable energy, however, the case can be objected through ˝portfolio greenness˝; as a share of green operations within one company or investment fund. This is the case as a green portfolio can be created out of securities, mutual funds, bonds or ETFs. European Commission (2021a) Draft on green FRPs includes the possibility of green labelling for UCITS equity, UCITS bond and mixed UCITS funds, Retail alternative investment funds (AIFs), Fund of Funds (FoFs), Unit-linked insurance products, Multi-option insurance product and all of their possible derivatives (European Commission, 2021b: 4-6).

The discussion initiated by EU Ecolabel for FRPs is based on equality of two dimensions: 1) sustainability achievements and 2) consumer protection. The objective is to provide consumers with a variety of free choices in terms of sustainable investing to be sure that their money will be specifically and exclusively used in sustainable activities. However, for consumers and financial institutions, the criterion declaring green FRPs has to be stated. To standardise such a criterion European Commission advocates its alignment within:

1. EU Green Deal,
2. EU Taxonomy Regulation and
3. EU Regulation on sustainable finance (EU Regulation 2020/852).

EU Green Deal includes a set of EU policies determining actions regarding climate, energy, transport, environment and oceans, R&D, innovations; which, in general, should provide a sustainable matrix for Europe to deal with sustainability and health issues, such as the current COVID-19 pandemic. EU Taxonomy Regulation, also known as Greenomy, has a purpose of alignment solutions, especially when new regulation, as green FRPs, come to the market. EU Regulation (2020/852) aims to establish a framework to facilitate sustainable investments, most of all by defining the criteria for determining

whether an economic activity qualifies as environmentally sustainable. For instance, *˝an economic activity shall qualify as contributing substantially to the protection and restoration of biodiversity and ecosystems where that activity contributes substantially to protecting, conserving or restoring biodiversity or to achieving the good condition of ecosystems, or to protecting ecosystems that are already in good condition…˝* (EU Regulation 2020/852, Article 15, Paragraph 1).

Above stated represents a basis for creating a general criterion for the assessment of greenness of the FRPs. The main characteristic of the given previous research is to provide assessment and verification for the set of criteria/standards by which portfolio greenness of the FRPs can be identified more easily. Moreover, indexes like GGFI and related initiatives of the European Commission are crucial to the contemporary development of green finance and sustainable investing practices on a global scale.

3. Conception of analysis

The analysis concept is based on provided EU Ecolabel criterion for FRPs and forecasts within the European Commission draft for green FRPs (2021a), which outcome is then compared with realistic cases of corporate and government green bonds. Furthermore, to determine a portfolio value invested in environmentally sustainable economic activity, a threshold of portfolio ˝greenness˝ is being used for all types of investment funds (European Commission, 2021b: 4):

$$G = \sum_{n=i}^{0} PCi * \frac{GTi + GCi}{Ti}$$

Where:

G = % of total portfolio value invested in environmentally sustainable economic activity (or 'portfolio greenness')

i = an individual company in which portfolio equities are held

n = total number of companies in the portfolio

PCi = % Portfolio contribution of company i

GTi = Green Turnover (EUR) of company i of the last year prior the application

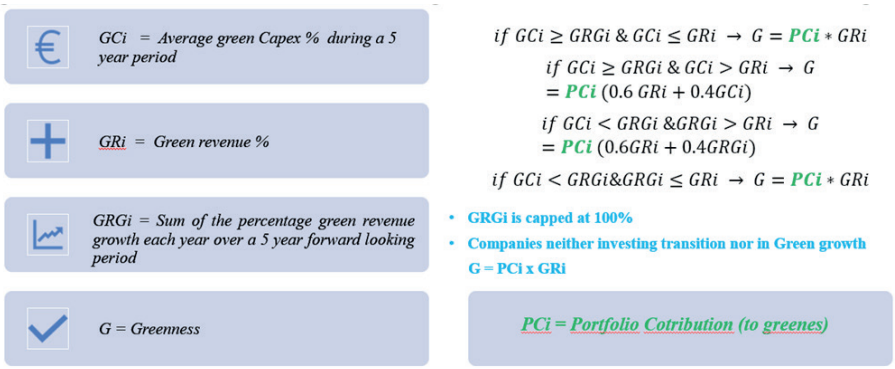
GCi = the highest annual Green Capex (EUR) of company i over the past 3 years' prior the application

Ti = Turnover (EUR) of company i of the last year prior the application

Nevertheless, given criterion may vary, and be demanded that at least 50% of the total portfolio value of the assets under management (AuM) shall be invested in environmentally sustainable economic activities in case of UCITS

equity funds, or even 70% in case of UCITS bond and mixed funds (European Commission, 2021b: 4-5). For example, investors can be incentivised to purchase shares of companies undertaking green, i.e. sustainable activities. When using the greenness criterion, a ˝green capex˝ is being used to define the capital expenditure made in environmentally sustainable economic activities (European Commission, 2021b: 3). However, in this research greenness of FRPs is generally examined, which calculation frame is presented in Figure 1 below.

Figure 1: Calculation frame for portfolio greenness



Source: Adapted from European Commission (2020b) *EU Ecolabel for Retail Financial Products: Criterion 1 portfolio 'greenness' calculation: supporting information and clarifications*, Sevilla: European Commission.

The proposed EU criterion for bonds recognizes that besides clear green bonds invested in exclusively environmentally sane activities, there are also bonds of general-purpose whose green contribution within the portfolio can be detected. However, an issuer of the bond must have a green revenue (GRi) above 50%, or it should be a case of a company investing in green technologies or sustainability solutions. The contribution can then be calculated as follows, results presented in Table 1 for mixed and Table 2 equity fund estimation of green portfolio (European Commission, 2020b):

- Value of the 'Use of proceeds' green bonds (sovereign or corporate): *G = PCi %*
- General purpose bonds (corporate): G = PCi x GRi (issuer),
- General purpose bonds (Sovereign or corporate): G = 0

Where: PCi = contribution of each asset i (bonds or equity) to the whole portfolio (other assets and cash included).

Table 1: Equity fund estimation of green portfolio

						Projection			Historic record			Projection								
				Green Revenue over 5 years					Green Capex over 5 years						Formulas					
	Type of company	Portfolio contribution	GR2020	GR2021	GR2022	GR2023	GR2024	GR2025	GC2018	GC2019	GC2020	GC2021	G2022	GC2023	Green Revenue GRi	GRGi	GCi	Greeness contribution without formula	Greeness contribution with formula	
Other Assets		9.0%																0%	0%	Other assets
Firm1		5.0%	3%												3%			0.15%	0.15%	Equities
Firm2	Company investing in transition	10.0%	10%	10%	10%	20%	20%	20%	21%	20%	15%	18%	15%	12%	10%	100%	17%	1.00%	4.60%	
Firm3	Company investing in transition	7.0%	10%	10%	20%	20%	20%	20%	20%	19%	18%	16%	16%	15%	10%	100%	17%	0.70%	3.22%	
Firm4	Company investing in transition	8.0%	10%	10%	10%	20%	20%	20%	15%	15%	16%	17%	10%	18%	10%	100%	15%	0.80%	3.68%	
Firm5	Company investing in transition	6.0%	20%	35%	40%	45%	50%	55%	10%	13%	15%	20%	16%	18%	20%	100%	15%	1.20%	3.12%	
Firm6		5.0%	40%	40%	40%	50%	50%	50%	20%	13%	17%	10%	13%	10%	40%	25%	14%	2.00%	2.00%	
Firm7		5.0%	40%	40%	40%	50%	50%	51%	20%	19%	15%	18%	12%	10%	40%	27%	16%	2.00%	2.00%	
Firm8		5.0%	40%	40%	50%	50%	50%	52%	20%	19%	19%	17%	15%	20%	40%	29%	18%	2.00%	2.00%	
Firm9	Company investing in green growth	20.0%	55%	55%	56%	58%	60%	61%	20%	19%	10%	15%	13%	10%	55%	11%	15%	11.00%	11.00%	
Firm10	Company investing in green growth	20.0%	52%	54%	55%	60%	65%	70%	12%	10%	15%	13%	13%	17%	52%	31%	13%	10.40%	10.40%	
Total Portfolio Contribution		**100.0%**																		
GCi: This term is the average Green Capex across the 5 years looking period																	**Portfolio Greenness**	31.25%	**42.17%**	
GRGi: There is a cap of 100%																				

Source: European commission (2020b) *Criterion 1 portfolio 'greenness' calculation: supporting information and clarifications, Sevilla: European Commission*

Table 2: Mixed fund estimation of green portfolio

						Projection			Historic record			Projection								
				Green Revenue over 5 years					Green Capex over 5 years						Formulas					
	Type of company	Portfolio contribution	GR2020	GR2021	GR2022	GR2023	GR2024	GR2025	GC2018	GC2019	GC2020	GC2021	G2022	GC2023	Green Revenue GRi	GRGi	GCi	Greeness contribution without formula	Greeness contribution with formula	
Other Assets		5.00%																0%	0%	Other assets
Firm1		5.00%	3%												3%			0.15%	0.15%	Equities
Firm2	Company investing in transition	7.00%	10%	10%	10%	20%	20%	20%	21%	20%	15%	18%	15%	12%	10%	100%	17%	0.70%	3.22%	
Firm3	Company investing in transition	7.00%	10%	10%	20%	20%	20%	20%	20%	19%	18%	16%	16%	15%	10%	100%	17%	0.70%	3.22%	
Firm4	Company investing in transition	4.00%	10%	10%	10%	20%	20%	20%	15%	15%	16%	17%	10%	18%	10%	100%	15%	0.40%	1.84%	
Firm5	Company investing in transition	6.00%	20%	35%	40%	45%	50%	55%	10%	13%	15%	20%	16%	18%	20%	100%	15%	1.20%	3.12%	
Firm6		5.00%	40%	40%	40%	50%	50%	50%	20%	13%	17%	10%	13%	10%	40%	25%	14%	2.00%	2.00%	
Firm7		5.00%	40%	40%	40%	50%	50%	51%	20%	19%	15%	18%	12%	10%	40%	27%	16%	2.00%	2.00%	
Firm8		5.00%	40%	40%	50%	50%	50%	52%	20%	19%	19%	17%	15%	20%	40%	29%	18%	2.00%	2.00%	
Firm9	Company investing in green growth	10.00%	55%	55%	56%	58%	60%	61%	20%	19%	10%	15%	13%	10%	55%	11%	15%	5.50%	5.50%	
Firm10	Company investing in green growth	15.00%	52%	54%	55%	60%	65%	70%	12%	10%	15%	13%	13%	17%	52%	31%	13%	7.80%	7.80%	
Sovereign Green bonds		10.00%																10.00%	10.00%	Bonds
Corporate green bonds		10.00%																10.00%	10.00%	
Sovereign bonds		2.00%																0.00%	0.00%	
Corporate bonds genereal purpose	Company investing in transition	4.00%	20%															0.80%	0.80%	
Total PC		**100.00%**																		
GRGi: There is a cap of 100% **GCi:** This term is the average Green Capex across the 5 years looking period																				
																	Portfolio Greenness	43.25%	**51.65%**	

Source: European Commission (2020b) *Criterion 1 portfolio 'greenness' calculation: supporting information and clarifications, Sevilla: European Commission.*

As presented in Table 1 and Table 2, estimation of contribution for each type of portfolio asset (equity and bonds) is based on two types of projection:

1. projection of their green revenue over 5 years and

2. green capital expenditures (Capex) over 5 years.

The first step in the analysis of the green portfolio that is constructed out of sustainable equity, should include the projection of the green revenues with the growth rate indicated by GRGi. Green revenue projection is based on the 5 years' time span (2020-2025) that includes revenues of various securities invested with focus on exclusively green projects. Therefore, it can be seen from Table 1 that European Commission has included 10 companies with diverse investing policies that should bring the green portfolio return to the greater scale.

Differently, in terms of capital expenditures (Capex), the European Commission has used the historical data on the expenditures for the first two years (2018-2019), and for the next three years (2021-2023) it has relied on the GCi projection. In that way, the goal was to establish the relationship based on the historical data and should provide the rate of return in the future. Furthermore, Capex´s impact in this estimation is crucial as it provides the rate of return of the green portfolio, where it subtracts the green revenues and thus gives the holistic focus on the total sustainability performance of analysed green portfolio.

For Table 2 estimation, that evaluates the equity mix in the portfolio, same approach was taken. Therefore, the projection of the green revenue is also determined by the GRGi which should indicate the percentage of the green revenue growth within 5 years. Simultaneously Capex has the same role as in Table 1 whereby using both historical and projection data indicates the costs that each green portfolio mixture return should be affected by.

Analysis provided by the European Commission on EU Ecolabel has indicated the methodology for the evaluation of the green portfolio performance. Since there are multiple models of green portfolio evaluation, the approach taken in this paper is going to answer the question if there are significant differences in investing trends for the various types of green bonds. By taking this approach, the goal is to provide motivation for the future research where the returns, or coupon payments of the bonds could be used to evaluate the portfolio performance by using the methodology explained above. This can open the thoughts for future analysis and can broader the spectrum of the green portfolio construction and green criterion validation. Also, evaluation of the green portfolio could facilitate further regulations and criterions implemented by the European Commission that can motivate the enlargement of the green market for tradable securities. In the next chapter, the evaluation of the green bonds issuance volume and types will be examined.

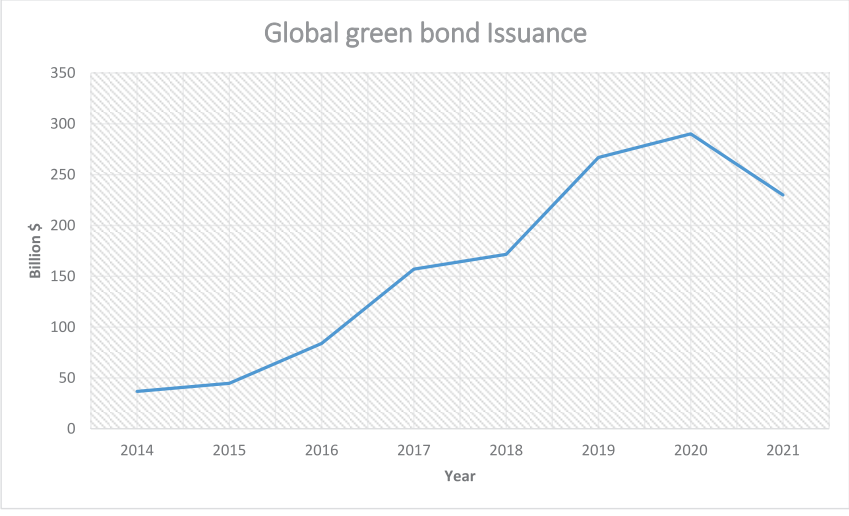
4. Empirical data and descriptive analysis

While previous chapters have provided theoretical background as well as the methodologies used for the evaluation of the green portfolios, here the descriptive analysis and the properties of the green bonds issued by the various entities will be provided. The period from 2014 to June 2021 was of particular interest: therefore, the green bonds' total issuance was obtained from a well-known database for the green bond data, Climate Bonds Initiative (2021). Beforehand, it has to be mentioned that the analysis in this paper does not aim to evaluate the impact of the green investment on the portfolio performance, but to show that trends in green bonds investments, which promote sustainable projects, have increased over the years.

As presented in the literature review and in Löffler et al. (2021), green bonds do indeed have a pricing premium for 15 to 20 basis points lower than conventional ones. That further motivated the analysis where the main goal was to present a difference in the governmental and corporate green bonds issuance, which can further be used for comparison with the conventional bonds. Also, this analysis has to be taken with exceptional care since a green portfolio may be constructed out of various securities that can exhibit unalike behaviour.

The amplitude of the change in the bond issuance can be seen in Figure 2 showing the issuance of the green bonds in billion USD on a global scale. It can be seen that the trend of the green bond issuance has steadily grown from 2014, where the total amount of the issued green bonds was 36.8 billion dollars, and in 2020 reached its peak with 266.9 billion dollars in green bonds issuance. That can further suggest that the green policies supported green growth and gave incentives for green investments in upcoming years.

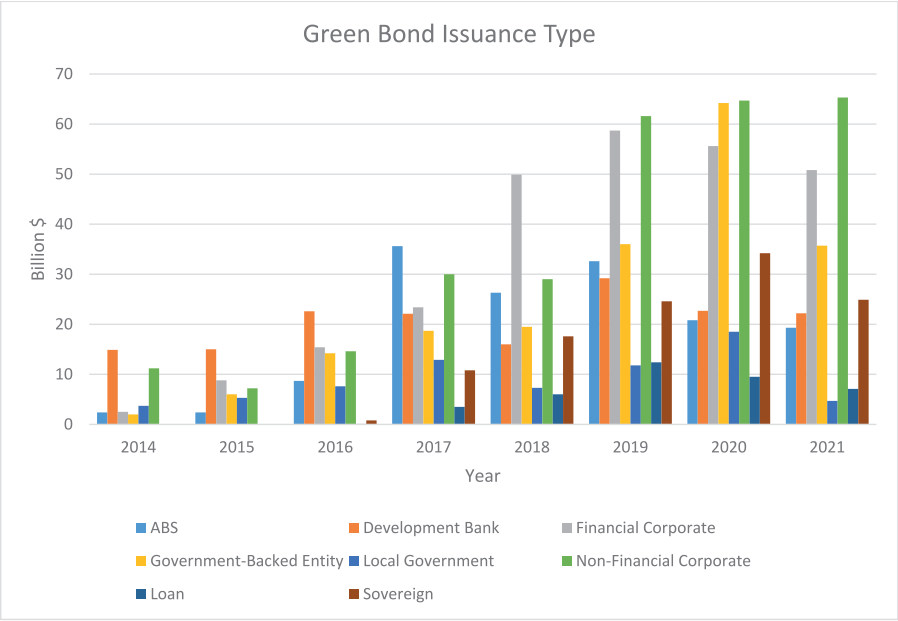
Figure 2: Global green bond issuance in billion USD ($)



Source*: Adapted from* Climate Bonds Initiative (2021) *Market Data* [online]. Available at: <https://www.climatebonds.net/market/data/> [Accessed 20.8.2021].

Also, it is expected that the trend would follow the same pattern in 2021 since the data for the specified year is not collected in full. Namely, the current data included the observations until June 2021, where the difference within the issuance of the green bonds in that period compared to 2020 is lower by only 60 billion USD. This finding may suggest that the COVID-19 crisis has positively impacted green investments, resulting from the investors' more significant focus on the environment and sustainable finance. In order to show the behaviour of the bond types and their issuers for the sustainable bonds, it was decided to plot all types regarding their yearly issuances. Objective was to describe further the trends in particular periods and the amplitude of the issuance, as presented in Figures 3 and 4.

Figure 3: Types of green bonds issued in billion USD ($)



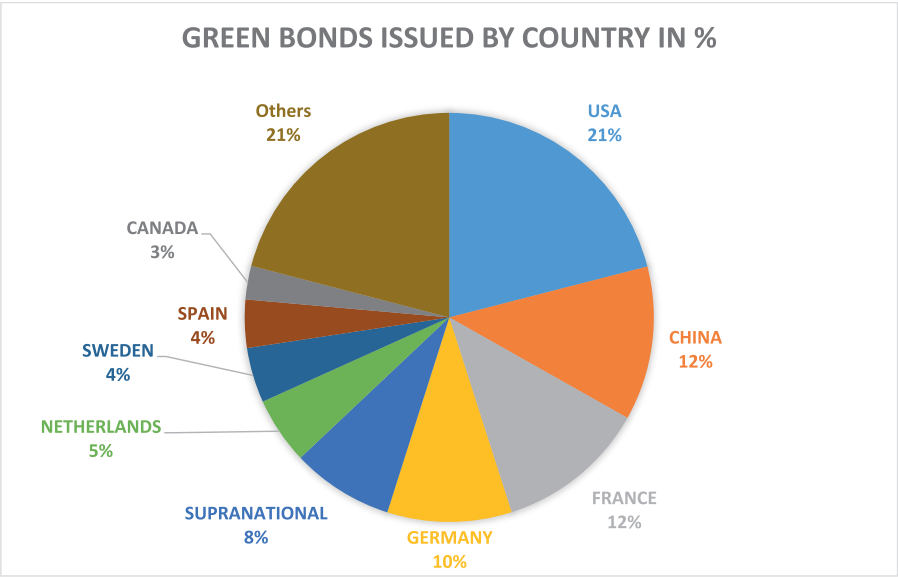
Source*: Adapted from* Climate Bonds Initiative (2021) *Market Data* [online]. Available at: <https://www.climatebonds.net/market/data/> [Accessed 20.8.2021].

Furthermore, Figure 3 describes the bond issuances of the various corporate and governmental entities in billion dollars. As it can be seen, the issuance trend is following the same pattern as Figure 2. However, the importance of a particular bond type indeed differs from year to year. For instance, it is obvious that bonds issued by development banks had the biggest value in 2014, but their importance started to decrease in 2017, where ABS (Asset-Backed Security), as well as Non-Financial corporate bonds gained more

significant growth momentum. In addition to Non-Financial Corporate bonds, the issuance grew in Financial corporate bonds and those issued by the Government sector, which can further explain how the issuance of those securities started being so widespread in upcoming periods. From 2020 to 2021, the issuers were mainly governments entities and Financial and Non-Financial corporates with their total global bond issuance of 66%.

Green investments, in terms of applied evaluation or sustainable outcomes, represent a significant upgrade for global financial markets and financial retailers. Their analytical base (traditionally financial) is in practice being broadened with elements of the Triple Bottom Line: environmental, social and contemporary pandemic (COVID-19) risk factors. More developed financial markets have already assimilated this to their regulations on securities issuance, insurance and evaluation. Therefore, additionally, analysis from green bonds is being assessed with its issuance by countries. As presented in Figure 4 the observation objective is to determine which countries are significant supporters of the environmental and sustainable projects i.e. investments.

Figure 4: Share of green bonds issued by countries (%)



Source: *Adapted from* Climate Bonds Initiative (2021) *Market Data* [online]. Available at: <https://www.climatebonds.net/market/data/> [Accessed 20.8.2021].

As shown by Figure 4, most of the sustainable projects are related to EU member countries where green bond issuance in Germany, France, Netherlands, Sweden and Spain exceeds 30%. Also, this may infer that the green bond issuance may be further related to the regulations such as

European Green Deal, as elaborated in Chapter 2. The USA are the second greatest issuer of green bonds with a share of 21%, and China being on the third place with 12%. This can suggest that the most powerful economies are the ones that execute more green investments. Due to this, existing and new green portfolios may achieve the greatest investing efficiency if they are constructed from the securities issued in mentioned countries and regions. It is not to be neglected that 21% of the green bonds are also issued by the other countries while 8% of them is supranational, showing a widely affirmative global trend in financial sustainability,

The findings of the analysis suggest that there should be a significant incentive in green or corporate bonds investments for the construction of the green portfolio. That further supports the green criteria and conception of analysis proposed in the second chapter of this paper. Additionally, this may give incentives for future research that can evaluate the impact of the green bonds on the portfolio returns in comparison with conventional ones. Crucial step is definitely in defining straight ecological, healthcare and social welfare criteria to evaluate a specific portfolio and its outcomes as sustainable or eco-labelled.

6. Conclusion

The aim of this paper was to analyse how to manage criteria for green labelling of FRPs in business practice, based on the proposed institutional guidelines and green portfolio evaluation models. A multidimensional criterial approach for detecting green FRPs was set as a research objective by respecting Triple Bottom Line contributions of 1. environmental, 2. social and 3. financial returns of sustainable investments. To detect a green FRPs portfolio, a set of criteria has to be obtained institutionally and provided to market investors in practice. Research presumption was based on currently available data and sustainability initiatives related to investments supporting environmental and social sustainability goals. Our analysis confirmed that there is a significant number of green investments on the market whose considerable green, social and health impacts can be evaluated in terms of ″Portfolio Greenness″. European Commission EU Ecolabel initiative is consumer-protecting oriented, demanding that UCITS, insurance funds, corporate or government bonds provide and assurance on green returns i.e. sustainability yields. By evaluating various types of the green bonds that could be used for the construction of the green portfolios, this research proved that long term green revenue growth (GRGi) can be obtained based on the given Ecolabel criterion and its projections presented by conceptions of analysis. Furthermore, the green contribution of the FRPs portfolio can be detected in estimations of mixed and equity funds where the sustainable growth rate indicated by GRGi provides long term green revenues (GRi in %). Main research limitation and a practical issue, based on our findings, is detecting an in-depth structure of the green FRPs portfolio and green return for a specific security within this portfolio. Furthermore, our research detected how financial institutions, companies, banks and governments provide customers/citizens with green FRPs, using the eco-labelled criteria to ensure sustainability outcomes of

such financial products and protect their consumers in general. Furthermore, this paper aimed to determine trends in green bond investments, where it was shown that the volume and the diversity of green bonds have significantly increased from 2014 to June 2021. Also, it was found that the EU countries value sustainable projects more than the rest of the world. This may infer that the global green investments were incentivised by green policies such as the EU Green Deal. This may motivate future research, which should determine the green portfolios' returns as well as risk and compare it to the conventional portfolios. Due to diversity of green portfolio existing on current financial markets, given research was limited to specific FRPs, which in this case those were green bonds. However, distinction had to be made in bonds issued by the government and corporates (companies). Government initiatives in sustainability area are always oriented to public welfare, while companies try to share them within the Triple Bottom Line management practices. Limitations, in difference to European Commission projection presented in the paper, were scarce data sources on green portfolio structures. To construct a green portfolio, we propose further analytical research and green FRPs data unification. In COVID-19 pandemic it is also of significant concert to analyse a share of efficient investments related to restraining pandemic negative outcomes in terms of ensuring joint results of environmental and health sustainability. Environmental and health issues are mutually connected more than ever and therefore, solutions for these complex socio-economic concerns have to be brought by unified alliance of the business sector, NGO´s and governments. This is the only way to respect and balance between social care and financial gains. Global solutions to environmental and pandemic problems are made of incentives, in this case of finding reliable evaluation criteria for green portfolio, along with incentives of the EU and those like Global Green Finance Index. This will then widen the spectrum of the green portfolio investments in practice and promotion of green portfolio management in accordance with global sustainability agenda.

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CHAPTER 17

Digital marketing activities during COVID-19 pandemic – database review

Iva Gregurec[1]

Abstract

As COVID-19 pandemic causes numerus changes in business operations and has big impact on transformation of business models it also affects changes in providing marketing activities. Companies now, more than ever, use digital technologies to meet the desires and needs of their consumers. The purpose of this paper and conducted research is to identify and provide insights of what is happening with elements of marketing mix and how can they be transform in digital environment. For the purpose of writing this paper desk research, research of secondary data was conducted through a comprehensive literature review and it is shown in this paper.

Key words: *Marketing activities, Digital marketing, Digital technologies, Changes, COVID-19*

JEL classification: *M300, M310, O310, O330*

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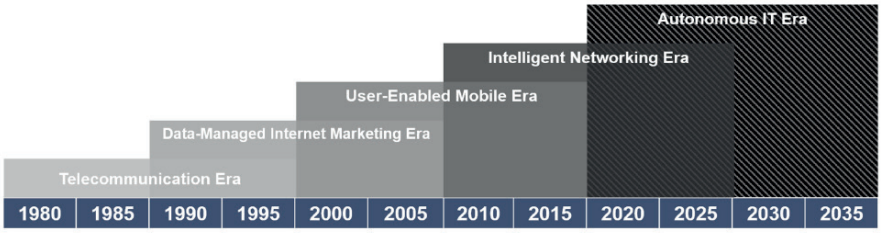
1. Introduction

For over a year now, the world is getting used to the “new normal” caused by the coronavirus pandemic. The pathogenic coronavirus was initially called “2019 novel coronavirus” or nCoV-19 but in January 2020 it was renamed to SARS-CoV-2 by WHO. The virus is said to have originated in bats and then passed to humans. The outbreak began in Wuhan City, Hubei Province, China, and was first reported to public in December 2019. The SARS-CoV-2 virus has spread to nearly all the countries of the world, wrecking health havoc in the way the world has not seen in the recent decades nor was it prepared for. In March 2020, the World Health Organization declared a pandemic, meaning that the disease was spreading worldwide (Akpan et al., 2020; Bretas and Alon, 2020; Liu, Lee and Lee, 2020). Statistics show that on 09th of June 2021 the COVID-19 pandemic is affecting 220 countries and territories of the world, infecting 158 166 576 million persons, and causing 3 762 987 deaths (Worldometer - Coronavirus Update (Live), 2021). So, now the “new normal” refers to a new lifestyle that includes social distancing as well as adherence to personal hygiene at a higher level. But not only on social aspects of our lives this “new normal” has a big impact on the global economy in general but some aspects of the economy are affected more than others. This paper focuses on changes that happened in marketing industry, with the focus on digital marketing industry and its activities that needed to be customized because of influence of this pandemic.

2. Development of technologies used in marketing

According to Graesch et al. (2020) four eras in enabling technologies and emerging marketing tools have evolved through the years. Chronological that eras are: telecommunication era, the data-managed Internet marketing era, the user-enabled mobile era and the intelligent networking era. But also, authors have derived insights about a potential fifth era called the autonomous IT era (see Figure 1).

Figure 1: Eras in enabling technologies and emerging marketing tools



Source: Graesch et al., 2020

1. Telecommunication era – This era occurs between 1980 and 1995. Marketing tool in the early 1980s was telephone. First it was used for selling and shopping (through call and catalogue ordering) in the 1980s and enhanced with telemarketing activities in the 1990s. Than speech understanding systems enabled the use of an access-automated call centre, and with the further technological development call centres were improved by integrating technologies of the later eras.
2. Data-managed era – This era occurs between 1990 and 2005. It includes technologies that enabled mainly data-based marketing and company-to-customer connectivity. IT brought enabling technologies that supported the companies in structuring information with data management systems (DMS), enterprise resource planning (ERP), neuronal networks (NS) and knowledge management systems (KMS). With the development of internet, marketing reach was increased via e-mail communication and the ability to communicate with customers, collect information about them and analyse their preferences and needs. Also, in this era companies could communicate with their customers proactively (through web pages) and reactively (through electronic commerce) without being manually involved in the marketing process. In this era, electronic commerce electronic marketing activities were established. Subsequently, customers used tools such as online marketplaces, electronic catalogues, online auctions and virtual stores to reach their suppliers.
3. User-enabled mobile era – This era occurs between 2000 and 2015. The era brought new marketing domains, such as mobile marketing, social media marketing and influencer marketing so in this era customers are the ones that gained influence through new IT solutions. In early 2000, web pages transformed from a passive medium to an active medium, where user-generated content (UGC), social media and electronic word-of-mouth (eWOM) became obvious. Through that kind of media customers could interact easily with other customers by using forums, blogs and online (virtual) communities.
4. Intelligent networking era – This era started approximately in 2010 and it is still developing. This era is connected to marketing analytics tools, technology marketing, as well as digital marketing. All tools or technologies that are a part of intelligent network era have been recognized as tools that use new connected data and collaboration. First machine learning algorithms were established, followed by artificial intelligence (AI) and web analytics in general. These technologies have enabled the marketing departments of companies to start predicting sales performances better, use automated analysis of text content, implement robo-advisory, personalize advertising in online environments and improve dynamic pricing. Due to big data technology sources, the tools' efficiency could be further improved and by using customer-provided data, such as the customer's location and heart rate gained through the use of wearable technologies, marketing could be further personalized to individual consumers. The useable amount of data and

technologies that can create data and process data boomed during this era and increased networking. Also, technologies like Internet of things (IOT), cloud computing, big data, blockchain technologies, augmented reality (AR) and virtual reality (VR) are included in this era.

5. Autonomous IT era – for this era identified technologies have not yet enabled marketing tools. And according to Graesch, Hensel-Börner and Henseler (2020)and marketing has become digitalized by adopting these technologies over time. The purpose of this paper is to demonstrate the impacts of these enabling technologies on marketing tools in the past and present and to demonstrate their potential future. Furthermore, it provides guidance about the digital transformation occurring in marketing and the need to align of marketing and IT. Design/methodology/approach This study demonstrates the impact of enabling technologies on the subsequent marketing tools developed through a content analysis of information systems and marketing conference proceedings. It offers a fresh look at marketing's digital transformation over the last 40 years. Moreover, it initially applies the findings to a general digital transformation model from another field to verify its presence in marketing. Findings This paper identifies four eras within the digital marketing evolution and reveals insights into a potential fifth era. This chronological structure verifies the impact of IT on marketing tools and accordingly the digital transformation within marketing. IT has made digital marketing tools possible in all four digital transformation levers: automation, customer interaction, connectivity and data. Practical implications The sequencing of enabling technologies and subsequent marketing tools demonstrates the need to align marketing and IT to design new marketing tools that can be applied to customer interactions and be used to foster marketing control. Originality/value This study is the first to apply the digital transformation levers, namely, automation, customer interaction, connectivity and data, to the marketing discipline and contribute new insights by demonstrating the chronological development of digital transformation in marketing.","container-title":"Industrial Management & Data Systems","DOI":"10.1108/IMDS-08-2020-0510","ISSN":"0263-5577","issue":"1","note":"publisher: Emerald Publishing Limited","page":"123-157","source":"Emerald Insight","title":"Information technology and marketing: an important partnership for decades","title-short":"Information technology and marketing","volume":"121","author":[{"family":"Graesch","given":"Jan Philipp"},{"family":"Hensel-Börner","given":"Susanne"},{"family":"Henseler","given":"Jörg"}],"issued":{"date-parts":[["2020",1]]}}}],"schema":"https://github.com/citation-style-language/schema/raw/master/csl-citation.json"} these technologies might change consumers' habits and enable new marketing tools in the future. These technologies include 3D printing production systems by applying blockchain technologies, neuronal networks, augmented intelligence and classification technology, 6G data connectivity, radio-frequency identification (RFID) systems and so on. So, this era has focus on predictive models to make automated decisions, which can be used for (automated) customer interaction.

3. Marketing activities during COVID-19 pandemic

This pandemic crisis has underscored the fragility of the foundations of the 21st century economy. This century economy is characterized by major technological changes, but also technological advances and remarkable globalization, cantered around globally interconnected production chains seeking maximum profitability faces unprecedented challenges (Carracedo et al., 2020). Companies sustainability depends on the adoption of new, innovative management and marketing strategies that allow them to overcome the sharp drop in orders and the pressure of costs stemming not only from rent, wages and taxes, but also those associated with the rise in the price of raw materials given the significant decline in suppliers. This unprecedented situation of global health pandemic has big consequences for the everyday life and affected dramatic changes in consumer demands and its consumption habits, or how they behave in general (Eger et al., 2021; Sheth, 2020), with people attempting to avoid physical contact in order to prevent possible contagion, leading to a pressing need for a global digital transformation and adaptation of supply chains to accommodate that changes (Carracedo et al., 2020).

In long term it is crucial for companies to adopt to this “new normal” and to adopt their business strategies and tactics to survive and/or gain or sustain competitive advantage. In the long term, this pandemic crisis could become an opportunity for companies that use digital technologies in their marketing activities (Ding and Li, 2021). But in the short term, business survival during this pandemic according to Ding and Li (2021) is the main goal of each company. To ensure survival, company can adopt some quick innovation tactics such as cash-flow shortages, the shutdown of facilities, and the disruption of the supply chain. To solve the problem of cash-flow shortages, company can adopt innovative marketing tactics to expand revenue sources (by applying for external funding such as government subsidies, tax cuts, loans, venture capital investments, and outside grants) and cut costs simultaneously. But such tactics are not suitable for every company, so on the other hand, the company can engage in rapid marketing innovation internally to explore more revenue sources from its current and new customers (Ding and Li, 2021). Also, during COVID-19 pandemic, many changes has emerged such as shift in the buying process, changes in the customer experience, and new marketing approaches were adapted (Almaslamani et al., 2020). So, for example, company can include artificial intelligence, big data, mobile technologies and social media to provide personalized offers and interactive contents to each customer so they can have better product experience and to have long-term relationships with them and other stakeholders (Ding and Li, 2021; Almaslamani et al., 2020; Amuso et al., 2021). Another tactic that a company can use is to undertake marketing innovations by embracing a customer-centric marketing mindset and engage in proactive customer relationship management by tracking and learning about each customer’s needs and preferences over time so that company can use proactive marketing management in the future. Such marketing innovations could effectively bring in new customers and increase revenues from current ones. Finally, company

can implement cost-cutting measures to reduce nonessential production and operation costs. During this pandemic crisis, companies should have a “people-first mindset” and treat their employees, partners, and customers fairly (Ding and Li, 2021). According to everything mentioned, company can implement innovative marketing tactics such as online operations, customer support, product offerings, and internal team collaborations with employees working from home or other safe locations based on their needs, goals and capabilities.

4. Methodology and data collection

For the purpose of writing this paper desk research was conducted to collect secondary data and to produce this paper in the form of a literature review. The literature review for this paper was conducted in May and June 2021. The review was carried out in few steps: performing a search of relevant research databases and platforms, followed by constructing a research framework for qualitative analysis, applying the qualitative analysis framework. Relevant databases for this study were: Scopus, ScienceDirect, Emerald, EbscoHost, ProQuest, Taylor and Francis Online and Wiley. The search strategy was based on keyword combinations: “marketing”, “marketing activities”, “digital technologies”, “changes”, “COVID-19” and “pandemic”, and it resulted in a total of 52 hits. After merging all 52 papers, duplicated papers were excluded, whereby 46 different papers remained for further qualitative analysis shown in this paper.

Parallel to the search and by detailed analysis of the papers, the dimensions of the research framework for the study were constructed (Table 1) and based on the goal to investigate the three dimensions of how COVID-19 pandemic influenced digital marketing activities: (1) Elements of marketing mix that are somehow changed under the influence of COVID-19 pandemic, (2) Drivers of changes to see what kind of changes were made and (3) Technology dimension related to technologies used for marketing activities and for the purpose of making those changes.

Table 1: Research framework

Scope dimension (SC) Elements of marketing mix	Drivers of changes (DC) Changes in digital marketing activities	Technology dimension (TC) Technologies used for marketing activities
SC1: Product/Service	DC1: Organizational driven changes	TC1: Social media and platforms
SC2: Price	DC2: Customer driven changes	TC2: Mobile technology
SC3: Place (distribution)	DC3: Technology driven changes	TC3: Big data and data analytics
SC4: Promotion	DC4: Financial driven changes	TC4: Artificial intelligence
SC5: People	DC5: General life changes (social changes)	TC5: Internet of Things
SC6: Process		TC6: Virtual reality
SC7: Physical evidence		TC7: Augmented reality
SC8: No specific reference on marketing element		TC8: Facial recognition technologies
		TC9: Blockchain technology
		TC10: Cloud computing
		TC11: Autonomous systems/robotics
		TC12: Machine learning
		TC13: E-mail marketing
		TC14: Innovative digital technology in general
		TC15: No specific technology reference

Source: Research

Relevant meta-data (e.g., author(s), title, year of publication, database source, type of article, source of the article) and content analysis data across the three dimensions from the selected 46 papers were extracted. Based on the three dimensions, the gathered scientific literature was investigated for appearing sub-concepts across dimensions. Each time a new sub-concept was recognized, it was added to the framework and recorded. Finally, the content of the articles was extracted and analysed. According to meta-data 46 papers were analysed, 45 of them are journal articles published in journals that covers the topic of this paper, and one of analysed papers is conference paper. 26 of the analysed articles are empirical ones, 15 are review articles and 5 of them are categorized as conceptual articles.

The content analysis (Table 2), of scientific paper analysed for the purpose of writing this paper, about digital marketing activities according to all elements of marketing mix was filtered in 8 identified groups or sub-concepts: 7p's – SC1 - product, SC2 - price, SC3 - place, SC4 - promotion, SC5 - people, SC6 - process and SC7 - physical evidence, plus SC8 - where no specific reference on marketing element was found, but the papers covered by this research focused on online consumer behaviour, online buying habits and decision making or marketing activities in general. Some publications referred to more than one sub-concepts, therefore, the sum of matching publications to content analysis presented as frequencies across all elements of marketing mix can be greater then the number of analysed papers (46 of them). Drivers of change were derived as the following: DC1 - Organizational driven changes, DC2 - Customer driven changes, DC3 - Technology driven changes, DC4 - Financial driven changes, and DC5 - General (social) life changes. Similar to the content analysis on the context dimension, it was possible to match a publication's content to more than one driver. As a result, the sum of frequencies across all drivers can also be greater than the number of analysed papers. And et the end content analysis on the technology dimension revealed 15 technology sub-concepts: TC1 - Social media and platforms, TC2 - Mobile technology, TC3 - Big data and data analytics, TC4 - Artificial intelligence, TC5 - Internet of Things, TC6 - Virtual reality, TC7 - Augmented reality, TC8 - Facial recognition technologies, TC9 - Blockchain technology, TC10 - Cloud computing, TC11 - Autonomous systems/robotics, TC12 - Machine learning, TC13 – e-mail marketing, TC14 - Innovative digital technologies in general, and TC15 - No specific technology reference (in the paper author(s) mention technology use, but they do not specify any of it). Similar to the content analysis of the other two dimensions, it was possible to match the publication's content to more than one technology.

Table 2: Content analysis in the sub-concepts of research framework

SUB-CONCEPTS OF RESEARCH FRAMEWORK	PUBLICATION
SC1: Product/Service	(Ding and Li, 2021); (Carracedo et al., 2020); (Eger et al., 2021); (Naeem, 2021); (Erdmann and Ponzoa, 2021); (Sheth, 2020); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Jiang and Wen, 2020); (Sharma et al., 2021); (Zaazou and Salman Abdou, 2021); (Nofal et al., 2020); (Almaslamani et al., 2020); (Bakhodirovna and Qizi, 2020); (Antúnez et al., 2021); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Sheresheva et al., 2021); (Sheng et al., 2020); (Brydges et al., 2020); (Pham et al., 2020); (Addo et al., 2021); (Ponzoa and Erdmann, 2021); (Brandtner et al., 2021); (Butu et al., 2020)
SC2: Price	(Carracedo et al., 2020); (Naeem, 2021); (Erdmann and Ponzoa, 2021); (Kang et al., 2020); (Sharma, 2021); (Zaazou and Salman Abdou, 2021); (Nofal et al., 2020); (Almaslamani et al., 2020); (Antúnez et al., 2021); (Alshaketheep et al., 2020); (Pham et al., 2020); (Addo et al., 2021); (Ponzoa and Erdmann, 2021); (Brandtner et al., 2021); (Butu et al., 2020)
SC3: Place (Distribution)	(Ding and Li, 2021); (Carracedo et al., 2020); (Eger et al., 2021); (Naeem, 2021); (Erdmann and Ponzoa, 2021); (Sheth, 2020); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Sharma et al., 2021); (Zaazou and Salman Abdou, 2021); (Nofal et al., 2020); (Almaslamani et al., 2020); (Kim, 2020); (Bakhodirovna and Qizi, 2020); (Antúnez et al., 2021); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Brydges et al., 2020); (Pham et al., 2020); (Addo et al., 2021); (Ponzoa and Erdmann, 2021); (Brandtner et al., 2021); (Butu et al., 2020)
SC4: Promotion	(Ding and Li, 2021); (Carracedo et al., 2020); (Naeem, 2021); (Erdmann and Ponzoa, 2021); (Kang et al., 2020); (Sharma, 2021); (Hudaefi and Beik, 2021); (Nofal et al., 2020); (Sobreira, Santos de Oliveira and García-Peñalvo, 2020); (Bakhodirovna and Qizi, 2020); (Antúnez et al., 2021); (Bhattacharya and Faisal, 2020); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Addo et al., 2021); (Ponzoa and Erdmann, 2021); (Hancu-Budui et al., 2020); (Kusá and Urmínová, 2020); (Vanko et al., 2021); (Dhar and Bose, 2020); (Brandtner et al., 2021); (Butu et al., 2020)
SC5: People	(Ding and Li, 2021); (Carracedo et al., 2020); (Erdmann and Ponzoa, 2021); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Jiang and Wen, 2020); (Zaazou and Salman Abdou, 2021); (Nofal et al., 2020); (Sobreira et al., 2020); (Kim, 2020); (Bakhodirovna and Qizi, 2020); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Sheresheva et al., 2021); (Sheng et al., 2020); (Pham et al., 2020); (Brandtner et al., 2021); (Butu et al., 2020)

SC6: Process	(Ding and Li, 2021); (Eger et al., 2021); (Naeem, 2021); (Erdmann and Ponzoa, 2021); (Sheth, 2020); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Jiang and Wen, 2020); (Sharma et al., 2021); (Nofal et al., 2020); (Almaslamani et al., 2020); (Sobreira et al., 2020); (Kim, 2020); (Bakhodirovna and Qizi, 2020); (Antúnez et al., 2021); (Bhattacharya and Faisal, 2020); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Sheresheva et al., 2021); (Sheng et al., 2020); (Pham et al., 2020); (Ponzoa and Erdmann, 2021); (Brandtner et al., 2021); (Butu et al., 2020)
SC7: Physical evidence	(Erdmann and Ponzoa, 2021); (Jiang and Wen, 2020); (Nofal et al., 2020); (Almaslamani et al., 2020); (Sobreira et al., 2020); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Brandtner et al., 2021); (Butu et al., 2020)
SC8: No specific reference on marketing element	(Ivasciuc, 2020); (Xie et al., 2020); (Amuso et al., 2021); (Zwanka and Buff, 2021); (Zhang et al., 2020); (Moon et al., 2021); (Pasquinelli et al., 2021); (Micu et al., 2021); (Baicu et al., 2020); (Purcărea et al., 2021); (Ali Taha et al., 2021); (Petrescu-Mag et al., 2020)
DC1: Organizational driven changes	(Ivasciuc, 2020); (Xie et al., 2020); (Ding and Li, 2021); (Carracedo et al., 2020); (Eger et al., 2021); (Erdmann and Ponzoa, 2021); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Jiang and Wen, 2020); (Sharma et al., 2021); (Zaazou and Salman Abdou, 2021); (Sobreira et al., 2020); (Kim, 2020); (Bakhodirovna and Qizi, 2020); (Antúnez et al., 2021); (Bhattacharya and Faisal, 2020); (Alshaketheep et al., 2020); (Sheresheva et al., 2021); (Sheng et al., 2020); (Brydges et al., 2020); (Pham et al., 2020); (Zwanka and Buff, 2021); (Addo et al., 2021); (Kusá and Urmínová, 2020)
DC2: Customer driven changes	(Ivasciuc, 2020); (Xie et al., 2020); (Ding and Li, 2021); (Carracedo et al., 2020); (Eger et al., 2021); (Naeem, 2021); (Erdmann and Ponzoa, 2021); (Sheth, 2020); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Jiang and Wen, 2020); (Sharma et al., 2021); (Zaazou and Salman Abdou, 2021); (Hudaefi and Beik, 2021); (Nofal et al., 2020); (Almaslamani et al., 2020); (Sobreira et al., 2020); (Kim, 2020); (Bakhodirovna and Qizi, 2020); (Antúnez et al., 2021); (Bhattacharya and Faisal, 2020); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Sheresheva et al., 2021); (Sheng et al., 2020); (Amuso et al., 2021); (Brydges et al., 2020); (Pham et al., 2020); (Zwanka and Buff, 2021); (Addo et al., 2021); (Ponzoa and Erdmann, 2021); (Zhang et al., 2020); (Hancu-Budui et al., 2020); (Kusá and Urmínová, 2020); (Vanko et al., 2021); (Moon et al., 2021); (Dhar and Bose, 2020); (Brandtner et al., 2021); (Micu et al., 2021); (Butu et al., 2020); (Baicu et al., 2020); (Purcărea et al., 2021); (Ali Taha et al., 2021); (Petrescu-Mag et al., 2020)
DC3: Technology driven changes	(Ding and Li, 2021); (Carracedo et al., 2020); (Erdmann and Ponzoa, 2021); (Sheth, 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Jiang and Wen, 2020); (Sharma et al., 2021); (Sobreira et al., 2020); (Sheng et al., 2020); (Amuso et al., 2021); (Micu et al., 2021); (Baicu et al., 2020); (Purcărea et al., 2021)
DC4: Financial driven changes	(Erdmann and Ponzoa, 2021); (Sharma et al., 2021); (Brydges et al., 2020)

DC5: General life changes (social changes)	(Ivasciuc, 2020); (Xie et al., 2020); (Ding and Li, 2021); (Carracedo et al., 2020); (Eger et al., 2021); (Naeem, 2021); (Erdmann and Ponzoa, 2021); (Sheth, 2020); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Jiang and Wen, 2020); (Sharma et al., 2021); (Zaazou and Salman Abdou, 2021); (Hudaefi and Beik, 2021); (Nofal et al., 2020); (Almaslamani et al., 2020); (Sobreira et al., 2020); (Kim, 2020); (Bakhodirovna and Qizi, 2020); (Antúnez et al., 2021); (Bhattacharya and Faisal, 2020); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Sheresheva et al., 2021); (Sheng et al., 2020); (Brydges et al., 2020); (Pham et al., 2020); (Zwanka and Buff, 2021); (Addo et al., 2021); (Ponzoa and Erdmann, 2021); (Zhang et al., 2020); (Hancu-Budui et al., 2020); (Kusá and Urmínová, 2020); (Moon et al., 2021); (Dhar and Bose, 2020); (Brandtner et al., 2021); (Pasquinelli et al., 2021); (Butu et al., 2020); (Baicu et al., 2020); (Purcărea et al., 2021); (Ali Taha et al., 2021); (Petrescu-Mag et al., 2020)
TC1: Social media and platforms	(Ivasciuc, 2020); (Xie et al., 2020); (Ding and Li, 2021); (Naeem, 2021); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Hudaefi and Beik, 2021); (Nofal et al., 2020); (Sobreira et al., 2020); (Kim, 2020); (Bakhodirovna and Qizi, 2020); (Antúnez et al., 2021); (Bhattacharya and Faisal, 2020); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Sheng et al., 2020); (Addo et al., 2021); (Zhang et al., 2020); (Hancu-Budui et al., 2020); (Kusá and Urmínová, 2020); (Vanko et al., 2021); (Dhar and Bose, 2020); (Pasquinelli et al., 2021); (Butu et al., 2020); (Ali Taha et al., 2021)
TC2: Mobile technology	(Ding and Li, 2021); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Nofal et al., 2020); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Sheresheva et al., 2021); (Sheng et al., 2020); (Addo et al., 2021); (Kusá and Urmínová, 2020); (Butu et al., 2020)
TC3: Big data and data analytics	(Ding and Li, 2021); (Kang et al., 2020); (Jiang and Wen, 2020); (Sharma et al., 2021); (Almaslamani et al., 2020); (Sheng et al., 2020); (Brandtner et al., 2021)
TC4: Artificial intelligence	(Ding and Li, 2021); (Kang et al., 2020); (Jiang and Wen, 2020); (Sharma et al., 2021); (Sheng et al., 2020); (Micu et al., 2021); (Purcărea et al., 2021)
TC5: Internet of Things	(Ding and Li, 2021); (Kang et al., 2020); (Sharma et al., 2021); (Nofal et al., 2020); (Sheng et al., 2020); (Addo et al., 2021)
TC6: Virtual reality	(Kang et al., 2020); (Kim, 2020); (Bhattacharya and Faisal, 2020); (Amuso et al., 2021); (Addo et al., 2021)
TC7: Augmented reality	(Ivasciuc, 2020); (Sharma et al., 2021); (Kim, 2020); (Bhattacharya and Faisal, 2020); (Amuso et al., 2021); (Addo et al., 2021)
TC8: Facial recognition technologies	(Ivasciuc, 2020); (Jiang and Wen, 2020)
TC9: Blockchain technology	(Sharma et al., 2021)
TC10: Cloud computing	(Ding and Li, 2021); (Kang et al., 2020); (Nofal et al., 2020)
TC11: Autonomous systems/robotics	(Ding and Li, 2021); (Kang et al., 2020); (Jiang and Wen, 2020); (Sharma et al., 2021); (Sheng et al., 2020)
TC12: Machine learning	(Ding and Li, 2021); (Sheng et al., 2020)

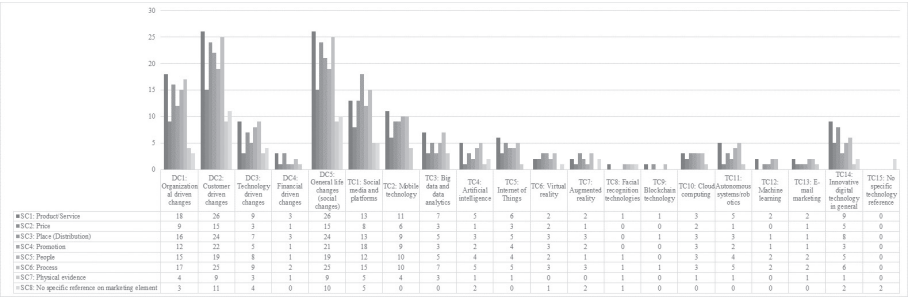
TC13: E-mail marketing	(Nofal et al., 2020); (Sheng et al., 2020)
TC14: Innovative digital technology in general	(Carracedo et al., 2020); (Eger et al., 2021); (Erdmann and Ponzoa, 2021); (Sheth, 2020); (Zaazou and Salman Abdou, 2021); (Sheresheva et al., 2021); (Brydges et al., 2020); (Pham et al., 2020); (Ponzoa and Erdmann, 2021); (Moon et al., 2021); (Baicu et al., 2020)
TC15: No specific technology reference	(Zwanka and Buff, 2021); (Petrescu-Mag et al., 2020)

Source: Research

5. Results

The data in Table 2 presents content matching of three dimensions research framework and its sub-concepts. From the content analysis of 46 publications in relation to the three dimensions and their: 8 scope dimension sub-concepts, 5 driver sub-concepts (dimension of changes) and 15 technology sub-concepts, 379 publications matching were recorded. Each publication was matched to at least one sub-concept in each of the three dimensions. The representation of appearances is visualized in Figure 1. showing changes of scope dimension across drivers or dimension of change and technology dimension sub-concepts.

Figure 1: Scope (elements of marketing mix) across drivers (dimension of change) and technology dimension



Source: Research

Figure 1 shows that overall DC2: Customer driven changes and DC5: General life changes (social changes) were the most significant driver for all elements of marketing mix, but especially for changing products, place, promotion and processes of a company. Those two drivers follow DC1: Organizational changes in terms of transforming elements of marketing mix according to needs of a company. Also, driver DC3: Technology driven changes has its role in changing elements of marketing mix especially in context of product, promotion and process. Although this driver is in focus of this paper, especially when technology dimension is taken into consideration, in this part the given

results can be interpreted that usage of technology and making changes of how companies do their business is not in the focus of changes during this pandemic disruption. DC4: Financial driven changes are the one with the least publications related to this driver. The reason for this can be found in Table 3, where the topics that papers cover can be found.

The most relevant technologies for making changes of marketing mix elements or to transform the way how companies do their business during COVID-19 pandemic were TC1: Social media and platforms (with 26 appearances in covered publications) and TC2: Mobile technology (with 12 appearances), followed by TC14: Innovative digital technology in general (with 11 appearances), TC3: Big data and data analytics, TC4: Artificial intelligence, TC5: IoT, TC7: Augmented reality, TC6: Virtual reality and TC11: Autonomous systems/robotics. Here it should be noted that most often the technologies are implemented in combination with others. As example, companies often use combination of social media and mobile technologies because they can be consumed via mobile technology so companies can communicate with their customers, delivering services online and collaborate with stakeholders through those technologies. According to conducted research, other technologies that are used during pandemic, and mentioned in this analysis, may be the ones for creating competitive advantage in the future if appropriate solutions based on these technologies can be developed for greater use in marketing activities.

In order to explore the qualitative reporting on the impact of COVID-19 on changes of marketing mix elements, the main topics from the publications were: sustainability of a company, increasing of companies' performance, strategy adjustment and increasing competitiveness of a company (Table 2). These results are not unusual and unexpected if viewed from the aspect of the challenges that companies had to face and changes they had to make because of the influence of the COVID-19 pandemic.

Table 3: Topics covered by research papers

TOPICS	PUBLICATIONS	FREQUANCY
Increasing competitiveness of a company	(Ivasciuc, 2020); (Ding and Li, 2021); (Jiang and Wen, 2020); (Antúnez et al., 2021); (Bhattacharya and Faisal, 2020); (Alyahya et al., 2020); (Sheng et al., 2020); (Moon et al., 2021); (Baicu et al., 2020); (Purcărea et al., 2021); (Petrescu-Mag et al., 2020)	11
Sustainability of a company	(Xie et al., 2020); (Ding and Li, 2021); (Carracedo et al., 2020); (Eger et al., 2021); (Kang et al., 2020); (Tajvidi and Tajvidi, 2020); (Sharma, 2021); (Jiang and Wen, 2020); (Zaazou and Salman Abdou, 2021); (Nofal et al., 2020); (Sobreira et al., 2020); (Antúnez et al., 2021); (Sheresheva et al., 2021); (Sheng et al., 2020); (Amuso et al., 2021); (Brydges et al., 2020); (Hancu-Budui et al., 2020); (Kusá and Urmínová, 2020); (Brandtner et al., 2021); (Pasquinelli et al., 2021); (Butu et al., 2020); (Ali Taha et al., 2021); (Petrescu-Mag et al., 2020)	23
Increase of companies' performance	(Ding and Li, 2021); (Erdmann and Ponzoa, 2021); (Sharma et al., 2021); (Bakhodirovna and Qizi, 2020); (Bhattacharya and Faisal, 2020); (Sheng et al., 2020); (Addo et al., 2021); (Ponzoa and Erdmann, 2021); (Zhang et al., 2020); (Hancu-Budui et al., 2020); (Vanko et al., 2021); (Dhar and Bose, 2020); (Brandtner et al., 2021); (Micu et al., 2021)	14
Strategy adjustment to changes caused by COVID-19	(Naeem, 2021); (Sheth, 2020); (Hudaefi and Beik, 2021); (Almaslamani et al., 2020); (Kim, 2020); (Alshaketheep et al., 2020); (Alyahya et al., 2020); (Sheresheva et al., 2021); (Sheng et al., 2020); (Pham et al., 2020); (Zwanka and Buff, 2021); (Ponzoa and Erdmann, 2021)	12

Source: Research

6. Conclusion

The results that can be found in this paper and the analysis of the impact of COVID-19 on digital marketing activities that is made for the purpose of writing this paper show that the scientific publications report mainly on implementing social networks and mobile technologies in transforming elements of marketing mix to get to their customers and to sustain on the market. The elements that changed the most were product, place, promotion and process, and the changes that occurred were caused by general (social) life changes and customers wants and needs that are influenced by it. Those two main changes cause the changes of organization and business transformation, especially in field of process as an element of marketing mix. Technological changes do not have as much of an impact on the development of marketing activities during a pandemic as was expected before this paper began. In any case, these changes are not insignificant and there is a space for transformation of marketing activities using digital technology, especially

by using big data, artificial intelligence, IoT, virtual and augmented reality, but also other technologies mentioned in this paper. According to obtained data, this research could be valuable for future research and identifying space for new technological solutions or marketing activities transformation, in terms of following the existing paradigms or selecting an alternative approach for a specific company for the purpose of increasing companies' performance and increasing competitiveness of a company.

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CHAPTER 18

Integrating data science in business: Evidence from Croatia

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Abstract

Data science market is characterised by progressive growth rate and along with its size, application of data science raises as well. In that sense, aim of this paper is to analyse integration of data science in business from perspective of demand and supply side of data science market in Croatia. Empirical segment of the research is divided in two segments. First segment refers to data analytics market in Croatia observed from demand side. Data on companies that use data analytics have been collected from European Company Survey 2019 published by European Foundation for the Improvement of Living and Working Conditions. Additionally, in order to get a better insight into Croatian data analytics market, we have compared its characteristics with 28 European countries by performing a cluster analysis. Supply side of data science market in Croatia has been studied by analysing primary data collected from survey analysis on data scientists. Obtained results indicate that companies in Croatia do use data analytics but when compared to other European countries, and observed from industry perspective, it seems that there is room for improvement. More specifically, data science could be used for more complex purposes which would consequently increase its application in various sectors. On the other side of the market, companies and individuals offering data analytics service seem to have a satisfying market position in a way that they perceive global trends in this field and they successfully manage to cope with implications of Covid-19 pandemic on their business.

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Key words: *Data science, Data analytics, Big data, Croatia, Digital transformation*

JEL classification: *L25, L86, O30*

1. Introduction

Almost everything we do leaves a digital trace that can be transformed into data and when we add all other types of information that could be collected from our surroundings it is obvious why importance of data science is growing rapidly. Huge amount of data is being created literally every second[3] and these data, often referred to as *big data*, can be used for various purposes ranging from predicting shoes that we might buy to fighting crime on a government level. Along with importance and applicability of data science, value of this market is growing as well. In that sense, Statista (Mlitz, 2021) published forecast on global big data and business analytics market estimating their growth to 274.3 billion U.S. dollars by 2022, with a five-year compound annual growth rate of 13.2 percent. However, before we continue dealing with data and data science it is important to stress that terms *big data* and *data science* are not synonyms, although many people tend to use them interchangeably. Jagadish (2015) states that this is not completely inappropriate since *big data* begins with data characteristics (and works up from there), whereas *data science* begins with data use (and works down from there). Further, he reflects on several other issues related to big data and data science that are worth mentioning such as: a) broadening focus from size of data to their volume, velocity, variety and veracity, b) detecting necessary steps/decisions while doing data analysis and c) being aware of possible problems related to data reuse.[4] Therefore, deeper analysis of this issue requires a wider perspective where data analytics is a segment of data science that is most often, but not strictly related to big data. In that sense, authors relate to these terms depending on source they refer to or data they have access to.

Analysing data for various purposes is not a new thing, but possibility to analyse rather quickly vast amount of various types of data collected from multiple sources is directly related to recent technological progress. Therefore, development of data science should be observed by taking into account its various determinants and repercussions, i.e. we should observe it from perspective of Industry 5.0 and Society 5.0. Namely, it became evident that fourth industrial revolution, i.e. Industry 4.0 that is focused on interconnectedness of machines and systems with the goal to improve efficiency and productivity, has its challenges or we even might say downsides. In that sense, Industry 5.0 evolved from Industry 4.0 in a way that it refines the interaction between humans and machines emphasizing importance of humans' critical thinking skills and creativity, all with sustainability in mind (Demir and Cicibaş, 2017). Carayannis et al. (2021) present even more comprehensive concept stating that technological progress has effects on entire society, which is considered a larger ecosystem. They reflect on

3 In 2018 Forbes published an article (Marr, 2018) stating that there are 2.5 quintillion bytes of data created each day at current pace, so it is reasonable to expect that today this number is even higher since this estimate has been made three years ago.

4 Reflecting on these aspects is an extensive research path; hence, it will not be addressed in this paper.

concept of Society 5.0 that should integrate numerous dimensions, such as innovation policies, entrepreneurial attitude and entrepreneurial skills. Further, they emphasize necessity of more agile approach to risk management in context of data that are processed quickly and artificial intelligence tools used to forecast future events and aid decision-makers. However, the very core and importance of their research is that they perceive that there are five pillars[5] (government, university, industry, civil society and environment) that define and shape innovation process and entrepreneurship ecosystems are forming emerging society, technology and economy paradigms.[6]

When we observe data science from this wider perspective, issue of integrating it in business has a completely new meaning. In that sense, Bartosik-Purgat and Ratajczak-Mrozek (2018) provide examples of industries with particular benefits resulting from big data analysis (BDA) ranging from production companies to public sector institutions, while both companies and their customers can benefit from these different sources of advantages given by BDA. Unlike Bartosik-Purgat and Ratajczak-Mrozek (2018) who did a comprehensive literature review on BDA as a source of companies' competitive advantage, Mikalef et al. (2020) made empirical research[7] trying to understand the mechanisms through which investments in BDA actually result in competitive performance. They argue that big data are a necessary tool but are not solely sufficient resource to drive competitive performance gains. Moreover, companies should reorganize their business and their resources in a way they exploit possibilities of technology. In other words, big data analytics capability (BDAC) affects different types of organizational capabilities and they influence competitive performance.[8] Along with benefits from adoption of big data technologies, there are associated risks as well and Raguseo (2018) states that privacy and security issues connected with big data are two risks most frequently recognized by companies.[9]

Importance of data and data science has been recognised beyond company level and it will inevitably increase since European Commission (EC) perceives data as "an essential resource for economic growth, competitiveness, innovation, job creation and societal progress in general" (European Commission, 2021a). Their idea and goal is it to use data as an asset to benefit citizens and businesses in many different ways, but having

5 Concept of the Quintuple Innovation Helix Framework.

6 Brady (2018) as well deals with societal and political change caused by big data and data science but he emphasizes ethical issues regarding political science research due to increasing amount of available data.

7 They used survey data from 202 chief information officers and IT managers working in Norwegian firms.

8 Wegener and Sinha (2013) for Bain & Company surveyed executives at more than 400 companies around the world asking them about their data and analytics capabilities. They analysed whether companies had right employees, suitable data, analytical tools and incentives to support analytical decision making and only 4% of these companies stated they had all respective elements.

9 Raguseo (2018) surveyed 200 medium and large-sized French companies in order to evaluate the benefits and risks that these companies have to face when adopting and implementing big data solutions.

in mind that it cannot be observed separately from issues regarding other aspects of technological progress such as artificial intelligence. To achieve these goals, various programmes, strategies, papers and regulations have been enacted[10] and they serve as a guiding line to European countries while forming their development strategies. Therefore, it is understandable why Croatian 2030 National Development Strategy encompasses development direction focused on green and digital transition with digital transition of society and economy as one of the four strategic goals (Government of the Republic of Croatia, 2021). These European and national development guidelines, along with presented issues on data science, make a frame for our research. Namely, our main goal is to analyse integration of data science in business with the focus on Croatian companies and data scientists working in Croatia. In that sense, this study addresses following research questions:

1. Why do companies use data analytics?
2. What are characteristics of Croatian data analytics market in comparison to other European countries?
3. In which industry the companies that perform data analysis mostly work?
4. What are the main characteristics of data scientists, especially regarding their education?
5. What are characteristics of companies providing services of data analytics?
6. What are attitudes of data scientists regarding application and development of data science?
7. Did data scientists perceive any effect of Covid-19 pandemic on development of data science in general and on performance of their company?

Answering these research questions will benefit companies and individuals on both sides of the data science market. Namely, data analytics and consequently usage of data science will most likely become inevitable activity for both private and public sector. Therefore, it is beneficial to be aware of its characteristics in Croatia in order to use it and develop it so it can help efficiently exploit all resources, both those tangible and intangible ones. Further, results of our findings might add to the field by providing guidance for policy makers and education sector in a way that they get a signal what activities and educational directions to support or encourage so integration of data science has beneficial effects for companies, institutions and society in general.

10 The Digital Europe Programme is an EU financial instrument focused on implementation of digital technology while the Data Strategy and the White Paper on Artificial Intelligence are backbones of new digital EC strategy. Along with development and implementation of data science, in order to ensure its leading position in global data economy, EU proposed a Regulation on European data governance as well (European Commission, 2021a, b, c, d).

Remainder of the paper has the following structure - second chapter explains methodology and used data and the third chapter, containing two main segments of the empirical analysis, presents obtained results and discussion. Concluding remarks are given in the last chapter.

2. Methodology and data used

Empirical segment of the research is divided in two segments. First segment refers to data analytics market in Croatia observed from demand side i.e. it answers first three research questions. Data on companies that use data analytics have been collected from European Company Survey 2019 published by European Foundation for the Improvement of Living and Working Conditions (EUROFOUND). We used data available from "Online questionnaire for management respondents" and did a descriptive analysis while detecting why do companies use data analytics and which industry do companies that use data analytics belong to. There are two questions in respective questionnaire that relate to our first research question:

- Does this establishment use data analytics to improve the processes of production or service delivery? (Code of the question is ITPRODIMP and there are two possible answers – YES/NO.)
- Does this establishment use data analytics to monitor employee performance? (Code of the question is ITPERMON and there are two possible answers – YES/NO.)

Our focus is on Croatian data science market and in order to make a grounded conclusion about it we made a cluster analysis[11] on 28 European countries[12]. The above refers to our second research question and we used following three variables to group these countries: 1) use of data analytics to improve the processes of production or service industry, 2) use of data analytics to monitor employee performance and 3) trend of data analytics from 2016. More specifically, we observed percentage of companies in each country that stated they use data analytics for one purpose and/or another and percentage of companies that experienced an increase in the use of data analytics in their establishment since 2016. Altogether, there are 555 valid responses for Croatia and 21 708 for EU28 countries.

In order to detect which industry do companies that use data analytics belong to, i.e. to answer the third research question, we analysed answers on question coded with MAINACT that refers to NACE 1-digit codes. Further, we used the opportunity to observe the trend in usage of data analytics so we analysed responses on question related to perceived change from 2016.[13]

11 K-Means Cluster with predefined number of clusters analysed by using IBM Statistics SPSS 23.
12 These countries are listed in results related to cluster analysis.
13 The question is: „Since the beginning of 2016, how would you say the use of data analytics in this establishment has changed?" It is codded ITPERFMONUSE and

Supply side of data science market in Croatia has been analysed by obtaining primary data from data scientists in Croatia in order to answer research questions 4 to 7. Online survey has been sent during June 2021 to 130 individuals detected as data scientists or data analysts.[14] Since there is no database that could be used for gathering necessary information, they have been contacted personally via different channels, mainly by LinkedIn. Snowball sampling technique has been used as well and in total, we received answers from 91 respondents, which makes response rate as high as 70%. However, this response rate is related solely to detected data scientists and it should be taken with caution since total population of data scientists in Croatia is unknown and most probably is larger than 130.

3. Results and discussion

As stated earlier, the empirical analysis is divided in two segments. First segment, addressing research questions 1, 2 and 3, explores characteristics of demand for data scientist in the Croatian market. Obtained results for Croatia are compared to results for 28 European countries that are encompassed with European Company Survey 2019. Analysis of supply side of respective market is presented in the second part of the chapter and relates to research questions 4 to 7 that are directed solely to data scientists in Croatia.

3.1. Demand side of data science market in Croatia

Results on implementation of data analytics in business and its trend observed from 2016 are presented in Table 1. When we observe data for Croatia we see that results on usage of data analytics significantly differ from those observed for EU28 countries in a way that there are approximately 34% more companies in Croatia than in EU28 countries that use data analytics to improve the processes of production or service delivery. When it comes to using data analytics to monitor employee performance this difference is even higher and the number of Croatian companies that stated they do use it for aforementioned purpose is almost 60% higher than in EU28 countries. Results on trend in the use of data analytics since 2016 differ as well, although this difference is not as strong. Additionally, trend for Croatian companies is not as positive as for these 28 countries and almost 20% more companies increased the use of data analytics than in Croatia.

has four following possible answers: 1) It has increased, 2) It has stayed about the same, 3) It has decreased and 4) This establishment does not us data analytics.

14 The questionnaire has been written on Croatian, structured in Google Forms with the total of 22 questions available at request. Further, there was no traditional pilot testing of a questionnaire, yet a pilot version of the questionnaire has been reviewed and upgraded by one of the most prominent data scientist is Croatia.

Table 1: Implementation of data analytics in business and its trend – Croatia and EU28

		Croatia N=555		Total (EU28) N=21.708	
		%	Number of companies	%	Number of companies
Improve the processes of production or service delivery		66.1	367	49.4	10,734
Monitor employee performance		50.1	279	31.5	6,866
Use of data analytics since 2016	It has increased	44.3	179	53.1	6,359
	It has stayed about the same	54.5	220	46.0	5,501
	It has decreased	1.2	5	0.9	107

Source: Author's research

At first, results on percentage of companies that use data analytics for two respective purposes seem to be encouraging, as they appear to indicate that Croatian companies are exploiting benefits of data analytics but differences in trend when compared to EU28 countries, make us think twice. Namely, in 55.7% companies in Croatia use of data analytics has stayed the same or decreased from 2016 which leads us to possibility that Croatian companies have not recognised all possible implementation paths of data science in business. Bartosik-Purgat and Ratajczak-Mrozek (2018) provided comprehensive overview of possible benefits from usage of data analysis in business such as increasing customer loyalty by personalising the offer, predicting future situations and updating the strategy etc. and they systematised possible sources of advantages in three groups: product quality advantage, risk reduction advantage and customer relationship advantage. Therefore, it seems that Croatian companies use data analytics in a way to get a product quality advantage[15], while they seem to be unaware that when it comes to data it is not just about their volume, but also about their velocity, variety and veracity (Jagadish, 2015). Additionally, it is not just about analysing various aspects of data yet about rearranging entire business in a way that company benefits from obtained information. Therefore, these narrow focused data on usage of data analytics are an indicator of possible under-use of data science in Croatia.

Aforementioned results formed a base for cluster analysis with the goal to detect what are characteristics of Croatian data science market in comparison to other European countries. In that sense we used three variables that show percentage of companies in each country that use data analytics: 1) to improve the processes of production or service delivery, 2) to monitor employee performance and 3) percentage of companies that experienced an increase in the use of data analytics since 2016. Tables 2 and 3 indicate that

15 And most probably to reduce costs.

observed European countries are, as expected, different when it comes to data analytics. At first, information on cluster centres (Table 3) indicate that being a member of a cluster 1 would mean that data science is developed in respective country since it contains the highest percentages related to the use of data analytics. However, an insight into cluster membership (Table 4[16]) reveals that countries that have highly developed, strong and structurally healthy economy, do not belong to the cluster 1[17]. That leads to conclusion that in countries belonging to cluster 2 and cluster 3 data science is most likely more used for other complex business activities then for the ones in the focus here and that are in their core rather basic.

Table 2: Descriptive statistics

Variable	N	Min.	Max.	Mean	Std. Deviation
Improve the processes of production or service delivery (%)	28	35.10	66.40	48.9250	8.93303
Monitor employee performance (%)	28	13.90	52.90	31.6107	10.53563
Use of data analytics has increased since 2016 (%)	28	36.50	73.60	51.8500	9.11578
Valid N (listwise)	28				

Source: Author's research

Table 3: Final cluster centres

	Cluster		
	1	2	3
Improve processes of production or service delivery (%)	60.86	49.96	42.44
Monitor employee performance (%)	44.84	31.29	25.16
Use of data analytics has increased since 2016 (%)	51.19	60.53	47.84

Source: Author's research

16 All other information on cluster analysis such as distance between final cluster centres is available at request.

17 Italy and Spain although belong to cluster 1, are economically strong countries, but their structural imbalances, demographic and labour problems affect external competitiveness (Puig and Sánchez, 2017) and it is reflected in these results as well.

Table 4: Cluster membership

Cluster 1		Cluster 2		Cluster 3			
Country	Distance	Country	Distance	Country	Distance	Country	Distance
Croatia	10.126	Denmark	6.867	Austria	6.973	Hungary	16.183
Cyprus	10.434	Finland	15.096	Belgium	11.089	Ireland	11.107
Italy	6.756	Greece	9.380	Bulgaria	11.845	Latvia	17.765
Lithuania	6.518	Netherlands	10.314	Czech R.	7.413	Luxembourg	4.770
Malta	11.260	Poland	2.795	Estonia	9.839	Portugal	12.599
Romania	10.420	Slovenia	10.049	France	12.062	Slovakia	11.855
Spain	10.534	United Kingdom	6.383	Germany	12.868	Sweden	13.262

Source: Author's research

In order to further analyse demand side of data science market in Croatia by answering the third research question, we observed which industries use data analytics for two respective purposes and which industries lead when it comes to an increase in its use since 2016. For that purpose, we ranked industries according to the portion of companies that stated they do use it and that the use of data analytics has increased since 2016. However, we presented results (Table 5) solely for first four industries and for all three aspects of data analytics first four industries cover more than 60% of all companies i.e. their representatives that answered YES. As expected, manufacturing industry precedes in use of data analytics to improve processes of production or service delivery, while labour intensive construction industry leads in using data analytics to monitor employee performance. These two industries along with G - wholesale, and retail trade; repair of motor vehicles and motorcycles lead in each of the three analysed aspects of data analytics.

Table 5: Usage and trend of data analytics in Croatia observed from industry perspective

Croatia	Improve processes of production or service delivery		Monitor employee performance		Use of data analytics has increased since 2016	
Rang	NACE Rev. 2	%	NACE Rev. 2	%	NACE Rev. 2	%
1	C	19.6	F	18.7	F	18.0
2	F	17.4	G	17.4	G	16.9
3	G	16.1	C	17.0	C	16.3
4	M	11.4	M	11.2	S	10.5
Sum of shares of the first four most represented industries	64.6%		64.3%		61.7%	

Note: According to NACE Rev. 2 classification C stands for *Manufacturing*, F is *construction*, G represents *Wholesale, and retail trade; repair of motor vehicles and motorcycles*, M is for *Professional, scientific and technical activities*, while S denotes *Other service activities*.

Source: Author's research

Presented results should be regarded as indicators of use of data analytics and its trend since they do not comprehend other possible application of data science in business and do not comprehend institutions that also can benefit from using data analytics in their activities. In that sense, it is worth mentioning that, importance of data science is being recognised in Croatia even outside companies' activities. For example, Cesare et al. (2020) emphasised possibilities of big data analysis in the crisis management system by using an example of Early Warning System for crisis management in the Republic of Croatia. Beside security issues, big data analysis is being used in Croatia for urban transport analysis in order to increase intermodal transport and environmental sustainability as drivers of efficiency and facilitators of tourism (Baučić et al., 2017). Altogether, it seems that there is room for improvement when it comes to both application of data science in Croatia as well as analysis on the issues. Namely, scientific research on the subject related to Croatia is rather scarce.[18]

18 There is also research on application big data in marketing in Croatia (Ćurko, Silović and Merkaš, 2018) but it is conducted from a consumer perspective.

3.2. Supply side of data science market in Croatia

Second part of the empirical research is focused on data scientists in Croatia since they represent supply side of data science market. Primary data on 91 respondent collected via questionnaire reveal that data scientist position is rather equally divided between genders with 44% of female respondents and 89.01% of them are employees, while there are 10 employers in the sample. However, age and formal education structure (Table 6) show that this profession, as expected, is dominated by young and highly educated individuals.

Table 6: Age and education structure of data scientists in Croatia

Age	%
24-33	75.82
34-43	18.68
44-53	5.49
Total	100,00
Level of formal education	%
High school (3-year program)	1.10
High school (4-year program)	1.10
Undergraduate program	9.89
Graduate program/master	78.02
Postgraduate specialist study (univ. spec.)	4.40
PhD	5.49
Total	100.00

Source: Author's research

Respondents from the sample are mostly employed in IT sector (64.84%), 16.48% work in financial sector and 3.3% work in telecommunication sector, while share of other sector is 2.2% or lower. Geographical distribution of their companies' headquarters once again reveals regional disparities[19] in Croatia since 82.42% of companies from the sample have headquarters in City of Zagreb. Split-Dalmatia County is represented by 7.69% and Istria County by 6.59% companies. When we focus more on business of these companies, we see that almost a quarter (24.18%) of companies do not have clients from Croatia, or in other words, these companies work solely with foreign clients, while similar portion (27.47%) has exclusively local clients.

19 Regional disparities in economic development are a severe problem for Croatian economy, and its causes and effects have been extensively studied and will not be addressed here since they are not directly correlated to data science.

Analysis of attitudes of data scientists regarding application and development of data science revealed that their estimates on future benefits from data science (Table 7) are in line with the structure of their former/current clients. Namely, most of their clients come from financial sector, IT sector and marketing[20] and their estimate obviously comes from understanding of respective industries.

Table 7: Data scientists' estimates on sector that will benefit the most from data science

Sector	%
Financial	27.47
IT	23.08
Marketing	17.58
All sectors	15.38
Health	10.99
Unable to predict	2.20
Education	1.10
Sport	1.10
Telecommunication	1.10
Total	100

Source: Author's research

Beside forecast related to sector, data scientists have been asked to give their opinion on: 1) the effect of data science on company's business in general, regardless of the company's sector and 2) predict improvement in business if a company applies data science in its activities. On both questions respondents answered by using 5-cathegory Likert scale (1 denoting strong negative influence and 5 denoting strong positive influence for the first question, while for the second question 1 denoted that business will not significantly improve and 5 that it will improve significantly). Majority of them (64.84%) stated that data science in general will have strong positive impact, while 32.97% respondents predict a moderate impact. None of them predicts a negative impact. However, their estimates seem to be slightly less optimistic when they have been asked to predict expected improvement if a company actually applies data science in its business (Table 8).

20 Detailed data are available upon request.

Table 8: Data scientists' estimates on effect of data science application in company's business

1 - It will not significantly improve	2	3	4	5 - It will significantly improve
0%	1.10%	13.19%	48.35%	37.36%

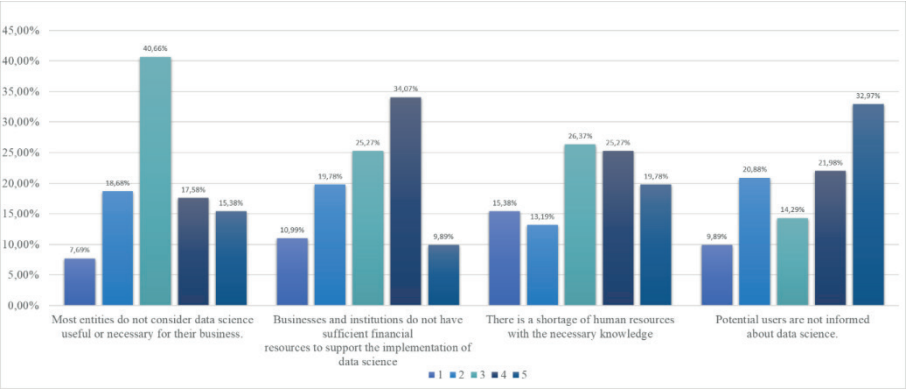
Source: Author's research

These slightly less optimistic estimates are reasonable if we think about how company operates and that changes such as digital transformation take time. It is not enough to get access to all kind of data and their analysis, yet the company should become more data-driven, and should change the way it operates so digitalization is not related just to some basic IT solutions, yet company's modus operandi should be based on data analysis.[21] Smaller companies are advised to introduce data analysis in order to improve their business because they are considered more flexible since they can change their business more easily and quickly. Likewise, larger companies have the opportunity to achieve better business results by introducing data science. However, unlike for the smaller ones, it poses a higher risk of failure in the implementation and adaptation process.

Research question number 6 (on attitudes of data scientists regarding development of data science) also includes their opinion, measured on 5-cathegory Likert scale, on four different factors that slow down development of data science in Croatia (Figure 1). Majority of them (40.66%) did not perceived awareness of potential clients of benefits resulting from application of data science for their business as a relevant factor. Regarding sufficient financial resources for implementation of data science 43.96% of them did not find it to be a problem at all. However, when it comes to shortages on labour market for data scientists, 28.57% of respondents stated it is strong or moderate problem that slows down development process. Answers are not uniform when it comes to attitude on how informed are potential users as well, but almost 70% of respondents do not consider that amount of information on data science that potential users have is a problem. Cronbach's Alpha, as a measure of internal reliability, for four respective items is sufficiently high (0.806).

21 Mcafee and Brynjolfsson (2012) state that a company should apply effort in five distinctive areas that simultaneously use big data: leadership, talent management, technology, decision-making and company culture (Urbinati et al., 2019).

Figure 1: Attitudes of data scientist on factors that slow down development of data science in Croatia



Note: 1 stands for “It is a big problem and slows down the development process” while 5 stands for “It is not a problem so it does not slow down the development process”.

Source: Author’s research

Regarding perception of data scientists about Covid-19 pandemic, respondents had to give their estimates on two following issues:

- the effect of the pandemic on data science, observed in general[22];
- the effect of the pandemic on business of their company.[23]

More than half respondents (53.85%) perceive period of Covid-19 pandemic beneficial for data science, while just 3.3% find it to have a negative effect. Similar results occur on company’s business level where 45.06% data scientists stated that the pandemic had moderate or strong positive effect, and 47.45% stated that it had no effect. These results are expected since Covid-19 pandemic actually induced faster digital transformation and resulted with an increase in data available to be analyzed but pandemic had effect on the way companies operate and data science can only be regarded as a valuable tool in volatile economic environment.

Results on supply side of data science market are hard to compare to similar studies, since to the authors’ best knowledge, this is the only study dealing with characteristics of data scientists and their attitudes on relevant topics. However, potential of data scientist as a job has been recognized a decade

22 There were three possible answers: a) Data science has regressed in that period, 2) Data science has developed in that period and 3) The pandemic had no effect on data science development.

23 Respondents had to choose on 5-cathegory Likert scale (1 - strong negative effect, 5 – strong positive effect).

ago and Davenport and Patil (2012) even called it "the sexiest job of the 21st century". Therefore, it is understandable there are studies on supply of courses on data science (Mills et al., 2016) and studies on implications of data science for education, employment and research (Murtagh and Devlin, 2018). However, together with development of data science and accompanying courses on the subject, it is necessary to develop soft skills for the data economy (Borner et al., 2018). Namely, obtained results indicate that data science in Croatia is still developing and it would be wise to use existing awareness of possible pitfalls to avoid them while further developing data science.[24]

4. Conclusions

Data science is a trendy, relatively new economic research niche. However, use of data science in business will undoubtedly become a *conditio sine qua non* for everyday operation of both companies and institutions. Namely, digital transformation will in our private and business lives cause a constant increase of data that can be used for various purposes. In that sense, demand for data science products will raise along with higher awareness of their possible application. At the same time, supply of data scientists becomes hot topic as well. Therefore, authors studied data science market in Croatia and obtained results indicate that companies in Croatia do use data analytics but when compared to other European countries, and observed from industry perspective, it seems that there is room for improvement. More specifically, data science could be used for more complex purposes which would consequently increase its application in various sectors. On the other side of the market, companies and individuals offering data analytics service seem to have a satisfying market position in a way that they perceive global trends in this field. Evidently they are successfully managing in this market considering high percentage of companies dealing (solely) with foreign clients. To the authors' best knowledge, this is a unique study on data science market on a country level, providing a comprehensive overview of the field. This kind of approach is beneficiary to both companies and policy regulators to get an insight what could be improved or encouraged to be developed in this volatile economic surroundings. Education system could benefit as well since there is enough proof that demand for data scientists will increase along with further development of data science. Further, development of data science and its application in activities of private and public sector is not just limited to changes related to fifth industrial revolution, yet the society as a whole should develop in a way to cherish all those human abilities and characteristics that digital transformation could never replace. Further, Covid-19 pandemic showed that even negative situations can have a positive impact on some aspects of economic activities. However, there are certain study limitations that are mainly related to the sample used in the research.

24 For example, 53,33% respondents stated they use mostly use Python as a data science tool, and it would be interesting to explore to which extend this tool is being presented to students in this field.

Namely, secondary data on European companies have been collected from a questionnaire that is not focused on data science. Therefore, obtained results should be regarded as a starting point for a future, more detailed research on data science market in Croatia. In that sense, including more companies and institutions in a specially designed survey analysis would enable authors to get more in-depth insights on the subject. Further, detecting population of data scientists in Croatia to form a sample for analysis of supply side of data science market in Croatia can be subject to criticism as well. Finally, this study shares a limitation with similar studies on data science that companies often regard as *l'art pour l'art*. In that sense, most significant enhancement and a prolific future research path would involve exploring relation between integrating data science in business and companies' financial performance.

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CHAPTER 19

RECENT DYNAMICS OF THE EUROPEAN LABOUR MARKET[1]

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Abstract

The globalization, technology development and more recently the pandemic have been changing global societies and economies. The consequences are visible in most areas of the economy. Overlapping of these trends contribute even stronger to the requirements for new skills and thus have disruptive effects on the labour market in the short run, causing shocks and changes of demand for labour. For example, the combination of technological advancements and changed working conditions caused by the pandemic put additional pressure on digitalization in every sector of the economy and thus create a greater demand for digital skills. The effectiveness of the social cohesion and the sustainability of modern social-economic models are depending on the notion that rapid technological changes should be systematically supported on many levels. This includes providing all citizens with tools and capacities to participate fully and successfully in the global digital transformation. The research in this paper is related to disruption new technologies are causing on the labour market, and its impact on the worker's skills in the context of the pandemic. We start by giving an overview

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of the trends on the EU labour market before the pandemics and proceed to analyse recent EU strategic documents as a response to the Covid-19 reality. States all over the world are confronted with the issues such as skill shortages, structural unemployment, or emerging forms of employment, and our goal is to identify the response of selected EU states to these challenges. The importance of these issues cannot be overemphasized, especially as global forecasts predict that gaps in skills, job requirements and the abilities of workers will continue increasing even at the greater pace putting additional burden at national economic and social systems, especially in less adaptive countries. Research results suggest that the impact of digitalization and other contemporary trends in the labour market require full attention and carefully designed recovery plans.

Key words: *labour market, European Union, workers` skills, globalization, digitalization*

JEL classification: *E24, F66, J01, J24*

1. Introduction

The impacts of technological changes and the Covid-19 pandemic are the two main factors influencing the demand for skills at the beginning of the third decade of the 21st century. These two factors, although most influential, are not the only global trends and carriers of change. Along with them, there are other phenomena inevitably affecting the structure of the economy and society as a whole (such as population aging, migrations, climate changes, various economic shocks, etc.), and consequently causing changes in attitudes towards work as one of the fundamental factors of production in the economy.

The media and popular business press often invoke narratives that reflect widespread anxiety that some jobs and professions will disappear completely, while new ones with requirements for different skills will appear. This is causing a huge gap between demand and supply on the labour market by leaving a part of the working population without existential means, business without needed human inputs and economies with structural labour market imbalances. Some of the changes come abruptly, like the digitalization of society due to the pandemic, and some are more gradual like task content changes due to the gradual introduction of new technologies. However, it is very likely that technology advancements (especially automation, robotics, artificial intelligence, etc.) will not only forever change or make obsolete some occupations. They will also bring some significant structural changes in the society and the economy.

In order for the general public and the enterprises to be equally able to take advantage of the opportunities technological advancement and globalization create, it is necessary to enable the acquisition of new skills as easily and affordably as possible. Continuing education and training programmes for current and future workers is especially important in that sense. For more than two decades, the European Union has been affirming the role of new skills and new knowledge in development strategies and other strategic documents, guided by the principles of smart, sustainable and especially, inclusive economic growth.

This research is primarily related to disruptions new technologies are causing on the European labour market, and their impacts on the worker's skills, especially in the context of globalization and the recent pandemic, which evidently caused greater demand for digital skills. The goal was to present an overview of the European labour market and current trends, as well as to identify the 'European' response to the major challenges which are triggering adjustments related to skill shortages, structural unemployment, or emerging forms of employment.

Therefore, after the Introduction, the paper continues with the Theoretical Background and the Research Context and Methodology sections, which explain the main issues triggering needed adjustments of the European labour market. After the statistical Overview of the recent trends, the Discussion explains the importance of the digitalization of the economy and the priorities and responses Europe and its particular countries initiated in order to face

the most important challenges of recent years. Concluding remarks focus on key scientifically based findings and determine further development priorities of the European labour market.

2. Theoretical Background

"Mankind has always turned toward improvements in technology as a means of advancing their society, even if it means the destruction of certain aspects and norms of the existing society" (Bard et al., 2020).

This sentence gives an impetus for a deeper understanding of the problems and challenges facing today's labour market, especially as technology changes become faster and adjustment periods are shorter. Advances in technologies are transforming work around the world (Ford, 2016; Šegota et al., 2017; Manyika et al., 2017; Acemoglu and Restrepo, 2020). Some of them with the most prominent influence on the labour market are automation and digitalisation. Both phenomena aim to raise productivity, but while digitalisation refers to supporting processes and tasks digitally, automation refers to running processes and tasks autonomously and automatically, and thus serves as a replacement of human activity with technical systems (Satchell, 1998). Automation may include a wide range of technologies from accounting software and scanners used in self-serve grocery lines to robotics and artificial intelligence (AI). There are many dilemmas about effects of technological trends on labour demand, productivity, wages, and employment. One stream of researchers and statisticians is concerned with joblessness caused by automation replacing human work (Brynjolfsson and McAfee, 2014; Frey and Osborne, 2017; Autor and Salomons, 2018), while the others are advocating automation as a growth factor which will consequently introduce more jobs (Harari, 2018; Acemoglu and Restrepo, 2019). None of them is denying change in occupations, leading to the changed structure of demand on the labour market. Moreover, while we cannot argue the disruptive nature of new technologies for human work, the history teaches us that those technological breakthroughs eventually increase the demand for labour and wages.

Acemoglu and Restrepo (2018) use task-based approach to explain the effect of automation on labour demand, productivity and work. According to them, new technologies increase the productivity of factors of production (i.e. capital and labour), but at the same time they change task content of production. Nevertheless, new technologies generate displacement effect, which means that capital is taking over tasks previously performed by labour. The jobs of production workers are being threatened with the implementation of industrial robots (Graetz and Michaels, 2018; Acemoglu and Restrepo, 2018), while jobs of white-collars are disrupted by software and digital platforms. In return, the process results in increased productivity, which consequently adds more capital to the production system and therefore the demand for labour raises again, but usually with a requirement for different competencies, causing the problems of impeded employability and ultimately structural unemployment. Consequently, the content of occupations is also changing, and new skills

are to be acquired. The research shows that high skilled workers are more resilient to these changes (Dahlin, 2019), while low skilled workers are less flexible and thus tend to stay longer on the labour market (Acemoglu and Restrepo, 2018). To conclude this section, changes in task content of production impact the (re)allocation of factors of production and thus can have major effect on labour demand and productivity.

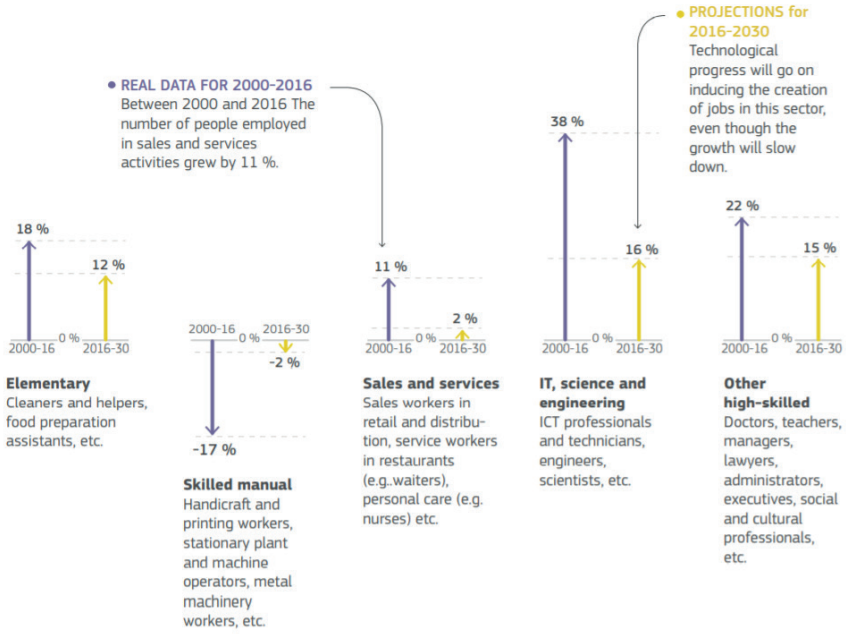
3. Research Context and Methodology

In this section of the paper we have focused on the context of the research, mainly connected to the impacts of technological progress toward the economy and specifically to the labour market and the workers' skills required for today's and future jobs, and a short methodology explanation. Besides globalization and other current factors speeding up various market processes, the pandemic the world is facing in the last two years is additionally causing shocks and changes of demand for labour. Some sectors, professions and jobs have been hit harshly, others will be perhaps experiencing a gradual transformation toward a digital and automated economy, causing a substantial change in skills needed to meet the evolving needs of the most dynamic segments of the labour market.

Looking back at the labour market structural changes in recent decades, it is evident that there is a clear decline in employment in primary industries and basic manufacturing (such as textiles, clothing, wood, printing and publishing, basic metals etc.), but also in public administration and defence. This is happening all over Europe, and it is especially clear within the advanced economies. On the other hand, employment is increasing in advanced and high value-added manufacturing activities/sectors (such as electronics, optical equipment, computers, motor vehicles and similar), but there is a clear trend towards a service-based economy. Therefore, increased focus is given on automation processes and the digitalization processes. The increase in production is supported by increased industrial investment, particularly in machinery and equipment and R&D, supporting the drive in robotisation. However, labour costs are increasing, as the level of needed skills is evolving, while robots become ever cheaper thanks to technological progress and sophistication. This requires fewer jobs in production, but new job openings are 'transferred' in supporting service industries. At least in the more competitive and more adjustable economies.

A comprehensive research by the Joint Research Centre (JRC) of the European Commission combined their own research and recent data from various scientific studies, with the main aim to assist policymakers and the broader public to face and understand better the future of jobs and education. The following Scheme 1 depicts a significant representation on how technological progress influenced specific categories of jobs in the period 2000-2016, and a projection for the period 2016-2030.

Scheme 1: Job creation driven by technological progress



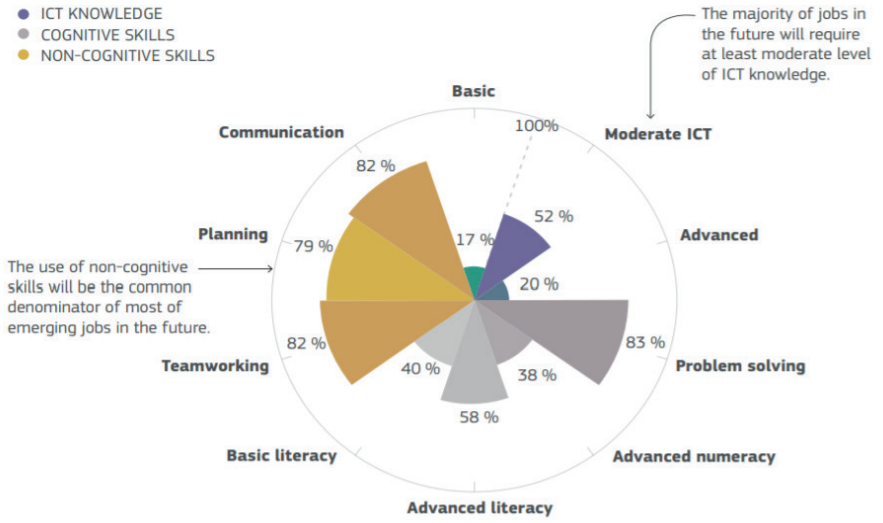
Source: Gonzalez Vazquez, I. et all (2019), p. 26 [originally: JRC based on Cedefop and Eurofound (2018)]

Although this scheme does not include yet the repercussions of the COVID-19 pandemic, it shows significant trends. As first, it looks obvious that the changes for these categories of jobs were greater in the previous two decades, compared with the expected changes up to the year 2030. Technology driven creation of new jobs was especially distinct for the IT, science and engineering jobs (+38%), while the 'skilled manual' jobs (such as handicraft and printing workers, machine operators, metal workers and similar) diminished by 17% in the period 2000 – 2016. However, minor changes are predicted for the period 2016 – 2030. Unlike this segment of the labour market, a 12% increase is expected in the group of jobs defined as "elementary", which includes cleaners, helpers and food preparation assistants (similar to the period 2000 – 2016, when the increase was 18%). Some 'lower paid' jobs will continue to be essential where technology, robotisation and artificial intelligence can still not replace humans.

Now, changing needs and improved job matching require adaptations of training and education systems, which often require societal efforts and significant investments. So, looking a bit more into skills, it is logical to assume digital skills to be of paramount importance. But, besides moderate digital skills, non-cognitive skills are becoming ever more crucial, as well as 'problem solving' (Photo 1). There is an increasing demand for workers with creative

and social intelligence, such as entrepreneurship, leadership or interaction skills. According to several studies (Gonzalez Vazquez et al., 2019), most emerging new jobs will require the ability of teamwork, communication and planning. Regions and countries with education and training systems already adjusted to that are thriving; others will have to cope. However, in Europe there are already several strategies, action plans and initiatives which include priorities, goals and examples how to catch-up with these challenges.

Photo 1: Average degree of importance of skills across jobs with a positive employment outlook, 2015-25, EU28



Note: The levels of skills were self-declared by surveyed workers.

Source: Gonzalez Vazquez et al. (2019) p. 32 [originally: JRC from Cedefop (2016a); Cedefop European skills and jobs survey; Cedefop European skills forecasts]

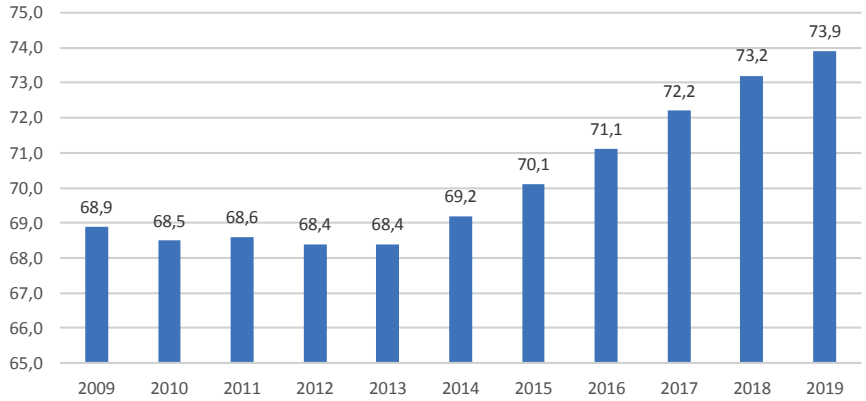
Besides this important explanation of the research context, which is also substantially oriented to the elaboration of the Joint Research Centre research, the following sections of the paper present a short statistical overview of key indicators of the European labour market trends, including the educational context. That part of the analysis covers the period from 2009 to 2019. Secondary data was collected from the European statistical database – Eurostat and the World Bank. Within the Discussion section, the methodological approach included the references connecting the trends from the statistical overview and the issues such as digital skills gap through a short analysis of the Digital Economy and Society Index – DESI 2020 of EU Member States, which consists of several 'dimensions' of digitalization,

including the Human Capital sub-index, and the overview of the various instruments, measures and strategies initiated in Europe which focus on tracking trends and phenomena influencing the labour market and especially (digital) skills needed today and in the near future. This approach allows us to identify the crucial challenges and priorities of the European labour market in the following period.

4. Empirical Overview of the Eu Labour Market

Recovering from the previous big economic shock, during the observed period (2009-2019), the EU achieved an increase in the employment rate of the population aged 20-64 by 5 percentage points, resulting 73.9% figure in 2019. This trend meant that the EU has closely approached the target value of 75% (Figure 1), which has been identified as one of the priorities of the EUROPE 2020 strategy – the crucial strategic document which set important goals for a competitive and dynamic European economy of the 21st century.

Figure 1: Average Employment Rate in the EU (% of the population 20-64 years old)



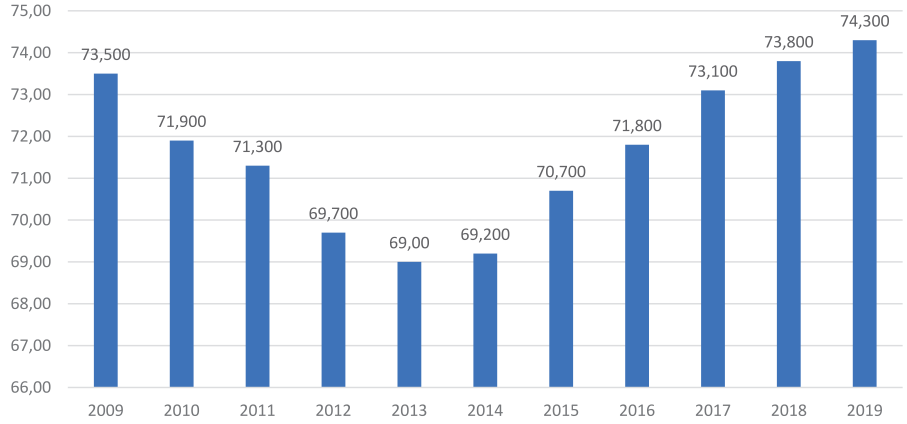
Source: according to data from Eurostat (1)(2021)

Looking at the situation in individual Member States (MS), certain differences are noticeable. The highest employment rates were recorded in Sweden (82.1%), Germany (80.6%) and the Czech Republic (80.3%). On the other hand, significantly lower employment rates were present in Greece (61.2%), Italy (63.5%) and Croatia (66.7%). This significant differences indicate that the EU has to cope with disparate national and local economic and social structures and requirements (as well as political, geographic and other specificities) in order to achieve economic convergence. Contemporary economic theories highlight the importance of human resources in order to

initiate convergence processes and achieve economic competitiveness, with special emphasis on the position of the young and educated population. Therefore, it is appropriate to analyse their position on the labour market.

According to Eurostat (2), (2021), the "youth" population consists of the population aged 15-29. The level of youth employment has been increasing since 2013, and in 2019 the level was 48.2%. The highest levels were achieved in the Netherlands (72.2%), Malta (68%) and Austria (63.4%). Contrary, the lowest levels of youth employment were recorded in Greece (31.3%), Italy (31.8%) and Spain (38.2%). This rates suggest that young Europeans, especially in many "southern" MS are either unemployed or preoccupied with formal education. But, in its key development strategies, the EU has focused on the need to increase the share of the population with completed tertiary education. Figure 2 indicates that the EU is significantly acting in this direction and since 2013 has been constantly increasing the level of employment of young people with tertiary education – achieving 74.3% in 2019. However, significant differences are again evident among different EU MS. While Lithuania, Latvia and Malta achieved nearly 90% of employment, Croatia, Slovakia and Greece had a much modest coverage (approximately 63 - 65%), while Italy even recorded a percentage lower than 50%. Additionally, Italy recorded the highest share of youth population not included neither in employment neither in education or training (NEET) of 22.2%, which is significantly higher than elsewhere in the EU (Eurostat (3), 2021).

Figure 2: Youth Employment in EU (15-29 years old) for those who completed tertiary education (%)



Source: according to data from Eurostat (2)(2021)

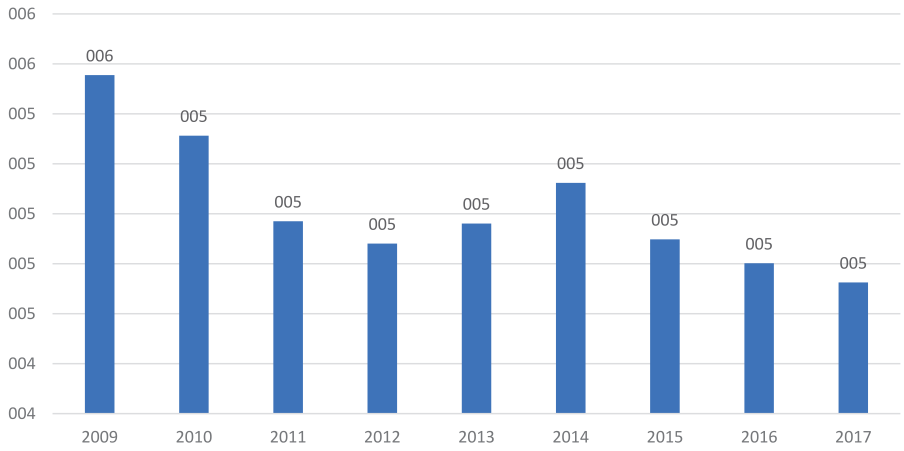
Positive trends in employment rates also resulted in a decrease of unemployment rates. The peak of unemployment at the EU level (population

aged 20-64 as a % of active population) was reached in 2013, when the unemployment rate was 11.2%. The recovery period, which followed, resulted in lower unemployment rates, with an average EU rate of just 6.5% in 2019. In the same year, the unemployment rate in Greece was 17.3%, in Spain it was 13.8% and in Italy 9.9%. Several EU MS had record low unemployment rates, for instance: the Netherlands (3%), Poland (3.2%), Hungary and Malta (3.3%) (Eurostat (4) 2021).

The analysis of the labour market dynamics in the EU indicates positive trends that shaped mainly after 2013, when most MS managed to recover from the adverse effects of the global economic and financial crisis. Although positive effects have been achieved, the demand of the labour market is becoming more specific and advanced and require increasing support and cooperation of education systems, the business sector and other stakeholders included in the implementation of a 'smart, green and digital' economy (and society).

Although education has been put forward as one of the key instruments for achieving economic growth and competitiveness, as well as to improve labour market conditions, Figure 3 shows that the EU might be facing reductions in this context, which is especially evident in the period after 2014. The latest available data indicates that the EU allocated 4.73% of its GDP for education in 2017, while in 2009 it amounted to 5.55%, according to the World Bank data.

Figure 3: Investments in Education in the EU (% of GDP)

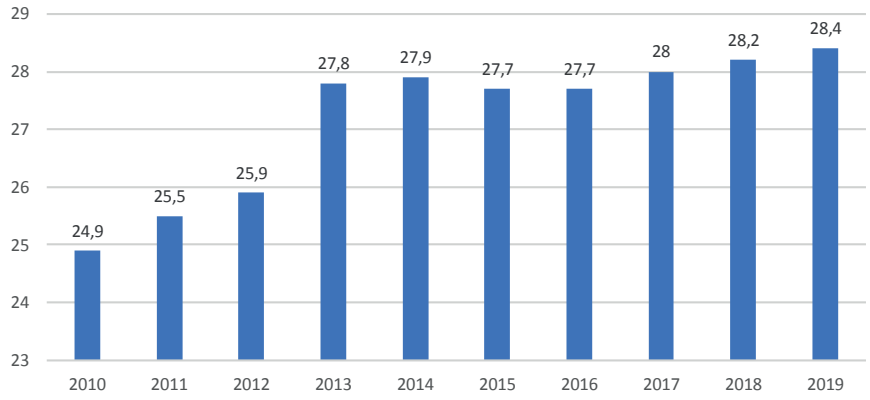


Source: according to data from World Bank (1), 2021

However, dynamic trends and continuous changes in the labour market require continuous training and participation in various forms of adult ('lifelong') learning and training. The data from Figure 4. indicates that the EU is making improvements in this area. According to the latest available

data (2019), 28.4% of the population aged 20 to 34 has participated in some form of education and training in the period of the prior five weeks. Compared to 2010, it is a 3.5 percentage point increase, which was again unequal in different MS.

Figure 4: Participation of persons aged 20-34 in education and training programs (in the last 5 weeks) in the EU



Source: according to data from Eurostat (5)(2021)

5. Discussion

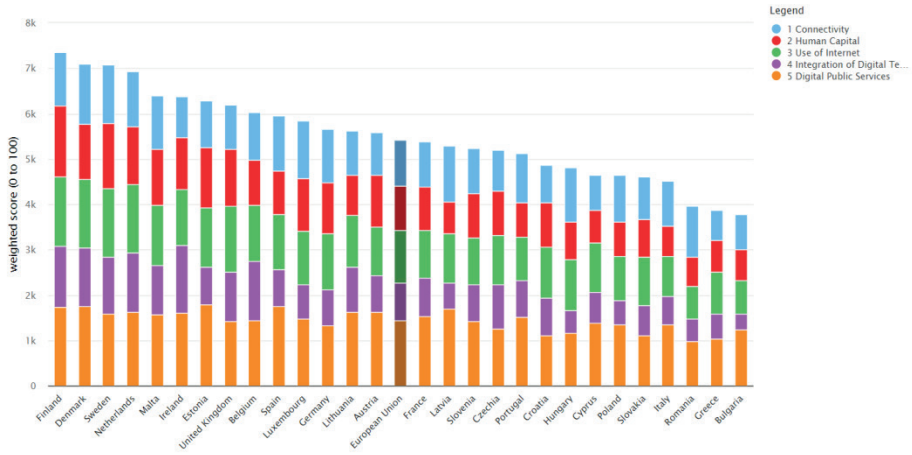
As identified in previous sections, the global economy and particular national markets are confronted (with different intensity and dynamics) by disruptions on their labour market, including skill shortages, structural unemployment, emerging forms of employment etc. Globalization, demographic changes and illegal migrations, technological progress and societal development, climate and other challenges cause financial, social, political and other instabilities which pressure the labour market as well. Although a lot of these issues might sound similar, there is a great difference between various parts of the world, but also within the European Union, in respect to the seriousness of particular problems, but also in the response to them and the adequate solutions.

As the global forecasts predict that gaps in skills, job requirements and the abilities of workers will continue increasing, even at the greater pace, it is essential to identify the crucial challenges which need to be addressed, as well as the response of selected countries to these challenges. As labour market disruptions put additional burden at national economic and social systems, especially in less adaptive countries, it is of utmost importance for the EU to intensify and broaden the scope of recovery plans and strategies which should create more functional labour markets, educational systems and inclusive digitalization processes.

Perhaps the most important challenge for the EU at this point is the digital skills gap in Europe. A digitally skilled labour force and population is crucial for European competitiveness and an inclusive digital society. According to the Digital Scoreboard of the European Commission (2021a), 42% of EU citizens do not have basic digital skills, while 37% of people in the labour force also lack sufficient digital skills, despite the increasing need for such skills in all jobs. EU lacks skilled ICT specialists to fill the growing number of job vacancies in all sectors of the economy, which is a clear sign that education and training systems need to be modernized. This actions should be directed not only to young Europeans but also adults seeking jobs and those which are already employed.

The European Digital Scoreboard provides for the Digital Economy and Society Index (DESI), which consists of five main aspects (or 'dimensions') of digitalization: (1) Connectivity (fixed broadband coverage, mobile broadband, broadband prices…); (2) Human Capital (Internet user skills and advanced skills); (3) Use of Internet (Internet users, e-Banking, video calls…); (4) Integration of digital technology (electronic information sharing, social media, big data, cloud, e-Commerce…); (5) Digital Public Services (e-Government users, open data…). Overall, the most advanced EU Members States in 2020 were Finland, Denmark, Sweden and The Netherlands. Contrary, Bulgaria, Greece, Romania and Italy are those mostly lagging behind (Figure 5).

Figure 5: Digital Economy and Society Index (DESI 2020)

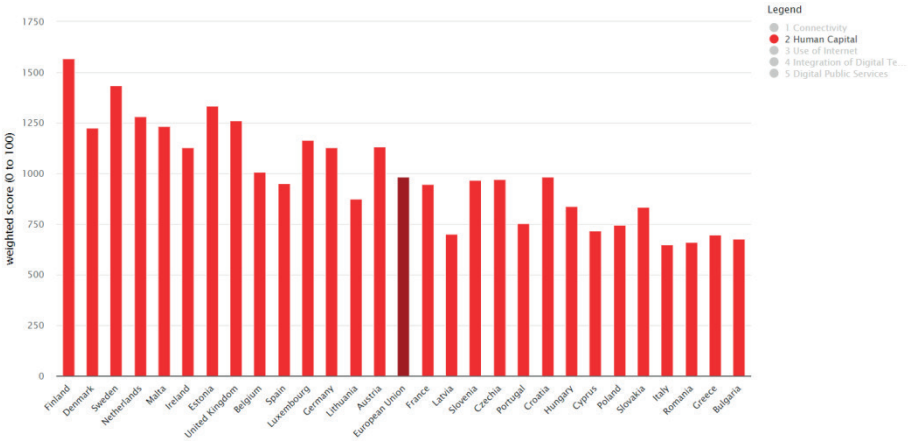


Source: European Commission, Digital Scoreboard 2020

Within this complex overview, perhaps the most interesting for the discussion is the 'Human Capital' dimension (Figure 6). Although 85% of EU citizens used the Internet in 2019 (prior to the COVID-19 pandemic), only 58% possessed at least 'basic digital skills'. Having internet connections is not enough. Appropriate digital skills include those that enable individuals to be

part of the digital society, but also advanced skills which allow the workforce to develop new digital goods and services. Here we also count the 3.9% of employees which are included as 'ICT specialists' in the overall workforce (DESI 2020). The score or particular EU Member States is similar as for the combined DESI. However, here Italy ranks as the last, while Estonia outperforms The Netherlands and Denmark.

Figure 6: Digital Economy and Society Index (DESI 2020): Human Capital



Source: European Commission, Digital Scoreboard 2020

The sudden appearance of the COVID-19 was an enormous shock to the economy, and the labour market. It exacerbated the 'digital' context of needed skills for workers who had to adapt abruptly to new labour conditions. Interesting revelations came up within public consultations in the EU during autumn 2020 regarding the COVID-19 impacts on the European society, including (Open Public Consultation on the Digital Education Action Plan 2021-2027, 2020):

- Almost 60% of respondents had not used distance and online learning before the crisis
- 95% consider that the COVID-19 pandemic marks a turning point for how technology is used in education and training
- Respondents expressed that online learning resources and content need to be more relevant, interactive and easy-to-use
- Over 60% felt that they had improved their digital skills during the crisis, with more than 50% of respondents wanting to build upon them.

Besides already established strategic documents and plans on the European level, prior to the COVID-19 crises, such as the EUROPE 2020 strategy (which included *'A digital agenda for Europe'*, supporting also a Digital Single

Market for households and firms, and '*An agenda for new skills and jobs*', focused on the modernisation of labour markets through labour mobility, new skills and better matching of labour supply and demand), the European Education Area, the European Skills Agenda, the European Social Pillar Action Plan, perhaps the crucial challenges and priorities for Europe were defined in the new Digital Education Action Plan for the period 2021-2027 (Digital Education action Plan 2021-2027, 2020).

Building up on the first 'Digital Education Action Plan (2018-2020)' (COM/2018/022 final), the new one also contributes to the priorities of 'A Europe fit for the Digital Age' and to the 'Next Generation EU' (including the Recovery and Resilience Facility). The Plan is set to foster the development of a high-performing digital education ecosystem and enhance digital skills and competences for the digital transformation. Examples of the Priority 2 ('Developing digital competences and skills') are: Higher Education Hub, EU Code Week in schools and Training for girls (Digital Education Action Plan 2021-2027, 2020).

In March 2021, the European Commission proposed a 'Digital Compass', in order to *translate* the Union's digital ambitions for the year 2030 into clear targets and achievements for the 'Digital Decade' (COM/2021/118 final). The Compass will follow the process of digital transformation through enhanced monitoring and focus on four priorities ('cardinal points'), the first being: 'A digitally skilled population and highly skilled digital professionals'. By 2030, the EU should achieve goals of 20 million of ICT specialists (which would include a gender balanced convergence) and 80% of the population with basic digital skills. Other examples of activities which show Europe's determination to resolve the digital gap issue and facilitate digital transformation include the 'Digital Skills and Jobs Platform' and the 'Digital Skills and Jobs Coalition', which brings together Member States, companies and organisations in order to jointly act and support the achievement of these goals (European Commission, 2021b). Under the framework of the 'Connecting Europe Facility' Programme (CEF), during the period 2021-2027 CEF Digital will invest 2.07 Billion € in high-capacity networks (including 5G systems), increased security and resilience of the digital backbone of the EU and the digitalisation of transport and energy networks (CEF Digital, 2021). Digital transformation will be supported also by the Digital Europe Programme (DEP) with 7.5 Billion € investments in supercomputing, AI, cybersecurity, advanced digital skills and digital capacity of the European economy and society (DEP, 2021).

Besides the digital aspects, the EU has prioritized the support for more and better skills (in general). For the period 2021-2025, the European Skills Agenda plans assistance to individuals and businesses associated with the goals of Sustainable Competitiveness, Social Fairness as well as Building Resilience to react to crises (based on the lessons learnt during the COVID-19 pandemic). Therefore, the EU will massively invest in necessary skills, also thanks to the Recovery Plan for Europe. The

anticipated funds include (in billions of €) (European Skills Agenda, 2021):

- 61.5 from the European Social Fund Plus (ESF+)
- 16.2 from Erasmus
- 4.9 from InvestEU
- 1.1 from the European Globalisation Adjustment Fund
- 0.8 from the European Solidarity Corps, and
- 0.5 from Digital Europe.

These investments should support the realization of 12 'Actions' and specific targets, such as (for instance): a 30% participation of low-qualified adults (25-64 years old) in learning programmes during the last 12 months; or a 70% share of adults aged 16-74 having at least basic digital skills. Examples of 'Actions' are; 'A Pact for Skills', 'Increasing STEM graduates and fostering entrepreneurial and transversal skills', and 'EU support for strategic national upskilling actions' (European Skills Agenda, 2021).

Finalizing this discussion, it becomes evident that the EU, as an entity has understood the importance of new and better skills in a global and digital environment. And thus, initiated numerous plans, initiatives and programmes to facilitate the transformation of the economy, education systems, labour market and the society in general. However, it is still essential to transfer this endeavours and priorities to the national levels (or even local), because they actually have the legal and political responsibility for enforcing these policies and goals. As of spring 2021, over 1/3 of the EU MS have approved a general country digitalization strategy in recent periods, with digital skills being one of the key pillars of their national digital transformation goals (Austria, Denmark, Germany, Slovakia etc.). Some MS have separate National Digital skills strategies (Portugal, Malta, Ireland, Italy), while some other MS have digital skills development targets integrated in their general national education, industry digitalization or employment strategies and policies (Hungary, Lithuania, Sweden). Finally, several MS target some specific digital skills and ICT technology fields (Finland, Latvia) (Digital Skills and Jobs Platform, 2021a). For example, the National Plan for Digital Skills in Spain aims to provide a roadmap, in order to identify the measures needed (on a national, regional and local level) to ensure that all citizens have access to relevant resources so they can acquire and develop digital skills in the period 2021-2025. Their budget of 3.75 Billion € will focus on: Digital inclusion and access to digital services and tools; Bridging the gender digital divide; Development of digital skills for teachers and students; Expanding the talent pool of ICT experts to match increasing demand; Ensuring the availability (and access to) sufficient and high-quality training resources on a national level to proactively address the need for digital specialists (Digital Skills and Jobs Platform, 2021b).

6. Conclusions

The goal of the paper was to present an overview of the European labour market and its current trends, as well as to identify the 'European' responses to the major challenges which are triggering adjustments related to skill shortages, structural unemployment, or emerging forms of employment in recent months and years (caused by globalization, technological advancements, digitalization trends and the pandemic crises). Although the EU was highly oriented towards the improvement of labour market conditions and labour force development in the previous periods, there are still significant differences between Member States and a gap toward its main global competitors, especially in digital skills and productivity. Rapid technological changes should be systematically supported on multiple levels, including the education and training systems, social systems and digitalization priorities of the society, especially if some jobs and professions disappear and technological advancement accelerate. Continuing skill gaps, new job requirements and the adjustment of labour and education systems will continue to burden national economic and social systems, especially in less adaptive countries. Therefore, it is of greatest importance to carefully design recovery plans and set long term strategies and priorities which will allow the EU and its Member States to achieve the digital transformation of the labour market and the economy.

Although digitalization and automation of jobs may replace human work in the short run, history tells us that we can expect higher productivity and even new jobs (usually with higher wages, but different competences). This might cause problems for unskilled workers and create structural unemployment. Therefore, the EU is actively striving to identify needed actions and support the European labour market and its workers in these transformations, especially taking care of skills for future jobs and for boosting employment. Numerous European and national initiatives, plans, programmes and strategies have been set in motion in the last decade (or two), but especially becoming important during the recent pandemic crises. Besides digital skills, these measures and funded programmes support the development of other skills and requirements for the labour market of the 21st century (problem solving, entrepreneurship, leadership or interaction skills, teamwork, communication and planning). As the JRC study shows, technology driven creation of new jobs was especially distinct for the IT, science and engineering jobs (even before the pandemic), while the 'skilled manual' jobs diminished by 17% in the period 2000 – 2016. Although, high skilled workers should be more resilient to dynamic changes on the labour market, some 'lower paid' jobs will still continue to be essential where technology, robotisation and artificial intelligence can not replace humans. For them, the problem which remains is the remuneration for their work, which might not be enough comfortable.

Before the 'corona crises', the employment trends in the EU were somewhat positive, especially in 'core countries' and the 'North'. MS such as Greece, Italy, Croatia and Spain, however, were not managing to converge completely. During the previous decade, the EU has managed to increase the level of employment of young people with tertiary education, despite the

apparent reductions of allocations toward education. Compared to 2010, it even managed to improve the share of population aged 20 to 34 which participated in some form of education and training in the previous five weeks by 3.5 percentage point. However, the most important challenge for the EU is the digital skills gap. According to the Digital Scoreboard of the European Commission (2021), 42% of EU citizens did not have basic digital skills, while 37% of people in the labour force also lacked sufficient digital skills. Furthermore, the EU lacks skilled ICT specialists, which also confirms the 'burning issue' that education and training systems need to be modernized, especially in MS such as Bulgaria, Greece, Romania and Italy. Additionally, 95% of surveyed Europeans consider that the COVID-19 pandemic marks a turning point for how technology is used in education and training. Therefore, the EU and its MS have put additional effort into the process of digital transformation by setting new and broadened goals and priorities for the coming years: the new European Skills Agenda, the new Digital Education Action Plan for the period 2021-2027, the Digital Compass 2030 for the 'Digital Decade', the 'Digital Skills and Jobs Platform' and the 'Digital Skills and Jobs Coalition', as well as the national strategies, policies and nationwide initiatives in the digital skills area.

Finally, future research should focus on quantifying the effects (using appropriate scientific tools and methods) of these processes on the progress and competitiveness of the European labour market and the achievement of international competitiveness and economic growth. Likewise, further research should emphasize on adequate levels of education and training resources and the identification of crucial priorities which will allow Europeans to adjust timely to economic and social transformations, especially regarding their skills and other job requirements.

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CHAPTER 20

Smart city/local tax: Specific consumption/sales tax for the post COVID-19 Croatia[1]*

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Abstract

Since efforts to introduce a contemporary value-based real estate tax as a local tax in Croatia have failed, the purpose of the paper is to propose an alternative solution to raise local public revenues, based on the smart city literature and the general literature on local public finance, as well as the specific Croatian situation. Special consideration is given to the (post) COVID-19 environment with different regional structure. The paper analyses and compares the concepts of true, good and smart local taxes and presents examples of good practice of smart city taxes.

The contemporary trend of increased use of local sales taxes contributing to the stability of local tax revenues is examined and applied to the current specific Croatian local sales tax (on beverages in the hospitality industry). The arguments in favour of this tax are presented and analysed, suggesting an extension of its scope and/or rates.

Key words: *smart cities, local taxation, sales tax, consumption tax, Croatia*

JEL classification: *H71*

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1. Introduction

Local governments around the world have the perennial problem of seeking additional revenues in order to achieve revenue stability and elasticity at the same time. The Covid-19 crisis has exacerbated this problem.

Croatian local finances have the additional problem of having failed to introduce true valued-based real estate tax that would have secured higher revenues. Thus, the purpose of the paper is to propose an alternative solution to increase local public revenues. This solution will be based on the analysis of the general local public finance literature, in particular the requirements for a true and good local tax (Bahl and Bird, 2008; Bird 2011; Bird, 1993; OECD, 1999; OECD, 2002), as well as the requirements and practical solutions of the smart city literature (Bahl et al., 2013; Huston et al., 2015; UN -Habitat and UN ESCAP, 2015; Mohanty, 2016; Flynn and Hamilton, 2018; Flynn, 2019; Mishra, 2019; Pratap, n.d.). It is our hypothesis that the existing local sales tax-that on the consumption of alcoholic and non-alcoholic beverages in hospitality facilities could be used to raise additional revenue and managed for elasticity in the post-Covid world.

After the introduction, the paper begins with the analysis and distinction between true and good local tax. The third chapter analyses the smart city literature with reference to (smart) taxes, followed by concepts and practical examples of smart city/local taxes, with reference to Croatia (in the footnotes). The fourth chapter reviews the benefits of the growing trend in the use of local sales taxes. The final chapter applies this to the current specific Croatian local sales tax (on beverages in the hospitality sector). The arguments in favour of this tax are analysed and the extension of its scope and/or rates is suggested. As usual, paper ends with the conclusion with some directions for future research.

2. True and good local tax in taxation literature

The smart local tax is based on the fundamentals of local public finance - the concepts of the true and the good local tax. The first, also called *the completely local tax*, is defined by a set of theoretically required but practically almost never achieved conditions. The second is based on the revenue assigning principles and is defined by a set of requirements in the taxation literature.

Truly/completely/totally local tax could be defined as one where (Bahl and Bird, 2008: 6; as well as Bird 2011: 6 and Bird, 1993: 213; see also OECD, 1999:11; OECD, 2002:13)

(1) “Local governments can decide whether to levy the tax or not.

(2) They can also determine the precise base of the tax.

(3) They can decide the tax rate.

(4) In the case of ‘‘direct’’ taxes, they assess the tax imposed on any particular

taxpayer.

(5) They administer the tax.

(6) They get to keep all they collect."

As noted above, in practice local taxes often have only one or two of these features. If it is a tax rate, which is relatively common, there is usually a cap set by the central government. The OECD (OECD, 1999: 11; OECD, 2002: 13) has detailed, structured and ranked these requirements in their famous *Taxonomy of tax autonomy* (OECD, n.d. a), which leads to its internationally comparative *Tax autonomy indicators* (OECD, n.d. b)

Table 1: Taxonomy of taxing power

a.1	- The recipient SCG sets the tax rate and any tax reliefs without needing to consult a higher level government.
a.2	- The recipient SCG sets the rate and any reliefs after consulting a higher level government.
b.1	- The recipient SCG sets the tax rate, and a higher level government does not set upper or lower limits on the rate chosen.
b.2	- The recipient SCG sets the tax rate, and a higher level government does sets upper and/or lower limits on the rate chosen. c.1 The recipient SCG sets tax reliefs – but it sets tax allowances only.
c.2	- The recipient SCG sets tax reliefs – but it sets tax credits only.
c.3	- The recipient SCG sets tax reliefs – and it sets both tax allowances and tax credits.
d.1	- There is a tax-sharing arrangement in which the SCGs determine the revenue split.
d.2	- There is a tax-sharing arrangement in which the revenue split can be changed only with the consent of SCGs.
d.3	- There is a tax-sharing arrangement in which the revenue split is determined in legislation, and where it may be changed unilaterally by a higher level government, but less frequently than once a year.
d.4	- There is a tax-sharing arrangement in which the revenue split is determined annually by a higher level government.
e	- Other cases in which the central government sets the rate and base of the SCG tax.
f	- None of the above categories a, b, c, d or e applies

Source: OECD, n.d. a

Good local tax is based on the following revenue assigning *principles* for subnational government levels in general (e.g. Bird, 2011: 13-14; as well as Bahl and Bird, 2008: 8):

"(1) Ideally, own-source revenues should be sufficient to enable at least the richest

subnational government to finance from its own resources the services that

they

provide primarily benefiting their residents.

2) To the extent possible, taxes imposed by subnational governments should burden

only their residents, preferably in relation to the benefits they receive from the

services provided.

(3) Governments at all levels should bear clear public responsibility at the margin for

financing expenditures for which they are politically responsible.

(4) Subnational taxes should not unduly distort the allocation of resources."

In line with the above principles, the following *criteria/characteristics/ requirements for a good local tax* should be considered when designing the main local taxes (e.g. Bahl and Bird, 2008; Bird, 1993; Bird, 2011; Blažić, 1994: 75-79).

2.1. Immobility (or low mobility) of the tax base

The tax base should be relatively immovable to allow local governments adequate rate variation without fear of losing tax revenue. The least advantageous taxes under this criterion are the corporate income tax, various local business taxes, payroll taxes and various consumption taxes. The most advantageous tax, of course, is the real estate tax (as well as other property taxes). However, the effects of tax competition are/should not be so pronounced when/if the differences among municipalities are not significant, if tax costs do not represent a significant part of the business costs and especially when/if differences in taxes are offset by differences in the public services provided.

2.2. Visibility

Visibility has positive effects for both local governments and their residents. It leads to more accountability on the part of the former and more awareness on the part of the latter. This awareness of the costs of a local public services dampens the (inefficient) push by local voters for higher levels of public services. The most beneficial tax, again, is the real estate tax. It is also suggested that other taxes should be collected separately from those of the central government as much as possible.

This visibility is in the best interest of the central government as opposed to the self-interest of local officials.

2.3. Easiness and cheapness of the tax collection and payment

It is about the low administrative, but also compliance costs of taxation. Although these are the general requirements of the tax system, the former could be a particular problem for the smaller and less developed local units,

and the latter could also be of greater importance at the local level. The simplest (but less equitable) taxes such as lump sum tax or taxes more akin to user charges (e.g., motor vehicle tax) are most beneficial here.

However, this requirement also calls for fewer (but more revenue raising) taxes, as well as centralised public administration for tax collection.

2.4. Buoyancy

Local tax revenues should be adequate to meet the level of local needs. Unfortunately, most local governments often impose a lot of unbuoyant taxes. This leads to a problem related to the 3rd criterion, but also to a lack of own revenues and requires the intervention of the central government (grants). So again, similar to the 3rd criterion, a smaller number of buoyant taxes, such as personal income tax and real estate tax are required.

2.5. Not exportable to residents of other local governments

Only the residents of the local government in question should bear its tax burden. Personal income tax is most appropriate here (the real estate tax for primary residence also, second residence tax depending on how it is paid). Again, this is in the best interest of the central government, not the local ones. However, the central government is aware of the "spillover effect" and the resulting transfers, but perhaps even local governments could manage this spillover effect through appropriate taxes (more on this in the next chapter). The non-exportability requirement is also linked to the aforementioned tax competition among local governments, which would help reduce/avoid this problem.

2.6. Stability (and predictability) versus elasticity of tax revenues

There is no complete consensus on this last criterion. Most (classical) requirements (Bahl and Bird, 2008; Bird, 1993; Bird 2011) insist on the former, which is true for real estate taxes (especially when based on some historical data or simple formulas) and lump sum taxes. Nevertheless, some (e.g. Hou and Seligman, 2007; Alfonso, 2013) argue that income elasticity of local tax revenues is necessary to meet the increasing demand for local goods and services. A progressive personal income tax seems to be the most appropriate here (especially when demand for public goods and services increases faster than income), although some other business taxes as well as (ad valorem) consumption taxes are also appropriate. The progressivity of the income tax is also consistent with the increasing demands on the redistributive role of local government (in addition to the purely allocative one).

3. Smart city tax in the literature and practice

Although the concept of smart city is widely used in both taxation literature and local practice, the concept of smart city/local tax is hardly found in both taxation literature and practical application. Therefore, the latter concept is based on the former.

Although the term “smart city” is very broad and not precisely defined (Pevcin, 2019), it definitely encompasses modern technology, sustainable development and a high level of learning and innovation (Bogdanov et al., 2019). Berrone (2016, cited in Lima et al., 2017) identifies the following ten dimensions that should be used to evaluate a city as smart: governance, public administration, urban planning, technology, environment, international connections, social cohesion, human capital, and the economy. Smart economy, governance and public administration also include smart taxes[3].

The first notion related to taxes in a smart economy concept is *digital tax filing and fiscalization with improved tax compliance, collection and minimized fraud* (Dobos and Takács-György, 2019; Baisalbayeva, n.d.; GIS Consortium, n.d.; UN-Habitat and UN ESCAP, 2015: 167, 173; Bélissent, 2010: 2, 7, 21). However, this paper does not address technical details related to these features, although this requirement is considered.

Some relevant “smart city” literature (Huston, et al., 2015; Herring, 2016; Noori et al. 2020; China Academy of Information and Communications Technology, 2014; Gray, 2016; UN -Habitat and UN ESCAP, 2015) points to the *investment tax incentives* targeted to specific/desirable city projects such as PPPs (China Academy of Information and Communications Technology, 2014), smart technologies (e.g. large ICT/IT companies) (Gray, 2016; Herring, 2016 + Masdar), environmental friendly industries (Mori, 2010: 22), and energy efficient buildings (Lindfield and Steinberg, 2012). Relevant local taxes could include corporate income tax (if local government revenue or a ‘region’ is entitled to such relief in the case of large cities), personal income tax (paid by smaller business units, if local government is entitled to the relief), real estate tax, various business charges/fees/levies (including their exemptions), and various local business/professional taxes (e.g. in Germany, Italy, and Spain).

The literature on specific smart city/local taxes/levies points to *various city/local land-related taxes/charges/fees/levies* in a narrower as well broader sense (Bahl et al, 2013; Huston et al., 2015; UN-Habitat and UN ESCAP, 2015; Mohanty, 2016; Flynn and Hamilton, 2018; Flynn, 2019; Mishra, 2019; Pratap, n.d.) as well as their mixture with various congestion charging taxes/instruments (Mishra, 2019).

Urban land (property) taxation has its justification in the benefit principle of finance, which is especially practical in local finance. Increased land values and local rents are the concrete results of various local (infrastructural and other public) expenditures. Most of the literature refers to the classical property tax (real estate tax). Its seems that the area-based tax with some zoning/location formula based on the land (rather than the entire property) value is the solution that has the most to do with the benefit principle[4].

3 Other sources of revenue specifically for smart cities include user charges, PPPs, and municipal bonds, especially green bonds (e.g. Pratap, n.d; China Academy of Information and Communications Technology, 2014).

4 Current Croatian real estate user charge (“public utility charge”) seems to be consistent with this.

In addition to this tax, the smart city literature (Mishra, 2019; Bahl et al., 2013; Mohanty, 2016; Pratap, n.d.; Flynn, 2019; Huston et al., 2015) also refers to the vacant land tax[5], as well as other more innovative sources of finance to capture the uplift in development land values. The direct ones are various development impact fees/charges paid by the new development for the cost of construction or expansion of infrastructure facilities[6] - e.g. infrastructure connection fees and lease charges. The indirect ones capture this uplift through higher taxes. "To tax land uplift increments, first designate the beneficial, value-capture project hinterland and then assign collection rights to the project proponent, usually, a special purpose vehicle..." (Huston et al., 2015: 71). Betterment charges/taxes capture the uplift in development land values by taxing the land uplift increments as a result of various infrastructural and other investments/projects (Lindfield, and Steinberg, 2012: 307; Mishra, 2019: 11). Tax increment financing (TIF) already present in the US and Canada (e.g. Huston et al., 2015: 66-75; Flynn and Hamilton, 2018: 9; Pratap, n.d.: 22; Lindfield and Steinberg, 2012: 18) is also highlighted in the smart city literature that does not deal with property taxation in general. New infrastructure investment at the local level (within the TIF zone) is financed by revenues from property tax increases for the defined period to capture ex-post project benefit streams. Thus, "infrastructure-induced property capital gains are 'ring-fenced' to offset some of the initial upfront disbursements" (Huston et al, 2015: 71). Similarly, special assessments are in place in the US, Canada and where local governments establish 'districts' within which differentiated taxes are levied on land and property whose values are expected to increase due to proximity to new infrastructure and spatial planning (EU (Mishra, 2019: 11).

The most comprehensive international overview of various land-based urban revenue instruments is structured/provided by Mishra (2019: 8-13)[7]. In addition to land-based taxes (such as property tax, land value tax, site value rating, land value increment tax, vacant land tax, land use conversion tax, property transfer tax, stamp duty, tax on planning gain, tax on development gain...), some more innovative and "smart" instruments could be identified. These are development financing tools and land value capture (LVC) instruments.

Development financing tools are "upfront payments in connection with land development undertaken by private developers with permission from local authority", such as development charges, external development charges, impact fees, development contributions, land readjustment or town planning schemes...

Land value capture instruments are post-development payments to capture land value increments such as land value tax, land value increment tax, vacant land tax, property tax, special assessment district, business improvement

5 Such a tax was introduced in Croatia, but later rejected by the Institutional court.

6 The Croatian charge/fee paid on the construction of a new building ("public utility contribution") could be the appropriate example of such a charge/fee.

7 His categories are overlapping, since some instruments are classified under two of them.

district, betterment levy, tax increment financing, sale of land or development rights, land pooling/readjustment and joint development mechanisms.

Above mentioned development financing tools could be regarded as meeting the "growth pays" as some sort of "polluter pays" principle inside the field of the land-based urban instruments. This principle, which in turn is a corollary of the benefit principle, could be achieved even more directly with various *congestion charging taxes/instruments that capture the negative externalities associated with density* (Mishra, 2019; UN-Habitat and UN ESCAP, 2015: 86). They mostly relate to vehicles/traffic. The following are some examples: vehicle quota system (certificate of entitlement to own a vehicle), high initial registration costs of vehicle[8], road tax[9], cordon pricing of parking by time of day and vehicle class[10], congestion charge for vehicles entering a designated congestion charge zone (e-g- city centre) in the rush hours or the relevant working time period (the entire daytime). Such congestion charges at the city/local level are complementary to various broader vehicle/fuel taxes such as motor vehicle tax,[11] tax on motor fuel[12], business licensing fees[13] and classical parking charges[14], for the latter are some less precise "proxy" for the "real" local congestion charges. So, "a strong case thus exists for …*a surcharge on motor vehicles/fuel taxes in cities*, especially metropolitan cities and dedicate the same to urban and regional transportation, including mass transit." There is also an alternative of replacing surcharges with shared taxes (between local and higher levels of government).

Although vehicle/fuel related charges/taxes reduce CO2 emissions, a more direct approach of introducing a local/city carbon tax (CO2 tax) on GHG emissions is on the agenda of smart cities. The Carbon Neutral Cities Alliance (2015), a collaboration of leading global cities, plans to "cut greenhouse gas emissions by 80% or more by 2050 or sooner". The C40, a forum of mayors of the world's largest cities, discusses urban solutions to the climate crisis. Among US and Canadian cities, the implementation of a local carbon tax or emissions trading scheme is being considered to achieve this goal (e.g. Boulder (Colorado) voters already passed this tax in 2006 and it is being applied in the San Francisco Bay Area and Canada British Columbia (Carbon Neutral Cities Alliance, 2015: 44, 65; City of Vernon, 2020: APP9, APP 120: 7;

8 Croatia sets higher charge for the initial registration than for subsequent registrations.
9 It is paid at the time of registration together with the special environmental charge and the annual road motor vehicle tax.
10 Already extensively present in Croatia, especially in the big cities and at the seaside during the season.
11 There are two motor vehicle taxes in Croatia – the excise duty on motor vehicles, which is a revenue of the central government, and the annual road motor vehicle tax (mentioned in footnote 8), which is a revenue of the higher level local units (counties - regions).
12 These excise duties are harmonized in Croatia under EU rules, but hey have always been there.
13 Croatia had a local annual business fee (called "firm or company name tax"), but it was abolished.
14 Already extensively used in Croatia.

APP 150: 18; Ciuriak and Ciuriak, 2013: 24; Mori, 2010: 21)). Tokyo and some other Asian cities have also implemented a local carbon tax (UN -Habitat and UN ESCAP, 2015: 187). This tax could also be set at the national level, but shared or even left entirely to local governments, where its use could be better targeted.

4. Why local sales tax?

Although local governments in developed countries derive only a small proportion of their tax revenues from sales/consumption taxes - about 4% in federal and 10% in unitary OECD countries (OECD, 2019, Table 6.10 and 6.12)[15], there is an increasing trend in their use. This is particularly true in countries such as the US, where they are being used more intensively, albeit as a complementary tax to the main local tax - the property tax. The idea is to combine "revenues that are stable and inelastic" (like property tax revenues) "with ones that are more elastic and therefore have greater growth potential" (Afonso, 2013: 652), like sales tax revenues. "In opposition to property taxes, sales taxes are estimated to be approximately unit elastic" (McCubbins and Moule, 2010; Sobel and Holcombe, 1996, cited in Afonso, 2013: 654), but when food sales are excluded, the remaining retail sales tax elasticity is almost 50% higher (Sobel and Holcombe, 1996, cited in Afonso, 2013: 654). Such diversification of local revenues not only improves the performance of local budgets, but also serves as a means to increase total tax revenue or reduce the tax burden of existing taxes, such as property tax (Afonso, 2014) or personal income tax.

The aforementioned elasticity is the advantage of the sales tax (compared to the property tax) for taxpayers as well, since they can cut spending (and related taxes) in times of recession, but not the property tax. Because of this fact, as well as the visibility of the property tax, the sales tax is far less unpopular than the property tax (Gallup, 2005 and 2006; Cole and Kincaid, 2006; cited in Campbell, 2009: 158).

It is also confirmed that local governments adopt "local sales tax for political and economic rationale, rather than fiscal condition" (Shon and Hou, 2017: 289) and that regional diffusion (more neighbouring local units already having local sales tax) is also likely to have a positive impact on adoption (Shon and Hou, 2017).

However, the local sales tax raises prices and can create economic distortions and inefficiencies, increase tax inequities, but also increase the regressive effect or decrease the progressive effect of the entire tax system. It increases the possibility of tax evasion and increases the administrative burden on retailers/businesses that collect it.

15 This proportion is generally higher in developing countries, especially in Brazil, Panama, Argentina and Nicaragua (OECD, 2021: 58), Albania, Bosnia and Herzegovina, Cambodia, Côte d'Ivoire, Indonesia, Kenya, North Macedonia, Serbia, Somalia, Tanzania, Thailand, Tunisia and Uganda (International Monetary Fund, 2021 – data missing for many countries).

The fact that sales tax rate differences among local units can change the place of purchase and lead to competition between local units is likely when a good/service is “readily available in a low-tax jurisdiction and easily transported to a different location for consumption or use” (Cornia et al., 2010).

5. Specific local sales/consumption tax for post Covid-19 Croatia

The general local public finance literature points out mostly the personal income tax (which is already extensively used in Croatia as local government shared and own revenue) as well as the real estate tax (the introduction of which has been strongly advocated in the last decade). The latter tax has been recommended not only by international institutions, including the EU, but also by domestic literature and policy makers (e.g. Blažić et al., 2016), including relevant laws that were proposed/imposed and then withdrawn/removed. It is now obvious that this tax will not be implemented in Croatia in the near future, as it seems politically unacceptable. It was advocated not only for its ability to pay principle and benefit principle, but also because of its ability to raise revenues, that are much higher compared to the existing public utility fee (the simple area-based real estate charge/tax). Plans to implement the true “value-based” real estate tax even included the abolishment of the personal income tax local surcharge/surtax in the long run, but the entire proposal was removed. A later phased approach included first the change of the public utility charge using more sophisticated formula as the transitory charge/tax to the true value-based real estate tax, but the relevant provisions cancelled.

It is thus obvious that Croatia must now seek another way to increase its local fiscal autonomy, which is traditionally low (Ott et al., 2019: 561). Instead of introducing a completely new tax or gradually transforming the existing one, the simpler solution could be to increase the revenue of one of the existing taxes. This could be done by raising the maximum rate and expanding the scope of the existing tax(es).

One of the best candidates for the post Covid-19 era seems to be the specific local consumption tax on alcoholic and non-alcoholic beverages in hospitality facilities. Its revenue capacity is far from exhausted. Currently, it is one of the smaller tax revenues of the lower level of local governments - municipalities (cities and municipalities), as shown in Table 2.

Table 2: Share of local consumption tax revenue in total local tax revenue and its absolute changes (indices) compared to the previous year

Year	% of total tax revenue			Indices (previous year = 100)		
	Cities	Municipalities	Total	Cities	Municipalities	Total
2014	1.19	1.97	1.30	-	-	-
2015	1.43	2.73	1.60	108.8	115.7	110.3
2016	1.40	2.67	1.68	104.5	110.5	105.8
2017	1.46	2.77	1.64	99.0	100.3	99.3
2018	1.20	1.64	1.28	103.9	104.9	104.1
2019	1.19	1.61	1.27	104.7	108.0	105.5
2020	*0.69*	*0.99*	*0.75*	*53.6*	*56.9*	*54.4*

Source: Ministry of Finance, 2021

As can be seen from Table 2, the revenue from the local consumption tax is almost negligible. However, its importance is 50 to 80 percent higher for municipalities than for cities, due to the higher and more differentiated revenue possibilities of cities. The Covid-19 crisis almost halved these revenues in 2020. Consequently, their share of total tax revenues declined, as they are among the most elastic local tax revenues. However, this fall could have been even higher taking into account the Covid-19.

This tax has already proven to be a flexible mechanism for Covid-19 crisis since many cities in continental Croatia (including the capital Zagreb), as well as some coastal cities in the less developed/attractive areas, have either abolished or reduced this tax from 1 January 2021.

Additional revenue from this tax could be raised by abolishing its ceiling (currently 3%) and extending its scope to all beverages and foodstuffs, or at least sweets/desserts (ice cream, cakes, etc.). This could increase the flexibility of this tax by municipalities, leading to greater differences in rates/scope among municipalities and possible seasonal variations during the year.

There are numerous arguments for such an extension of this taxation, rooted in the general (local) public finance literature, the taxation of smart cities and the current Croatian fiscal situation. Among them, the most important are:

- *Benefit principle and spill-over effect*. Besides local residents, non-residents/tourists, even on a (partial) daily basis, enjoy not only the consumption of the aforementioned beverages (and other possible hospitality products/services), but also the entire local landscape including not only local infrastructure, but also natural resources with associated developments, sights, attractions, sport facilities, etc. The already existing tourist/non-resident fee does not cover the tourists who come (partly) on a daily basis. So there is a specific spill-over effect of such local services and in the public finance literature this effect is a justification for the grants from the higher level of government. However, it is hardly possible to take advantage of this opportunity, so increasing the targeted local tax might be a better alternative. The non-residents benefiting from such services could be burdened with an additional tax burden considering

their demand elasticity, seasonality and intensity during the week. The regional differences of the (post) Covid-19 pandemic could deepen such justification. Moreover, local residents who do not enjoy such hospitality services will be completely exempt from this additional burden. Those who enjoy them more will also pay more.

- *Congestion charging element*. This is closely related to the first point, but concerns the "negative" benefit principle, i.e. the "polluter pays principle" (PPP). As already stated in chapter 3 for cars and traffic, negative externalities are associated with density. For example, the (over) crowding of tourists in open spaces and especially in hospitality facilities reduces the quality of life of residents, whose taxes finance the local goods and services that attract them. It also has a negative impact on the quality of tourist and hospitality services for the tourists themselves. If the (post) Covid-19 restrictions on the number of people allowed in a particular hospitality establishment turn into recommendations (perhaps only regionally) to reduce the number of people, the sales tax rates could be (one of) a market mechanism(s) (instead of "command and control" mechanisms)[16]. Rates could vary on a monthly or even daily basis as well as on regional or local or locational basis. This could help solve the perennial problem of peak seasons, weekends as well as regional/ locational differences. The prices of some hospitality facilities/services already reflect this problem, so why should not a smart local government have its share.
- *Decline in population and/or old-age challenge*. In Croatia, it is common for smaller local units to lose inhabitants who migrate to larger cities or abroad. In addition, "... overall populations are not growing as quickly, cities often face a limited and shrinking tax base, meaning that many face the age-old challenge of having to do more with less" (Bélissent, 2010: 2). Therefore, for the increasing number of municipalities/cities with an already advanced tourism and hospitality industry, it is important that they receive more direct and intensive funding from their tourists.
- *Elasticity and increase in disposable income*. Reference has already been made to the income elasticity of local tax revenues in general and specifically for the sales tax. It is expected that there will be an economic upturn in the post Covid-19 period, as is usually the case after crises The likelihood of implementing a local sales tax is increased when consumers have more disposable income (Shon and Hou, 2017). This is true for the country/region in general, but also for the specific local units with higher per capita income, including higher per capita income of its non-residents who often visit it for tourism, business and other purposes. In particular, the seaside resorts are expected to see this increase in the post-Covid-19 period.

16 Stiglitz (2001) points out too that "one person's decision to … do any activity that might expose someone else imposes a cost on others that he does not pay for. The best response would be to have action-specific taxes, i.e. interaction-specific taxes, which are difficult to impose."

- *Absence of increase in standard VAT rate and (re)introduction of reduced VAT rate for hospitality*. Prior to Covid-19, there was an idea to increase the standard VAT rate by one or two percentage points due to fiscal consolidation efforts. However, as the standard Croatian standard VAT rate is already quite high (25%), this was avoided and with it the resulting upward pressure on prices. Moreover, the reduced VAT rate of 13% for the hospitality sector (but still not for beverages) was reintroduced in 2020. Both contributed positively to the overall burden on hospitality services and provide room for an extension of the specific sales tax to include also sweets, coffee and (some) foodstuffs.
- *Simplicity (easiness and cheapness) of tax collection and payment*. The hospitality industry is already familiar with the local sales tax and the increase in the tax rate will not affect compliance costs, which are in Croatia especially high for small businesses (Blažić, 2004). It is expected that the broadening of this tax will have a moderate effect, as it will increase the scope of taxable items, but with the same known technique as before. As with any consumption tax, the payment of the tax is associated with the payment of the price, which is easy and "convenient" for the taxpayers.
- *Absence of increase in other local revenues (or even decrease in local personal income surtax) and failure to implement real estate tax*. As explained above, there is little chance that changes in current real estate taxation/charging will be applied, let alone a true "value-based" real estate tax. A potentials of a local surtax have been exhausted, especially in the capital Zagreb and the coastal cities. Moreover, it was planned to reduce the burden of this tax and eventually abolish it by introducing the true value-based real estate tax, but this failed. The potentials of various smart local taxes related to property or congestion are already been exhausted also
- *Increased revenue flexibility and local autonomy*. The uncapped tax rate with unlimited upward and downward fluctuations, including (currently excessive) abolition, provides the opportunity to achieve revenue flexibility but also to accommodate the Laffer Curve effect. This increases local autonomy of cities/municipalities and helps not only to adjust the tax rate to demand, but also to local expenditure needs.

6. Conclusions

It is obvious that the real local real estate tax (the value-based one), which was expected to raise more revenue than the existing area-based real estate charge (public utility charge), will not be applied in Croatia for the time being. The local personal income tax is already too heavily used to be increased any further. So, a new/additional revenue raising mechanism should be applied, based on the principles of true, good and smart local tax. In our opinion, this could be the local consumption tax on alcoholic and non-alcoholic beverages in hospitality facilities, as hypothesized in the Introduction.

Although consumption is elastic on the basis of several types of elasticity, especially when food is taken out, Croatian local consumption in hospitality facilities (especially cafés and bars), as a dominant form of sociability, also has some elements of internal stability, which was proved even in the times of the Covid-19 crises. The decline in local consumption tax revenue in 2000 as well as 2001 is/will be the result of a partial lockdown, but also a chosen additional flexibility by local governments to help the hospitality industry by eliminating/reducing this tax in 2021. It appears to be a tax that could reasonably be adjusted to the post Covid-19 situation, taking into account regional and seasonal differences. This could be emphasized by widening the scope and raising the cap.

Moreover, this tax could be justified by the numerous following reasons: benefit principle, spill-over effect, congestion element, decline in population and old-age challenge, elasticity and future increase of disposable income, no increase in standard VAT rate, reintroduction of reduced rate for hospitality industry, simplicity (easiness and cheapness) of tax collection and payment, no increase in other local revenues, decrease in local surtax, non-introduction of real estate tax, increased revenue flexibility and local autonomy.

Future research should include the pandemic, price, income, and seasonal elasticity of beverage (and other) consumption in bars and cafes (and other hospitality facilities), and the resulting elasticity and flexibility of the local consumption tax on alcoholic and non-alcoholic beverages (including its extension to other beverages and perhaps some foods).

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CHAPTER 21

Optimal structure of taxation and response to COVID-19[1]

Denis Buterin[2]

Abstract

The tax system of the Republic of Croatia is focused on consumption taxation, and the Republic of Croatia is one of the countries in the European Union with the highest tax burden, i.e. the share of total taxes in gross domestic product. Social security contributions are proportional, socially regressive and have a negative impact on the competitiveness of the economy. Despite numerous changes in the tax system and certain forms of taxation in recent decades, notably in the form of tax deductions and reliefs and tax rates, there have been no really significant changes in the tax structure. In particular, taking into account the different nature of each form of tax in the context of its impact on social balance, fiscal generosity and economic growth objectives, it is indeed a system whose effects do not change. As expected, the response to the COVID-19 pandemic manifested itself in a decline in consumption and a consequent decline in VAT revenues, which threatened to cause major fiscal dislocations. A similar decline in VAT revenues has occurred in previous crisis periods, when revenues from consumption taxation declined more than other types of tax revenues. In the context of these assessments, the stagnation of the tax structure in the Republic of Croatia is worrying and therefore the issue of structural change in the tax system is again becoming one of the priority fiscal and economic issues.

Key words: *Tax structure, Fiscal policy, Taxes, Growth*

JEL classification: *E62, H21, H60*

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1. Introduction

Although the pandemic COVID-19 appears to have eclipsed a number of economic issues, the fiscal capacity of countries and their adaptive capacity have proved to be very important in responding to the crisis. The design of a country's tax system, i.e. the formulation of its tax policy, is one of the most complex tasks of all economic policy. Tax policy must achieve several conflicting objectives, such as contributing to economic growth and ensuring that tax pressures do not become burdensome; financing government spending, including government investment and the government social security system; equitable distribution of the tax burden; and efficiency and cost-effectiveness of tax collection. In addition, the tax system must be clear, simple, and stable, must not be an obstacle to business, and must be such that it discourages tax evasion. Often, adherence to one set of objectives causes consequences on the other side, the effects of which become apparent only over time, so that the question of political expediency may outweigh the question of the actual usefulness of designing a tax system in the country. The tax structure affects savings, labour supply, investment in human capital, the decision of firms to produce, create jobs and invest in development. Both the level of tax rates and the system of tax forms used to collect taxes, i.e., the tax structure, are important to such decisions. The pandemic COVID-19 has shown that the most generous tax revenues of Croatia are affected in times of crisis. Therefore, the issue of tax structure is once again raised as one of the priority issues for the Croatian economy.

2. Literature review

The impact of a tax structure on a country's economy is reflected throughout the economy, hence many OECD countries have made structural changes to their tax systems in recent decades by lowering tax rates and increasing the tax base while maintaining the level of tax revenues (OECD, 2010). Arnold (2008) believes that all taxes, with the exception of flat taxes, have a distortionary effect that can have a negative impact on growth. This conclusion builds on a thesis by Easterly (1993) which shows that distortions, whether caused by taxes or other policies, are negatively correlated with growth. Ramsey (1927) believes that an efficient tax system should be maintained and that tax policy should distort consumer behavior as little as possible, so in this sense he mentions differential taxation of consumption. He proposes high consumption taxes for goods with low price elasticity, because when elasticity is low, the price increase caused by taxation does not significantly affect the demand for these goods. On the other hand, he proposes low tax rates for goods with high price elasticity to avoid distortions in consumption patterns. Mirrlees (1971) assumes that individuals differ in their innate ability to earn income and in the effort they are willing to invest. Income taxation may cause people to work less, i.e. due to the effect of taxation they do not invest the same amount of effort in earning income, so taxation has a negative effect on the overall level of income.

The first study that analysed the effect of fiscal variable on economic growth was conducted by Barro (1991, 1991a) in his two studies in which he analysed the ratio of real government expenditure to real GDP and found a significant negative correlation with growth. In contrast, Koester and Kormendi (1989) found only a limited relationship between taxes and growth. Levine and Renelt (1992) and Easterly and Rebelo (1993) also do not find that growth can be affected by taxes. Slemrod (1995) also found no relationship between tax rates and GDP per capita for OECD countries in his study.

Fölster and Henrekson (2001) came to different conclusions when they examined the relationship between economic growth and state size. Their results suggest a negative relationship between total public expenditure as a share of GDP and growth. Leibfritz et al. (1997) examined the relationship between taxes and OECD growth rates and concluded that a ten percent increase in tax rates leads to a half percent decline in the growth rate. They believe that about one-third of the causes that led to a slowdown in growth in OECD countries in the second half of the last century can be explained by an increase in the overall tax burden. While they recognize that the ageing of the population and the associated pressures on public finances through the social security system limit the scope for reducing the overall tax burden, they believe that positive effects on growth could be achieved through a change in the tax structure and a shift from capital and labor taxes to consumption taxes. The results of their study show that direct taxes constrain growth more than indirect taxes. Mankiw et al. (2009) suggest, among other things, taxing consumption to achieve an optimal tax structure, focusing on VAT. McNabb and LeMay-Boucher (2014) argue that the shift towards direct taxes has a strong negative relationship with economic growth, i.e., increasing the rate of direct taxes reduces the growth rate. Plosser (1992) found a significant negative correlation between income tax and profit tax with GDP growth rate for OECD countries. Dowrick (1993) also used OECD countries to show the negative effect of income tax on economic growth, in contrast to profit tax, which he found to have no effect. Kneller et al. (1999) and argue that income tax and wealth tax are distortionary taxes that have a negative impact on the growth rate, while consumption taxes are non-distortionary taxes that do not reduce growth. They also believe that government spending can be productive, which stimulates growth, and unproductive, which does not. These findings are confirmed by Alinaghi and Reed (2016), who find unproductive government spending and distortionary taxes to have a strong negative relationship with growth, while non-distortionary taxes and productive consumption have a positive impact on growth. And research by Bleaney and others in OECD countries has shown that non-distortionary taxes and productive government spending raise growth rates. In this regard, consumption taxes are the only ones that can safely be considered undistorted. The bias of income and revenue taxes has also been indirectly identified by Myles (2009). Although Myles does not establish a relationship between the overall level of tax burden in the country and growth, he has demonstrated that higher income and payroll tax rates have a discouraging effect on entrepreneurship and thus indirectly reduce growth rates. Similarly, Widmalm (2001) finds that the tax structure in which the share of income tax

increases negatively affects growth. She also finds that the progressivity of the tax system has a negative effect on growth. Afonso and Jalles (2014) also conclude that income taxation slows down growth.

The research was conducted by Acosta-Ormaeche and Yoo (2012) by dividing countries by income level and concluded that:

1. in high income countries, increasing income and profit taxes while decreasing consumption and wealth taxes leads to a reduction in economic growth, and the negative impact on economic growth is due to income tax. When consumption and wealth taxes are considered separately, wealth taxes have a larger positive impact on growth than consumption taxes.
2. in middle-income countries, the negative impact of income tax on economic growth is more pronounced, and when the impact of consumption and wealth taxes are analyzed separately, wealth taxes have a positive impact on economic growth.
3. in low-income countries, it is not possible to identify the impact of tax forms on economic growth.

Grdinić et al. (2017) find in a sample of former transition countries that consumption and wealth taxes have no impact on growth. At the same time, they find extremely negative and statistically significant effects of social security contributions on economic growth in these countries in the short and long run. Such a negative impact can be partly explained by the significant share of the informal sector, i.e. the shadow economy, in the observed countries. Indeed, in countries where there is no effective system to combat the informal economy, tax evasion and evasion of other public benefits, there is a greater number of undeclared workers and employers who register employees at the minimum wage in order to reduce the income tax base and social contributions. In these circumstances, the tax burden and social security contributions are collected only from those who work legally, i.e. from the formal sector, while the income of those who work in the informal sector is not registered and cannot be taxed. Often those from the informal sector receive unemployment benefits or other forms of assistance intended for vulnerable groups. For this reason, the entire social security system, which includes the pension and health care systems as well as programs for the unemployed, can only be financed by contributions collected from the salaries of formal sector workers, resulting in relatively high wage benefits for those who work legally. Such high social contributions do not stimulate new employment and have a negative effect on economic growth. Employment in the informal sector of former transition countries also promotes labor market inflexibility, which translates into high employment and termination costs. Due to the need to finance growing public expenditures, social contribution rates have to rise, which increases the cost of labor and reduces investment or leads to substitution of labor by capital. This further reduces the number of people employed in the formal sector and reduces revenues from income taxes and social security contributions, while increasing the amount of money needed to finance the unemployed. Social security contributions have a

distortionary effect, which is exacerbated as growth increases.

In addition, there is the problem of an aging population and its impact on an increase in social security expenditure. In a given situation, it is possible either to reduce spending on pensions and health care, as well as unemployment spending, or to further increase contribution rates, which directly increases labor costs and distorts the competitiveness of firms and the economy as a whole (Buterin, 2020).

Easterly and Rebelo (1993: 442) argue that the evidence that tax rates have an impact on growth is "disturbingly fragile". Since then, a number of studies have been conducted to more clearly identify the impact of taxation on growth. Thanks to improvements in the quality and quantity of available data, as well as the development of more modern tools, research is yielding increasingly reliable results that suggest that taxes do indeed affect growth. However, there is no general view on which form of taxes has a greater impact on long-term economic growth. Indeed, it is well understood that it depends primarily on the characteristics of each country's tax system and the system's economic environment. It is also a very complex question under which conditions which tax structure would be conducive to growth. Although not all taxes have the same effect at all income levels or for every type of government expenditure, and this question cannot be answered unambiguously, it seems that income taxation may be more or less negatively correlated with economic growth.

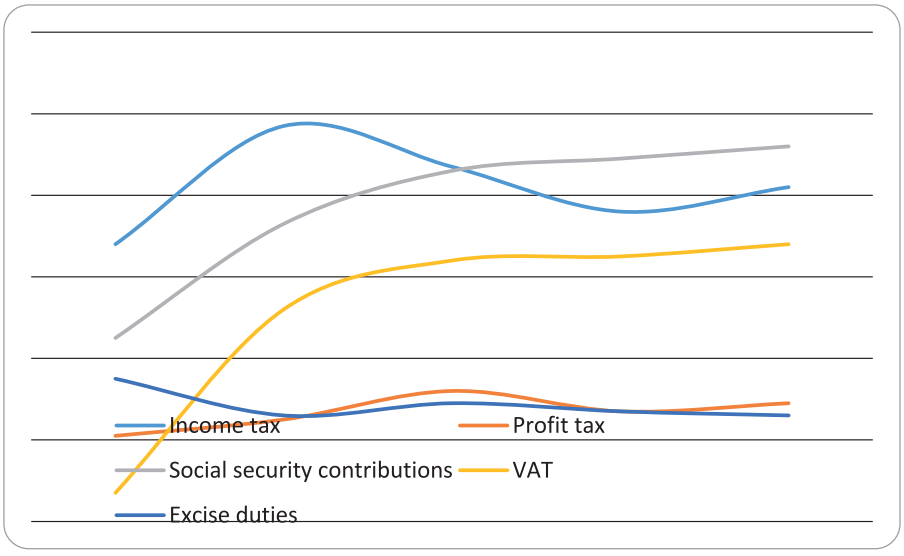
3. Tax structures of OECD countries and the Republic of Croatia

The tax policy of a country, that is, the policy of collecting public revenues in a broad sense, distributes the burden of financing public goods and services among the various contributors, and a glance at the structure of public revenues shows the distribution of this burden among particular categories of its economy and population. Numerous fiscal imperatives fulfil different strategic objectives, so that the structures of public revenues can vary considerably from country to country. Their diversity is due to a number of historical, institutional, political and economic reasons. Public revenue structures are expressed as percentages, that is, as shares of each tax category in the total tax revenue collected by the government during the period under consideration. Table 1 in the Annex shows the public revenue structures of OECD countries in 2016. Iceland had the highest tax ratio in 2016, but this resulted from the introduction of a one-off tax on the book value of assets of failed banks, which exceptionally brought in tax revenues equivalent to 15.7 per cent of GDP at that time. Iceland's tax-to-GDP ratio rose from 36.3 per cent in 2015 to 51.6 per cent in 2016 and fell again to 37.7 per cent in 2017 (OECD, 2018 and 2018a; Baldursson et al., 2017). Excluding Iceland Denmark has the highest tax burden at 46.2 percent, followed by France, Belgium, Finland and Sweden with a rate of more than 44 percent. Mexico has the lowest tax burden with a rate of 16.6 percent, followed by Chile with 20.2 percent and Ireland with 23.3 percent. The peculiarity is that Ireland had a tax-to-GDP ratio of 30.8 percent in 2000 and the reduction in

the ratio to 23.3 percent is due to a particularly large increase in Ireland's GDP in 2015. Ireland's GDP growth rate of 26.3 per cent in 2015 could almost be described as sensational, but as it is not based on real economic growth but on a strategy of tax avoidance by multinationals, this rate does not reflect the true state of the Irish economy and has almost no impact on other macroeconomic indicators.

The unweighted average of OECD countries shows that social security contributions account for the largest share of total tax revenue, although Australia, New Zealand and Denmark do not collect them separately but integrate them into their income taxes. These three countries, together with Chile and the US, belong to a group whose tax structure deviates upwards from the OECD average. On the other hand, Portugal, Norway, Finland, Luxembourg and Spain form a group whose tax structure is most similar to the average tax structure of OECD countries. In addition to social security contributions, income tax also has a very high share, namely 23.8 percent of total taxes.

Figure 1: Changes in the tax structure of OECD countries, % of GDP

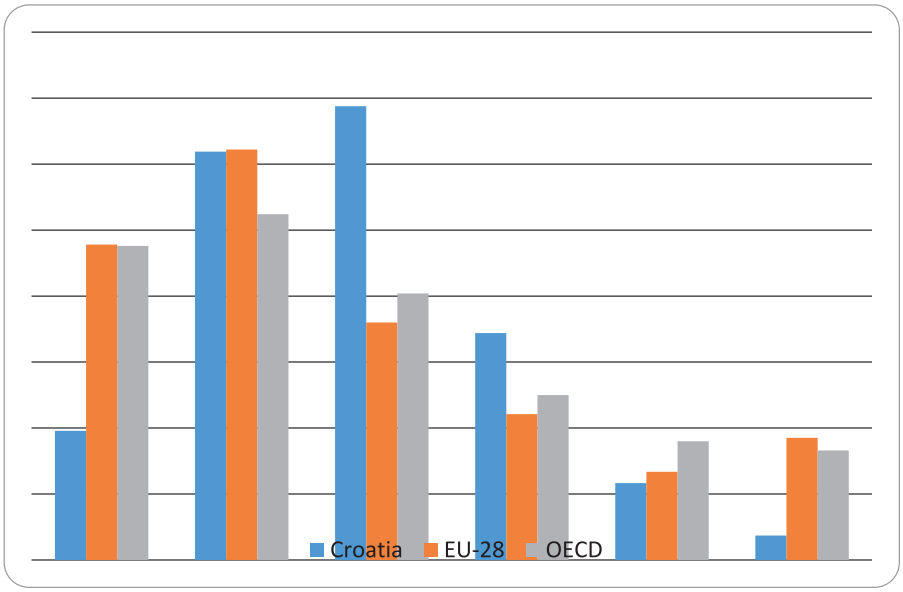


Source: OECD, 2018

The structure of public revenues in OECD countries is relatively stable and has changed only slowly in recent decades. It is characterized by a very small increase in the share of GDP and the greatest relative importance of taxation on labor. The share of VAT in OECD countries is growing and in the structure of public revenue in 2016 is 20.2 percent. This tax was first introduced by Denmark in 1967, and the last of the OECD countries was Australia in 2000

(OECD, 2018a). To date, it has been introduced by all OECD countries except the United States, and overall rates range from 5 percent in Canada to 27 percent in Hungary. In European Union countries, the general rate of VAT ranges from 17 percent in Luxembourg to 27 percent in Hungary. Croatia introduced VAT in 1998, and today it is the most important and generous tax in its public revenue structure.

Figure 2: Tax structure of Croatia, the EU and the OECD in 2016, % of GDP



Source: European Commission, 2018; OECD, 2018

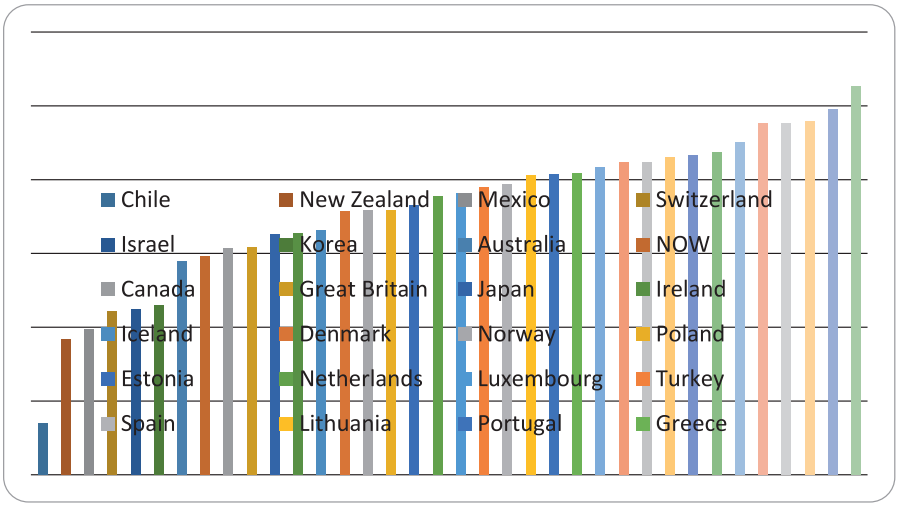
In Croatia, VAT has the largest share in the tax structure, and in this, as well as in the smaller share of income tax, a significant difference from the average of EU and OECD countries can be seen. This difference is the effect of a relatively high VAT rate, a high share of personal consumption in GDP and its relatively low level per capita. The movement of personal consumption as the most important segment of GDP directly determines the movement of VAT revenues, i.e. the movement of total Croatian government finances (Olgić Draženović et al., 2018; Buterin et al., 2017). When the VAT was introduced in 1998, its general rate was 22 percent, but due to the decline in personal consumption during the recession, revenues from this tax decreased significantly, so in order to reduce the deficit in 2010, the general rate was increased first to 23 percent and then to 25 percent in 2012. It is the second highest VAT rate in the European Union, and in addition to Croatia, Denmark and Sweden still have a 25 percent rate. Denmark is the only country in the European Union that has a one-tier VAT system.

4. Wage tax burden

In contrast to Croatia, the public revenue structures of OECD countries increasingly emphasize income taxation and the collection of social contributions. Contributions and income tax together account for about half of the total tax revenues of OECD countries, which is somewhat surprising given the distorting effect of the tax wedge. A very similar situation with the structure of public revenues existed in 2016 in the European Union, where income tax and social contributions account for 65 percent and VAT for 18 percent of public revenues (European Commission, 2018).

Since in 2016, total tax revenues in OECD countries averaged 34 percent of GDP, it follows that the tax wedge reaches about 17 percent of GDP. The tax wedge, i.e. the total tax burden on wages in OECD countries in 2018, is shown in Figure 3.

Figure 3: Tax wedge in OECD countries in 2018, % of labour costs

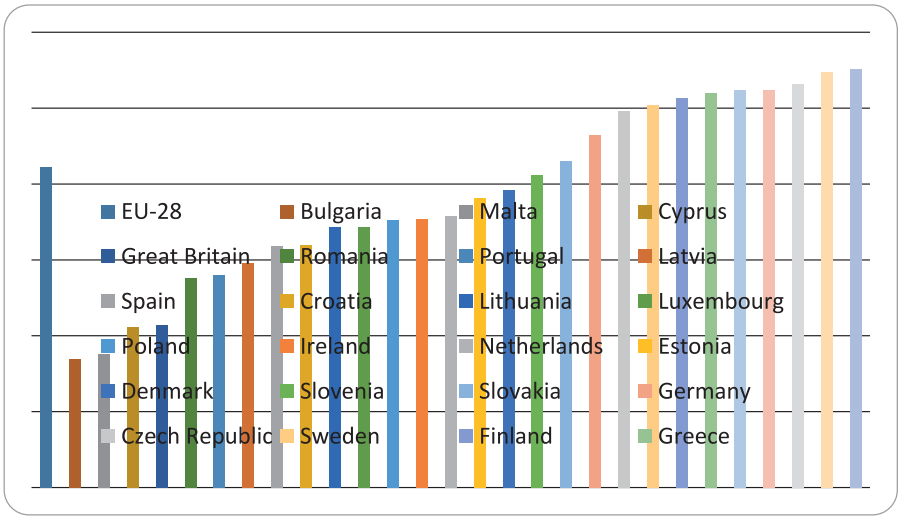


Source: OECD, 2019

Chile has the lowest wage burden, and Mexico and New Zealand are among the countries with a tax wedge below 20 percent. All European Union countries that are members of the OECD have a tax wedge of more than 30 percent, and in 14 of them it is even more than 40 percent. The largest tax wedge is found in Belgium at 52.7 percent. The fact is that the high tax wedge discourages employers from creating new jobs, encourages downsizing initiatives during recessions, and favours the informal sector of the economy, i.e. the shadow economy (Deskar-Škrbić et al., 2018). In addition to the tax wedge, an indicator of the implicit tax rate on labour is used to measure the

total tax burden, which is obtained by dividing taxes and social contributions by the income of all employees.

Figure 4: Implicit labour tax rates in the EU in 2016



Source: European Commission, 2018

The average implicit tax rate on labour was 36.1% in 2016 in European Union, with significant differences between Member States. The highest rates are found in Italy, Belgium and Hungary, and the lowest in Bulgaria, Malta and Cyprus. In Italy, the total workload is 81.3% higher than in Bulgaria. Croatia, with a rate of 31.0%, is below the European average, so it turns out that the workload in European Union is among the lowest. Indeed, if we divide the total amount of income tax and social contributions by the total income, it does not become clear that in Croatia, due to the amount of salary and due to the method of income taxation, a large part of employees do not pay income tax or possibly only pay the lowest rate.

Income tax in its current form was introduced in Croatia in 1994 and applied not only to income from employment but also to income from self-employment and income from property and property rights. At that time, two tax rates were introduced for different income levels, i.e. for different tax brackets, for earned income. In the following years, numerous amendments to the law as well as three completely new laws on income tax led to numerous changes in the amount of taxable income, the personal allowance, the tax rates and the tax brackets, which changed the overall tax burden on earned income.

Until 2015, the tax burden on wages increased or fell in response to changes in fiscal needs. Since 2015, wages have had five consecutive tax cuts. The problem, however, is social security contributions, which make work

expensive and are calculated from salaries and on the salaries of all workers, regardless of their level or other status issues.

The problem of high contributions has been identified as one of the obstacles to the competitiveness of the Croatian economy. Grdović Gnip and Tomić (2010) note that the tax burden on labor in Croatia is largely borne by employees, but that when VAT is added to the tax wedge, which hits those with the lowest incomes due to its regressive effect, Croatian workers join the group of European workers with the highest tax wedge. Deskar-Šrbić et al. (2018) find a significant impact of the tax wedge on employment in Croatia, but find that further intervention in the income tax not only fails to significantly reduce workload, but may also lead to significant disruptions in the financing of local government. Instead, they suggest reducing the tax wedge by focusing on contributions. By creating a tax wedge, contributions directly reduce competitiveness and lead to further negative macroeconomic effects. Their role in the structure of public revenues is relatively large in Croatia and in EU and OECD countries, but their function in financing social spending is irreversibly changing (Buterin et al., 2021). This is particularly pronounced in Croatia. This is because, due to the growing financial needs of the pension and health care system, accompanied by long-term unfavorable demographic processes leading to a reduction in the labor force or the part of the population that can pay contributions, the contributory social security system will become less sustainable. The resources raised through contributions are already insufficient to pay pensions and cover all the costs of public health care, and since this will increase in the coming decades, the current way of financing the social security system will have to be changed and adapted to the circumstances that are likely to arise. The revenue needed for the social security system must be provided through changes in the tax structure, which includes a gradual reduction in contribution rates. Taking into account the consumption orientation of the Croatian tax system, changes in the structure that would reduce the importance of contributions could lead to an increase in tax revenues, with a prior effect on increasing the competitiveness of the economy and the level of income earning capacity of households.

5. The COVID-19 pandemic and changes in the tax structure of the Republic of Croatia

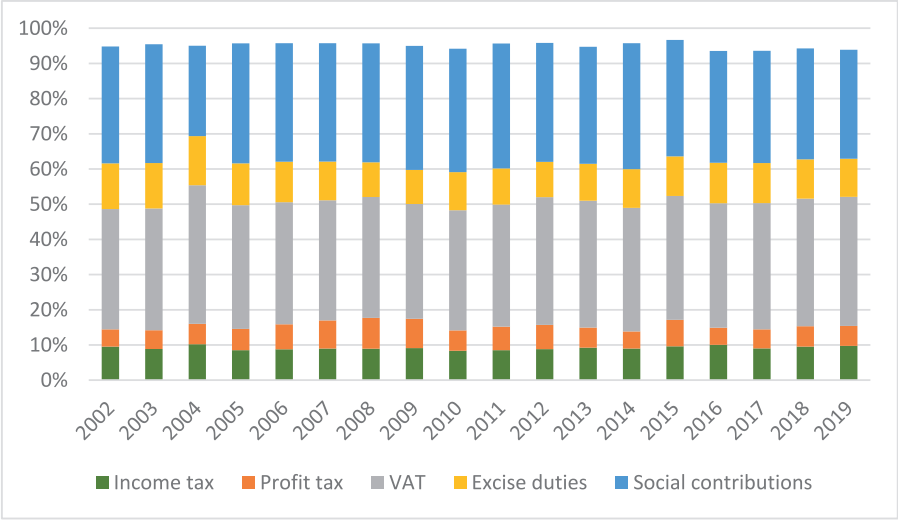
It must be said that when considering the share of individual taxes in total revenues, it is difficult to isolate the effects of changes in tax rates and tax bases within the movement of individual tax forms in the tax structure. Nor is it easy to isolate the asymmetric growth or decline of the individual forms of tax in relation to the state of the business cycle. However, these are characteristic problems that exist in other empirical studies, and some caution is warranted in assessing the intensity of the impact of particular forms of taxation on economic growth, but the direction of the effects is an important indicator for assessing the direction of public revenue policy. An additional problem is the incomparability of the data at the time of the pandemic COVID-19 due to reduced business volumes, temporary closures,

measures to support the economy, and delays and exemptions from certain tax revenues, which changes the tax structure in 2020.

As mentioned above, the study of tax structure, as well as the overall tax burden on macroeconomic categories, is one of the most important research areas within modern tax science. The Republic of Croatia is one of the countries in the European Union, characterized by the highest level of tax burden, i.e. the share of total taxes in the realized gross domestic product (if social security contributions are included).

Figure 5 shows the movement of the tax structure from 2002 to 2019, showing a relatively stable movement in the share of certain forms of tax, suggesting that despite numerous changes in the tax system and certain forms of tax, particularly in the form of tax deductions and reliefs, as well as the tax rate, there have actually been no really significant changes within the tax structure. In particular, taking into account the different nature of each form of tax in the context of its impact on social balance, fiscal generosity and economic growth objectives, it is in fact a system whose effects do not change. Certain oscillations can be seen, with the increase in the share of social security contributions and the simultaneous decrease in VAT being particularly noticeable in the crisis years from 2009 to 2014.

Figure 5: Tax structure from 2002 to 2019

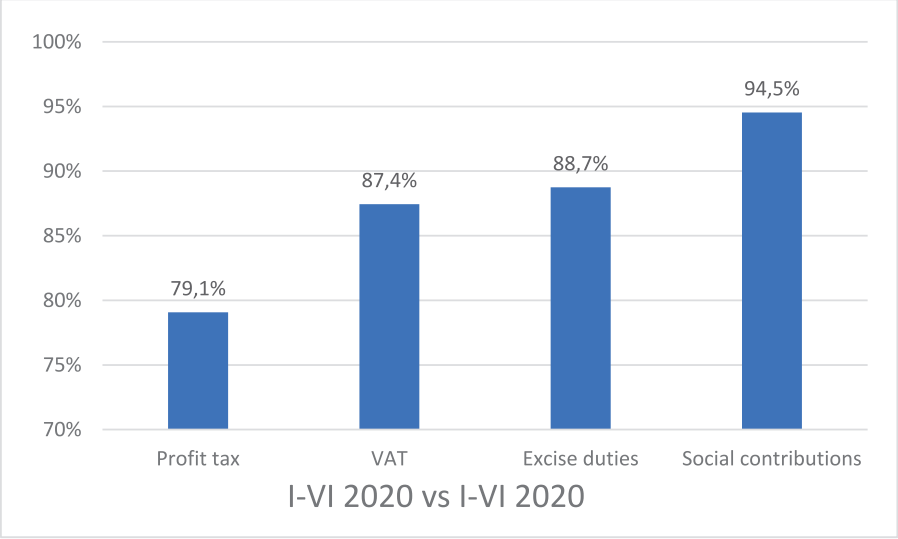


Source: Ministry of Finance, author's calculation

The pandemic COVID-19 led to unexpected fiscal changes, both in terms of falling tax revenues and measures to support the economy. Namely, changes in tax regulations allowed entrepreneurs who had or were estimated to have a drop in income of more than 20% to defer and pay direct taxes

and contributions in installments without interest. Subsequently, a measure was adopted whereby entrepreneurs with an annual income of less than HRK 7.5 million and an income decrease of more than 50% are fully exempt from paying direct taxes and contributions due in April, May and June 2020. For the same period, companies that had a turnover of more than HRK 7.5 million and a decline in turnover of more than 50% could be partially exempted from paying these benefits, depending on the decline in turnover (Ministry of Finance, 2021).

Figure 6: Decline in tax revenues during the pandemic COVID-19



Source: Ministry of Finance, 2021, edited by the author

Data for the first six months of 2020 show a decrease in tax revenues. It is expected that profit tax will be lower compared to the same period last year. Although due to the above-mentioned limitations the data are not fully comparable, it can be stated that the decrease in VAT was greater than the decrease in social contributions, which in turn indicates that in times of crisis the share of VAT decreases, while the share of contributions increases.

The fact is that the tax system of the Republic of Croatia is focused on consumption taxation, as under normal circumstances the revenues from VAT and excise taxes account for about 50% of the total tax revenues. However, the tax system is also characterized by high levies, which reach about 35% of the total tax revenues. On the other hand, income tax revenues, as a progressive tax element, account for only up to 10% of total tax revenues. Contributions and income tax are often linked by their impact on labor costs, i.e. competitiveness, and the social features of the system. However, it is

important to distinguish between these two forms of public revenue. Namely, while income tax in the Croatian tax system has experienced a decline in progressivity despite the reduction of the top marginal tax rate, a large number of citizens with lower income status do not pay this tax due to the high personal deductions. On the other hand, social security contributions are de facto proportional and at the same time have a socially regressive effect, negatively affecting the part of the labor market that is in gross wage competition on the world market. In view of such assessments, the stagnation of the tax structure in the Republic of Croatia is worrying. The first fiscal reactions to the pandemic COVID-19 confirm that its effects are changing as in the previous crisis years and point to the influence of the level of social contributions on the competitiveness of the economy.

When it comes to the mutual feedback between the tax system and the economic structure, it is important to emphasize the specific structure of the Croatian economy and tax system. A significant part of the tax burden imposed by the tax system of the Republic of Croatia is borne by foreign residents. Therefore, such a situation represents an additional opportunity to reduce the general tax burden, but also to further reduce the burden of certain forms of taxes, especially social security contributions. The prerequisite for such measures is, of course, the increase in efficiency and effectiveness of the public sector, which frees up space for the reduction of the tax burden, but also increases the economic or tax base.

6. Conclusions

The COVID-19 pandemic has led to a number of economic problems that have highlighted the importance of countries' fiscal capacity and their ability to respond to crises. The tax structure directly, but also very often indirectly, determines future economic impacts and performance. Research shows that an increase in the tax burden on income negatively affects economic growth. Croatia's tax structure is characterized by the largest share of consumption tax, which is mainly due to the high share of personal consumption in GDP, the relatively low per capita level and the relatively high VAT rates. Croatia is also characterized by a high tax wedge, mainly through high levies, but also through VAT, which with its regressive effect hits mainly the poorest contingent of the population. Contributions also have a socially regressive effect and, due to their proportionality, mainly hit those with the lowest incomes. At the same time, they directly reduce the competitiveness of the Croatian economy, and it should be borne in mind that their role in financing the social system is irreversibly changing due to demographic changes. The revenues of the social security system must be secured through changes in the tax structure, which means a gradual reduction in contribution rates.

Despite numerous changes in certain forms of taxation in recent decades, there have been no real changes in Croatia's tax structure so far. It can be said that the impact of the tax system has not changed structurally. However, at the time of the COVID-19 pandemic, similar to the time of the previous economic crisis, revenues from VAT decreased much more than revenues

from social contributions, which is to be expected given the consumption orientation of the Croatian economy. The fiscal responses to the pandemic COVID-19 show the impact of the level of social contributions on the competitiveness of the economy and point to the need to reduce them, as well as the need to reduce the overall tax burden.

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CHAPTER 22

The role of EU funded financial instruments in addressing the COVID-19 crisis and post recovery period

Josip Grgić[1]

Abstract

As COVID-19 spread uncertainty and insecurity across Europe, member states and European support institutions delivered tangible support to European businesses to address this crisis. This paper addresses the role of the Croatian Bank for Reconstruction and Development (HBOR), Croatian Agency for SMEs, Innovations and Investments (HAMAG BICRO) and the European investment fund (EIF) during the 2020/2021 crisis years and addresses the plans for the EU recovery plan. The focus lies on financial instruments (loans, guarantees and equity investments). These instruments will play a crucial role in accessing much needed sources of affordable funding for the economic recovery, while still addressing also current liquidity needs.

Key words: *COVID-19, Crisis, Financial instruments, Recovery*

JEL classification: *G0*

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1. Introduction

The COVID-19 pandemic has severely impacted the global economic outlook, with unprecedented damage resulting from the lockdown measures. The European economy is expected to have contracted by more than 8% over the course of 2020. (EIF 2021). This slowdown in economic activity could have a devastating effect on European insolvencies, and the worst hit European countries are estimated to have experienced an increase in bankruptcies of up to 30% in 2020.

COVID-19 pandemic that emerged in Europe in early 2020. brought a need for urgent state intervention in the field of access to finance, especially to SMEs[2] on which this paper focuses.

There is a broad consensus about SMEs significant impact on economic growth, job creation, social cohesion, poverty reduction, local and regional development, promotion of flexibility and innovations, and the creation of export revenues (Harvie and Lee, 2002). And yet, even though SMEs are so significant for each economy, they face specific financing problems in accessing finance, compared to large companies.

The lack of credit resources often prevents the development of SMEs potential in the economy. The credit limit encountered is most often caused by the high administrative costs of small credits, asymmetric information and high risk of such lending and the lack of collateral (Green, 2003).

Current financial needs are predominately working capital needs but the SME sector will again need investments as they are expected to play an important role in the economic recovery of Croatia and Europe. These problems can be addressed with financial instruments (loans, credit guarantees and equity instruments), and are offered from EU funded sources as well as national sources.

This paper focuses mostly on EU funded financial instruments offered by the three following institutions: HBOR, HAMAG BICRO and the EIF to SMEs in Croatia and argues that state intervention can efficiently help in addressing not only SMEs working capital but also investment needs by addressing its fundamental financing weaknesses.

2. The SME sector in Croatia and access to finance

2.1. The SME sector in Croatia

Small and medium sized entrepreneurship (SME) is a special category of the economy, which differentiates entrepreneurs by volume of its business or the number of employees. SMEs in 2019. account for 99.7% of the total number of registered companies and simultaneously employ 74.3% of workers in Croatian companies (CEPOR, 2020). SMEs usually make up the bulk of all national economies, mainly by the number of companies, but often also by

2 Small and medium sized enterprises.

the number of employees.

Under the Croatian Act on the Promotion of Small business development, size of the company is in line with the European Union standards. Small businesses are made up of micro, small and medium enterprises. Small economy is commonly referred to as small and medium sized entrepreneurship, as it automatically includes micro enterprises.

2.2. Access to finance for SMEs

Public policy action at European and national level – lockdowns – caused economic distress and brought an urgent need for liquidity measures to help SMEs survive these challenging times. Even though liquidity needs were dominant, the crisis is ongoing and has increased the existing financial constraints for SMEs.

Credit limitations where SMEs face greater obstacles to the credit market than big companies; namely higher interest rates, shortened period for credit repayment and increased requirements for collateral than large enterprises are still a cause for concern for SMEs.

Despite higher flexibility offered by smaller size of the enterprise, there are also negative aspects connected with its size. SMEs are more often than large enterprises faced with problems in financing, especially new investments. They are faced with larger interest rates and narrower options for funding than large companies (Bartlett and Bukvič, 2001). One of the main reasons is smaller capital that creditors do not find adequate insurance in the case of default.

In conditions of asymmetric information, creditors besides cash flow assessment also consider collaterals as a mean of protecting its receivables. Asymmetric information indicates a situation in which one side (creditor) does not know all it needs to know on the other side (SME) to decide properly (Mishkin, 1990). If asymmetric information occurs before the transaction, negative selection occurs, that is a situation where potential borrowers that have the highest chance to achieve bad results, are selected for a loan.

If asymmetric information occurs after the loan has been approved, moral hazard occurs. Moral hazard appears after the loan has been approved to the borrower and the creditor is exposed to risk (hazard) that the borrower will take action that are undesirable but can lead to loan default. The problem of moral hazard arises from asymmetric information. The lack of information that the creditor has on the borrower's activities can lead to borrower's behaviour that can be defined as moral hazard. Preventing moral hazard is often too expensive for the creditor.

Mishkin (1990), points to the fact that using quality collateral can help in resolving asymmetric information problem. Quality collateral reduces the affects of negative selection and moral hazard because it reduces the creditors losses in case of loan default. SMEs here face large issues because they often do not have enough quality collateral for the planned loan.

In such cases, especially in times of crisis as this one, state intervention is one of the possible solutions for efficiently resolving this issue of access to finance.

3. Role of HBOR, HAMAG BICRO and the EIF in access to finance for SMEs

3.1. HBOR

Croatian Bank for Reconstruction and Development (HBOR) is the development and export bank established with the objective of financing the reconstruction and development of the Croatian economy. HBOR was founded and is owned by the Republic of Croatia. One of its main activities is supporting the development of SMEs, even though HBOR also finances large companies. This is achieved through a set of instruments, that include loans, guarantees, equity, insurance policies. Activities are performed through its own programs but also through mandate products.

Quickly after the COVID-19 pandemic started in Croatia, in April 2020. HBOR started applying measures to alleviate the status of SMEs that have HBOR-s loans through rescheduling of existing loan obligations by introducing a grace period in the repayment of loan principal. Rescheduling of obligations was agreed with each client individually in accordance with the client's repayment potential. HBOR also made it possible for its clients who have been granted a direct loan to make use of a moratorium in duration of 7 to up to 16 months. After these measures HBOR introduced numerous working capital measures where the interest rate could be even 0 percent in some cases, as well as several insurance policies and guarantee products for specially affected industries.

In regard with EU funded crisis measures, HBOR introduced the EU funded working capital for rural development loans where eligible borrowers are farmers and entities doing business in the agricultural products processing industry as well as entities doing business in the forestry industry. HBOR also introduced working capital loans with the backing of EU funded HAMAG BICRO guarantees as well as working capital and investment loans backed with an EIF guarantee.

HBOR-s existing investment loans were fully operational and remain a strong policy instrument for the future economic recovery. HBOR also plans to play a strong role in the economic recovery through numerous existing ESIF financial instruments and upcoming initiatives.

3.2. HAMAG BICRO

Croatian Agency for SMEs, Innovations and Investments (HAMAG-BICRO) was founded with the aim of supporting the development of SMEs, improving the innovation process and encouraging investments, and as such it is entirely focused on SMEs. HAMAG BICRO has numerous business activities but issuing micro and small loans and especially guarantees that are being issued since 1994 are its core activities.

As the COVID-19 pandemic started, HAMAG BICRO was well equipped to help SMEs through existing loan and guarantee products financed from EU funds. Moratoriums on existing loans were given and funding for existing programs, especially those for working capital were boosted. HAMAG BICRO also implemented the new COVID-19 loan for SMEs intended for working capital, that was also financed from EU funds.

This enabled HAMAG BICRO to be a strong support mechanism for SMEs in these crisis times. By June 30th 2021. HAMAG BICRO supported 7867 SMEs with 2.9 billion HRK of funding through all programs intended for COVID-19 support (loans and guarantees)

3.3. The EIF

The European investment fund (EIF) is a provider of risk finance to benefit SMEs across Europe and is a part of the European investment bank (EIB) group (EIF 2021). It is owned by the European Investment Bank (EIB) and the European Union, represented by the European Commission as its two main shareholders, and a wide range of public and private banks and financial institutions. HBOR is a shareholder of the EIF.

The EIF designs financial instruments that absorb some of the risk that banks, guarantee institutions, microfinance lenders and funds take when they finance small businesses. This encourages banks to lend, funds to invest and private investment to crowd in, to create a sustainable financing ecosystem for Europe's SMEs.

In response to the COVID-19 crisis, the EIF has launched a series of new initiatives and adapted existing ones in order to generate as much support as possible in the form of better access to finance for European SMEs and mid-caps. These COVID-19 response measures generated financing opportunities for more than 370,000 SMEs (EIF 2021). The support was mainly given through credit guarantees and equity products. For both business lines, debt (credit guarantees) and equity, demand has sharply increased and - due to the magnitude of the economic shock.

The EIF will also play a fundamental role in implementing debt and equity instruments that the European Commission plans for the future period and will especially be focused on green and digital investments to help restructure the European economy in the recovery period that follows.

4. Does state intervention work – path to economic recovery

4.1. Effectiveness of guarantee systems in supporting SMEs

It is evident by the nature of the crisis that unprecedented economic damage resulted from the lockdown measures. We can also argue that the liquidity measures that were quickly implemented in Europe and Croatia were needed and were timely offered. The real question is weather state intervention can efficiently address the economic recovery needs that follow.

This question is tested by analysing the effectiveness of state issued credit guarantees for SMEs that should help in ensuring access to finance in the following period. Since it is impossible to test this question on this current period, we take in consideration SMEs that received state support in the last economic crisis and test the effectiveness of credit guarantees for SME loans as a state intervention measure.

Numerous scientific studies are related to an attempt to evaluate the effectiveness of credit guarantee schemes. Numerous authors have dealt with the issue of credit guarantees as instruments of state intervention. It is possible to single out Stigliz and Weiss (1981); Stulz and Johnson (1985); Vogel and Adams (1997); Holden (1997); Levitsky (1997); Uesugi, Sakai and Yamashiro (2010); Lelarge et al. (2008); Arping et al. (2010).

When entrepreneurs seek funding for their long-term investments, creditors are faced with asymmetric information, i.e. they do not know everything they need to know about other party in order to make the right decisions. Ex-ante asymmetric information between creditors and entrepreneurs, along with the agency's problems related to the proper use of external assets, often lead to well-known phenomenon of credit rationing or restricting access to credit with an increase of interest rates for small businesses (Stiglitz and Weiss, 1981). For these reasons creditors often refuse requests for credit, or credit under unfavourable interest rates, achieving negative selection, and after the transaction also moral hazard due to the cost of controlling small businesses.

Besanko and Thakor (1987) suggest that credit guarantees may reduce moral hazard and the likelihood of bankruptcy. Honohan (2010) agrees that guarantees can help in certain circumstances where the market cannot find an impetus for investment due to the imperfect efficiency. He believes that with an increase in the availability of credit, guarantees must help the achievement of the overall prosperity of the economy. He believes that prosperity can come from three sources: from the reduction of negative selection that is associated with market failures, from helping less wealthy through the availability of collateral and from encouraging the SME sector that is not sufficiently funded because of high transaction costs and problems in evaluating such requests.

Stulz and Johnson (1985) in their model confirm the thesis that banks are more willing to finance projects with better and bigger collateral or other insurance. Vogel and Adams (1997) argue that despite numerous positive effects given by guarantee systems, it is still impossible to reach cogent conclusions about the effectiveness of this instrument, and find it necessary to conduct more research on numerous guaranty systems in the world. Holden (1997) and Levitsky (1997) find that credit guarantees may open opportunities for financing SMEs if certain assumptions are met. Uesugi et al. (2010) discussed the Japanese special program for credit guarantees to SMEs. The results showed that the system had a positive impact on the Japanese economy by encouraging investments. The results were challenged because they tested only successful companies.

Lelarge et al. (2008) show the evidence indicating that the guarantees helped the young French companies in finding funding. In their paper, the authors conducted an experiment to prove causal assessment of the effectiveness of the French program for credit guarantees. The results of their research suggest that the program has significantly influenced the development of the newly created companies. Companies that have been targeted with the program have collected more money, paid lower interest rates and achieved higher growth in comparison with similar enterprises outside the program.

Gudger (1998) conveys the opinions of several authors who believe that good collateral can, in certain circumstances, reduce the effects of negative selection and moral hazard because it reduces the creditor losses in the case of defaults. Proponents of guarantee funds often refer to the fact that creditors have difficulties when issuing credits due to lack of collateral and state that government guarantees could be used as substitute collateral. Gudger narrates that such collateral is considered superior to physical collateral that SMEs often cannot provide in sufficient quantities to ensure a credit approval.

Arping et al. (2010) have shown in theory that partial credit guarantees are an effective and less costly instrument than grants, if they are designed properly. Benavente et al. (2006) tried to prove that the guarantee system in Chile helped to increase access to credit for businesses. The goal of facilitating access to credit for Chilean entrepreneurs has been achieved. It has been proven that companies that use guarantees have a 14% greater chance of getting credit funds.

In that sense, Bannock and Partners (1997) and Green (2003) argue that credit guarantees can help to include those businesses with a lack of collateral in the portfolio of projects that banks want to fund. In this way credit guarantees can contribute in achieving financial and economic benefits (added value). However, one of the main Grahams objections is that guarantees encourage moral hazard and weaken moral behavior in the credit market. Motivation and commitment of borrowers to repay the credit may be reduced if they know that the guarantee fund, often a government one, will perform this obligation for them. Second level of moral hazard may appear, in which the bank weakens its supervision of such credits if the majority of the credits is covered by the guarantee. Such hazard may be averted with the proper design of the guarantee scheme, so that entrepreneurs are aware that their obligations must be respected, and by reducing the percentage of the guarantee to the bank, so that it also participates in the project risks.

Zechini and Ventura (2006) conducted a research whether the Italian government-funded guarantee fund for SMEs was an effective instrument in the effort of overcoming the main obstacles faced by small businesses in accessing credit markets. Their research showed that the fund has a limited positive impact on reducing barriers to borrowing for SMEs, and to a certain extent reduces the cost of borrowing. Furthermore, Rhyne (1988) states that the purpose of the guarantee institutions is not to correct market failures, but it should, as Keynesian device, stimulate growth through lending to small and medium-sized enterprises in an economy where resources are not fully used. The functionality test in this case would be that the companies that have

received a guarantee grew faster than those who did not.

In contrast to these studies that mostly view the constitution of guarantee funds from a positive perspective, there are some studies where authors, taught by practical experience of guarantee funds that were closed due to high costs, state that a guarantee is not an effective instrument (see for example Vogel and Adams, 1997 or Bannock and Partners, 1997). They often mention that the effects are not worth the effort. If the credit market is not sufficiently developed, guarantees will not be able to achieve the effect on additional lending. If the guarantee fund fails to properly evaluate the issuing price of its guarantees, the risks will eventually result in losses that will erode the guarantee capital. Guarantee funds often repeat the same credit analysis done by banks, thus slowing down the process, or in practice give guarantees with the same model of risk assessment. Ultimately, an opportunistic behaviour of creditors is more likely because they now have the collateral provided by the third party and are more prone to engage in risky projects.

No consensus has been reached on whether government intervention in the field of credit guarantees is reasonable and effective. Previous studies have provided quality theoretical framework for the subject of credit guarantees, but the space for research of the impact of such schemes in practice remains open. Quantitative analyses in this area are particularly significant because they are not frequently used.

4.2. Model and testing

The established lack of consensus on whether government intervention in the field of credit guarantees is reasonable and effective, creates the need for the research of the effectiveness of the guarantee system in Croatia. The aim of the research is to find quantitative evidence of the positive impact of obtaining credit guarantees on the degree of financial leverage of companies that have received a guarantee versus a group of companies that have not used a guarantee.

Tests will be conducted on the financial data from a group of SMEs that have received a guarantee from the guarantee system, and group of companies that have not used a guarantee and could have. Financial data for both groups of companies were obtained from the database of the Financial Agency (FINA) and the database Croatian Business. Information on companies that have received a guarantee in 2007. was received from the members of the guarantee system in the Croatia (predominately HAMAG BICRO, 99% of the test sample).

The group of companies that have used a guarantee is made up of 57 companies that have received a guarantee in 2007 and have financial reports. Another group of companies that have not received a guarantee and could have applied in accordance with their size and sector, consists of 150 companies from the sectors of manufacturing industry, agriculture and fisheries, hotels and restaurants, commerce and health and are a representative sample. The sectors were selected in accordance with

the standards of eligibility of guarantee programs and by shares of issued guarantees by the guarantee system in individual sectors in 2007. Information about companies that have not received a guarantee and are used for comparison in this analysis was obtained from FINA, on demand.

We formulate the following econometric model to test the indebtedness of companies that have and have not received a guarantee by observing the status of the companies in 2007 and 2012.

$$\ln \mathbf{y}_t = \alpha + \beta_1 \ln \mathbf{x}_{1t} + \beta_2 \ln \mathbf{x}_{2t} + \beta_3 \ln \mathbf{x}_{3t} + e_t$$

log od Y - depended variable in time t, indebtedness coefficient which is obtained by dividing total liabilities and total assets.

α - constant

$\beta_1 \mathbf{x}_{1t}$ - log of – logarithm of profit after tax (N)

$\beta_2 \mathbf{x}_{2t}$ - log of – logarithm of total assets (U)

$\beta_3 \mathbf{x}_{3t}$ - log of – logarithm of long term obligations (O)

e_t - (residuals)

Logarithm model is selected because of the nature of the data. Since SMEs consist of micro, small and medium sized companies, the selected variables considerably vary in amounts. The model tests the impact of the guarantee on using financial leverage, i.e., increase of debt financing of the group of SMEs that have used a guarantee vs those that did not. Model measures the dependent variable in the form of indebtedness coefficient as a recognised indicator of company's indebtedness. This proxy can be satisfactory for SMEs because their total obligations are usually long term, and usually exclusively loans. SMEs that have limitations to getting a loan should have a lower coefficient. SMEs that have received more loans should have a higher coefficient. The regressors are three independent variables that are important indicators to a bank on the health of a company. The rise of these indicators indicates a more successful business, or in the case of a rise of long term obligations, higher success in obtaining sources of finance for their investments.

Figure 1: Results of the regression on companies that have used a guarantee in 2007

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.658356	0.146669	31.76108	0.0000
LOG(N)	-0.029954	0.008350	-3.587314	0.0007
LOG(U)	0.071017	0.026013	2.730084	0.0086
LOG(O)	-0.022822	0.025336	-0.900775	0.3718

R-squared	0.356200	Mean dependent var	5.193173
Adjusted R-squared	0.319758	S.D. dependent var	0.347446
S.E. of regression	0.286562	Akaike info criterion	0.405869
Sum squared resid	4.352246	Schwarz criterion	0.549241
Log likelihood	-7.567258	F-statistic	9.774567
Durbin-Watson stat	2.298205	Prob(F-statistic)	0.000031

Source: Author's calculation in E-views programme.

Figure 2: Results of the regression in 2012 on companies that have used a guarantee.

Dependent Variable: LOG(Y)
Method: Least Squares
Date: 05/16/14 Time: 21:40
Sample: 1 57
Included observations: 57

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.465755	0.056041	79.68789	0.0000
LOG(N)	-0.004746	0.004757	-0.997709	0.3230
LOG(U)	0.024557	0.006306	3.894045	0.0003
LOG(O)	0.015645	0.004428	3.533365	0.0009

R-squared	0.733895	Mean dependent var	5.065087
Adjusted R-squared	0.718833	S.D. dependent var	0.247814
S.E. of regression	0.131404	Akaike info criterion	-1.153494
Sum squared resid	0.915147	Schwarz criterion	-1.010122
Log likelihood	36.87457	F-statistic	48.72323
Durbin-Watson stat	2.020570	Prob(F-statistic)	0.000000

Source: Author's calculation in E-views programme.

Figure 2 shows that there is a statistically significant impact of both independent variables important for the indebtedness coefficient (total assets and long term obligations). Both variables show that that their growth causes also the growth of the indebtedness coefficient. Such situation leads to a conclusion that SMEs that have used a guarantee are enlarging their assets and are financing it more from long term obligations.

Figure 3: Results of the regression on companies that have not used a guarantee in 2007

Dependent Variable: LOG(Y)
Method: Least Squares
Date: 05/18/14 Time: 14:35
Sample: 1 150
Included observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.396076	0.190323	28.35224	0.0000
LOG(N)	-0.004972	0.003233	-1.537729	0.1263
LOG(U)	-0.020188	0.011102	-1.818378	0.0711
LOG(O)	0.011532	0.003115	3.701983	0.0003

R-squared	0.086141	Mean dependent var	5.093726
Adjusted R-squared	0.067363	S.D. dependent var	0.194879
S.E. of regression	0.188200	Akaike info criterion	-0.476313
Sum squared resid	5.171235	Schwarz criterion	-0.396030
Log likelihood	39.72351	F-statistic	4.587334
Durbin-Watson stat	1.780538	Prob(F-statistic)	0.004231

Source: Author's calculation in E-views programme.

Figure 4: Results of the regression in 2012 on companies that have not used a guarantee.

Dependent Variable: LOG(Y)
Method: Least Squares
Date: 05/18/14 Time: 20:18
Sample: 1 150
Included observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.533851	0.143968	38.43802	0.0000
LOG(N)	-0.010113	0.004017	-2.517790	0.0129
LOG(U)	-0.020877	0.008878	-2.351430	0.0200
LOG(O)	0.008400	0.003306	2.540520	0.0121

R-squared	0.107179	Mean dependent var	5.154816
Adjusted R-squared	0.088833	S.D. dependent var	0.247664
S.E. of regression	0.236407	Akaike info criterion	-0.020215
Sum squared resid	8.159722	Schwarz criterion	0.060069
Log likelihood	5.516117	F-statistic	5.842180
Durbin-Watson stat	1.878978	Prob(F-statistic)	0.000851

Source: Author's calculation in E-views programme.

Figure 4 shows that companies that have not used a guarantee have a smaller impact of long-term obligations on the growth of the indebtedness coefficient and are subsequently acquiring less assets. This is also a logic indicator that they are using more short-term financing of their assets which is more expensive and less efficient.

5. Conclusion

The purpose of this paper was to answer how financial instruments, especially those funded from EU funds and offered by the three following institutions: HBOR, HAMAG BICRO and the EIF to SMEs in Croatia were used to address the COVID-19 crisis that emerged early in 2020. and brought significant economic impact to the EU and Croatian economy. Second aim was to analyse how efficient state intervention can be in the recovery period that follows.

These three institutions reacted quickly and offered financial instruments primarily addressed in resolving liquidity problems (working capital loans), with significant amounts of available funding. Weather these measures will bring economic results is a topic that remains and will be investigated in due time when relevant date becomes available and significant time passes for serious analysis.

Second aim of the paper was approached by formulating a model that can be used in due time to analyse investment measures that these three institutions are offering besides the working capital measures. The model was tested on data from 2007 until 2012 in order to answer the question weather state intervention measures can help address access to finance problems SMEs face and especially in times of crisis.

Tested model shows that SMEs that used state credit guarantees in 2007 in order to get investment loans use financial leverage more than the other test group that did not use guarantees and finance their business more from long term obligations which is more efficient compared to the other test group. The model can be further upgraded by analysing other economic indicators like profitability, but this test is also sufficient to indicate that state intervention in the SME market was efficient in the last crisis and can be again.

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Appendix

Table 1: Structure of public revenues of OECD countries

	Tax revenues as a percentage of GDP		Share in total tax revenues in 2016						
	2016	2000	Income tax	Profit tax	Social security contributions	Property taxes	VAT	Other consumption taxes	All other taxes
Australia	27.8	30.5	40.8	16.5	0.0	10.8	12.9	14.2	4.9
Austria	42.2	42.3	21.6	5.6	34.7	1.3	18.3	10.0	8.5
Belgium	44.1	43.5	27.7	7.8	31.1	8.0	15.4	9.1	0.9
Canada	32.7	34.8	36.3	10.5	14.9	12.0	13.5	9.7	3.2
Chile	20.2	18.8	8.8	20.9	7.2	5.1	41.2	13.4	3.5
Czech Republic	34.2	32.4	11.2	11.0	42.9	1.4	21.7	11.3	0.5
Denmark	46.2	46.9	53.5	5.8	0.1	4.0	20.4	11.6	4.5
Estonia	33.7	31.1	17.2	5.0	33.2	0.8	27.0	16.3	0.5
Finland	44.0	45.8	29.6	5.0	29.1	3.2	20.7	12.1	0.3
France	45.5	43.4	18.8	4.5	36.8	9.4	15.2	9.2	6.2
Germany	37.4	36.2	26.6	5.2	37.6	2.8	18.5	8.6	0.6
Greece	38.8	33.4	15.2	6.5	28.5	8.1	21.2	18.4	2.1
Hungary	39.2	38.5	13.3	6.0	33.2	2.8	23.7	18.6	2.3
Iceland	51.6	36.3	26.7	4.9	6.7	34.2	16.2	7.1	4.1
Ireland	23.3	30.8	31.6	11.5	16.8	6.0	20.1	12.6	1.4
Israel	31.3	34.9	19.8	9.9	16.6	10.3	24.1	13.7	5.6
Italy	42.6	40.6	25.8	5.0	30.1	6.6	14.4	13.8	4.4
Japan	30.6	25.8	18.6	12.0	40.4	8.3	13.3	7.1	0.3
Korea	26.2	21.5	17.6	13.6	26.2	11.6	15.8	12.3	2.9
Latvia	30.4	29.1	21.0	5.6	27.3	3.5	26.8	15.1	0.7
Lithuania	29.8	30.8	13.4	5.4	40.8	1.1	26.2	12.2	0.8
Luxembourg	38.1	36.9	24.7	12.2	28.5	9.3	16.7	8.5	0.3
Mexico	16.6	11.5	20.4	21.0	13.0	1.9	23.7	15.1	5.0

Netherlands	38.4	36.9	18.5	8.7	38.2	4.0	17.6	11.9	1.1
New Zealand	31.6	32.5	36.8	15.5	0.0	6.1	29.8	8.5	3.2
Norway	38.7	41.9	27.6	10.4	27.4	3.3	22.3	9.1	0.0
Poland	33.4	32.9	14.5	5.5	38.1	4.1	21.1	15.3	1.4
Portugal	34.3	31.1	19.8	8.9	26.6	3.7	24.8	14.8	1.4
Slovakia	32.4	33.6	10.2	10.8	43.5	1.3	20.6	12.4	1.2
Slovenia	36.5	36.6	14.4	4.4	39.7	1.7	22.5	16.8	0.5
Spain	33.2	33.2	21.4	6.8	34.2	7.7	19.1	10.3	0.5
Sweden	44.0	49.0	29.8	6.2	22.6	2.4	20.9	7.2	10.9
Switzerland	27.8	27.6	31.0	11.3	24.3	7.3	12.2	9.2	4.7
Turkey	25.3	23.6	14.6	6.5	28.8	4.8	19.8	23.8	1.6
Great Britain	32.7	32.9	27.4	8.3	18.9	12.6	20.8	11.5	0.5
USA	25.9	28.2	40.3	7.6	24.0	11.1	0.0	16.9	0.0
OECD	34.0	33.8	23.8	9.0	26.2	5.7	20.2	12.5	2.6

Source: OECD, 2018

CHAPTER 23

Effectiveness of traditional going concern forecasting models based on financial indicators in Croatian economy

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Abstract

The aim of this research is to examine the effectiveness of the going concern forecasting models based on quantitative financial indicators and traditional statistical methods which are mostly used in creditworthiness practice in Croatia and recently going concern prediction. The going concern concept is the basic prerequisite for company's business activities and its forecasting is essential for large number of stakeholders participating in company's value chain. The key success factor in going concern forecasting is the selection of the most appropriate model that can accurately generate efficient going concern prediction. The going concern prediction is mostly connected to audit engagements and corporate finance and in the last 35 years, become one of the global key economics research topics. Accordingly, the purpose of this research was to critically examine the effectiveness of traditional going concern forecasting models based only on quantitative financial indicators in Croatian economy. Traditional models were selected according to their regularity in the literature, application and degree of prediction accuracy, namely: Altman model (Z'-score indicator from 1983), Zmijewski model and Ohlson model. Empirical research and efficiency analysis performed on the selected three statistical models were conducted on the data sample from companies operating in Croatian economy. Efficiency was analysed on the sample of 1,796 companies distributed in two groups: medium and large company, from 2013 to 2018. Using statistical methods, the analysis was performed on two dimensions: the selected sample of companies examined the effectiveness of the model in the classification of companies

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to successful and unsuccessful, and the accuracy of the model in identifying the occurrence of business disruption in companies. The research confirmed that "Altman's Z'-score model, Zmijewski model and Ohlson model, based on quantitative financial indicators, are effective in predicting the company's going concern in the current macroeconomic conditions in Croatia. These conditions allowed companies to continue with operation despite their poor performance. Research also confirmed that there is a difference in the prediction performance of these three models in the Croatian economy, as well as in different industries.

Key words: *forecasting models, going concern, effectiveness*

JEL classification: *G3*

1. Introduction

The going concern concept is the basic prerequisite for company's business activities and its forecasting is essential for the entire business community as well as for the large number of stakeholders participating in company's value chain. The key success factor in going concern forecasting is the selection of the most appropriate model that can factually and accurately generate efficient going concern prediction, thus enabling the key decision makers to make the right decision. The going concern prediction is mostly connected to audit engagements, but in time of fast changes in global economic environment and corporate finance, going concern prediction has become one of the global key economics research topics.

Since the middle of the 70th century, i.e. since the beginning of Altman's pioneering work (1968), numerous models of business forecasting have been developed and to this day they are one of the main topics in corporate finance. In the last 35 years, the topic of going concern forecasting has grown into one of the main topics in corporate finance. A large number of academic researchers have been engaged in and is still engaged in the development of going concern forecasting models (Balcaen and Ooghe, 2006, give an overview of the world's most important authors and models in the last 35 years) based on various statistical methods and assessments, prerequisites and computational complexity that could help all interested groups assess the going concern of a particular company. Various statistical and mathematical models are being developed to assess the financial crisis and business continuity, especially after the financial crisis (end of 2007 and 2008) more demanding business control conditions have been introduced due to the fact that global market business risks are more difficult to identify. Therefore, their impact on business continuity is more uncertain. The great financial crisis of the 21st century has resulted in many companies going bankrupt, and according to global research, many factors have contributed to the financial crisis, such as poor governance and fraud, inadequate capital, poor legislation (Samkin et al., 2012), and lack of knowledge of financial managers, poor capital management, poor debt management, inadequate preparation from sudden adverse events, problematic operational discipline in the financial market (Chen and Du, 2009). Some authors consider that bankruptcy models are mainly needed by financial institutions like banks (Hafiz at al., 2015) because of potential risks and their elimination on time. Recently, due to the accelerated development of information technology, various techniques such as Artificial Neural Networks (ANNs) or Support Vector Machine (SVM) are increasingly used in predictions. Their main advantages are the ability to generalize and to learn (Sayadi et al., 2014).

The constant relevance of this topic is visible, not only through the efforts of scientists to optimize statistical methods through models that combine various variables to define forecasting models and then combining these various variables, but it has also become a consulting activity. The significance of this topic is also supported by legal provisions which require the assessment of business continuity as a part of business risk management being a fundamental obligation of the Company's Management Board or as part of the

initiation of financial or operational restructuring. To cover the risks of financial institutions, the Basel standards were introduced, which made credit scoring models mandatory, which encourages the development of going concern forecasting models. Identification of companies' going concern is of great importance for the assessment of creditworthiness by the company itself, but also by financial institutions related to the company, business partners and other directly related stakeholders, but also for all budget users and the entire real and public sector. In this context, the prognostic capabilities of developed models are constantly reviewed with the aim to find and propose more efficient models by continuously adding new variables to the models, according to the requirements of the environment.

The research problem of this paper was to critically examine the effectiveness of the going concern forecasting models based on quantitative financial indicators in the Croatian economy and calculating the risk of business operations of companies based on financial indicators. Selection of the models for the analysis was based on their frequency in the literature, application and degree of forecasting accuracy, namely: Altman model (Z'-score indicator from 1983), Zmijewski model and Ohlson model. The efficiency analysis was conducted on Croatian companies in macroeconomic conditions in the last 6 years (from 2013 to 2018), after the financial crisis, with the aim of detecting and assessing their effectiveness in timely recognition of company's going concern and possible start of the restructuring process. This research examined the effectiveness of the model in classifying companies as successful and unsuccessful, and the accuracy of the model in identifying the occurrence of business disturbances in companies. A common feature of these three models is that they all use financial indicators that measure liquidity, indebtedness, and profitability. Altman et al. (2017) confirmed that the most important financial ratios came from the solvency category, with profitability ratios also being important. The difference between the models is reflected in different parameters and statistical techniques for predicting business continuity (multivariate discriminant analysis, probit and logit statistical methods).

The subject of the research arises from the research problem, which is the evaluation of the success of traditional statistical models, Altman's Z'-score model, Zmijewski model and Ohlson model, in forecasting companies' going concern in transition macroeconomic conditions, on a sample of Croatian companies.

Despite criticisms of these models, numerous studies to date have not unanimously proven that, in all economic conditions, they are less effective than models based on increasingly popular artificial neural networks or theoretical models, or models that use market data in addition to accounting data (Ashraf et al. 2019; Wu et al., 2010; Boritz et al., 2007; Shumway, 2001; Trigueiros and Taffler, 1996), but their effectiveness depends on the characteristics of a specific market, economic structure and business conditions.

From the theoretical base and empirical research, two hypotheses were to be confirmed or rejected in this paper:

H1: “Altman’s Z-score model, Zmijewski model and Ohlson model, based on quantitative financial indicators, are effective in companies’ going concern forecasting in the current macroeconomic conditions in Croatia, which allow companies to continue to operate despite their poor results.”

H2: “There is a difference in the forecasting efficiency between Altman’s Z-score model, Zmijewski model and Ohlson model when applied on companies in the Croatian economy”.

2. Literature review and the importance of the research issue

Studies of individual authors show that statistical models for bankruptcy prediction in most cases show a greater efficiency in differentiating among companies that are actively operating and companies that will end up in bankruptcy in comparison to auditor’s assessment (without the use of models) on the company’s going concern (Kuruppu et al., 2003).

Out of all traditional models based on accounting indicators, the most cited models are Altman (1968/1983), Ohlson (1980) and Zmijewski (1984) (Salimi, 2015; Kumar and Kumar, 2012; Grice and Ingram, 2001; *Bârbutâ Misu and Mara Madaleno, 2020). This is the main reason for the selection of these three models for detailed analysis and research conduction. A significant number of authors have been and continue to be engaged in research (Lawrence et al*., 2015; Branson and Alareemi, 2013; Wu et al., 2010; Agarwal and Taffler, 2008; Grice and Dugan, 2003; Kuruppu et al., 2003; Grice and Ingram, 2001; Boritz et al., 2007; Begley et al., 1996; Shumway, 2001 and others) of Altman, Ohlson and Zmijewski models, analysing models’ effectiveness in modern times and their bankruptcy prediction in the longer period. They are also examining whether the models are useful in other business results’ assessment besides bankruptcy. Empirical results confirm the effectiveness of these models, although their accuracy has been reduced in the recent business environment. If original statistics rates are used, the accuracy rates for the models of Altman (1968), Ohlson (1980), Zmijewski (1984) are respectively 80.6%, 93.8%, 95.3% (Avenhuis, 2013).

Almost all statistical prediction models in use today are variations of the same concept. Models are usually divided into two general categories depending on the type of variables used, i.e. static (Altman, Ohlson, Zmijewski, Theodossiou, Taffler) and dynamic models (Shumway, Hillegeist). Static models include a combination of various quantified financial indicators presenting company’s performance with a smaller number of additional variables supporting individual qualitative elements of the company’s credit process or business. A common feature of the Altman, Ohlson and Zmijewski models is the use of accounting indicators, which evaluate company’s liquidity, indebtedness, and profitability performance, in forecasting company’s going concern. The difference between these three models is in the number of accounting indicators used and the statistical techniques applied in defining the models for forecasting company’s going concern.

2.1. Altman model (1968/1983)

Edward Altman's pioneering work has confirmed the possibility of discriminating signs of financial disruption in companies by using and combining different financial indicators. In 1968, E. Altman defined his first statistical scoring model for financial failure prediction. He was the first author to apply multivariate discriminant analysis (MDA) in the definition of model's indicator set and business distress analysis, which had been mainly used in biology and psychology until then (Lacher et al., 1995). Following Altman's research, MDA has been used since 1968 as the primary statistical method in identifying business distress in various industries. MDA is a technique that allows researchers to simultaneously examine and define differences between two or more mutually exclusive groups in relation to several variables, ie it classifies an observation into one of several a priori groups depending on the individual characteristics of the observation.

The research conducted by E. Altman was conducted on a sample of 33 manufacturing companies in bankruptcy (or those that went bankrupt in the period from 1946 to 1965) and 33 manufacturing financially successful companies (those that were actively operating one year after the data collection, in the same period from 1946 to 1965). Altman has matched the companies according to the assets size and the industry in which they operate. He used a cross-validation approach to check the function, i.e. a modeling sample (function estimation) and a validation sample to check the effectiveness of the estimated function. Extremely small (below $ 0.7 m in asset value) and extremely large (more than $ 25.9 m) assets were excluded from the sample. The research result was a definition of five indicators (out of the initial 22) that best discriminate performing companies from those facing bankruptcy, and their combination results in a measure, Z score, credit risk score.

The discriminant function is:

Z score =1.21X1+1.42X2+3.3X3+0.6X4+0.999X5

with the following definitions:

X1 = working capital / total assets

X2 = retained earnings / total assets

X3 = earnings before interest and tax / total assets

X4 = market value of equity / total liabilities

X5 = sales / total assets

Using discriminant coefficients values, it is possible to calculate the value of the total index, the Z score. Altman concluded that Z score of 2.675 strongly discriminates companies in bankruptcy or financial distress from those that are generally "healthy" and successfully performing. The Z score is based on the minimum value of Type 1 and Type 2 Errors (Type 1 Error is defined as the number of companies performing negatively, and incorrectly classified as companies performing positively in relation to the total number

of companies in the sample, and Type 2 Error is defined as the number of companies performing positively and incorrectly classified as companies performing negatively in relation to the total number of companies in the sample). If a company has a Z score above 2.675, the company is classified as financially stable and below 2.675 as a company that has initiated bankruptcy proceedings. Altman confirmed a 95% success rate in the correct classification one year before the bankruptcy, and an 82% success rate the two years before the bankruptcy.

In 1983, Altman revised the original 1968 (Altman, 2000, Altman, 2002) model with the aim to define indicator for private companies, replacing the market value with the book value of equity when calculating X4. That resulted in Z'score model:

Z' score =0,717X1 + 0,847X2 + 3,107X3 + 0,420X4 + 0,998X5

The lower value of Z 'score = 1.23, companies below this value are considered unsuccessful, and the upper value Z' score = 2.90 represents the limit above which the company is considered as successful.

The success rate of the revised Z 'score of the unperforming companies was 91% and the correct classification of the successful 97%. This revised Z 'score model will be the subject of this paper empirical research as it allows the inclusion of private companies in the research sample.

The main critiques of the Altman model relate to the following issues:

- The use of the MDA statistical method and any data distribution constraints required by that method, e.g. variance matrices and covariance of variables must be the same for both groups,
- The original parameters are defined based on a small and evenly distributed sample which does not ensure representativeness of the whole population,
- Authors Grice and Dugan (2003) consider that the sample on which the efficiency of the model was validated is biased because it consists of companies from the same industries as the main sample,
- The authors Wu, Gaunt, Gray (2010), Grice and Ingram (2001) believe that the degree of efficiency of Altman in recent times and new macroeconomic conditions is significantly lower than other static models (Ohlson, Zmijewski, Shumway).

2.2. Ohlson model (1980)

James A. Ohlson developed a model based on the logit statistical method in 1980 and attempted to move away from techniques that had been commonly used in that time for bankruptcy prediction. Ohlson argued that using logit analysis eliminates all deficiencies of the MDA method and that his model is simple and usable in variable business conditions (Ohlson, 1980). The logit function is suitable for predicting corporate bankruptcy since the dependent variable can have only two categories (bankruptcy or non-bankruptcy). The

logit function pairs a value with a probability ranging from 0 to 1, and in the Ohlson model the limit was 0.38 since that limit had the lowest value of Type 1 and 2 Errors.

Ohlson conducted a research in the period from 1970 to 1976 on a sample of 2,163 companies (105 companies under bankruptcy proceedings and 2,058 positively performing), and the characteristics of his sample were the following:

- The period from 1970 to 1976 was observed,
- The company in the sample had to have securities issued on the stock exchange or OTC market,
- The company in the sample was to be classified as industrial and manufacturing.

The research included data collection from the financial statements for the period of three years before the initiation of bankruptcy proceedings over the companies in the sample.

Ohlson considers as the main determinants of bankruptcy forecasting: size, financial structure measured by indebtedness, business performance indicators that include the ratio of net profit to total assets and / or cash flow ratio from operating activities and a total of six dummy variables (used in cases when they want to emphasize the presence or absence of certain characteristics in the function), liabilities and finally liquidity indicators (share of working capital in total assets or the same indicator combined with the ratio of short-term liabilities and current assets) (Zenzerović and Peruško, 2006). He found a negative correlation between the probability of bankruptcy and the size, profitability and company liquidity, and a positive correlation between the bankruptcy probability and the company indebtedness.

The final logit function with variables and estimated coefficients was as follows:

Ohlson = – 1,3 – 0,4X1 + 6,0X2 – 1,4X3 + 0,8X4 – 2,4X5 – 1,8X6 + 0,3X7 – 1,7X8 – 0,5X9

Probability of default = P(B) = 1/(1+e-z)

This formula is the logistic regression used in the research, and the result P (B) > 0.5 indicates a company at risk, and P (B) < 0.5 a performing company not at bankruptcy risk.

Explanations of all variables are shown below:

X1= value measured by the logarithm of the total asset ratio and GDP price level index

Adjusted value where Ohlson measures the size of the asset adjusted for inflation using the GDP deflator. Smaller companies have a higher risk of negative business development.

GDP price level index = (Nominal GDP / Real GDP)*100

Nominal gross domestic product is an indicator expressed in current prices, and real gross domestic product is an indicator expressed in constant prices.

X2 = total liabilities / total assets (balance on the day)

X3 = working capital / total assets (balance on the day)

X4= current liabilities / current assets

X5 = dummy variable 0 or 1 (1 = if total liabilities are greater than total assets, 0 = vice versa)

X6 = net profit / total assets (balance on the day)

X7 = cash flow from operating activities / total liabilities

X8 = dummy variable 0 or 1 (1 = if net profit has been negative over the last two years, 0 = vice versa)

X9 = (NIt – NIt-1) / (|NIt| + |NIt-1|), NIt as net profit in the last evaluation period

This variable is designed to consider potential progressive losses over the last two years.

Ohlson acknowledged that the disadvantage of his model is in the fact that the model does not consider the market value of the company or transactions in the company's securities. He also recommended further research that would increase the accuracy and efficiency of his model, as the results were still weaker than Altman's Z'-score model, by adding additional variables. One of the shortcomings of the model is also the comparison of cumulative variables (such as income and profit) with the variables expressed in balances on the day. Calculating variables based on average values would give more accurate results, but this is not always possible due to data availability. No other significant criticisms of Ohlson's model have been made by researchers.

2.3. Zmijewski model (1984)

In 1984, Zmijewski defined a model for bankruptcy prediction, based on a sample that included 40 companies in bankruptcy (those that filed for bankruptcy) and 800 financially performing companies. The study, published by Zmijewski, analysed two methodological aspects of sample definition that may have an impact on reducing the objectivity and accuracy of the model: a targeted sample and a selected sample with complete data. The first aspect refers to the excessive number of bankrupt companies in the total sample of companies, i.e. when pairs of bankrupt companies and financially performing companies are selected (one on one), whereas the potential of bankruptcy is overemphasized in the model. The second problem in sample selection is the modelling based on a sample with complete data, where the results of the model are extremely different from the sample in which the researcher does not have all the necessary data. Zmijewski tried to avoid the problem of the influence of a targeted sample in the model that leads to the bias of model coefficients and the predictions that overestimate the share of companies in bankruptcy that are accurately classified. Due to that reason, he modelled the entire enterprise population. Zmijewski concluded that both problems and

sample bias do not significantly affect the statistical conclusions of the model and the overall model classification accuracy.

Zmijewski included all New York Stock Exchange listed companies in the model in the period from 1972 to 1978, excluding the ones from service industry, financial services and public administration. He used the probit statistical method, and the final function contains three variables. The Zmijewski model retained the same degree of accuracy as Altman and Ohlson although including only three variables, and the accuracy of the model was 99% on the selected sample. The final probit function with variables and estimated coefficients was as follows:

Zmijewski = – 4,3 – 4,5X1 + 5,7X2 + 0,004X3

whereas:

X1 = net income / total assets

X2 = total liabilities / total assets

X3 = current assets / current liabilities

As with the logit function, the probit function maps the values of the dependent variable in the range 0 to 1.

Z = 1/1 + exp (-X)

If the value of the function Z is equal to or greater than 0.5, the probability of bankruptcy is very high. Zmijewski classified values differently from Ohlson in such a way that companies that had value of the dependent variable equal to or greater than 0.5 were classified as bankrupt companies, and those with a value less than 0.5 as financially performing companies.

Grice and Dugan (2003) stated that model is in the fact that variables in the model were not chosen on theoretical basis, but the effectiveness of variables in research and models by other authors, which is also deficiency of Altman and Ohlson models. Also, one of the disadvantages of the model is its development on only manufacturing companies which could restrict the model application on companies from other industries.

2.4. Static models disadvantages

All three models are often used in practice and according to the available literature are the subject of great interest of many researchers. All three models are simple and applicable in many industries, and they are based on publicly available data which simplifies their application. However, given the fact that all three models were developed on a relatively small sample of companies and with a small number of accounting variables from publicly available data, the question of their effectiveness in recent period is raised. Especially when quantitative data from the previous year represent outdated data and qualitative data often have stronger predictive power from quantitative.

The first significant problem with business forecasting models, which users of

the model encounter, is their general use, i.e. the problem of general use in different macroeconomic environments and national economies. This is due to the fact that each individual model was developed on a specific sample including companies in specific industries in a specific time period.

Another problem faced by users of the models that were developed according to specifics of individual markets is their effectiveness in going concern or future disruptions prediction, given the fact that most are based on traditional statistical methods (MDA, probit and logit). The results of models based on traditional statistical methods imply strict assumptions of linearity, normal distribution, and independence of predictive variables (Lacher et al., 1995), and they are not compatible with the complexity, constraints, and interrelationships of financial indicators.

A third problem with existing models is the fact that most models use only financial performance indicators that are based on historical accounting data and publicly available information that may be out of date at the time of publication. For this reason, such models are not sensitive enough and do not provide early warning signs to model users.

3. Effectiveness analysis of Altman Z'score model, Ohlson model and Zmijewski model -

The research analysed and examined the general applicability of all three statistical models in the Croatian macroeconomic environment, which can be considered as representative for transitional countries in the region.

3.1. Empirical research sample

Empirical research and analysis of the effectiveness of these three models was conducted on a sample of companies from the Croatian economy. Efficiency was analysed on a sample of 1,796 companies divided into two groups of medium and large companies in the period from 2013 to 2018:

1. The first group of companies consisting of:
    - bankrupt companies,
    - companies with initiated pre-bankruptcy settlement procedure,
    - companies with negative business performance indicators:
        - loss (main criteria) or
        - profit, but
            - indebtedness ratio > 1 (total liabilities / total assets)

              and
            - quick ratio <1 (current assets - inventories) / current liabilities)

2. The second group of companies successfully performing

Medium and large companies were selected based on total income, regardless of the ownership structure. Small enterprises were not included in the analysis due to the possible lack of objective information in financial results, their large number and individually relatively small impact on the national economy. The sample was defined on the approximately equal share of companies in bankruptcy, pre-bankruptcy settlement or with negative business results in the total sample to share of such companies in the total population (about 7,500 companies in the Republic of Croatia with revenues over HRK 7.5 million, according to financial statements from Financial Agency). According to the calculation of share of companies with negative performance in the share of medium and large companies in 2013, the share of positively performing companies' vs negatively performing companies in the research was 38%: 62% respectively. This follows the approach of Ohlson and Zmijewski who, unlike Altman, used an unequal number (unpaired sample) of companies that are successful and unsuccessful. The source of data was the companies' annual public financial reports from the annual announcement of the Financial Agency and data available from the Zagreb Stock Exchange.

To analyse the forecasting effectiveness of the models based only on financial indicators, Altman model, Zmijewski and Ohlson models were selected as the ones most used in practice. The accuracy of business distress occurrence and the number of years with negative indicators before company's bankruptcy were examined. Research has confirmed that Altman and Zmijewski models are effective in predicting unperforming companies, while Ohlson's model provided weaker indicators for differentiating between successful and unsuccessful companies.

3.2. Empirical research methodology

Main methodological approach of this research includes the calculation of all three models' indicators for the entire sample of companies over 6 representative years, the assessment of business continuity according to defined values in the original models, and the evaluation of model efficiency. Three phases of research have been defined and conducted:

1. The first research phase includes definition of the research sample

2. The second phase includes the collection of financial data necessary for the analysis

3. The third research phase includes the calculation of indicators for 1,796 companies over 6 years for three models, a total of 10,776 indicators for each model. After calculation of Altman Z'-score, Zmijewski score and Ohlson score, a classification method was performed by the SPSS program. The prediction accuracy of business distress occurrence and the number of years of negative indicators before bankruptcy onset were analysed. The effectiveness of company's going concern forecasting for all entities in the sample was also tested.

In third research phase, following models have been used to calculate the

indicators and scores:

1. Altman Z' score = 0,717X_1 + 0,847X_2 + 3,107X_3 + 0,420X_4 + 0,998X_5

Z' score < 1.23 → unsuccessful companies, Z' score > 2.90 successful companies, Z' score= 1.23 to 2,90 grey zone companies

Whereas: X1 = working capital / total assets, X2 = retained earnings / total assets, X3 = earnings before interest and tax / total assets, X4 = book value of equity / total liabilities, X5 = sales / total assets.

2. Ohlson O score = – 1,3 – 0,4X1 + 6,0X2 – 1,4X3 + 0,8X4 – 2,4X5 – 1,8X6 + 0,3X7 – 1,7X8 – 0,5X9

O score > 0.5 → company at risk, O score < 0.5 → successful company

Whereas: X1= value measured by the logarithm of the total asset ratio and GDP price level index, X2 = total liabilities / total assets (balance on the day), X3 = working capital / total assets (balance on the day), X4 = current liabilities / current assets, X5 = dummy variable 0 or 1 (1 = if total liabilities are greater than total assets, 0 = vice versa), X6 = net profit / total assets (balance on the day), X7 = cash flow from operating activities / total liabilities, X8 = dummy variable 0 or 1 (1 = if net profit has been negative over the last two years, 0 = vice versa), X9 = (NIt – NIt-1) / (|NIt| + |NIt-1|), NIt as net profit in the last evaluation period.

3. Zmijewski score = – 4,3 – 4,5X1 + 5,7X2 + 0,004X3

Z Score > 0.5 → company at risk, Z score < 0.5 → successful company

Whereas: X1 = net income / total assets, X2 = total liabilities / total assets, X3 = current assets / current liabilities.

In the third research phase, two analogue terms for the assessment of the going concern forecasting accuracy were introduced, Type 1 and Type 2 accuracy assessment, and Type 1 and 2 Errors:

1. Type 1 accuracy assessment is defined as the number of companies performing poorly accurately forecasted as companies performing poorly in relation to the total number of companies in the sample
2. Type 2 accuracy assessment is defined as the number of successfully operating companies accurately forecasted as successfully operating companies in relation to the total number of companies in the sample
3. Type 1 Error is defined as the number of companies performing poorly and incorrectly classified as companies operating successfully in relation to the total number of companies in the sample
4. Type 2 Error is defined as the number of successfully operating companies incorrectly classified as companies performing poorly in relation to the total number of companies in the sample

Additionally, the total accuracy assessment and forecasting Error of all three models was included on the entire sample:

1. Total accuracy indicator defined as the number of companies accurately classified (as successful or unsuccessful) according to the models in relation to the total number of companies in the sample
2. Total Error indicator defined as the number of companies incorrectly classified (as successful or unsuccessful) according to the models in relation to the total number of companies in the sample

Descriptive statistics tests and correlation matrices were used.

4. Research results and discussion

The performed analysis can be divided into the following topics:

1. Descriptive statistics with the aim of examining the sample characteristics and differences in the performance of all three indicators in companies' performance prediction for individual periods, as well as differences of individual variables within these indicators,
2. Analysis of variance to examine the differences in observed characteristics,
3. Correlation analysis between observed variables in order to obtain an initial insight into the relationship between the variables set in the research,
4. Analysis of Type 1 and Type 2 Errors and the overall accuracy and Error indicator.

4.1. Descriptive statistics

The results of statistical tests of descriptive statistics, comparing both samples of companies (successful and unsuccessful) by all three calculation methods (Altman, Ohlson and Zmijewski) in the period from 2013 to 2018, indicate significant statistical differences between successful and unsuccessful companies in all periods and by all methodologies, confirmed by standard Error indicators (F, p).

Table 1 contains basic indicators of descriptive statistics and, in addition to standard Error indicators F and p, includes number of companies in the sample, median as a mean indicator that divides the numerical series into two equal parts, and standard deviation as the average deviation of individual values from the mean.

Table 1: Comparison of performance indicators for successful and unsuccessful companies according to Altman, Ohlson and Zmijewski in the period between 2013 – 2018

Indicators		No companies	Median	St. deviation	F-ratio	p-value
Altman2013	Successful	1106	2.95	1.77	239.39	p<0.01
	Unsuccessful	690	1.56	1.98		
	Total	1796				

	Successful	1106	-1.47	1.76		
Zmijewski2013	Unsuccessful	690	0.45	3.08	283.02	p<0.01
	Total	1796				
	Successful	1106	2.99	1.86		
Altman2014	Unsuccessful	690	1.54	2.02	239.04	p<0.01
	Total	1796				
	Successful	1106	0.59	0.28		
Ohlson2014	Unsuccessful	690	0.68	0.31	43.13	p<0.01
	Total	1796				
	Successful	1106	-1.40	1.71		
Zmijewski2014	Unsuccessful	690	0.62	3.21	301.53	p<0.01
	Total	1796				
	Successful	1106	2.85	1.77		
Altman2015	Unsuccessful	690	1.50	2.08	217.98	p<0.01
	Total	1796				
	Successful	1105	0.56	0.31		
Ohlson2015	Unsuccessful	690	0.69	0.32	72.19	p<0.01
	Total	1795				
	Successful	1106	-1.33	1.63		
Zmijewski2015	Unsuccessful	690	1.05	4.40	264.52	p<0.01
	Total	1796				
	Successful	1106	3.00	1.81		
Altman2016	Unsuccessful	690	1.40	2.16	287.73	p<0.01
	Total	1796				
	Successful	1106	0.52	0.31		
Ohlson2016	Unsuccessful	690	0.69	0.33	133.69	p<0.01
	Total	1796				
	Successful	1106	-1.59	1.57		
Zmijewski2016	Unsuccessful	690	1.40	5.11	329.19	p<0.01
	Total	1796				
	Successful	1106	3.16	1.89		
Altman2017	Unsuccessful	690	1.42	2.38	292.31	p<0.01
	Total	1796				
	Successful	1106	0.48	0.30		
Ohlson2017	Unsuccessful	690	0.69	0.32	214.93	p<0.01
	Total	1796				

Zmijewski2017	Successful	1106	-1.81	1.51	291.06	p<0.01
	Unsuccessful	690	1.74	6.66		
	Total	1796				
Altman2018	Successful	1106	3.23	1.96	312.55	p<0.01
	Unsuccessful	690	1.30	2.64		
	Total	1796				
Ohlson2018	Successful	1106	0.46	0.30	270.40	p<0.01
	Unsuccessful	690	0.71	0.34		
	Total	1796				
Zmijewski2018	Successful	1106	-1.86	1.53	143.56	p<0.01
	Unsuccessful	690	2.94	13.19		
	Total	1796				

Source: Authors

Based on the analysis results, conclusion that successful and unsuccessful companies on average differ statistically significantly at the level of significance of 1% can be confirmed. The average values of indicators are in line with the original ranges of indicators, except in the case of the Ohlson indicator in successful companies, and they are of the following values:

Successful companies

- Altman Z'-score: 3.03 (successful companies according to Altman)
- Ohlson score: 0.52 (companies at risk according to Ohlson)
- Zmijewski score: -1.58 (no bankruptcy risk according to Zmijewski)

Unsuccessful companies

- Altman Z'-score: 1.45 (grey zone according to Altman)
- Ohlson score: 0.69 (companies at risk according to Ohlson)
- Zmijewski score: 1.37 (high probability of bankruptcy according to Zmijewski)

The analysis results indicate the effectiveness of the Z'-score in forecasting successful companies, especially in the period of two years before the occurrence of the business event, while it is weaker in forecasting unsuccessful companies. The effectiveness of the Ohlson indicator forecasting can be considered acceptable in the period of one year before the occurrence of the business event, although there is a risk of Type 1 Error. Zmijewski indicator is effective in going concern forecasting even four years before the occurrence of the business event, but with a limitation due to high standard deviation of the sample.

4.2. Correlation analysis

To determine the characteristics of the variables' relationship in the model, a correlation matrix was set to determine the direction and strength of the performance indicators. Correlation is the statistical correlation of two or more variables. Correlation analysis measures the degree of strength of statistical relationships, and standardized correlation indicators are correlation coefficients. If the existence of a linear statistical relationship is assumed between the two variables, then the strength and direction of the relationship are measured by the linear correlation coefficient r ($-1 \leq r \leq 1$).

Correlation matrix for Altman Z' score, Ohlson O score and Zmijewski score, containing all linear correlation coefficients of variables is presented in the following table.

Table 2: Correlation matrix of indicators of Altman Z'-score and Altman Z'-score performance indicator in observed period for successful and unsuccessful companies

Criteria		Z (2013)	Z (2014)	Z (2015)	Z (2016)	Z (2017)	Z (2018)
Successful companies	X1	0.403**	0.397**	0.364**	0.374**	0.394**	0.381**
	X2	0.300**	0.321**	0.282**	0.271**	0.264**	0.280**
	X3	0.324**	0.368**	0.354**	0.353**	0.383**	0.335**
	X4	0.496**	0.556**	0.561**	0.626**	0.580**	0.577**
	X5	0.432**	0.484**	0.514**	0.455**	0.443**	0.381**
Unsuccessful companies	X1	0.225**	0.253**	0.310**	0.382**	0.370**	0.459**
	X2	0.247**	0.329**	0.289**	0.300**	0.260**	0.219**
	X3	0.110**	0.200**	0.251**	0.291**	0.314**	0.335**
	X4	0.424**	0.531**	0.542**	0.521**	0.552**	0.349**
	X5	0.571**	0.533**	0.466**	0.434**	0.432**	0.397**

**p<0.01; *p<0.05

Source: Authors

Analysed indicators:

1. X1 = working capital / total assets
2. X2 = retained earnings / total assets
3. X3 = earnings before interest and tax / total assets
4. X4 = book value of equity / total liabilities
5. X5 = sales / total assets

As a conclusion, the variables “book value of equity / total liabilities” and “sales / total assets” are statistically most significantly correlated with Altman’s Z’-score for successful and unsuccessful companies. The correlation is positive which means that increasing or decreasing the variables will have the greatest impact on the increase or decrease of Altman’s Z’-score.

Table 3: Correlation matrix of indicators of Ohslon O-score and Ohlson O-score performance indicator in observed period for successful and unsuccessful companies

Criteria		O (2014)	O (2015)	O (2016)	O (2017)	O (2018)
Successful companies	X1	-0.069*	-0.114**	-0.097**	-0.086**	-0.094**
	X2	0.800**	0.857**	0.859**	0.835**	0.796**
	X3	-0.588**	-0.592**	-0.632**	-0.652**	-0.614**
	X4	0.528**	0.548**	0.588**	0.587**	0.548**
	X5	0.137**	0.138**	0.135**	0.131**	0.108**
	X6	-0.145**	-0.123**	-0.180**	-0.238**	-0.261**
	X7	-0.292**	-0.319**	-0.320**	-0.315**	-0.300**
	X8	-0.064*	-0.073*	-0.05	-0.03	-0.03
	X9	0.118**	0.104**	0.090**	0.04	-0.04
Unsuccessful companies	X1	-0.253**	-0.217**	-0.211**	-0.227**	-0.205**
	X2	0.446**	0.469**	0.483**	0.479**	0.472**
	X3	-0.361**	-0.401**	-0.404**	-0.380**	-0.394**
	X4	0.160**	0.181**	0.192**	0.183**	0.186**
	X5	0.435**	0.454**	0.487**	0.499**	0.475**
	X6	-0.131**	-0.145**	-0.125**	-0.154**	-0.174**
	X7	-0.208**	-0.237**	-0.281**	-0.292**	-0.297**
	X8	-0.07	-0.097*	-0.06	-0.02	-0.04
	X9	0.082*	0.133**	0.152**	0.164**	0.116**

**p<0.01; *p<0.05

Source: Authors

Analysed indicators:

1. X1= value measured by the logarithm of the total asset ratio and GDP price level index
2. X2 = total liabilities / total assets (balance on the day)
3. X3 = working capital / total assets (balance on the day)
4. X4= current liabilities / current assets
5. X5 = dummy (1 = if total liabilities are greater than total assets, 0 = vice versa)
6. X6 = net profit / total assets (balance on the day)
7. X7 = cash flow from operating activities / total liabilities
8. X8 = dummy (1 = if net profit has been negative over the last two years, 0 = vice versa)
9. X9 = (NIt – NIt-1) / (|NIt| + |NIt-1|), NIt as net profit in the last evaluation period

As a conclusion, the variables “total liabilities / total assets” and “current liabilities / current assets” are statistically most significantly positively correlated with the Ohlson score in successful companies. Increasing or decreasing the variables will have the greatest impact on the increase (increase in risk) or decrease (decrease in risk) of the Ohlson score. The variable “working capital / total assets” is statistically significantly correlated with the Ohlson score for both successful and unsuccessful companies, but with a negative sign, which means that a decrease in this indicator affects the growth of the Ohlson score, i.e. an increase in bankruptcy risk.

Table 4: Correlation matrix of indicators of Zmijewski score and Zmijewski score performance indicator in observed period for successful and unsuccessful companies

Criteria		ZM (2013)	ZM (2014)	ZM (2015)	ZM (2016)	ZM (2017)	ZM (2018)
Successful companies	X1	-0.374**	-0.395**	-0.372**	-0.447**	-0.480**	-0.466**
	X2	0.803**	0.863**	0.884**	0.873**	0.840**	0.777**
	X3	-0.461**	-0.484**	-0.460**	-0.479**	-0.485**	-0.453**
Unsuccessful companies	X1	-0.200**	-0.362**	-0.420**	-0.440**	-0.627**	-0.710**
	X2	0.644**	0.746**	0.792**	0.759**	0.768**	0.743**
	X3	0.01	0	0.01	-0.01	0.01	0

**p<0,01; *p<0,05

Source: Authors

Analysed indicators:

1. X1 = net income / total assets
2. X2 = total liabilities / total assets
3. X3 = current assets / current liabilities

As a conclusion, the variable “total liabilities / total assets” most statistically correlates with the Zmijewski score for successful and unsuccessful companies. The correlation is positive, which means that an increase or decrease in the liability-to-assets ratio will have the greatest impact on the growth (increase in bankruptcy risk) or decline (decrease in bankruptcy risk) of the Zmijewski score. The variable “current assets / current liabilities” also correlates statistically significantly in successful companies, but the direction is negative, which means that the deterioration of the variable will affect the increase of the Zmijewski score, i.e. the increase of bankruptcy risk.

4.3. Type 1 and 2 Errors analysis

The following table presents the results obtained by applying the Altman model to the entire sample of 1,796 companies, and the table consists of two parts. The first part of the table shows the split of companies, according to the calculated Z’-score, into: unsuccessful, suspicious (gray zone) and successful, in all years for which the financial statements were available compared to the actual state of the company (successful and unsuccessful) and calculated accuracy estimates of Type 1 and 2. The right part of the table shows the indicators Type 1 and 2 Error of the model:

1. Type 1 Error is defined as the number of companies performing poorly and incorrectly classified as companies operating successfully in relation to the total number of companies in the sample
2. Type 2 Error is defined as the number of successfully operating companies incorrectly classified as companies performing poorly in relation to the total number of companies in the sample

Type 1 and Type 2 Errors were calculated for all 1,796 companies. All six years of evaluation period were analysed, where T1 represents the first year of observation, and T6 the last year.

As shown in Table 5, the accuracy rating of the Type 1 Altman model is 57% for the first, 54% for the second, 53% for the third, fourth, and fifth, and 52% for the sixth year before company’s performance evaluation. The Type 2 accuracy score was only 46% for the first, 44% for the second, 41% for the third, 37% for the fourth, 40% for the fifth, and 41% for the sixth year. Additionally, the overall performance score was 85%, 86%, 83%, 79%, 81%, and 79% from first to sixth year. The Type 1 Error of the Altman model was 17% for the first year and 16% from the second to the sixth year before the business observation, and the Type 2 Error was 4%, 3%, 6%, 8%, 8%, and 9% of the first to the sixth year.

Table 5: Calculation of Type 1 and 2 Errors for Altman Z'score

Year	Company's performance	Classification based on Altman Z'score						Type 1 and 2 Errors			
		Z' < 1.23		1.23 < Z' > 2.90		Z' > 2.90		Type 1 Error		Type 2 Error	
		Unsuccessful		Grey zone		Successful					
T1	Unsuccessful	360	52%	217	31%	113	16%				
	Successful	97	9%	557	50%	452	41%	113	16%	97	9%
	Total correctly classified	79%									
T2	Unsuccessful	366	53%	211	31%	113	16%				
	Successful	83	8%	579	52%	444	40%	113	16%	83	8%
	Total correctly classified	81%									
T3	Unsuccessful	367	53%	212	31%	111	16%				
	Successful	91	8%	605	55%	410	37%	111	16%	91	8%
	Total correctly classified	79%									
T4	Unsuccessful	367	53%	214	31%	109	16%				
	Successful	62	6%	596	54%	448	41%	109	16%	62	6%
	Total correctly classified	83%									
T5	Unsuccessful	376	54%	204	30%	110	16%				
	Successful	33	3%	588	53%	485	44%	110	16%	33	3%
	Total correctly classified	86%									
T6	Unsuccessful	391	57%	182	26%	117	17%				
	Successful	45	4%	553	50%	508	46%	117	17%	45	4%
	Total correctly classified	85%									

Source: Authors

The results obtained are somewhat consistent with the original Altman results, with one exception. Type 1 Errors are slightly higher than in the original study, and these errors can, in most cases, result in actual losses for investors, financial institutions, and other stakeholders.

The following Table shows the results obtained by applying the Ohlson model to the entire sample. According to the results, the accuracy estimates of Type 1 Ohlson model are 73% for the first, 72% for the second and third, 73% for the fourth and 71% for the fifth year before company's performance evaluation. The Type 2 accuracy score was only 57% for the first, 55% for the second, 47% for the third, 42% for the fourth, and 44% for the fifth year.

Table 6: Calculation of Type 1 and 2 Errors for Ohlson O score

Year	Company's performance	Classification based on Ohlson O score				Type 1 and 2 Errors			
		O > 0.5		O < 0.5		Type 1 Error		Type 2 Error	
		Unsuccessful		Successful					
T2	Unsuccessful	490	71%	200	29%				
	Successful	615	56%	491	44%	200	29%	615	56%
	Total correctly classified	55%							
T3	Unsuccessful	503	73%	187	27%				
	Successful	642	58%	464	42%	187	27%	642	58%
	Total correctly classified	54%							
T4	Unsuccessful	498	72%	192	28%				
	Successful	588	53%	518	47%	192	28%	588	53%
	Total correctly classified	57%							
T5	Unsuccessful	494	72%	196	28%				
	Successful	493	45%	613	55%	196	28%	493	45%
	Total correctly classified	62%							
T6	Unsuccessful	507	73%	183	27%				
	Successful	477	43%	629	57%	183	27%	477	43%
	Total correctly classified	63%							

Source: Authors

Additionally, the overall performance score was 63%, 62%, 57%, 54%, 55% from the first to the fifth year. The Type 1 Error of the Ohlson model is significantly higher than the Altman model and was 27% for the first year and 28% for the second and third years, 27% for the fourth and 29% for the fifth year before business performance observation, and the Type 2 Error was 43%, 45%, 53%, 58% and 56% from the first to the fifth year. High Type 1 and Type 2 Errors indicate less accuracy compared to the Altman model and demand caution in application of the model for going concern forecasting.

The following table shows the results obtained by applying the Zmijewski model to the whole sample with the same structure as in the previous two tables.

Table 7: Calculation of Type 1 and 2 Errors for Zmijewski score

Year	Company's performance	Classification based on Zmijewski score				Type 1 and 2 Errors			
		Z > 0.5		Z < 0.5		Type 1 Error		Type 2 Error	
		Unsuccessful		Successful					
T1	Unsuccessful	302	44%	388	56%				
	Successful	124	11%	982	89%	388	56%	124	11%
	Total correctly classified	71%							
T2	Unsuccessful	326	47%	364	53%				
	Successful	137	12%	969	88%	364	53%	137	12%
	Total correctly classified	72%							
T3	Unsuccessful	353	51%	337	49%				
	Successful	151	14%	955	86%	337	49%	151	14%
	Total correctly classified	73%							
T4	Unsuccessful	368	53%	322	47%				
	Successful	94	8%	1012	92%	322	47%	94	8%
	Total correctly classified	77%							
T5	Unsuccessful	376	54%	314	46%				
	Successful	61	6%	1045	94%	314	46%	61	6%
	Total correctly classified	79%							
T6	Unsuccessful	419	61%	271	39%				
	Successful	53	5%	1053	95%	271	39%	53	5%
	Total correctly classified	82%							

Source: Authors

According to the results, accuracy assessments of the Type 1 Zmijewski model is 61% for the first, 54% for the second, 53% for the third, 51% for the fourth, 47% for the fifth year and 44% for the sixth year before business performance observation. The Type 2 accuracy score was a high 95% for the first, 94% for the second, 92% for the third, 86% for the fourth, 88% for the fifth, and 89% for the sixth year. Additionally, the overall performance score was 82%, 79%, 77%, 73%, 72%, and 71% from first to sixth year. The Type 1 Error of the Zmijewski model was 39% for the first year and 46% for the second, 47% for the third year, 49% for the fourth, 53% for the fifth and 56% for the sixth year before business observation, and Type 2 Error was 5 %, 6%, 8%, 14%, 12% and 11% from the first to the sixth year.

Type 1 and 2 Errors are higher in Zmijewski than in Altman, but lower than in Ohlson, which indicates better accuracy of the model than Ohlson's model, and lower accuracy compared to Altman's model.

5. Conclusion

Empirical research confirmed the first hypothesis based on the results of descriptive statistics tests that compared both samples of companies by all three calculation methods (Altman, Ohlson and Zmijewski) in the period from 2013 to 2018. The results indicate significant statistical differences between successful and unsuccessful companies in all periods and according to all methodologies, confirmed by standard error indicators. On average, successful and unsuccessful companies differ statistically significantly in the values of all indicators and in all periods at the level of significance of 1%. By shortening the time in relation to the result of the company's performance, the standard deviation of the indicators is reduced, which confirms the better representativeness of the sample average value by years and the efficiency of the model. Type 1 and Type 2 Errors of all three models are acceptable, and overall efficiency scores are high (Altman and Zmijewski about 80%, Ohlson above 60%). The research confirmed the second hypothesis. Altman Z'-score values were confirmed to have the most accurate results and overall efficiency scores of 85%, 86%, 83%, 79%, 81% and 79% from the first to the sixth year, followed by the Zmijewski model with total efficiency values of 82 %, 79%, 77%, 73%, 72% and 71% from the first to the sixth year. Ohlson's model resulted in the worst prognosis, estimates of overall efficiencies of 63%, 62%, 57%, 54%, 55% from first to fifth year, although still acceptable given the values of Type 1 and Type 2 Errors. The analysis confirmed the effectiveness of Z'-score indicator in forecasting business performance at successful companies, especially in the period of two years before the business event occurrence, while it is weaker for forecasting unsuccessful companies. During the entire period taken into research regarding Ohlson indicator, companies' sample has low standard deviation which indicates the representativeness of the sample, but the effectiveness of the forecast for Ohlson indicator can be considered acceptable in the period of one year before the occurrence of the business event. Zmijewski indicator is effective in the business performance forecasting even four years before the occurrence of the business event with a limitation due to the high standard deviation of the sample. The research confirmed that Altman's Z'-score model, Zmijewski model and Ohlson model, based on quantitative financial indicators, are effective in predicting the continuation of business operations in the current macroeconomic conditions in Croatia. These conditions allowed companies to continue to operate despite their poor results. Also, this part of the empirical research confirmed the difference between efficiency of the prediction properties of the Altman Z'-score model, the Zmijewski model and the Ohlson model in the Croatian economy.

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CHAPTER 24

The process of fiscal decentralization in the Republic of Croatia in the conditions of the COVID-19 crisis

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Abstract

The paper explores how, due to the decline in economic activity, various central government measures taken to alleviate the COVID-19 crisis, which took place in parallel with the fiscal relief process, affected the fiscal decentralisation process in the Republic of Croatia in 2020.

At the beginning of 2020, a new (fifth in a row) round of fiscal relief was implemented, which also included reductions in income tax rates, and the existing way of financing local self-government units largely depends on the movement of the number of employees resident in the area of some JLS and their income, so that a significant part of the financing of local units is dependent on income tax revenues. The paper analyzes and compares data for the period 2014-2020. on trends in local government revenues in the Republic of Croatia, size of local units (measured by number of inhabitants), number of employees per thousand inhabitants, number of inhabitants, shares of Tax revenues and Assistance from abroad and from entities within the general budget in local government revenues in order to quantify the effects of the COVID-19 crisis on the fiscal position of local units in the Republic of Croatia.

Likewise, the use of Eurostat data compared the trends in the share of own income and total expenditure of the local level of government in the total revenues and expenditure of the general government in Austria, Croatia, Hungary and Slovenia during the period 2014-2020, with the aim of obtaining a comparative analysis of the potentially recessionary effects of the COVID-19 crisis on the fiscal capacities of local units in the observed countries.

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The current COVID-19 crisis and the decline in revenues of local units in Croatia in 2020 further weakened their fiscal position and increased their dependence on central government assistance, since most local units were forced to use interest-free loans from the Ministry of Finance as a measure of assistance from the Government of the Republic of Croatia aimed at improving liquidity and more efficient management of budgetary resources, and a good part of employees living in the territory of individual units and working in activities that were temporarily suspended during the "closure" (lockdown) received support from the central government to preserve jobs.

It is expected that even after the end of the pandemic, there will be consequences for the financing of local units, as the COVID-19 crisis, the end of which is still not in sight, will have a negative impact on their revenues, while increasing expenditure on social services. This will create more lasting consequences for the entire Croatian fiscal system, which is largely centralised, with a focus on changes to the current level of fiscal decentralisation. If the degree of fiscal decentralisation is reduced, the question arises whether it's necessary to update the implementation of reforms of the local and regional self-government system in terms of reducing their number in order to increase their efficiency and reduce their dependence on financing from the central budget.

Key words: *fiscal decentralization, COVID-19, local government*

JEL classification: *E62, H24, H71, H72.*

1. Introduction

The global pandemic of COVID 19 and its consequent impact on economic activity also had a strong impact on local and regional self-government throughout Europe and the world, including Croatia. In Croatia, about 75% -80% of revenues and expenditures during the period 2014-2020. exercised at the central level of government. Before the outbreak of the pandemic, according to the latest available data (Eurostat, 2019), the share of own revenues of local and regional self-government units in the revenues of the consolidated general government was 26.4%, and the share of expenditures of local and regional self-government units in expenditures consolidated general government was 27.4%. Data from the research (Jurlina Alibegović, 2018) indicate that revenues of local and regional self-government units in 2016 in gross domestic product amounted to 6.31 percent, and expenditures to 10.31 percent, which puts Croatia at the bottom of the scale of European countries according to the degree decentralization.

On the other hand, Croatia is an administratively very decentralised country (127 cities, 429 municipalities, 21 counties) so there is an explanation for why Croatia do better than similar smaller countries in the EU in terms of decentralisation. Given the size of the territory, population, differences in fiscal capacities, territorial organisation is ineffective, and most authors call for the merger or consolidation of local and regional units (e.g. Krtalić et al., 2020; Đulabić and Čepo, 2017; Jurlina Alibegović, 2010; Koprić, 2015; Koprić, 2010).

The COVID-19 crisis only confirmed the inefficiency of the existing territorial organisation in Croatia, and through the decline in economic activity, which stood at 8.4% at the end of 2020 compared to 2019 (WB, 2021), local unit revenues also declined. This combined with the implementation of the measures of the so-called The fifth round of tax reform[2] affects the halt to the already slowly enforceable and inadequate fiscal decentralisation and fiscal levelling started in 2007 (Bajo, 2014). These measures were somewhat intensified in 2018 in the so-called first round of tax reform, when a new fiscal levelling model was established, through which local unit income tax revenues increased by 3,4 billion HRK (0,45 bil. EUR), i.e. by 30% compared to 2017 (MFIN of Croatia, 2020). This increase in tax revenues was also contributed by the decrease in unemployment and employment growth that began in 2015.

Unlike the previous global crisis, which began in 2007 and saw a rise in unemployment worldwide, there was no significant increase in unemployment during the COVID-19 crisis, as countries paid employers and workers job support subsidies from the central government budget. On the expenditure

2 so-called rounds of tax reform, where each year of application of the new tax framework represents a round: the first round is presented by the changes that came into force on 1 January 2017, followed by the rounds: 2 - 2018, 3 - 2019, 4 - 2020 and the last 5th round of tax reform, which entered into force on 1 January 2021, and includes measures to combat the pandemic crisis, along with previously initiated changes in the structure and characteristics of the tax system.

side of the general government budget, expenditures for aid for job preservation had a favorable effect on the labor market in Croatia, which in addition to the increase in other expenditures caused by the COVID-19 crisis, also increased the budget deficit. The budget balance of the consolidated general government was in surplus of 0.3% of GDP in 2019, and in 2020 a deficit of 7.4% of GDP was recorded, with a simultaneous increase in public debt from the level of 72.8% of GDP at the end of 2019 to 88.7% of GDP at the end of 2020. Although almost 50% weaker than in the pre-pandemic 2019, the tourist season in 2020 had a beneficial impact on the labor market because in Croatia there was no increase in unemployment in that and related activities, due to weaker demand for labor and restrictions on movement. people reduced and the import of scarce labor to the Croatian labor market. In line with the principle that state aid measures should have a stabilizing function, it is necessary to act quickly and prevent the occurrence of rising unemployment (Baldwin and Weder di Mauro, 2020). The Croatian state started implementing measures to help the economy in the first months of COVID-19. In order to help economic entities particularly affected by the corona crisis, in March 2020 the Croatian Government adopted a package of measures to support jobs. The purpose of the aid is to help economic operators whose incomes have been significantly reduced to retain their employees by paying them salaries from the central government budget.

Negative fiscal developments during the COVID-19 crisis have consequences for the entire fiscal system. This is particularly evident through the reduction of all public revenues, including tax revenues, as the measures allow businesses to defer the payment of income and profit taxes and contributions to salaries for three months, with the possibility of extending to three more, and after this allows for repayment of the debt in 24 months.

Given that local self-government in Croatia is dependent on income tax revenues, this change is strongly reflected in the revenues of local and regional self-government units.

The COVID-19 crisis and declining revenues of local and regional self-government units further fiscally weakened local units and increased their dependence on the central government, as most were forced to take advantage of interest-free loans by the central government. In addition, in 2020 the local government felt the decline in income tax income due to the reduction of income tax rates under the “4th round of tax reform” (which continued in 2021 in the “5th round of tax reform”).

The paper also investigates how the crisis caused by the COVID-19 pandemic affected the process of fiscal decentralization in Croatia, and therefore the paper compares the degree of fiscal decentralization before the COVID-19 crisis with the situation after.

Research question:

1. How has the COVID-19 crisis affected the fiscal decentralisation process in Croatia in 2020?

2. What is the impact of maintaining the employment level in the conditions of the COVID-19 crisis on the fiscal capacities of local units in the Republic of Croatia and are similar effects observed in Austria, Slovenia and Hungary?

Hypothesis: The COVID-19 crisis and the decline in revenues of local self-government units in Croatia in 2020 have weakened the fiscal position of local units and increased their dependence on the central government and slowed down the fiscal decentralisation process.

The remaining part of the work is structured as follows. The second part provides an overview of the literature on the areas of fiscal decentralisation and the COVID-19 crisis. The third part describes the methodology used in the work. The results of the conducted studies and analyses are presented in the fourth part of the paper, and the fifth part discusses theoretical contribution and implications for politics, practice and future research. The final part of the paper refers to the conclusions.

2. Literature review

There is extensive literature on the impact of the COVID crisis on the economy and the public sector, given the implications it has on the world economy. Barro et al. (2020) compare the economic consequences of the coronavirus pandemic with the Spanish flu, which lasted from 1918 to 1920 as a template for the worst-case scenario. Gordon et al. (2020) point out that the COVID-19 pandemic, as well as the resulting recession, put enormous pressure on the state and the budgets of all levels of government. Collier et al. (2020) stress that tax policy plays an important role in mitigating and addressing the negative consequences caused by the COVID-19 pandemic. Although the COVID-19 surveys deal largely with the socio-economic consequences of the crisis, they are nevertheless numerous and concerning public finances, although mostly focused on the central level of government, there is also research concerning local and regional self-government and the impact covid has had on their fiscal position.

During the economic downturn, central government budgets and subnational levels are under attack due to reduced revenues and increased spending needs. Forecasts for the USA show that the lack of tax revenues will sample a 0.5% drop in gross domestic product (Clemens and Veuger, 2020) An analysis covering the overall situation with the fiscal position of local units in the EU is an OECD (2021) survey showing that the COVID-19 crisis will negatively impact local government finances with a dangerous “scissor effect” due to increased expenditure and a decrease in revenues. It can also be followed by a survey by the European Committee of the Regions (CEMR, 2020) indicating that different funding models for local and regional authorities in Europe (share of own resources relative to central government funds), due to COVID-19 have a different impact on the fiscal capacity of local and regional authorities. Reduced revenues lead to reduced investment by local authorities and can lead to a decline in the number of job cuts.

That's why local authorities need support from central government and the EU. Maher et al. (2020) argue that from the perspective of local authorities, this pandemic is something they have not yet faced. That is why in the future it is necessary to have a strategy of local authorities in such cases, which will take into account the fiscal effects of the pandemic and have the financial resources provided in the budget to combat them. Most of the other papers on the impact of COVID-19 on local government relate to country-specific research. Nemec and Špaček (2020) analyse the response of local authorities in the Czech Republic and Slovakia to COVID-19, and partly address the impact of COVID-19 on local government budgets in these countries. Due to limited responses from the central government, local unit budgets suffer more from the COVID-19 pandemic than the central budget. Černěnko et.al. (2021) their paper explores how the COVID-19 pandemic has affected the tax revenues of local governments in Slovakia and whether tax revenues are resilient to economic shocks equally throughout Slovakia. Through the comparison of income and expenditure, and the use of HHI receive different results for certain parts of Slovakia, but the general conclusion is that the finances of local units in Slovakia were not greatly affected by the crisis. In addition to addressing the impact of COVID-19 on local government budgets in England, Ahrens and Ferry (2020) question their long-term resilience to economic shocks and outline the main activities to strengthen resilience, which should ensure greater sustainability of local government revenues but strengthen the principles of local democracy. At the level of individual countries, unemployment analyses were also made, which, given the large share of income tax revenues in local budgets, also has a big impact on the fiscal capacity of local units. So Gulyas and Pytka (2020) compare unemployment in Austria caused by coronation to that caused by the 2009 global financial crisis. They identify that global financial crises have increased the unemployment of higher earners, the male sex, who worked in older businesses. On the other hand, during coronation, the unemployed became lower-income people, immigrants and people who worked in smaller and newer lower-wage enterprises. As a result, expected earnings losses are lower, while job losses are comparable to those from the global financial crisis.

As for Croatia, there are several scientific papers that analyze the impact of the COVID-19 crisis on the Croatian economy, and consequently the impact on the public sector and local and regional self-government. Čavrak (2020) defines COVID-19 crises as a result of primarily four shocks: a health shock that can be characterized as a supply shock, a drop in consumption or a demand shock, a shock of negative expectations and high uncertainty, and the latest, potential shock of poor economic policy measures. In his paper, he presents proposals for a macroeconomic response to the COVID crisis. Arcabic (2021) analyses the impact of COVID-19 on unemployment and compares it with historical data from the 1999-2002 and 2008-2014 recessions. COVID-19 crises shows at the beginning the classic characteristics of the recession, because at the very beginning it causes a sharp rise in unemployment, which after a few months due to state interventionism and good tourist season slows down, which ultimately results in a much smaller drop in the income of local

and regional self-government compared to the forecast at the beginning of the pandemic. Zunic-Kovacevic (2021) deals with the impact of COVID-19 on the fiscal system and analyzes the measures taken to preserve jobs, as well as support entrepreneurs. Among the surveys related to fiscal decentralisation in Croatia Bajo and Primorac (2014) study the degree of fiscal decentralisation and fiscal imbalance in Croatia and compare with EU countries, the results of the survey indicate relative fiscal centralization, while in terms of tax decentralisation it is close to the average of EU members. Jurilna Alibegović (2018) through the index of tax autonomy of Croatian cities indicate that a small number of cities can, without the help of the central government, settle the existing level of public services to residents and entrepreneurs and manage their development. This is an important conclusion in considering the future role of cities in assuming new public functions and increasing the decentralisation of the state's public administration and territorial organisation. Fiscal decentralisation surveys carried out even before the covid-19 outbreak showed the necessity to change the existing model of local and regional self-government.

3. Methodology and conception of analysis

In accordance with research issues through which it is sought to determine how the COVID-19 crisis has affected the fiscal decentralisation process in Croatia, it is necessary to investigate the degree of decentralisation.

Determining the degree of fiscal decentralisation is a very complex procedure and requires the determination of the degree of autonomy of lower levels of government and what degree of independence they have lower levels of government in determining disposable income and expenditure (Ebel and Yilmaz, 2002). According to de Mello and Barenstein (2001 fiscal decentralisation indicators are most often calculated using data available through a database from the publication GFS Yearbook (Governance Finance Statistics) of the IMF. One of the indicators often used in the literature as an indicator of the vertical imbalance between levels of government is the share of transfers (grants) of higher levels of government in the total revenues of subnational levels of government (de Mello and Barenstein, 2001) According to the World Bank, the main indicators of fiscal decentralisation are: expenditure of subnational levels of government in total expenditure (%); revenues of subnational levels of government in total revenues (%); tax revenues in total revenues of subnational levels of government including grants (%). In Croatia, Bajo and Primorac (2014) in their research determined the degree of fiscal decentralisation with indicators of the coefficient of income decentralisation (the share of local units' income in general government income), decentralisation of expenditures (share of expenditures of local individuals in general government expenditures), decentralisation of tax revenues (share of local tax revenues in general government tax revenues) and the share of tax revenues in total income of local individuals, and additionally the ratio of expenditure for employees at the local level and total expenditures for employees at the general government level.

Jurlina – Alibegović (2018) used the following two indicators in the survey of the degree of decentralisation: 1. share of revenues and expenditures of local and regional self-government units in total revenues and expenditures of the consolidated general government 2. share of income and expenditure of local and regional self-government units in gross domestic product.

In this paper, we use the share of revenues and expenditures of local and regional self-government units in the total revenues and expenditures of the consolidated general governmentto assess the degree of decentralisation. In addition, the calculation of the share of tax revenues in the operating income of regional self-government units and the share of assistance from abroad and from entities within the general budget in the operating income of regional self-government units (average 2014-18, 2019 and 2020) is also used for the purpose of determining the degree of decethralisation and response to the first research question. Under this item include funds received on the basis of fiscal decentralisation and other from the state budget. These indicators are used in the paper to determine the evolution of the degree of fiscal decentrealazation before and after the COVID-19 pandemic crisis. In addition, the share of local and regional self-government revenues and expenditure in total prhodes and consolidated general government expenditure is compared with equivalent indicators for Austria, Slovenia and Hungary, in order to obtain an answer to another research question, relating to the fiscal capacities of the local units in COVID crises.

The data needed to calculate these fiscal indicators were primarily from the Eurostat-European Statistics Office, and data from the Ministry of Finance on local BIL and PR-RAS budgets of local units and comparison of individual items in 2014-2018 and 2019 and 2020 on the revenue and expenditure side related to COVID-19 effects were also used.

The Herfindal-Hirschman index analyzes the concentration of tax revenues we use it to determine the relationship between employment and the size of local units in the Republic of Croatia and determine the correlation with the number of employees per 1000 inhabitants and the size of the local unit. HHI is a method used in industry to determine the degree of market concentration, but it can also be used in economic research and in other sectors. T Chernyčko, E Neubauerová, A Zubažová (2021) use HHI to determine the concentration of tax revenues in Slovakia, Ratmanova and Wroblowsky (2012) use HHI to examine the fragmentation of the Czech tax system.

The data for calculating HHI were obtained from the PR-RAS Ministry of Finance and were taken for the period 2014-2020, while the calculation was made at the county level by calculating the concentration of tax revenues at the level of each county and Croatia in total. In doing so, a standard formula was used to calculate:

$$H= \sum_{i=1}^{\mathbb{N}} t_{i}^{2}$$

where is: t^2- the share of individual tax in the total tax revenues of the local unit

HHI values are interpreted on the basis of the degree of market concentration, where a value above 0.25 means that it is a high concentration of

The indicators of the HHI concentration of tax revenues were calculated for the average period 2014-18, 2019 and 2020 for the Republic of Croatia in total and individually for all units of regional self-government

Counties and the City of Zagreb are divided by size classes according to the number of inhabitants:

Population:	
<100,000	1
100.001 - 200.000	2
200.001 - 300.000	3
300.001 - 400.000	4
400.001 - 500.000	5
>500,001	6

4. Empirical data (documentation background) and analysis

The shares of local government own revenues in total revenues of local governments in the Republic of Croatia, Austria, Slovenia and Hungary are shown in Table 1. According to Eurostat data, Croatia records the share of local government revenues slightly above the EU average, which is higher compared to similar shares in the other three observed countries. If we compare the results, it can be seen that due to the pandemic, the share of local government revenues in general government revenues increased, while the shares of expenditures decreased. This is the result of a decrease in the total revenues of local authorities in 2020 compared to the pre-pandemic 2019. A similar phenomenon was recorded in other observed countries, because due to increased government expenditures, the shares of local government expenditures in general government expenditures decreased, while the shares of revenues increased or remained at the same level. This is a result of the fact that most countries mitigate the decline in local government revenues through non-repayable loans. In Slovenia, financial measures for municipalities are included in two separate “anti-crown laws”, including an increase in municipal funding. The municipal financing system is based on a complex formula, the most important of which is the agreed average amount per capita. The Slovenian government has raised this amount from EUR 589 per capita to EUR 624 per capita, which represents an additional EUR 70 million more for all municipalities (CMER, 2020). In Austria, at the end of May 2020, the federal government announced an investment program for municipalities for the period 2020-2021, with an emphasis on green and sustainable infrastructure. The volume of financing will amount to about one billion euros in two years, which is equal to a quarter of the annual volume of investments of municipalities and comes with a co-financing rate

of 50%. Additional assistance to local units will also be provided by regional authorities (eg the Tyrol region has pledged € 70 million to support local units) (CMER, 2020). There are no special measures in Hungary to support local and regional self-government units, and through fiscal relief measures for citizens and businesses, the Hungarian government has halved the municipal business tax. Lost income for smaller local units of up to 25,000 people will be offset by central government support - while support for larger local units will be considered on a case-by-case basis. (CMER, 2021)

Table 1. Share of local government level's own income in total general government revenues between 2014 -2020 (%)

Time/Country	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
EU 28	24.19	26.88	24.18	23.91	23.75	23.6	25.04
Austria	17.05	17	17.12	17.14	17.11	17.06	17.6
Croatia	29.02	27.32	25.52	25.32	26.55	26.38	28.07
Hungary	19.32	16.38	13.88	14.18	14.85	15.28	15.12
Slovenia	21.32	20.13	18.92	18.65	18.72	19.07	21.35

Source: Calculation based on Eurostat database Annual goverment finance statistics

Table 2: Share of total local government level expenditure in total general government expenditure between 2014-2020

Time/Country	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
EU 28	23.04	23.08	23.07	23.08	23.24	23.34	21.66
Austria	16.22	16.7	16.75	17.02	17.14	17.33	15.7
Croatia	26.15	25.11	25.09	25.79	26.89	27.42	26.13
Hungary	15.55	15.4	12.73	13.33	14.02	14.78	12.5
Slovenia	19.27	18.36	17.74	18.56	19.44	19.41	17.55

Source: Calculation based on Eurostat database Annual goverment finance statistics

Table 3: Shares of Tax Revenues and Assistance from Abroad and from entities within the general budget in operating income of regional self-government units in Croatia

	Tax revenues			Assistance from abroad and from entities within the general budget		
	avg 2014-18	2019	2020	avg 2014-18	2019	2020
Republic of Croatia	54.4	57.3	54.5	19.0	18.8	24.3
City of Zagreb	74.4	73.8	73.2	2.8	4.6	5.9
Zagreb	62.0	65.1	62.3	9.7	17.9	16.6
Krapina-Zagorje	52.1	54.8	51.1	32.5	33.5	38.7
Sisak - Moslavina	38.0	46.6	39.7	34.2	30.0	39.4
Karlovac	49.1	52.5	49.5	31.4	28.9	34.5
Varaždinska	51.7	57.7	53.3	28.2	26.7	31.6
Koprivnička - Križevci	38.3	47.9	44.9	30.8	30.0	37.4
Bjelovar - Bilogora	41.5	50.0	47.1	37.7	35.7	40.1
Primorsko-goranska (T)	51.4	51.6	48.3	9.2	13.3	10.9
Lika - Senjska (T)	31.2	38.3	38.4	42.1	34.6	35.4
Virovitica - Podravina	28.3	39.5	40.6	49.0	45.3	45.8
Pozega - Slavonian	37.2	51.0	47.9	48.0	38.1	41.8
Brodsko - Posavina	41.7	55.3	48.9	40.4	32.0	39.5
Zadarska (T)	42.2	49.0	41.5	23.9	21.2	31.2
Osijek - Baranja	46.4	52.1	48.9	30.9	31.1	37.1
Sibenik-Knin (T)	41.6	49.5	43.7	28.7	25.8	32.9
Vukovar-Syrmia	32.4	47.4	48.1	47.7	35.0	38.1
Split-Dalmatia (T)	50.5	53.6	51.5	17.9	15.6	22.5
Istrian (T)	47.8	50.4	42.3	14.8	13.5	24.8
Dubrovnik -Neretva (T)	41.6	41.9	43.8	20.9	19.1	29.2
Međimurje	46.9	50.9	47.5	32.5	34.8	38.9

T- special designation for tourist counties

Source: PR-RAS Reports of the Ministry of Finance

Table 3, through the analysis of the share of tax revenues in the income of Croatian regional self-government units and the share of assistance from abroad and from entities within the general budget, monitors the change in shares in the years before COVID-19, and in 2020. The table shows that the share of tax revenues falls in 17 counties including the City of Zagreb, growing in only 4 of them, while helping to grow in all counties except one.

Table 4 lists the calculated indicators of the HHI concentration of tax revenues for the average periods 2014-18, 2019 and 2020 for the Republic of Croatia in total and for all counties individually. All values are (very) highly concentrated (>0.25), due to the high share of income tax in the county's tax revenues. In addition to the HHI index, the number of employees in legal entities is listed in total and individually by county. The observed counties and the City of Zagreb are also classified according to the population.

Table 4: Herfindal-Hirschman tax revenue concentration indices, number of employees per 1000 inhabitants and size of local units in the Republic of Croatia

	HHI			Number of employees per 1000 inhabitants			Size by
	avg 2014-18	2019	2020	avg 2014-18	2019	2020	number of flats. 2019
Republic of Croatia	**0.78**	**0.80**	**0.82**	**262**	**285**	**293**	**-**
City of Zagreb	0.88	0.86	0.88	401	433	441	6
Zagreb	0.87	0.86	0.87	195	223	246	4
Krapina-Zagorje	0.84	0.86	0.88	214	231	241	2
Sisak - Moslavina	0.87	0.91	0.91	205	215	224	2
Karlovac	0.84	0.87	0.86	238	247	250	2
Varaždinska	0.84	0.88	0.89	291	314	321	2
Koprivnička - Križevci	0.84	0.87	0.89	211	230	234	2
Bjelovar - Bilogora	0.83	0.88	0.89	206	223	231	2
Primorsko-goranska (T)	0.69	0.70	0.70	282	299	306	3
Lika - Senjska (T)	0.60	0.69	0.70	232	246	249	1
Virovitica - Podravina	0.82	0.90	0.91	181	193	201	1
Pozega - Slavonian	0.86	0.92	0.91	200	220	230	1
Brodsko - Posavina	0.84	0.91	0.90	182	206	214	2
Zadarska (T)	0.57	0.60	0.62	199	226	227	2
Osijek - Baranja	0.82	0.88	0.86	236	258	264	3
Sibenik-Knin (T)	0.60	0.61	0.67	220	235	242	1
Vukovar-Syrmia	0.83	0.91	0.90	199	222	229	2
Split - dalmat. (T)	0.66	0.69	0.73	218	244	253	5
Istrian (T)	0.60	0.60	0.61	270	288	283	3
Dubrovnik - ner. (T)	0.67	0.72	0.73	231	256	270	2
Međimurje	0.83	0.86	0.87	267	278	287	2

Source: PR-RAS Ministry of Finance Reports for local and regional units and CBS, Cities in Statistics

5. Results and discussion

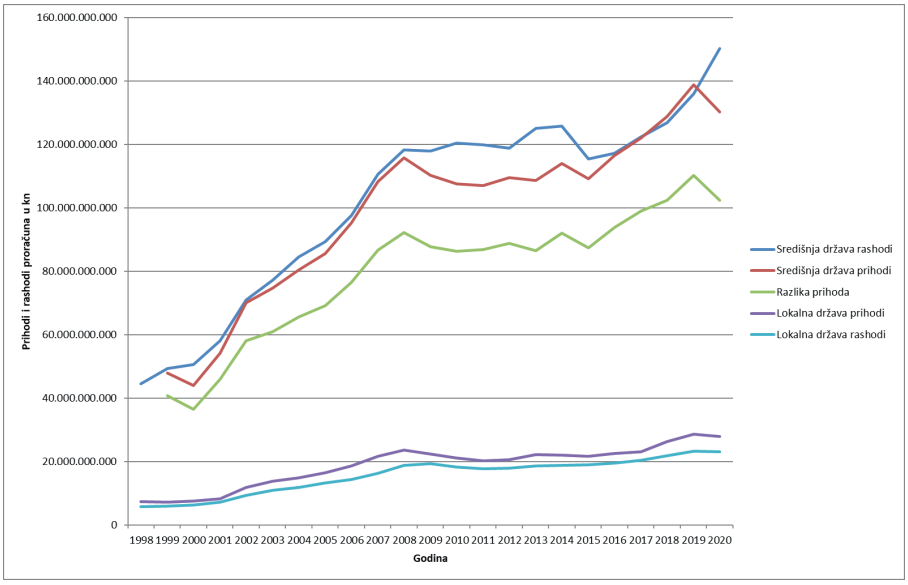
The analysis of the share of revenues and expenditures of the local level in total general government revenues according to Eurostat data shows that the degree of fiscal decentralisation inCroatia is above the EU average. The data in the table is part of the answer to the first research question, so given eurostat data, it could be argued that COVID-19 has had a positive impact on the fiscal decentralisation process. But if we know that revenues have increased due to loans provided and transferred by the central government to local units, this has actually increased the dependence of local individuals on the central government and created debt to it. In graph 1 we can go through the ratio of revenues and expenditures of central and local government in the period 1998-2020 and see that over almost the entire period the difference increases in favor of the central government, and although in 2020 there is a decline in this difference, it is an exclusive consequence of the decrease in revenues at the central government level.

Data for Austria, Hungary and Slovenia that do not reduce the share of the local government in total and general government revenuesand expenditure show that reflecting the level of employment, using an instrument of a temporary EU nature to provide support tothe state of themember states in emergency situations– SURE[3] (Support to mitigate Unemployment Risks in an Emergency) allows Member States to be able to finance their increased public expenditure dedicated to measures and programmes that protect jobs and employment, as well as employed and self-employed people from the risk of unemployment.

This also gives us an answer to another research question on employment, which was maintained through state interventions and through sure. In Croatia, for example, unemployment has grown by as much as 15% since February 2020 in the corona crisis, which is much faster than in the previous two recessions, but the impact of coronation was soon brought under control and unemployment was only ten percent higher in mid-2020 than it was in February 2020, just before the crisis and quarantine began (Arčabić, 2020). According to Eurostat data in Croatia, unemployment stood at 7.5% at the end of 2020, much higher than Austria (5.3%), Slovenia (5%) and Hungary (4.3%).

3 Regulation (EU) 2020/672 of 19 May 2020 on the establishment of a European instrument for temporary support it mitigate unemployment risks In an emergency (SURE) following the COVID-19 outbreak, OJ L 159, 20. V. 2020, p. 1-7, establishing a European instrument for temporary support to reduce the risk of unemployment in an emergency (SURE) after COVID-19 outbreak, COM/2020/139 Final, available on https://eur-lex.europa.eu/legal-content/ HR/TXT/?uri=CELEX-:52020PC0139 (20/2020).

Graph 1: Movement of central and local government revenues and expenditures in the Republic of Croatia in the period 1998-2020 (HRK)



Source: PR-RAS of the Ministry of Finance and Implementation of the State Budget 1998-2020

Analysis of data from Table 3 shows an above average share of tax revenues in Zagreb (which falls from 74.4% on average in 2014-18 to 73.2% in 2020) and a below-average share of Zagreb in aid (which increased from 2.8% on average in 2014-18 to 5.9% in 2020). The above-average share of tax revenues is still only in Zagreb County, where its fluctuations are insignificant (65.1% in 2019 compared to 63.3% in 2020), but there is a significant increase in aid in 2020, which is the case in all counties and the City of Zagreb, except Primorsko-goranska and slightly Virvitičko-podravska, which even in the period 2014-2020 had the highest shares of assistance in Slavonian counties (Pozega-Slavonia, Osijek-Baranja, Brodsko-Posavina, Vukovarsko-Srijemska, Virovitičko-Podravska) increase the share of tax revenues, but still have high shares of assistance (some receive more assistance than they collect in taxes, e.g. Virovitičko-Podravska). Tourist counties (T) have shares of tax revenues below the level of the Average of the Republic of Croatia, their level of assistance is moderate, but there is an increase in 2020.

In Table 4, where the indicator of the HHI concentration of tax revenues for the average of 2014-18, 2019 and 2020 for the Republic of Croatia is in total and for all local units, the values are highly concentrated (>0.25), so the City of Zagreb has almost the highest level of concentration of tax revenues (e.g. 0.88 in 2020), since income tax revenues predominantly prevail in the structure of tax revenues. This is further supported by the figures on the number of employees per 1000 inhabitants, which is absolutely the highest and above

the average of the Republic of Croatia in the City of Zagreb (441 in 2020, the average of the Republic of Croatia was 293). The data refers to the number of employees in legal entities. The more employees per 1000 inhabitants, the higher the amounts of taxes paid into county budgets, the higher this amount is due to both the higher the share of income tax and the surtax payments to income tax. In continental counties, the share of HHI is also higher than the average of the Republic of Croatia, which indicates higher employment.. In tourist counties (including Lika-Senj, where Plitvice and Novalja on Pag belong) HHI is lower than the average of the Republic of Croatia (e.g. Istria has the lowest of 0.61 in 2020, the number of employees in legal entities per 1000 inhabitants is about the average of the Republic of Croatia, class size =3 (200-300 thousand inhabitants). This can be interpreted by the fact that they have an average or below average number of employees in legal entities per 1000 inhabitants, so both the payments of taxes and surtaxes on income are less represented. In addition to the number of employees in legal entities, in tourist counties there is probably a higher proportion of craftsmen and flat-rate renters who rent accommodation facilities, which are not covered under legal entities, and who pay often flat taxes (which are effectively lower than income taxes paid in “normal” local units. In the structure of tax revenues is in all tourist counties and a higher relative share of property taxes (real estate transfer tax paid when buying houses and apartments), which affects the decrease in the value of HHI.

6. Conclusions

The aim of this paper is to show the impact of the COVID-19 crisis on the fiscal decentralisation process in Croatia, while hypothesising that the position of local units has been weakened due to the crisis, and that their dependence on the central government has increased and thus the fiscal decentralisation process has slowed down.

According to the Ministry of Finance (PR-RAS Report, 2020), local units in Croatia had 2.7% lower operating income in 2020 compared to 2019, and on the basis of income tax their income was 6.2% lower. Given the possibility of using the loan from the Ministry of Finance, local units did not suffer the losses that were expected at the beginning of the COVID-19 pandemic. This smaller decline is the result of support for the preservation of radih sites secured through state intervention, funds provided through EU instruments and programmes. That is why the COVID crisis itself has not greatly weakened the fiscal position of local units, but it can be concluded that it has increased its dependence on the central government since there were no state aid for the preservation of jobs, unemployment would rise, which would mean lower income tax revenues.

Other data obtained through the survey also show that due to the COVID-19 crisis, the fiscal decentralisation process has slowed down. Increased assistance from the central government budget, reduced shares of tax revenues in local unit budgets confirm the hypothesis that in 2020 the fiscal position of the local level is weakened, and thus the slow process of fiscal decentralisation.

The results of the survey confirm the thesis in the OECD Survey (2020) that in conditions of crisis we can expect a consolidation effect, which implies greater central government activity and expenditure, while the local level tends to fall in tax revenues, which implies that the fiscal decentralisation process is slowing down.

Conducting future research on this topic is extremely important since in 2021 years due to legal changes of the local and regional self-government unit there is a further drop in revenue. Additional dependence on the state in 2021 will also arise from the amendments to the Law on financing local and regional self-government units in the tkz. The fifth round of reforms, which further reduced income tax rates and paid fiscal leveling to local units directly from the state budget, since there is insufficient funds for the current model of disbursement directly through the fiscal levelling fund, which is filled from income tax, given the reduced rates. Additionally, in 2021 there is a payment on the basis of a youth tax refund, where income tax is exempted in 100% of the amount of persons under 25 years of age, and 50% of people under 30, for which there is no compensation in the state budget.As the duration of coronation so far is longer than expected and will certainly continue in 2022, it is necessary to evaluate over a long period of time the effects of coronation on the public finances of central and especially local units, so that economic policymakers in Croatia and the rest of the EU can adopt measures to stop the negative effects of coronation on the public finances of local units. In order not to further deteriorate the relative position of Croatian local units in relation to the local unit in the rest of the EU, it is necessary to adopt at EU level appropriate supranational regulations regulating fiscal decentralisation processes in general. In view of the results obtained and the impact that income tax has on the income of local and regional units the amounts of tax concentration calculated through HHI are above all averages in all fiscal units of regional self-government, the results, given the higher share of income tax belonging to municipalities and cities, would certainly be at these levels there as well. Dependence of income exclusively on income tax i.e. the high concentration of local government tax revenues on income tax, from which there is less and less income every year due to legislative changes, is unsustainable and makes local units extremely vulnerable to economic crises. The only possible alternative to getting out of this addiction is to increase revenue from other taxes and fees. For this reason, it is necessary to introduce a property tax, as a new source of financing for local and regional self-government. It is also necessary to start the process of transformation and consolidation of local and regional self-government in Croatia, because the existing fragmented territorial structure with a large number of municipalities, cities and counties makes it difficult to introduce new taxes, namely their replacement with existing ones. That is why the introduction of new taxes, which also mean a new model of financing local self-government, is a precondition for embarking on a territorial overhaul.

Croatia is at the EU28 average by most indicators, but it is far from a decentralised state and this is one of the key development problems. And as long as the economic criterion does not prevail over the political one that is the cause of today's territorial organization and all the problems faced

by local and regional self-government, the decentralisation process will be formal, without real developments.

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CHAPTER 25

Covid-19 as an ultimate stock market Black Swan

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Abstract

The economic consequences of COVID-19 are detrimental not only to public health systems but to trade and travel, food and agriculture industries, financial markets and others. The financial markets exhibited quick fall after the outbreak of the COVID-19 infection, which was an unprecedented stock market reaction to the biggest global pandemics in the last 100 years. Its devastating impact on economy and financial markets makes it an ultimate Black Swan event. Goal of this paper is to investigate the impact of COVID-19 disease on values of eight major stock market indices: Nikkei 225, DAX performance-index (DAX), Dow Jones Industrial Average (Dow Jones), NASDAQ Composite (NASDAQ), S&P 500, France CAC 40 Index (FCHI), FTSE 100 and FTSE MIB Index. The results of the analysis have shown that COVID-19 variables had negative impact on the values of all observed market indices. The same conclusion was brought when the COVID-19 variables were observed on the world level and on the level of individual countries, in which the certain market index is used. According to the regression results it was shown that the value of market indices has dropped roughly a month or month and a half before it should, depending on the confirmed cases of infection. This can be explained with the destructive effect of COVID-19 outbreak started in Wuhan, China in December 2019 and negative expectations on the stock markets. The results obtained from this paper can be important and relevant for market experts and investors as a guide in making investment decisions.

Key words: *COVID-19, stock market indices, Black Swan.*

JEL classification: *G15, I19*

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1. Introduction

The economic consequences of COVID-19 are detrimental not only to public health systems but to trade and travel, food and agriculture industries and financial markets, (Evans, 2020). A global spillovers of COVID-19 are also evident in hospitality and sport industry, oil industry and import-dependent countries, event and entertainment industries, (Peterson and Thankom, 2020). COVID-19 pandemics had also negative impact on financial markets and stock market indices. Its devastating impact on economy and financial markets makes it an ultimate black swan event. The characteristics of a black swan event are rarity, extreme impact and retrospective predictability. Black swans come out of nowhere to derail financial markets. They are so-called due to an old saying stating that „black swans did not exist, until one appeared to prove otherwise“, (Smith, 2020).The financial markets exhibited quick fall after the outbreak of the COVID-19 infection, (Liu et al., 2020). There was an unprecedented stock market impact of Covid-19, Baker et al. (2020), that has not been seen in 20th century, not even after Spanish flu influenza. Investors reacted with fear which had a negative impact on stock markets. Although there was an evident sharp loss in stock markets returns, the financial markets are showing signs of recovery in the long run.

Goal of this paper is to investigate whether COVID-19 is a major stock market black swan event. The data for eight major stock market indices, Nikkei 225, DAX performance-index (DAX), Dow Jones Industrial Average (Dow Jones), NASDAQ Composite (NASDAQ), S&P 500, France CAC 40 Index (FCHI), FTSE 100 and FTSE MIB Index, are brought into connection with the selected COVID-19 variables: new cases and total cases of COVID-19 infection, new death and total death due to COVID-19 infection. A simple linear regression models will be used to estimate market indices based on actual values of COVID-19 variables at the world level and on the level of individual countries in which the observed market index is used. It is expected that there exists a negative impact of COVID-19 infection on the values of stock market indices.

The paper consists of five chapters. After the introduction, in short literature review the state-of-the-art on the impact of COVID-19 on financial stock markets is presented and elaborated. In the methodology and data section the data sources an methodology of the paper are explained. In the results and discussion section the main results of the analysis for eight stock market indices are displayed. Final chapter presents concluding remarks.

2. Short literature review

Global financial markets entered a state of collective hysteria triggered by the Covid-19 virus suggesting that Covid-19 is a financial markets “black swan” event, (Morales and Andreosso-O’Callaghan, 2020). Markets did not react well to volatility levels exhibited by the Shanghai stock market but awoke when Italy registered its first cases of infection with financial markets free fall at the end of the February 2020. Onali (2020) investigated the impact of Covid-19 cases and related deaths on the United States’ stock market indices (Dow Jones and S&P500). The main findings suggested that changes in the number

of cases and deaths in the United States and six other observed countries did not have an impact on the United States' stock market returns. The only significant were reported cases from China. Liu et al. (2020) evaluated the impact of COVID-19 outbreak on 21 leading stock market indices in major affected countries. Stock markets in major affected countries fell quickly after the virus outbreak with Asia experiencing more negative returns as compared to other countries. Investors' fear sentiment was proved to be a transmission channel for the COVID-19 infection negative effect on the stock markets. No previous infectious disease outbreak has impacted the stock market as powerfully as the COVID-19 pandemic, (Baker et al., 2020). Yan et al. (2020) analysed the potential effects of the COVID-19 on the stock markets and investment strategies. Past outbreaks propose a possible ways that an individual can profit off because markets react adversely to such incidents in the short run but eventually correct themselves in the long run. Adenomon et al. (2020) examined the effect of COVID-19 outbreak on the performance of the Nigeria stock exchange.There was an evident loss in stock returns and high volatility in stock returns under the COVID-19 period compared to the normal period before the outbrake. Financial markets reacted dramatically to the global COVID-19 pandemic, creating an unprecedented level of risk and causing investors to suffer significant loses in short period of time, (Dayong et al., 2020). Pavlyshenko (2020) studied different regression approaches for modeling COVID-19 spread and its impact on the stock markets. The results have shown that different crises with different reasons have different impact on the same stocks so it is important to analyze their impact separately. Sansa (2020) revealed the positive and significant relationship between the COVID-19 confirmed cases of infection and trends in financial markets in China and USA. The analysis was conducted in the period from March 1st 2020 to March 25th 2020 by applying a simple regression model in order to investigate the impact of COVID-19 on the Shanghai Stock Exchange and New York Dow Jones Index. Zeren and Hizarci (2020) using cointegration test investigated the effect of reported COVID-19 cases on stock markets. The existence of cointegration between daily cases of death and volatility in stock markets was detected in all observed countries.

3. Data and methods

In the analysis the data for eight stock market indices are compared with the COVID-19 variables on the global (World) data and on the country data where the observed stock market index is used. Following eight market indices are chosen: Nikkei 225, DAX performance-index (DAX), Dow Jones Industrial Average (Dow Jones), NASDAQ Composite (NASDAQ), S&P 500, France CAC 40 Index (FCHI), FTSE 100 and FTSE MIB Index. The four COVID-19 variables are observed: new cases, total cases, new deaths and total deaths. The values of the chosen market indices and the COVID-19 variables are compared for Japan (where Nikkei 225 is used), Germany (where DAX is used), the United States of America (Dow Jones, NASDAQ and S&P 500), France (FCHI), the United Kingdom (FTSE 100) and Italy (FTSE MIB Index). The data for the selected market indices are taken from the Fusion Media (2020) and the Yahoo! Finance web pages (Yahoo! Finance, 2020,

a-g). The daily close values of market indices are used in the analysis. The values of market indices are expressed in national currencies (yens, euros, British pounds or US dollars). The data for COVID-19 variables are collected from the EU Open Data Portal (2020) webpage. The data for all variables are observed for the period from December 31, 2019 to April 20, 2020. The limitation of the analysis is the lack of data for some days in the observed period due to weekends, holidays and other restrictions related to the indices.

The number of daily data between the observed market indices is different. In the analysis the main emphasize will be given to correlation and regression analyses. In the simple linear regression models the role of dependent variable will have the actual value of the observed market indices whereas the independent variable will be the one of COVID-19 variables. The estimated linear regression models will be then employed to estimate market indices' values based on an actual values of the COVID-19 variable. Therefore, the actual values of COVID-19 variables will be put in the regression equation. In that way the estimates of the observed market indices will be calculated by taking into account COVID-19 variables at the World level and on the country level where the observed market index is used.

4. Results and discussion

In Table 1 the regression results for the Nikkei 225 market index are presented. According to the results from Table 1 all regression models are highly statistically significant. Furthermore, all correlations between the Nikkei 225 values and the observed COVID-19 variables are of medium strength and, what is more important, of negative direction. In other words, with increase of COVID-19 variables the value of Nikkei 225 decreases. If regression coefficients between the World and Japan are compared, it can be concluded that situation in Japan regarding the COVID-19 variables has much higher impact on the value of Nikkei 225 than the situation in the World related to the COVID-19. On average, the highest impact on the value of the Nikkei 225 seems to have new deaths variable due to the COVID-19 infection.

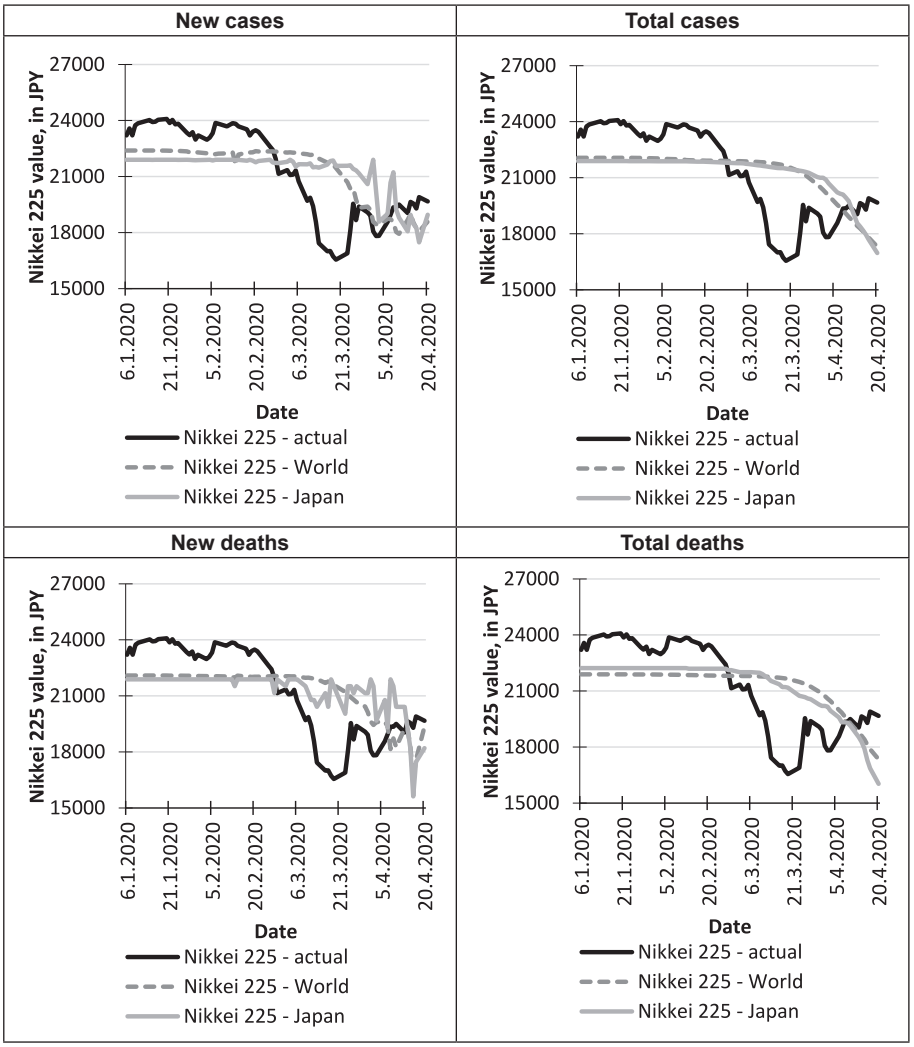
Table 1: Linear regression results, dependent variable Nikkei 225, n = 72 daily data

Area / country	COVID-19 variable	Statistics					
		Coef. of correl.	Coef. of determ.	Intercept		Regression coefficient	
				Estimate	P-value	Estimate	P-value
World	New cases	-0.6458	0.4171	22389.98	2.05E-71	-0.051	9.03E-10
	Total cases	-0.5224	0.2729	22066.85	7.46E-69	-0.002	2.51E-06
	New deaths	-0.5515	0.3041	22089.07	9.16E-70	-0.531	5.16E-07
	Total deaths	-0.4621	0.2135	21889.06	1.94E-68	-0.028	4.39E-05
Japan	New cases	-0.4706	0.2214	21900.09	1.31E-68	-7.561	3.03E-05
	Total cases	-0.4651	0.2163	21889.16	1.56E-68	-0.458	3.86E-05
	New deaths	-0.4795	0.2299	21884.05	4.71E-69	-368.485	2.03E-05
	Total deaths	-0.6043	0.3652	22227.74	8.90E-71	-36.240	1.90E-08

Source: EU Open Data Portal (2020), Yahoo! Finance (2020f), authors.

In Figure 1 the actual values of the Nikkei 225 and estimated values based on the regression models are shown.

Figure 1: Actual and estimated values of the Nikkei 225 based on estimated regression models for World and Japan



Source: EU Open Data Portal (2020), Yahoo! Finance (2020f), authors.

All figures are suggesting that the estimated linear regression models have weaker reaction than the actual values. The length of the lag seems to be about a month. For example, the actual Nikkei 225 values started to decrease at the end of February 2020 whereas the estimated regression lines for new cases, both for the World and Japan, started do decrease at the end of March 2020.

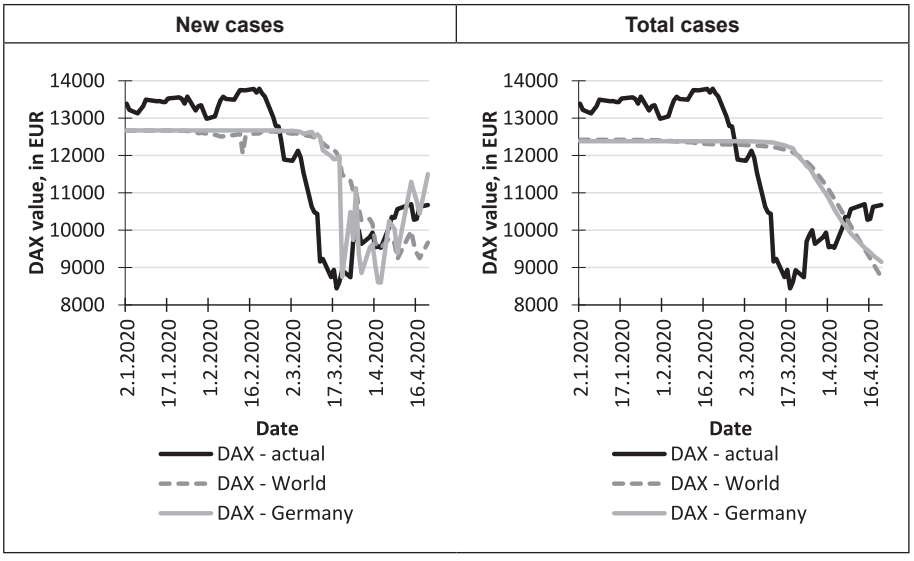
Table 2: Linear regression results, dependent variable DAX, n = 76 daily data

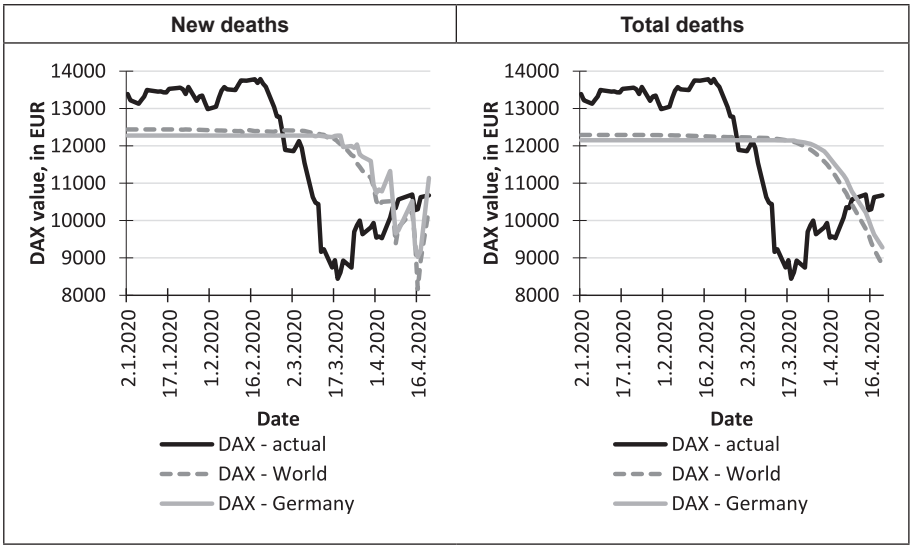
Area / country	COVID-19 variable	Statistics					
		Coef. of correl.	Coef. of determ.	Intercept		Regression coefficient	
				Estimate	P-value	Estimate	P-value
World	New cases	-0.6545	0.4284	12666.12	2.15E-68	-0.040	1.43E-10
	Total cases	-0.5114	0.2615	12418.49	5.79E-65	-0.002	2.35E-06
	New deaths	-0.5473	0.2995	12438.08	4.36E-66	-0.413	3.13E-07
	Total deaths	-0.4470	0.1998	12290.11	2.06E-64	-0.021	5.18E-05
Germany	New cases	-0.7201	0.5185	12671.22	6.15E-72	-0.660	2.29E-13
	Total cases	-0.5196	0.2700	12381.18	1.03E-65	-0.023	1.51E-06
	New deaths	-0.4558	0.2077	12275.36	7.05E-65	-10.315	3.52E-05
	Total deaths	-0.3554	0.1263	12150.11	8.81E-64	-0.652	0.0016

Source: EU Open Data Portal (2020), Yahoo! Finance (2020b), authors.

Table 2 contains the regression results for the market index DAX. All conclusions based on the regression models are identical to the conclusions for the Nikkei 225.

Figure 2: Actual and estimated values of the DAX based on estimated regression models for World and Germany





Source: EU Open Data Portal (2020), Yahoo! Finance (2020b), authors.

In Figure 2 the actual and estimated regression values for DAX are given. Again, regression models have shown that the DAX value should decrease but with a certain lag.

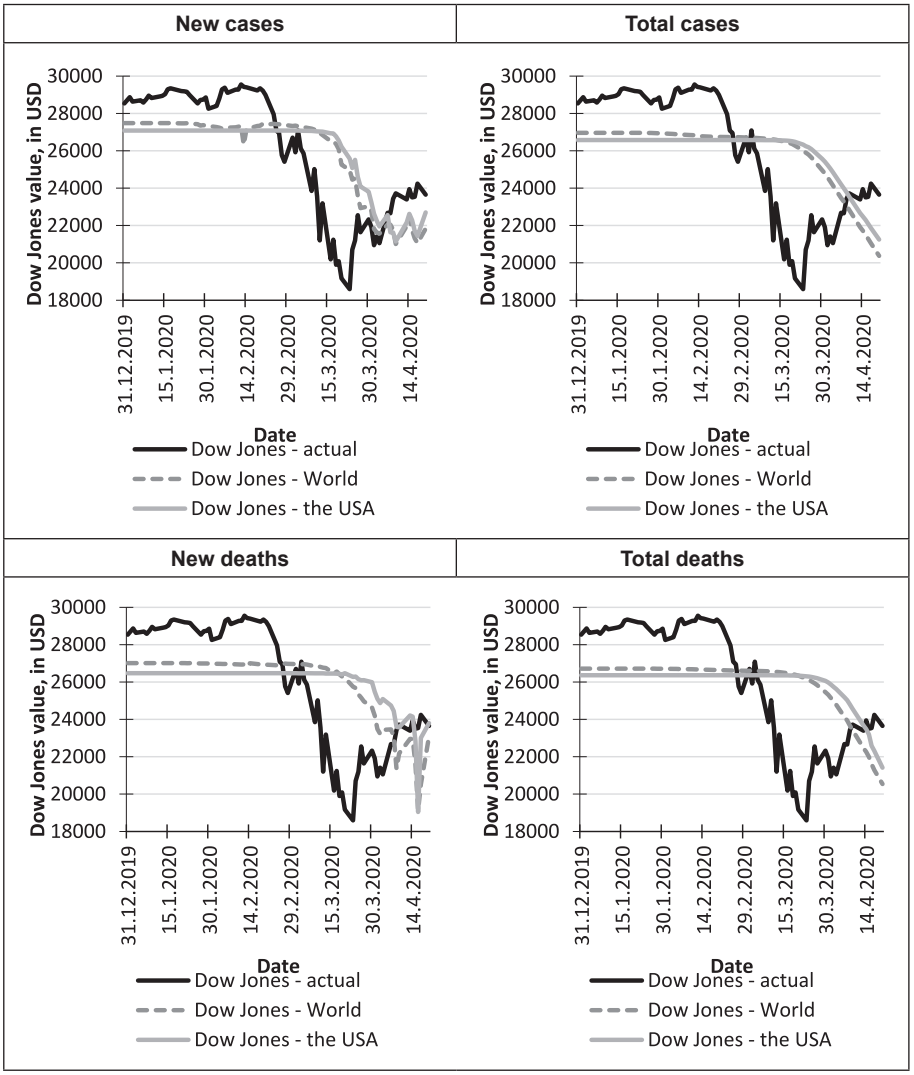
Table 3: Linear regression results, dependent variable Dow Jones, n = 76 daily data

Area / country	COVID-19 variable	Statistics					
		Coef. of correl.	Coef. of determ.	Intercept		Regression coefficient	
				Estimate	P-value	Estimate	P-value
World	New cases	-0.6619	0.4382	27482.70	1.27E-72	-0.076	7.48E-11
	Total cases	-0.5007	0.2507	26960.27	9.45E-69	-0.003	4.11E-06
	New deaths	-0.5411	0.2928	27015.31	6.31E-70	-0.762	4.50E-07
	Total deaths	-0.4343	0.1887	26717.03	3.14E-68	-0.037	8.85E-05
the United States of America	New cases	-0.5792	0.3355	27085.14	5.01E-71	-0.178	4.22E-08
	Total cases	-0.3929	0.1543	26576.13	4.63E-68	-0.007	0.0004
	New deaths	-0.3586	0.1286	26471.77	5.87E-68	-1.508	0.0015
	Total deaths	-0.3034	0.0921	26363.59	1.68E-67	-0.122	0.0077

Source: EU Open Data Portal (2020), Yahoo! Finance (2020c), authors.

The linear regression results in Table 3, related to Dow Jones market index, are in the line with previous linear regression results displayed in Table 1 and Table 2. So, the correlations between the Dow Jones market index and the observed COVID-19 variables are negative. Again, the highest impact on the Dow Jones market index seems to have new deaths variable due to the COVID-19.

Figure 3: Actual and estimated values of the Dow Jones based on estimated regression models for World and the United States of America



Source: EU Open Data Portal (2020), Yahoo! Finance (2020c), authors.

Figure 3 shows actual and estimated values of Dow Jones index by taking into account the observed COVID-19 variables at the World level and for the United States of America. According to the results, regression models have pretty high lag. The regression models pointed out that the Dow Jones market index should decrease about three months after the start of epidemic of the COVID-19.

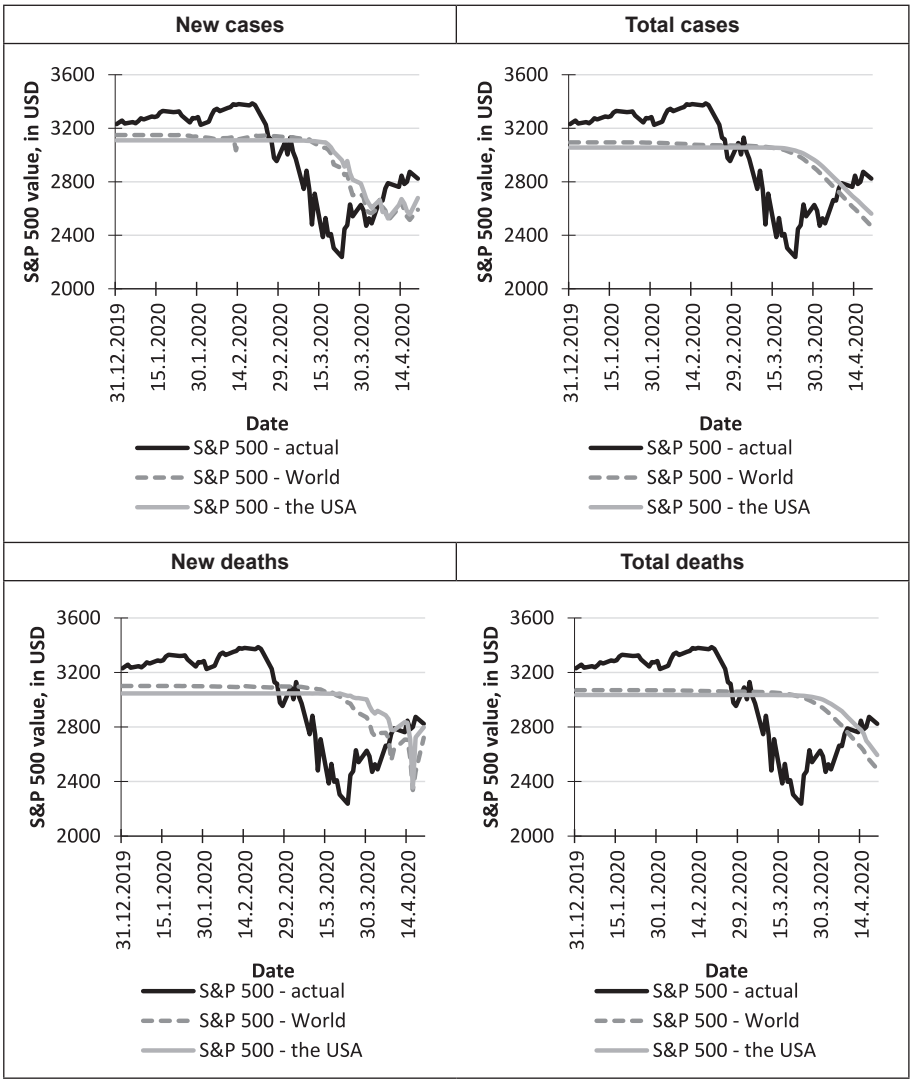
Table 4: Linear regression results, dependent variable S&P 500, n = 76 daily data

Area / country	COVID-19 variable	Statistics					
		Coef. of correl.	Coef. of determ.	Intercept		Regression coefficient	
				Estimate	P-value	Estimate	P-value
World	New cases	-0.6396	0.4091	3149.39	1.91E-75	-0.0075	4.98E-10
	Total cases	-0.4656	0.2168	3094.07	1.04E-71	-0.0003	2.25E-05
	New deaths	-0.5127	0.2628	3101.18	6.14E-73	-0.0739	2.19E-06
	Total deaths	-0.3977	0.1582	3069.83	2.44E-71	-0.0035	0.0004
the United States of America	New cases	-0.5562	0.3094	3109.42	4.33E-74	-0.0175	1.82E-07
	Total cases	-0.3567	0.1272	3056.15	2.79E-71	-0.0007	0.0016
	New deaths	-0.3263	0.1065	3046.56	2.64E-71	-0.1403	0.0040
	Total deaths	-0.2642	0.0698	3034.89	7.18E-71	-0.0108	0.0211

Source: EU Open Data Portal (2020), Yahoo! Finance (2020g), authors.

The results given in Table 4 have confirmed that the correlations between the market indices and the COVID-19 variables are negative. However, the impact of COVID-19 variables seems to be lower for S&P 500 than at Dow Jones market index.

Figure 4: Actual and estimated values of the S&P 500 based on the estimated regression models for World and the United States of America



Source: EU Open Data Portal (2020), Yahoo! Finance (2020g), authors.

According to Figure 4, the lag between actual decrease of the S&P 500 market index value and the decrease suggested by the regression models seems to be between one and one and half months.

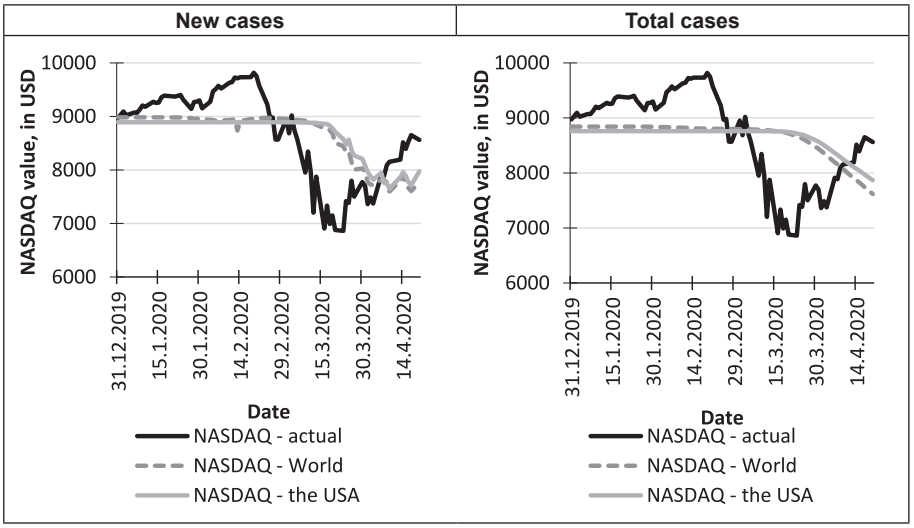
Table 5: Linear regression results, dependent variable NASDAQ, n = 76 daily data

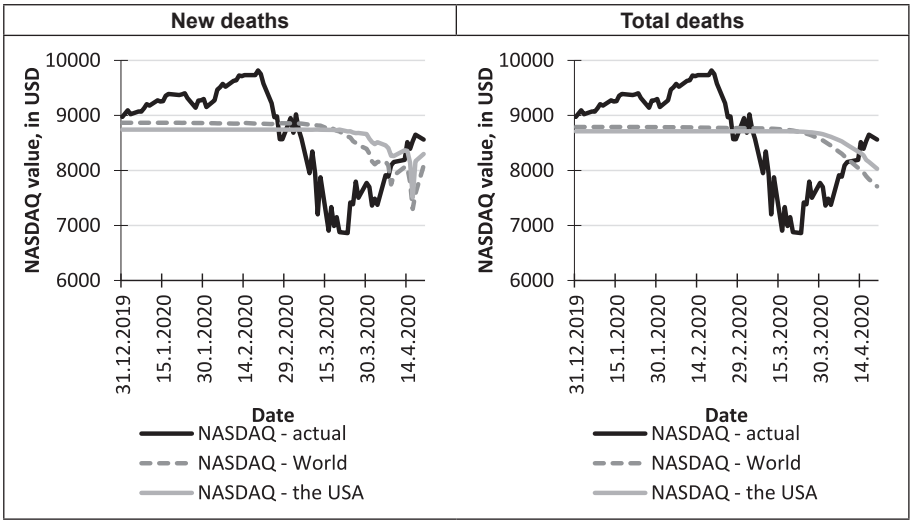
Area / country	COVID-19 variable	Statistics					
		Coef. of correl.	Coef. of determ.	Intercept		Regression coefficient	
				Estimate	P-value	Estimate	P-value
World	New cases	-0.5587	0.3122	8982.69	1.82E-77	-0.016	1.56E-07
	Total cases	-0.3679	0.1353	8843.12	1.25E-74	-0.001	0.0011
	New deaths	-0.4235	0.1793	8866.19	9.69E-76	-0.151	0.0001
	Total deaths	-0.2990	0.0894	8788.88	1.22E-74	-0.007	0.0087
the United States of America	New cases	-0.4761	0.2267	8891.27	8.30E-77	-0.037	1.38E-05
	Total cases	-0.2594	0.0673	8759.92	8.23E-75	-0.001	0.0236
	New deaths	-0.2343	0.0549	8741.51	4.95E-75	-0.250	0.0417
	Total deaths	-0.1648	0.0272	8712.36	8.62E-75	-0.017	0.1548

Source: EU Open Data Portal (2020), Yahoo! Finance (2020e), authors.

In Table 5 the main estimates for the regression models for the NASDAQ market index are given. All correlations between the NASDAQ market index and the COVID-19 variables are negative. However, it seems that variables new deaths and total deaths do not have statistically significant impact, at significance level of 1%, on the value od the NASDAQ market index.

Figure 5: Actual and estimated values of the NASDAQ based on estimated regression models for World and the United States of America





Source: EU Open Data Portal (2020), Yahoo! Finance (2020e), authors.

In Figure 5 the actual and estimated values of the NASDAQ market index, based on estimated regression models for World and the United States of America, are given. Again, the response of regression models is about a month behind the actual decrease.

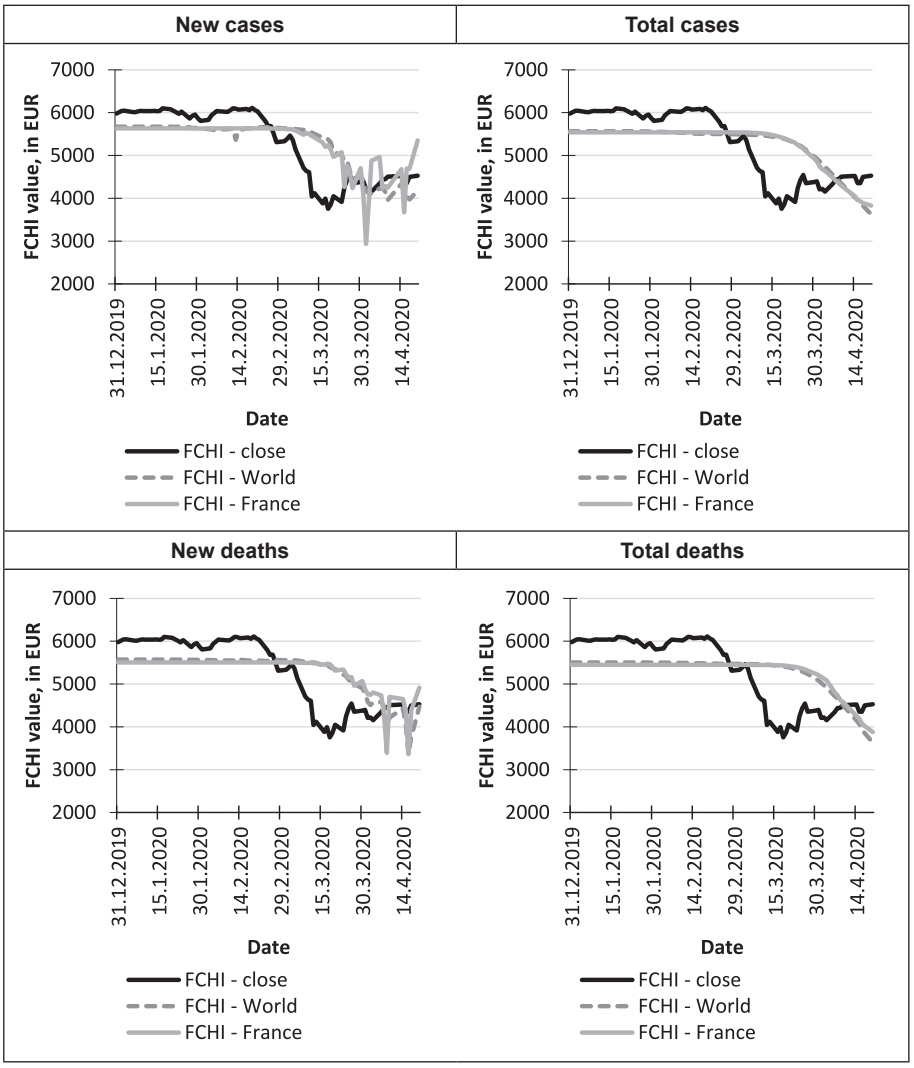
Table 6: Linear regression results, dependent variable FCHI, n = 77 daily data

Area / country	COVID-19 variable	Statistics					
		Coef. of correl.	Coef. of determ.	Intercept		Regression coefficient	
				Estimate	P-value	Estimate	P-value
World	New cases	-0.7028	0.4940	5673.04	2.55E-70	-0.020	1.04E-12
	Total cases	-0.5801	0.3365	5565.96	1.32E-66	-0.001	3.21E-08
	New deaths	-0.6085	0.3703	5570.57	1.05E-67	-0.213	4.35E-09
	Total deaths	-0.5182	0.2685	5503.81	1.00E-65	-0.011	1.39E-06
France	New cases	-0.7017	0.4924	5631.36	4.57E-71	-0.356	1.17E-12
	Total cases	-0.5806	0.3371	5540.64	3.38E-67	-0.015	3.11E-08
	New deaths	-0.5388	0.2903	5504.75	2.00E-66	-1.490	4.31E-07
	Total deaths	-0.4484	0.2011	5447.37	6.47E-65	-0.080	4.32E-05

Source: EU Open Data Portal (2020), Yahoo! Finance (2020a), authors.

In Table 6 the linear regression results for French market index FCHI are presented. Again, all correlations between the FCHI market index and the COVID-19 variables are negative and highly statistically significant.

Figure 6: Actual and estimated values of the FCHI based on estimated regression models for World and France



Source: EU Open Data Portal (2020), Yahoo! Finance (2020a), authors.

Actual and estimated values of the FCHI based on estimated regression models for World and France are given in Table 6. The response lag of the regression models again seems to be between one and one and half months.

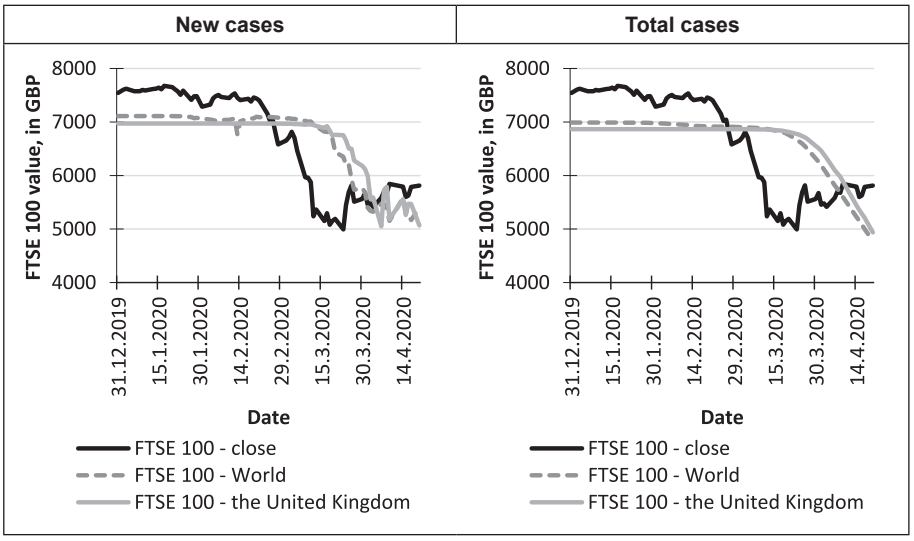
Table 7: Linear regression results, dependent variable FTSE 100, n = 77 daily data

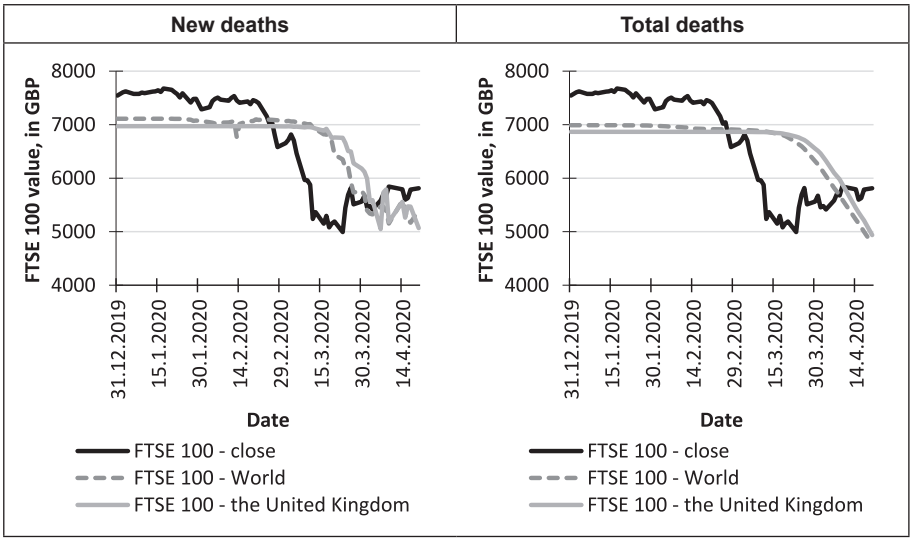
Area / country	COVID-19 variable	Statistics					
		Coef. of correl.	Coef. of determ.	Intercept		Regression coefficient	
				Estimate	P-value	Estimate	P-value
World	New cases	-0.7041	0.4957	7110.66	2.04E-73	-0.023	9.10E-13
	Total cases	-0.5807	0.3372	6988.07	1.06E-69	-0.001	3.10E-08
	New deaths	-0.6067	0.3681	6992.12	9.94E-71	-0.243	4.95E-09
	Total deaths	-0.5167	0.2670	6916.24	8.44E-69	-0.013	1.50E-06
the United Kingdom	New cases	-0.5943	0.3532	6970.98	1.29E-70	-0.325	1.21E-08
	Total cases	-0.4666	0.2177	6866.47	2.82E-68	-0.016	1.89E-05
	New deaths	-0.5071	0.2571	6895.79	6.51E-69	-1.892	2.52E-06
	Total deaths	-0.4047	0.1638	6822.64	1.46E-67	-0.109	0.0003

Source: EU Open Data Portal (2020), Yahoo! Finance (2020d), authors.

The linear regression models from the Table 7 are suggesting that the correlations between the FTSE 100 market index value and the observed COVID-19 variables are negative. Also, the highest impact on the FTSE 100 market index value has new deaths variable.

Figure 7: Actual and estimated values of the FTSE 100 based on estimated regression models for World and the United Kingdom





Source: EU Open Data Portal (2020), Yahoo! Finance (2020d), authors.

In Figure 7 the actual and estimated values of the FTSE 100 based on estimated regression models for World and the United Kingdom are shown. The response of the regression models seems to be about one month behind the actual changes of FTSE 100 market index.

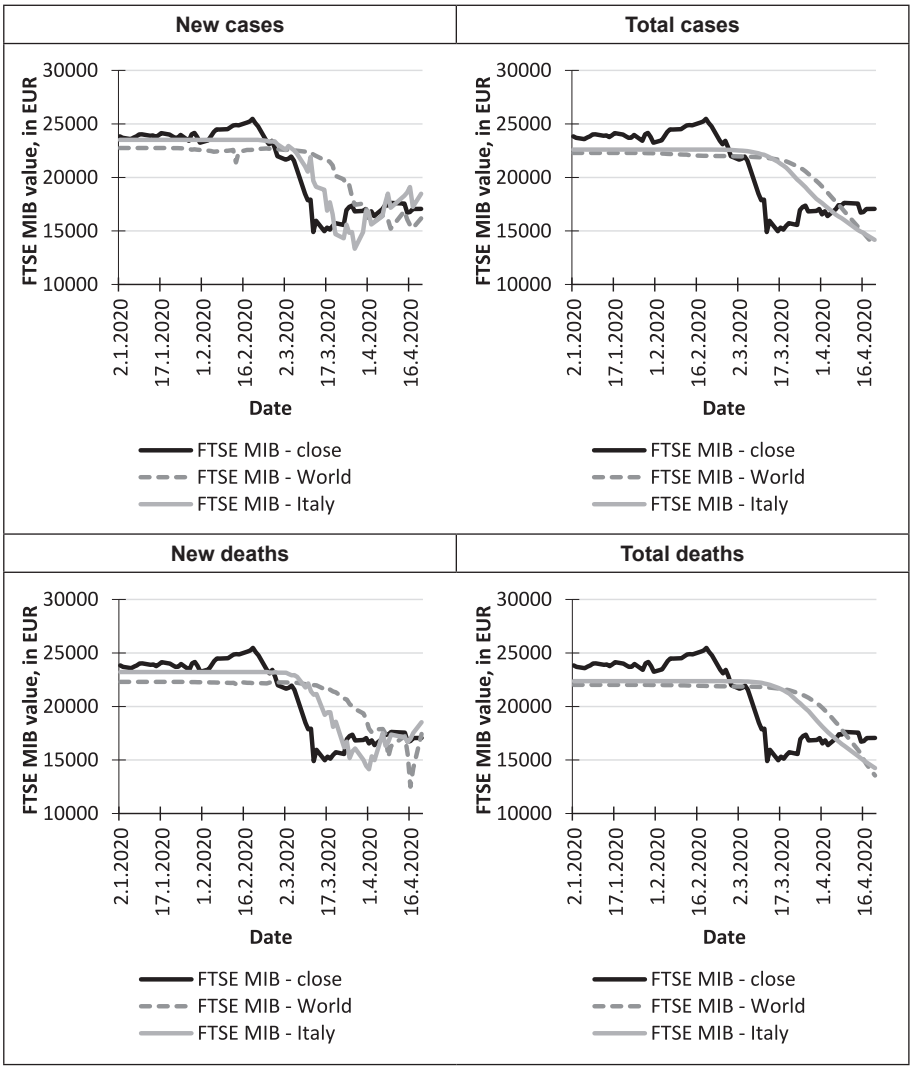
Table 8: Linear regression results, dependent variable FTSE MIB, n=76 daily data

Area / country	COVID-19 variable	Statistics					
		Coef. of correl.	Coef. of determ.	Intercept		Regression coefficient	
				Estimate	P-value	Estimate	P-value
World	New cases	-0.7102	0.5044	22,750.33	6.21E-67	-0.089	6.73E-13
	Total cases	-0.5959	0.3550	22,292.18	2.24E-63	-0.004	1.36E-08
	New deaths	-0.6209	0.3856	22,304.74	2.14E-64	-0.947	2.18E-09
	Total deaths	-0.5387	0.2902	22,021.78	1.59E-62	-0.051	5.18E-07
Italy	New cases	-0.9079	0.8242	23,509.13	4.09E-83	-1.653	1.18E-29
	Total cases	-0.7059	0.4983	22,597.20	2.45E-67	-0.047	1.07E-12
	New deaths	-0.8521	0.7260	23,215.11	2.35E-76	-10.822	1.69E-22
	Total deaths	-0.6481	0.4201	22,364.12	2.31E-65	-0.343	2.46E-10

Source: EU Open Data Portal (2020), Fusion Media (2020), authors.

Lastly, in Table 8 the linear regression results for regression models in which the FTSE MIB market index variable was the dependent variable and the COVID-19 variable being an independent variable in the models, are shown. All regression models turned out to be highly statistically significant. Also, all individual correlations between the FTSE MIB variable and the COVID-19 variables seems to be negative.

Figure 8: Actual and estimated values of the FTSE MIB based on estimated regression models for World and Italy



Source: EU Open Data Portal (2020), Fusion Media (2020), authors.

According to Figure 8, it seems that the response lag of the regression models is lower than one month for the FTSE MIB market index. It can be concluded that the value of all eight world major stock market indices have fallen dramatically due to the confirmed cases of COVID-19 infection and the number of fatalities. The main findings of this paper are in the line with previous research in this field. There was a sharp fall in major stock market indices in the middle of the February which coincides with the first reported

cases of COVID-19 infection outside the China. The results obtained from this analysis can be relevant for market experts and investors as a guide when making investment decisions. On could ask what should investors do? According to Smith (2020) they should avoid fear of missing out, forget trying to time the market, try to be prudent and invest in safe forms of investments such as gold, sovereign and corporate bonds.

6. Conclusions

Goal of this paper was to investigate the impact of COVID-19 infection on the values of major stock market indices. The case of eight stock market indices was investigated. The research results have shown that the observed COVID-19 variables have negative impact on the values of all observed market indices. The same conclusion was brought when the COVID-19 variables were observed on the World level and on the level of an individual country in which the certain market index is used. It has been shown that the highest impact on stock market index value has the COVID-19 new deaths variable. The value of market indices has dropped roughly a month or month and a half before it should according to regression results and the number of confirmed cases of infection respectively. That can be explained with negative expectations of destructive effect of COVID-19 outbreak started in Wuhan, China in December 2019.

Limitations of the paper are related to the uneven number of days for different stock market indices due to the data unavailability for each observed day due to weekends, holidays and other restrictions related to the indices. There is also a methodology problem related to confirmed number of infected persons and the number of fatalities because official data does not take into account unconfirmed or unreported cases of infection. Recommendation for future research is to inspect in more details the lags between the actual and regression values due to market negative expectations. If the lag is precisely estimated, the regression models could be used for predicting the actual values of market indices.

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CHAPTER 26

The expected impact of a digital euro on non-Eurozone EU member's states and EU candidate countries: The case of Croatia and North Macedonia

Mario Pečarić[1], Šime Jozipović[2] Andrej Ilievski[3]

Abstract

Due to the Covid-19 pandemic and technological advancements in recent years, central banks across the world are moving forward with various projects concerning the innovation of payments, which are especially focused on CBDCs like the Digital Euro. There is a broad debate among experts about the right model for a digital euro within the Eurozone. In contrast, the impact of this future digital currency on non-Eurozone EU member states and EU accession candidates has been insufficiently researched and elaborated. In fact, an uncontrolled transition to adoption could lead to the materialization of various risks both in the Eurozone and in the aforementioned groups of countries. The aim of this paper is to analyze, through a case study, the potential impact of the introduction of a digital euro under the most likely model(s), using Croatia and North Macedonia as examples. The case study presents an analysis of the impact and risks of different concepts of the introduction on payment systems. Particular attention is paid to the regulatory legal framework for the introduction of a digital euro. The main

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findings show that there are significant differences in the legal standards for financial institutions, which in turn lead to different readiness levels of the observed countries. While the paper explains that the Croatian reaction to a digital euro will be straightforward due to its already high level of integration into the European financial regulation framework, North Macedonia has more flexibility concerning the reaction to a digital euro, but also faces multiple challenges.

Key words: *Digital Euro, fintech regulation, Croatia, North Macedonia,*

JEL classification: *G17, G18, G21, G28, O33, K20*

1. Introduction

The increasing level of digitalization in the financial industry, especially in relation to cash-less payment services, caused central banks to work on their own innovation in this field. This work has culminated in the creation of new means of payment in the form of virtual currencies that are backed by a central bank and thus called “Central Bank Digital Currencies“ (CBDCs). These new forms of (supra-)national currencies offer numerous benefits, including better control over financial transactions, the ability to be linked to smart contracts and the potential for digital tokenization that could be a valid substitute for cash in the future. However, as CBDCs would be more secure than deposit money, often cheaper and easier to use than other financial services and open for fin-tech innovation, they could have a significant impact on the financial sector in general. Thus, it is essential that the laws governing these virtual currencies consider the severe impact and risks that could come with such a wide-reaching innovation to the financial system.

While the potential implications, which a digital euro would have on the Eurozone, are widely discussed, the implications for EU member states outside the Eurozone and especially EU accession candidates have still not been sufficiently explored and elaborated. This is particularly problematic because an uncoordinated adoption could lead to the materialization of various risks not only in the Eurozone but especially in the aforementioned groups of countries. The aim of this paper is to analyze, through a case study, the expected impact of different scenarios of the introduction of a digital euro, using Croatia and North Macedonia as examples. The case study presents an analysis of the impact and risks of the most likely implementation model on financial stability and payment systems. Given the expected model of the digital euro, our hypothesis is that increasing institutional capacity by modifying the regulatory framework will enable the effective use of fin-tech and reduce the negative impact in the observed countries.

In order to test this hypothesis, we first analyze the potential risks and benefits that could materialize with the implementation of a digital euro in the second part of paper. Then we look into the various models for a digital euro. Considering the risks and benefits, as well as the current position of the European Central Bank (ECB), we then continue the analysis based on the most likely model for a digital euro, whose impact we consider from the aspect of the institutional capacities, the legal framework and the fin-tech readiness level of the analyzed countries in the third part. Based on this, we assess the impact that the implementation of a digital euro system could have, and potential legislative measures that could mitigate negative effects.

2. A European CBDC- promises and pitfalls

Storing a (monetary) value in electronic form is not a new concept. Electronic money in the form of payment cards or digital payment systems have been developed decades ago. Platform-based currencies, such as those used in video games or on various web platforms, have also been around

for some time without radically changing the shape of the global payment infrastructure. It was only with the advent of cryptocurrencies that a new era of innovation in the fin-tech sector began. The decentralization and (in some cases) programmability of cryptocurrencies, along with a general lack of regulatory constraints, allowed for rapid and extensive innovation in the field. The creation of smart contracts, the exclusion of middlemen, and the establishment of a fast and reliable global payment system were all features that became possible with this new technology.

Nearly instantaneous cross-border transactions, automation and programmability of transactions have increasingly become a relevant part of various payment systems. In this environment, governments and central banks around the world had to take a position on these new means of payment. While some governments took the position that a restrictive approach was the best solution, others opted to legalize cryptocurrencies and tax cryptocurrency gains (Jozipović et al., 2020:12). However, recent developments, especially after the start of the Covid-19 health crisis, have shown a shift from simply accepting cryptocurrencies to embracing the potential of the technology and the opportunities that come with a fully digital currency. (Barontini and Holden, 2019: 8). Such a move can especially be explained through the lens of monetary competition, both amongst various national currencies, as well as between them and private means of payment. Fernández-Villaverde and Sanches (2018) conducted an analysis with the assumption that paper currency becomes obsolete and the central bank does not offer any form of digital currency. Under these assumptions, the analysis shows that the economy can be subject to indeterminacy. They also conclude that there may not be an equilibrium that has stable prices. Their analysis concludes that price stability can be ensured by issuing CBDC in conjunction with an appropriate monetary policy framework.

Due to the increasing global attention to the potential of CBDCs and the potential technical and financial possibilities such a currency could have, the Governing Council of the European Central Bank (ECB) has established a Task Force to work on the concept of a digital euro in early 2020.[4] In the following text, we look at the Task Force's considerations concerning a digital euro and its role for monetary policy, global currency flows and the European Union in general.

2.1. Key motivations, potential benefits and risks of a digital euro

When discussing the impact of a digital euro, it is essential to consider the various financial and systemic reasons for its introduction. There are clear advantages of a digital euro from a consumer perspective. Some of the key benefits of a CBDC system include transaction security, inclusiveness of a large portion of the population, and (cost) efficiency. (Bindseil, 2020: 7). A

4 European Central Bank, Report on a digital euro, October 2020, p. 6, available at https://www.ecb.europa.eu/pub/pdf/other/Report_on_a_digital_euro~4d7268b458.en.pdf, accessed: 22. July 2021, further in the text: Report on a digital euro.

digital euro would furthermore be safer than deposit money, as it erases the risk of insolvency of the deposit bank. However, the benefits of a digital euro have to be weighed against the risks of its introduction, and should only be implemented in a way that is adapted to the specifics of the given financial system.

As a source of several risks that could arise in connection with the digital euro, the Report highlights the impact on the financial sector in general and banks in particular. Financial institutions as intermediaries for transactions have the role of ensuring secure and reliable transactions – a service usually provided for a commission that therefore creates notable transaction costs. (Turpin, 2014: 338) Banks could respond to these developments in various ways (increasing remuneration, bundling deposits with additional services, borrowing from the central bank, or funding through capital market-based means, which are more expensive) to stabilize or replace deposit funding. Apart from the fact that banks would accept higher risk in this situation to compensate for lost profits, such a way of doing business (conditional on the introduction of a digital euro) could also lead to a lack of information about customers. This in turn would affect banks' ability to assess risk and could jeopardize the effective application of Directive (EU) 2015/849 on the prevention of the use of the financial system for the purpose of money laundering or terrorist financing[5] and Directive (EU) 2018/843, which amends the aforementioned Directive.[6] Another negative effect of a digital euro could concern the cross-border use of the euro. Here risks are related to the exchange rate of the euro and capital flows, spillovers and spillbacks on a wider international scale, international criminal activity, and currency substitution (digital "euroization") in third countries. (Report on a digital euro, 2020: 21-22)

Considering the risks and opportunities that come with the introduction of a CBDC, it is essential from a risk mitigation perspective to first understand the steps that would be taken from the planning phase to the full integration of the CBDC. In this context, a guideline can be the report conducted by the Bank for International Settlements and seven central banks (2020). The report emphasized three main principles for the introduction of a CBDC. First, a central bank should not jeopardize monetary and financial stability by issuing

5 Directive (EU) 2015/849 of the European parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing, amending Regulation (EU) No 648/2012 of the European Parliament and of the Council, and repealing Directive 2005/60/EC of the European Parliament and of the Council and Commission Directive 2006/70/EC (L 141/73).
Directive (EU) 2018/843 of the European parliament and of the Council of 30 May 2018 amending Directive (EU) 2015/849 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing, and amending Directives 2009/138/EC and 2013/36/EU (L 156/43).

6 Directive (EU) 2018/843 of the European parliament and of the Council of 30 May 2018 amending Directive (EU) 2015/849 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing, and amending Directives 2009/138/EC and 2013/36/EU (L 156/43).

a CBDC. Second, a CBDC should coexist with and complement existing forms of money. Finally, a CBDC should promote innovation and efficiency. All these conditions should be met in the implementation phase, in order for a CBDC to be successfully introduced.

In the following text, we provide an overview of the most relevant scenarios under which the ECB considers the introduction of a digital euro, as well as certain risks that would accompany such an intensive change in the eurozone monetary system. Starting from them, we will then determine the most likely path for an introduction of a digital euro by considering the above-mentioned risks and guidelines.

In its report, the ECB presents several scenarios that could prompt the issuance of a digital euro. The scenarios can be divided into those that relate to the core functions of the central bank and those that relate to the broader objectives of the EU. (Report on a Digital Euro, 2020: 9-15) Scenarios that relate to the core functions of the central bank are further divided into scenarios in which[7] :

(a) The European economy (its digitalization and independence) can benefit from a digital euro. In this scenario, a digital euro would be adopted because it would help improve digital payments, leading to greater digitization of the financial sector. This would then benefit the independence and expansion of the wider European economy. (Report on a digital euro, 2020: 9-10)

b) The use of cash continues to decline to a point where financial transactions in the EU would rely heavily on private forms of money and payment solutions. In this scenario, a digital euro would be introduced by the Eurosystem as an additional means of payment and a form of public money. This would ensure that the euro continues to have strong support from citizens and that the EU has its own alternative for cash. (Report on a digital euro,2020; 10-11)

(c) Other forms of money, such as commercial bank deposits, electronic money and central bank money not denominated in euros, are becoming a medium of exchange, store of value and a credible alternative in the euro area. The report identifies several ways this could come about, such as other foreign central banks issuing their own CBDC that would be widely accepted and used by European citizens, or large tech companies developing their own payment solution (such as “stablecoins”) used around the world outside the oversight of European financial authorities. In this scenario, a digital euro would also be introduced as a support for European stability and sovereignty (especially in the financial and monetary dimensions) and as an assurance that European citizens can make payments with the highest standards that are efficient, secure and controlled by the EU. (Report on a digital euro, 2020: 11-12)

(d) The Eurosystem concludes (from a monetary policy perspective) that the

7 For each scenario, the report indicates the requirements that the digital euro should meet in order to function properly in that type of scenario, but since all these requirements fit in with the main features of the digital euro that we have already mentioned, we did not feel it necessary to highlight them again.

issuance of a digital euro is appropriate and necessary. In this scenario, a digital euro would be introduced to strengthen monetary policy. (Report on a digital euro, 2020: 12-13)

(e) There is a need to ensure the provision of payment services in the event of a natural disaster, pandemic, cyber incident or other extreme event. In this scenario, a digital euro would be introduced to mitigate the likelihood of a shortfall in the provision of payment services. The report states that such extreme events could result in outages of private card payment systems, cash withdrawals from automated teller machines (ATMs), and online banking, but cash and digital euros (due to their characteristics) could remain in use and maintain the provision of payment services even then. (Report on a digital euro, 2020: 13)

Scenarios relating to the wider goals of the EU are made to look at the ways in which a digital euro could help achieve the Union's goals, and they are divided into scenarios in which:

(a) A digital euro helps to support the international role of the euro. As an objective of the Eurosystem, strengthening the international role of the euro is always a relevant objective, but it could become even more relevant if important foreign central banks started to issue CBDCs, which would improve the status of other international currencies in relation to the euro. In this scenario, a digital euro could be issued to make the euro more attractive to foreign investors, support the improvement of cross-currency payment infrastructures and enhance the international role of the euro in general. (Report on a digital euro, 2020: 14)

(b) A digital euro helps reduce the costs and environmental footprint generated by monetary and payment systems. The report notes that these systems are not always energy efficient and the Eurosystem could take the lead and proactively support improvements that would focus on a digital euro. (Report on a digital euro, 2020: 15)

Considering the above described scenarios in the light of recent events, it can be concluded that the ECB has strong incentives to actively work on a digital euro, as multiple scenarios are already materializing in parallel. Not only has the current health crisis made digital payments even more relevant, but numerous other central banks have already issued the first generation of their own CBDC. As there are serious risks of non-implementation of a digital euro system, it is not surprising that the ECB is actively working on the digital euro project. A digital euro would have a lot of potential in various fields, as long as it is implemented as a modern, fully virtual means of payment that aims at being an alternative for paper money, as well as other state backed or decentralized virtual currencies.

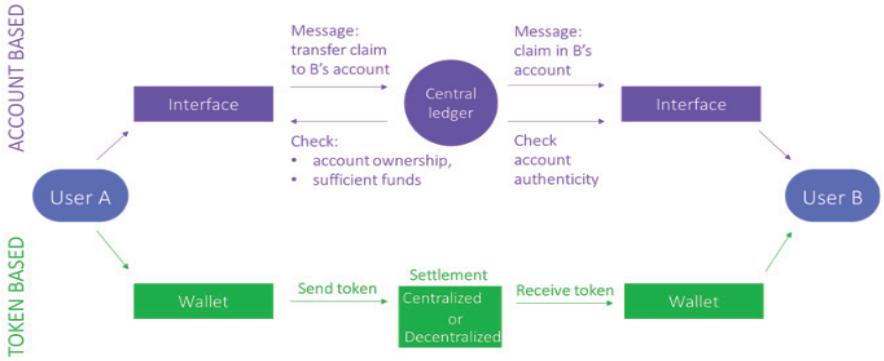
2.2. Possible and probable models for the introduction of a digital euro

As due to the recent events caused by the emergence of Covid-19 and the related digitalization efforts, multiple of the above-mentioned factors from various scenarios have been realized to an extent that can't be disregarded,

it has now become more a question of how, rather than if a digital euro should be introduced. As the various risks mentioned above all have to be mitigated, it becomes therefore even more important to consider the right model to introduce a digital euro. The Report deliberately does not commit to a predefined system for a digital euro, but presents several possibilities to serve as a starting point for public dialog. (Report on a digital euro, 2020: 2). Because CBDCs are new payment instruments that are largely still being deployed in regulatory sandboxes and various types of pilot programs around the world, there is no single concept that has emerged as the dominant solution. Thus, the report on a digital euro considers multiple diverse approaches. (Report on a digital euro, 2020: 36 f.) Despite these broad contemplations on the best models, the report highlights that it would be challenging for the ECB to organize and manage all aspects of the digital euro network on its own. In particular, with regard to the issuance of CBDCs, the report highlights the benefits of indirect issuance of a digital euro. Direct access would require the central bank to provide complex and resource-intensive end-user services, while an indirect system would allow the delegation of key roles such as issuance and identification to financial institutions, which would be preferable as long as central bank liability status is maintained. (Report on a digital euro, 2020: 26 f.) However, even considering that a CBDC system in the euro area would require some degree of financial institution participation, this only slightly narrows down the possible models for a digital euro system.

The first distinction to make is between account-based CBDCs and token-based CBDCs. An account-based system exists on a centralized ledger controlled by a supreme authority (the central bank). This ledger records every account balance and every single transaction. On the other hand, under a token-based systems tokens are stored in a wallet and then at the moment of transaction authenticated. (Griffoli et al., 2018: 7 f.)

Diagram 1: Comparison of account based systems and token based systems



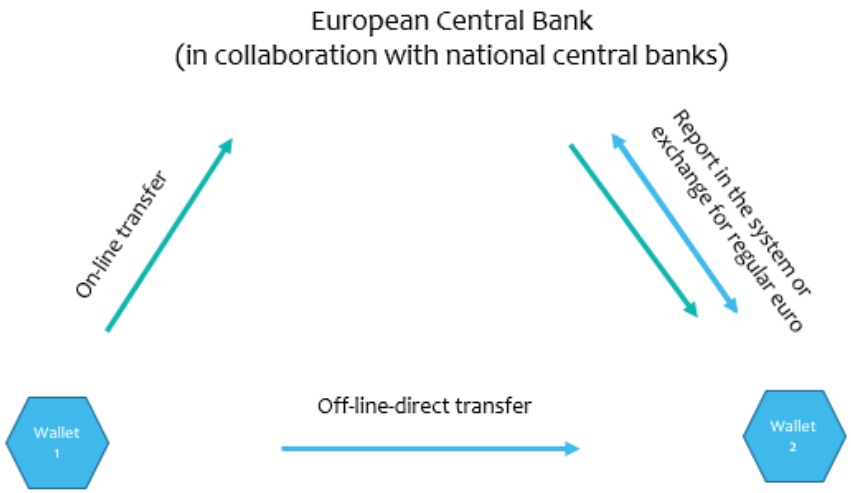
Source: Griffoli et al. (2018: 8)

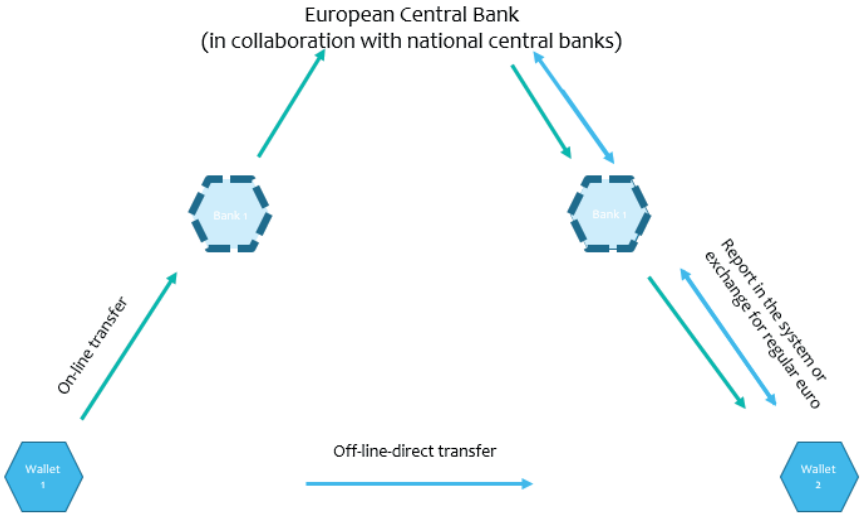
In general, either of the two described systems could be used as the basis for a digital euro. A combination of the two systems would also be possible. However, certain models that the ECB report considers for a digital euro would

not be possible under one approach or the other. Therefore, the advantages and disadvantages of an account-based and token-based system need to be carefully weighed. A particularly important question that the Report considers is whether a digital euro should be usable offline. This would require a token-based system that uses dedicated hardware to ensure secure transactions. Such a feature could make a digital euro a cash substitute that could be a useful addition to the monetary system. In contrast, an online system could be used through existing hardware, similar to online banking or mobile banking. It would also allow programmable transactions to be executed based on smart contracts. An online system could certainly take more advantage of existing infrastructures and thus be easier and faster to implement. It would furthermore easier to align with general EU monetary policy considerations. It is therefore likely that the ECB will introduce an online system, which could evolve into a combined system in the future.

In addition to the distinction between online and offline systems, the main factor affecting the design of a digital euro is the degree of involvement of financial institutions. As mentioned above, it is unlikely that the ECB would operate the entire digital euro system without the support of financial institutions or the involvement of the existing financial infrastructure. However, the actual role of financial institutions could vary widely even within these margins.

Diagram 2: Comparison of a fully centralized system and a centralized system with intermediaries





Source: Authors

Finally, one has to consider what the legal basis for the issuing of a digital euro would be. It is essential to define the digital euro from a legal perspective in order to determine how and in what way it could be used as means of payment. The ECB states in its report that the Eurosystem could invoke Article 128(1) of the TFEU in conjunction with Article 16 of the Statute of the ESCB for the issuance of a digital euro having the status of legal tender. However, it could also take the approach that a secondary legislation act (based on Article 133 of the TFEU[8]) could be drafted to regulate the conditions for this type of issuance of digital euro. In the case of issuing a digital euro without legal tender status, which would have limited use, the ECB states that the Eurosystem could invoke Article 127(2) of the TFEU together with Articles 17, 20 or 22 of the Statute of the ESCB. (Report on a digital euro, 2020: 24). Considering the importance for the digital euro to become the eurozone's virtual currency, it is unlikely, that it would not be deemed legal tender in the long term. However, in the short term, it is possible, that during the early implementation phase, this CBDC would not immediately receive such a status, as that status would imply the obligation on third parties to accept it as payment, before the entire infrastructure is tested and proven secure. We can therefore conclude, that a digital euro will first be tested without becoming legal tender. After an initial phase, it would have to become legal tender issued in collaboration with retail banks and built on a hybrid account based and token-based system, where the token-based elements might be only included at a later stage.

8 Article 133 TFEU states that, without prejudice to the powers of the European Central Bank, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall lay down the measures necessary for the use of the euro as the single currency. These measures shall be adopted after consultation of the European Central Bank.

2.3. Expected cross-border effects of a digital euro

There are several expected cross-border effects that the introduction of a digital euro could have. First, a digital euro could amplify the cross-border spillover effects of domestic monetary policy shocks by creating a new channel for their propagation. In this context, existing measures to manage capital flows could be circumvented by new digital forms of payments, including CBDCs, if not precluded by design or regulation. New payment instruments and service providers may render existing transaction verification mechanisms ineffective. Existing regulations and implementation practices need to evolve to ensure that measures to manage capital flows remain robust in the digital age. However, careful design of CBDCs and new technologies could help.

Second, the accessibility of a digital euro could lead to currency substitution and digital "erosion" in third countries, particularly those with weak currencies and fragile economic fundamentals, as well as those with close trade ties to the EU. Depending on design and regulation, the cross-border availability of CBDCs could reduce the cost of acquiring, storing and issuing foreign currency. There are already significant network effects for international currencies, and lower costs could therefore make already established international currencies even more attractive. The issuance of CBDCs by foreign central banks could enhance the status of these international currencies at the expense of others. This could contribute to more widespread currency substitution via the adoption of a foreign CBDC, especially in countries with high inflation and volatile exchange rates. As discussed in IMF (2020), currency substitution is already widespread and persistent (foreign currency deposits exceed 50% in more than 18% of countries worldwide). While the main cause of currency substitution is a lack of confidence in a country's own currency, rapid currency substitution due to domestic conditions could undermine countries' efforts to correct domestic policies.

Third, widespread use of a digital euro outside the euro area could significantly influence monetary sovereignty in the affected economies. Widespread currency substitution would undermine monetary policy independence and poses risks for both the issuing and the receiving country. For the issuing country, shifts in external demand for CBDCs could imply large movements in capital flows that could also affect monetary policy. This could weaken the monetary transmission mechanism - that is, the mechanism through which policy-induced changes in monetary instruments such as short-term nominal interest rates affect macroeconomic variables. To the extent that foreign currency is issued by countries whose business cycles do not correlate with those of the host country, the latter will suffer from ineffective monetary policy control and more volatile inflation, with a disproportionate impact on poorer and more vulnerable households.

Fourth, currency substitution may also undermine the ability of the domestic central bank to perform the lender of last resort function. This is because when domestic banks have large liabilities denominated in foreign currency, which can occur as a result of large-scale currency substitution, the central

bank is unable to create foreign currency to provide liquidity support and instead relies on foreign reserves or liquidity provision by foreign central banks.

Cheaper and faster cross-border transactions, other things being equal, can increase the risks of runs on the domestic banking sector and currencies. Currency substitution, as in moves away from one currency, could occur quickly. In many emerging and developing economies, a run on the banking system is already often effectively a run on the national currency as funds leave the country (Laeven and Valencia, 2018). In addition, lower costs for transactions in foreign currencies could lead to higher foreign currency risk for households and firms, and possibly for banks, with negative implications for financial stability.

2.4. Design requirements concerning third countries

In particular, when considering the cross-border implications, the ECB report points to the need for a limit on the use of a digital euro outside the eurozone. Such a limit might be necessary to prevent excessive capital flows and should be coordinated through cross-border cooperation with other central banks. (Report on a digital euro, 2020: 29) A good example of such a cooperation is the case of the Monetary Authority of Singapore (MAS) and the Bank of Thailand (BOT) launching the PromptPay real-time retail payment system on 29/04/2021. This is the first of its kind in the world and was the result of several years of intensive collaboration between MAS and BOT, the payment system operators of both countries, banking associations and participating banks. Customers of participating banks in Singapore and Thailand are able to transfer funds of up to 1000 SGD, approximately 620 euros, or 25,000 THB, approximately 660 euros, daily between the two countries, using just one mobile number. More importantly, no additional information fields such as the recipient's full name and bank details are required, as with normal money transfer solutions. (The Monetary Authority of Singapore and the Bank of Thailand, 2021) The goal is for funds to flow seamlessly and securely between customers' accounts in Singapore and Thailand. While this system in itself is not a joint CBDC system, it shows the direction in which a collaboration in this field could move.

As has been shown above, there are numerous risks and challenges concerning the introduction of a Eurozone CBDC into the financial system. Therefore, the design of the digital euro should include specific conditions for access and use by residents outside the euro area to ensure that it does not contribute to excessively volatile capital flows or exchange rates. For example, CBDCs could be designed by issuing central banks to preclude or restrict their use outside the issuing country, or wallets in recipient countries could be designed to allow local authorities to implement certain measures to control capital flows. In addition, the programmability of CBDCs (see Glossary) could potentially be used to limit their circulation. It also makes sense to draw comparisons to the proposed "waterfall method" concerning excessively large sums of digital euro transferred into a single wallet. Under this method, a ceiling for each wallet would be established, and when a

payment is received beyond the allowed amount, any excess is transferred to regular bank deposit, or it could alternatively incur negative interest. Finally, these solutions could make the implementation of capital flow management measures more effective than today, at least compared to the use of cash.

Caps on amounts or values for cross-border capital transactions could prevent excessive capital flows. Additional costs through the application of (negative) interest rates could prevent hoarding of digital euro outside the Eurozone. In order for digital euro system operators to enforce technical limitations on where the currency can be used (e.g. outside the euro area), the information should be obtained and verified before the payment is confirmed. In any case, caps on amounts or values for cross-border payment flows would be limited to the digital euro and would therefore not prevent citizens outside the euro area from using other forms of the currency. This is in line with the fundamental freedom of capital movements enshrined as a core principle of the euro area. With third countries, it will furthermore be important to establish collaboration to a degree that is proportional to the importance of the euro as currency in their local market.

3. Impact of the expected model on Croatia and North Macedonia - Case study analysis

We can assume from the previous chapter that the most likely design of a digital euro will be legal tender built on a hybrid account-based system with potential elements of tokenization at a later stage. Cross border effects, especially concerning currency substitution and currency hording will have to be addressed, through integrated smart features like automated remuneration, bilateral collaboration with euroized countries, or a combination of those two approaches. Without such safeguards in place, negative effects could occur both in the Eurozone, as well as in the affected countries outside of it. In the following text, we compare the readiness levels of Croatia and North Macedonia to prevent such negative effects and adapt to the existence of a digital euro.

3.1 The legal framework constraints and risks of the introduction of the digital euro in Croatia and North Macedonia

Croatia and North Macedonia are highly euroized countries (they have a high share of credit and deposit euroization) with a fixed exchange rate pegged to the euro. The issue of currency sovereignty is not crucial for either country. Remittances from abroad in euro are a significant source of foreign exchange in the country. Both countries have agreements with the ECB for the use of euro lines (Exchange Rate Mechanism II (ERMII) in the case of Croatia and a repo agreement in the case of North Macedonia), which provide exchange rate stability. The financial system in both countries is heavily dependent on the significant role of banks (oligopolistic structure). Although the banking systems in both countries are Basel-regulated, they differ in regard to the structure of the banking system and thus in the degree of financial

development, in the fin-tech legal framework as a prerequisite for the efficient use of the digital euro and in financial literacy as an indicator for the adoption of a digital euro in the future.

The National Bank of Croatia is closely collaborating with the ECB with an accession to the Eurozone being the final goal. Thus, the work on a CBDC in Croatia will primarily focus on the introduction of the euro and consequently the digital euro. Furthermore, EU institutions will consider the interests of non-Eurozone countries when drafting legislation concerning the status of new payment systems. Such systems will due to their relevance for cross-border trade unquestionably fall within the area of competence of the European Union.

The situation is different for North Macedonia. On February 16, 2021 the National Bank of the Republic of North Macedonia (NBRNM) issued a statement that is part of the Q&A on cryptoassets informing the public that there is no activity to issue its own digital currency (digital denar)[9]. This is a major shortcoming in terms of the current state of development of digital assets and the evaluation of alternative models that could improve cross-border payments and settlements.

a. Level of financial development

There is a wide range of indicators that can determine the financial development of countries. Standard measures of financial development include the ratio of credit to the private sector to GDP and the ratio of liquid liabilities to GDP. Beck et al. (2005) introduce a new set of indicators and conclude that, among others, higher branching and ATM are positively correlated with financial development. According to this approach, the level of development of the Croatian financial system is at a higher level compared to North Macedonia. Namely, in 2017 there are 140.4 ATMs per 100,000 adults in Croatia, compared to 59.4 in North Macedonia. Moreover, the number of bank branches per 100,000 adults in Croatia is 32.3 compared to 25.7 in North Macedonia. Historical data of ATMs per 100,000 adults and bank branches per 100,000 adults in Croatia and North Macedonia can be seen in the table “ATMs per 100,000 adults”. Selected financial indicators show a higher level of banking system development in Croatia compared to North Macedonia.

9 https://www.nbrm.mk/ns-newsarticle-kakva-e-ulogata-na-narodnata-banka-vo-vrska-so-kripto-sredstvata-en.nspx

Table 1: ATMs per 100,000 adults and Bank branches per 100,000 adults in Croatia and North Macedonia

Series Name	Country Name	2013	2014	2015	2016	2017
ATMs per 100,000 adults	Croatia	114,12	117,08	123,40	127,81	140,42
ATMs per 100,000 adults	North Macedonia	54,04	55,59	60,67	60,01	59,44
Bank branches per 100,000 adults	Croatia	34,65	33,91	33,60	32,83	32,34
Bank branches per 100,000 adults	North Macedonia	24,75	24,87	24,69	25,01	25,66

Source: World bank – Global Financial Development Database

The Macedonian banking system is at a lower level of development compared to that of Croatia. The reasons for this include legislation, the size of the market, the readiness of customers to use new digital services, etc. Large banks are leaders in financial innovation and are slowly adapting their business strategies to the new digital age (Ilievski, 2020). Macedonian banks enjoy the comfortable position of weak competition in the banking sector and cooperation with new fintech players is mostly in the form of commercial partnerships. Future implementations of PSD2 regulation will enable entry of new competitors into the banking market of North Macedonia and force banks to behave more competitively. However, this is a complex process, considering the high cost and the time needed. In contrast, Croatia is part of the Single Euro Payments Area (SEPA) and the real-time gross settlement system owned and operated by the Eurosystem (TARGET2). Beau (2021) argues that the SEPA project to support defragmentation for credit transfers and direct debits has been favorable.

Moreover, in the case of North Macedonia, the international payment system is subject to regulation by the Law on Foreign Exchange Transactions, the Decision on the Manner of Conducting International Payment Transactions and the Instructions on Enforcement of the Decision on Foreign Exchange Transactions. That is, all transactions between residents and non-residents and between residents and residents in foreign currencies are subject to detailed analysis and control. The execution of payments and transactions in foreign currency is a prerequisite documentation specifically associated with a payment base code. An exception is payments between two natural persons up to 2,500 euros.

b. Degree of fin-tech adoption

In accordance with the PSD2 regulation, Croatian banks provide a separate API that allows authorized third-party providers to access data, which customers have agreed to share. Croatian banks are required to share information with third party providers (TPPs) via a specially developed Application Programming Interface (API) that allows certified third-party

providers to access data that customers have agreed to share. This allows new fin-tech players such as Air Cash, Revolut, Corvus Pay, Mones, Settle and others to enter the financial market, increasing competition but also creating new consumer needs and digital habits. In this sense, the positive approach is surprising, i.e. banks compete in terms of quality and efficiency of the use of APIs.

In contrast, North Macedonia has no obligation to harmonize legislation with EU directives including PSD2. For these reasons, policy makers and legislators have a longer period of time to implement PSD2 into national legislation. However, in the current context of the EU accession process and the rapid development in the field of digitalization in banking and e-commerce, North Macedonia is lagging behind EU member states in this area. In fact, the legal framework on North Macedonia is lagging behind in the area of payments. The PSD2 regulation, which forces banks to allow TPP (Third Party Provider) access and increase potential interoperability levels, is still in the process of implementation in North Macedonia. Although the new Law on Payment Services and Payment Systems was supposed to introduce so-called "Open Banking", the process of adopting the new law is unreasonably inefficient.

This creates the risk that North Macedonia may face micro-crises due to a hasty adoption of the EU legislation. This may reduce both the confidence of Macedonian citizens in the Macedonian authorities and the perception of the EU and the EU institutions responsible for issuing Digital Euro. Such results are a clear signal that EU regulations on fin-tech promotion and regulation should be adopted as soon as possible, both through the efforts of North Macedonian and EU policy makers.

c. Level of financial competence

The OECD (2018) defines financial literacy as a combination of awareness, knowledge, skills, attitudes, and behaviors necessary to make sound financial decisions and ultimately achieve individual financial well-being. All of these attributes can influence adoption of Digital Euro. According to the data from the OECD's recent survey (2020), the level of financial literacy in the two main study countries observed is below the global average of 12.7. However, there is also a difference when comparing two countries. Croatia has a score of 12.3 and North Macedonia has a score of 11.8.

The country's level of digital adoption is also important in terms of the adoption of a Digital Euro. The World Bank (2016) introduced the Digital Adoption Index (DAI), which measures countries' digital adoption on a scale of 0-1. The DAI emphasises the "supply side" of digital adoption to maximise coverage and simplify theoretical linkages. According to 2016 data, there is a difference between Croatia and North Macedonia. Namely, similar to the level of financial inclusion, Croatia has a score of 0.647486746, which is a significantly higher result then the score of North Macedonia of 0.571940541267395. The average on the global scale is 0.515524086356163.

Addressing these so-called "soft skills" necessary for Digital Euro adoption would take both time and resources, especially as resistance can be

expected from banks which could consider this new means of payment to be competing with their existing payment services. Therefore, this process must be conducted carefully and in a way that takes into account the position of the domestic banking sector. This means that it will only be possible for the ECB to enter into some kind of contract with the central banks of the EU accession countries. On the other hand, there should be an EU legal framework for compliance for Croatia as an EU member state.

3.2. The need to adapt to the digital euro in Croatia and North Macedonia

All the above arguments indicate that there will be differences in the effects that the creation of a Digital Euro would have on Croatia and North Macedonia. We can conclude that Croatia is already part of the European payment systems (Target 2) and the introduction of the central bank digital currencies will be achieved through the already established participation in the European payment network. In the case of North Macedonia, additional efforts are obviously needed. The main obstacle for the future adoption of the digital euro on North Macedonia is the lower level of interoperability with the EU payment infrastructure.

This poses risks for the Macedonian financial system in relation to the future issuance of the digital euro. Namely, the risk of concentration may occur when the use of banknotes eventually decreases and people rely mainly on digital payments. In this scenario, there will always be a higher degree of concentration due to economies of scale, i.e. larger players will establish monopolies or oligopolies and possibly achieve higher prices for payment services. This in turn will lead to higher costs for products and services, which may affect the productivity of the Macedonian economy. Second, payments are of strategic importance to countries and there is a risk that larger global players in payments can easily dominate the Macedonian payments market, creating dependence on foreign companies to maintain currency sovereignty.

Considering the economic connection of North Macedonian with the EU countries and the process of association with the EU, it is necessary that both North Macedonian and the EU monetary authorities explore the technical and technological modes of interoperability and accept similar regulatory frameworks for cooperation in the future implementation of a digital euro. The latter is crucial as North Macedonia is in the process of convergence with the EU and all the previously mentioned risks indirectly affect both North Macedonia and the EU. Therefore, this article should be understood as a warning for the Macedonian authorities to implement the European legislation on fin-techs in a timely manner. The introduction of new regulatory mechanisms would allow a more efficient implementation of financial stability at lower costs of the payment system.

3.3. Compatibility models for cross-border CBDC systems

As described above, Croatia and North Macedonia are in different positions when it comes to preparing for the introduction of a digital euro. However, regardless of their relation to the EU and Eurozone, both countries will have

to react to this matter, in order to protect their domestic economies and their monetary system. An important action in this regard could be the collaboration on an interoperable cross-border CBDC system. In general, central banks could design interoperable cross-border CBDC systems from the outset by issuing CBDCs using one of three models:

Compatible CBDC systems (Model 1) could provide an additional means of settling transactions across borders from existing central bank money markets. Coupled with the development of open, competitive and compatible domestic payment systems that allow a more diverse group of banks and non-banks wholesale access to central bank money for the settlement of payments, a wider variety of cross-border and cross-currency "front-end" payment services could become possible. This could reduce both fragmentation and concentration in payments.

Networked CBDC systems (Model 2) could build on these potential improvements and provide additional security. In particular, PvP settlement could be incorporated through a technical interface between domestic systems. New technologies could enable this through novel means (e.g., Bank of Canada (BOC) and Monetary Authority of Singapore (MAS) (2019)). Common clearing mechanisms could also provide greater efficiency, particularly when linked to FX trading venues.

Finally, a single mCBDC system (Model 3) could provide the same improvements as linked systems, but with additional integration. For example, all FX settlements would be PvP by default, rather than requiring routing or specific settlement instructions through an interface (see Glossary). Trading venues could also be integrated into mCBDC systems, which (assuming the right designs) could further reduce complexity, fragmentation and concentration in FX markets (Bank of Thailand and Hong Kong Monetary Authority (2020)). Such a model has been adopted, for example, for Project Dunbar and in Project Aber (see SAMA and CBUAE (2019, 2020)), which even goes a step further via the joint issuance of a CBDC used in the single mCBDC arrangement. Since both the Saudi riyal and the UAE dirham are pegged to the US dollar, the issued CBDC was effectively guaranteed a fixed exchange rate to both local currencies for the duration of the proof of concept.

Table 2: Potential improvements of various CBDC arrangements related to the current frictions in cross-border payments.

Frictions cross-border Payments	Model 1 – mCBDC arrangement based on compatible CBDC systems	Model 2 - mCBDC arrangement based on interlinked CBDC systems	Model 3 - single mCBDC multi-currency system
Legacy technology platforms	Compatible systems allow for efficiency gains in existing banking relations	A common clearing mechanism could reduce the number of relationships and provide economies of scale	A single system does not require such relations (however, a single system may add to operational costs)
Limited operating hours	CBDCs can be open 24/7, eliminating any mismatch of operating hours		
Fragmented and truncated data formats	Compatible message standards allow payments to flow without data loss or manual intervention	The message standard (eg ISO 20022) adopted by the interlinkage would act to harmonise standards across systems	Single message standard across the system eliminates mismatches
Unclear FX rates and unclear incoming fees	Compatibility requirements for wallet providers could enable users to calculate fees and rates prior to a payment	Common calculation of rates and fees for transfers using any interlinkage would aid transparency	A single system would likely be designed to include options for FX conversion
Long transaction chains	CBDCs could settle instantly, reducing the need for status updates		
Complex processing of compliance checks	Compatible compliance regimes reduce uncertainty and costs	Interlinking systems do not impact multiple or conflicting compliance requirements	Single set of access requirements means compliance could be equivalent across the system

Source: Adapted from Auer et al. (2021), “Multi-CBDC arrangements and the future of cross-border payments”, BIS Papers No 115

After the previous elaboration, it is difficult to say which model for collaboration amongst the central banks of Croatia or North Macedonia will have with the ECB. However, due to the high level of integration of Croatia into the European financial system, and the importance for the EU to regulate this issue in relation between the Eurozone and other EU member states, it is likely that a uniform solution will be designed through legislation. Differences might exist, depending on the extent to which a member state fulfils the standards to adopt the euro in general.

For North Macedonia, the situation is however different. The National Bank of North Macedonia cannot be forced to start work on their own CBDC. However, currently the Central Bank still has the opportunity to choose more freely to participate as partner in the design of the system. At later stages, with the growth of the technological rift between the Eurozone and North Macedonia, it becomes increasingly likely that North Macedonia will have to accept predesigned solutions that the EU offers, in order to ensure continuous control over monetary flows and its own monetary policy. It is therefore in the best interest of the National Bank of North Macedonia, to reconsider its stance towards a digital denar, and begin actively collaborating with the EU in this early phase, in order to establish a cross-currency system that is suited for its domestic monetary policy.

4. Conclusions, policy prescriptions and implications for future research

The introduction of digital euro will facilitate the use of euro in the observed countries (enhancing informal euroization). The analysis shows that there are significant differences in the financial legal framework of the two studied countries, which in turn lead to different challenges. The successful adoption of a digital euro depends on: the level of fin-tech development in each country as well as of financial literacy development, compliance with the EU legal framework and the structure of the financial and banking system (bank size and foreign ownership structure). Croatia was obliged to harmonize its legal framework in line with EU law, while North Macedonia still expects to do so through the accession process. Thus, it is to be expected that the use of a digital euro in Croatia will be more widespread and streamlined by European regulation. The lack of an institutional framework in North Macedonia could increase the risks associated with an uncoordinated inflow of digital euro into the national economy. It will therefore be important for the National Bank of the Republic of North Macedonia to work on a collaborative solution with the European Central Bank. Such a solution could especially include a cross-currency transfer system. If this is however seriously considered, the National Bank of the Republic of North Macedonia would need to participate actively in the digital euro project at the current stage, in order to influence the design of the cross-currency transfer system to serve its national monetary policy goals.

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CHAPTER 27

Determinants of a sports fans' loyalty to a sports club[1]

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Abstract

Developing a loyal customer base is one of the goals of any business entity. If we focus on spectator-sports consumers - fans - previous research indicates that they are valuable to sport clubs because they contribute both directly and indirectly to the club's revenue. There are many positive spin-offs associated with fans, such as providing free promotion for the sports club. Fans indirectly influence the various sponsors and media to take notice of the sports club, allowing the club to charge higher prices for the sale of its TV rights or sponsorship space. The main purpose of this paper is to investigate the determinants of sport clubs fans' loyalty. The research methodology used previously established scales related to consumer motives in attending a sports game, satisfaction with the integral service experienced at the sporting event, identification with the sports club, and customer loyalty. The research was conducted on 155 fans of football club CFC Rijeka. The research results show that the most important motives for attending a sports match are enthusiasm for the game, pride in the local community and socializing with friends. Overall consumer satisfaction with stadium services has no influence on the general loyalty of CFC Rijeka fans. However, certain elements such as cleanliness of the stadium, comfort on the stadium and discipline of other fans in the stadium are highly related to sports fans' loyalty. Moreover, research emphasises that highly identified fans are also very devoted to the sports club through their behavioural and attitudinal loyalty.

Key words: *Loyalty, Fans, Satisfaction, Identification, Sport club*

JEL classification: *JEL_M30, JEL_M31, JEL_L83*

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1. Introduction

When it comes to competitive sports, one is far above the others – football. When talking about the most famous sport in the world it should be mentioned that football market is highly developed and billions of euros are turned annually through various competitions. As in any other service industry, consumers are the focal point of sport clubs marketing manager attention, due to the fact that sports clubs generate revenues through the sales of tickets, scarves, jerseys, etc. (Kerr and Emery, 2011). All of the above is followed by sponsors whose contracts can be worth millions of euros.

Smith and Stewart (2010) argue that decisions related to the consumption of sport services are not rationally grounded as it is assumed in any other, more traditional industry. Further, Silva and Casas (2017) note that when talking about sports fans, there is only one supplier on the market for them which makes fans highly loyal consumers who contribute numerous benefits to their favourite sport clubs. Wakefield and Sloan (1995) assert that fans, during the time they spend in relation with their favourite club, establish deep and lasting psychological and emotional connection toward the club which in turn leads to loyalty. According to Kunkel et al. (2017) it is very important that fans perceive values through consuming the sport services, which is important for them as an individual. Therefore, every fan has a certain motive for experiencing sport service such as spending time with friends, seeking excitement, seeking achievement etc.

Consumer satisfaction is one of the main components which explain consumer behaviour and loyalty towards the service provider. When it comes to spectator sport context, there are authors who emphasize the importance of the fan's satisfaction with efficiency on the field while others emphasize peripheral services provided within the stadium (Matsuoka et al., 2003). Furthermore, identification with the club is the most important element of sport fans loyalty according to many researchers (Mahony et al., 2000; Robinson et al., 2004; Trail et al., 2000). Identification is the core feature of the fans which is published through the fact that sport fans stick to their favourite clubs even through unsuccessful moments and experience feelings of sadness and worry along with their favourite club (Ashforth and Mael, 1989).

Furthermore, according to previously mentioned, there is still a under researched area related to exploring the determinants of a sports fans loyalty, especially in terms of satisfaction and how does it affect fans loyalty.

The main purpose of the paper is to understand loyalty determinants of Croatian football club Rijeka (CFC Rijeka) fans with the aim of developing better fan – club relationship. CFC Rijeka is one of the most successful Croatian football teams and it is recognized as a brand beyond Croatian borders, as it plays games in European tournaments.

Main goal of the paper is to define football fans through a consumer context, and to explore which causes are main motivational forces that affect fans to attend CFC Rijeka matches. Furthermore, measuring respondents' satisfaction with CFC Rijeka integral service with aim to explore relationship

between fans satisfaction and their identification; loyalty towards the club.

Paper is structured as follows. After Introduction, Literature review is presented followed by the research hypotheses. Third part is the Methodology followed by the Empirical data and analysis section, structured out of research sample and research results. Section, Results and discussion of the research results and managerial implications, relate research results with previous research. Final part is the Conclusions section.

2. Literature review

Motivation, according to Schiffman and Kanuk (2004) is the force that drives individuals to act. Furthermore, Hawkins et al. (2004) claim that motivation is an energetic force which activates individual's behaviour, influences its direction, and ensures its purposes. McDonald et al. (2010) point out that motivation shapes fans attending sports games, allegiance, and loyalty towards the club. Every individual meets different needs through the consumption of sports club services (Samra and Wos, 2014). Various authors deal with consumer motivation study in spectator sports industry, for example Silva and Casas (2017) believe that motivation depends on gender, sport and individual preferences. Trail et al. (2003) point out that an individual may be motivated by desire for socialization or as an escape from everyday routine. Among the most cited authors who explore consumer motivation in spectator sports industry are Sloan (1989); Mahony et al. (2002); James and Ross (2004); Pritchard et al. (2009). They emphasize motives such as: seeking achievement through clubs success, seeking stimulation and drama, self-esteem enhancement, attachment to club/sportsman/sport, entertainment seeking, and socialization. Understanding of consumer motivation is extremely important for sports clubs marketing managers in terms of increased revenues, as well as in terms of attracting new consumers and indirectly through attracting new sponsors or retaining existing ones.

Satisfaction is defined as a post-consumer evaluation of perceived quality in relation to pre-purchase quality expectations (Homburg et al., 2005). Further, Schijns et al. (2016) study satisfaction as a consumer's comparison between experienced services and expected ones. Matsuoka et al. (2003) claim that consumer satisfaction is one of the most important factors in consumer loyalty development, they also believe that in terms of spectator sports industry, consumer satisfaction is affected by quality of the game as a core service and as well by peripheral services such as food and beverage service, employee interaction, stadium atmosphere etc. There are different views about consumer satisfaction in terms of spectator sport, per example Matsuoka et al. (2003) consider satisfaction as an extremely important precondition for the use of sports services. Furthermore, Cronin et al. (2000); Kao et al. (2007); Chen (2006) believe that consumer satisfaction is the most important factor that influence consumer loyalty. On the other hand, Tapp (2002) per example points out that consumer satisfaction does not guarantee consumer loyalty. In line with Tapp, Chang and Chiu (2016) claim that fans could stop attending sports games even though they are happy with the experienced services. Yoshida et

al. (2015) aren't considering sports satisfaction as an important prerequisite for fans attending the stadium. Authors (Trail et al., 2005; Theodorakis and Alexandris, 2008) believe that club's success is the most important predictor of consumer's satisfaction. Thwaites (1999) considers that consumers experience satisfaction or dissatisfaction with the game as an integral sports service through: factors related to the game (quality and excitability); factors related to the stadium (tidiness, flow without crowds, secondary service and products quality); factors related to other fans (decency, civilized behaviour, stadium occupancy, etc.). Furthermore, Wakefield and Blodgett (1994) emphasize stadium access, as well as aesthetics of the game, comfort of the seats and cleanliness of the stadium as an important factors influencing fans satisfaction. Wakefield (1995) furthermore emphasizes catering offer and discipline as important factors. Consumer satisfaction is certainly an important factor in the formation of consumer loyalty in any industry, as well as spectator sports, especially related to the consumers who haven't already reached high levels of identification and loyalty towards the club.

Identification is defined as the extent to which a fan is psychologically connected to his favourite sports club (Wann et al., 2005). In line with previous, Real and Mechikoff (1992) claim that highly identified fans emotionally experience all the events which are related to their favourite club. It is important to emphasize Ashforth and Mael (1989) research where they argue about the fact that highly identified individuals experience success or failure of a sports club which is the subject of their identification as their own experience. Highly identified fans are buying tickets but they are also buying various other services and products related to the subject of their identification (Donavan et al., 2005); those individuals also spread positive word of mouth (Chang and Chiu, 2016) and thus give free promotion for their favourite club. There are numerous research who believe that identification is the most important factor that influences consumer loyalty (Wakefield, 1995; Fisher and Wakefield, 1998; Murrell and Dietz, 1992; Wu et al., 2012). Decrop and Derbaix (2010) point out that in terms of highly identified fans, consumption is not the result of objective calculations but instead it is the result of emotions. In line with previous, Wakefield and Sloan (1995) claim that success of the club does not affect loyalty towards the club in terms of highly identified fans. According to the aforementioned it stands to reason that, identification is the most important fans feature.

Loyalty is defined as a consumer trust and commitment directed towards the sports club, which is based on consumer interest in the club and is developed over time (Wakefield and Sloan, 1995). Biscaia et al. (2013) define loyalty as a psychological connection with the club that results in consistent and lasting positive behaviour and attitude towards the club; through spending directed towards the club and positive WOM. On one hand, there are various authors who consider consumer loyalty as a one-dimensional construct made of loyal behaviour (Fisher and Wakefield, 1998; Matsuoka et al., 2003; Madrigal, 2000). On the other hand, there are vast majority of authors who explore consumer loyalty as a two-dimensional construct made of previously listed-behaviour and attitude as well (Oliver, 1997; Bauer et al., 2008; Bee and Havitz, 2010; Bodet and Bernache-Assollant, 2011; Kaynak et al., 2007).

Furthermore, Fujimoto et al. (1996) point out that loyalty towards a club is the main socio-psychological factor that directly affects actual match attending, and, its frequency. Consumer loyalty is something that all researchers in the field of sports marketing point out as the key goal of every sport club for several different reasons and mostly to generate revenues.

2.1. Research hypotheses

Kunkel et al. (2016) point out that fans influence on professional sports clubs is crucial, bearing in mind that they buy tickets, merchandise and various additional services which directly influence clubs' income, moreover they, indirectly raise value of the club from a sponsor perspective. Previous research concluded that spectator sport is a specific market in which rules borrowed from traditional industries are not applicable, per example Silva and Casas (2017) claim that fans perceive their favourite club as their only supplier in the market when it comes to entertainment. Furthermore, it is important to understand fans motivation for attending games to better satisfy them and also to attract new consumers more successfully, which leads to higher revenues in the future (Samra and Wos 2014). Kunkel et al. (2017) argue that the key for an individual to develop loyalty towards the club is his own perception of achieving values through attending sports games of their favourite club (per example: social interaction, excitement, seeking achievement etc.). Based on previous, we posit:

RH: Understanding determinants of fans loyalty affects fan-club relationship development.

Different researchers consider satisfaction to be an important prerequisite for consumer loyalty (Matsuoka et al., 2003; Kao et al., 2007; Chen, 2006). In accordance with previous Gray and Wert-Gray (2012) claim that satisfied consumers will continuously buy products and services in the future. Furthermore, there are authors such as Tapp (2002), who argues that satisfaction is not a guarantee of consumer loyal behaviour. In line with this, Yoshida et al. (2015) also consider satisfaction as nonessential prerequisite of fans loyalty. Based on previous, we postulate:

AH1 – Fans satisfaction with services experienced at CFC Rijeka sports game correlates positively with their loyalty towards CFC Rijeka.

Highly identified fans experience success or failure of their favourite club as their own experience (Ashforth and Mael, 1989). Furthermore, Zetou et al. (2013) point out identification with the club as a crucial variable in understanding fans loyalty. Matsuoka et al. (2003) consider identification to be more powerful factor influencing consumer behavioural loyalty towards the club over satisfaction with the overall services experienced at the game. In line with previous, Murrel and Dietz (1992) consider identification to be significant antecedent of fans loyalty. Based on previous, we postulate:

AH2 – Fans identification with CFC Rijeka correlate positively with their loyalty towards the club.

3. Methodology

CFC Rijeka is a professional football club with a long tradition and rich history. According to the data published on the official website of CFC Rijeka (2018), among the greatest successes of the club were achieved in the years 1978 and 1979 by winning Marshal Tito Cup (ex-Yugoslavia Cup), followed by winning 6 Croatian national cups in the years: 2005, 2006, 2014, 2017, 2019, 2020. Furthermore, the year 2017 is written with golden letters in the clubs history due to winning their first and only Croatian championship title. Since privatization (2012), CFC Rijeka has been one of the most successful Croatian sports teams and it is recognized as a brand beyond Croatian borders.

In order to determine and examine attitudes of those individuals who truly experience CFC Rijeka services, survey is conducted through two fans forums - "HoćuRi" and "Forza Fiume". Survey was conducted in October 2018 on a sample of 155 respondents. Questionnaire is used as a mean to examine attitudes of CFC Rijeka fans, and is majorly consisted out of closed questions although there are four questions where the respondents were given the opportunity to independently enter answers listed as "other". Attitudes of the respondents were examined using a 5-point Likert scale ranging from 1-5, with 1 meaning "completely disagree" and 5 meaning "completely agree".

Research uses previously established scales in measuring fan's motives of attending football match such as football commitment, local community pride, aesthetics of the game, escape, achievement seeking, spending time with friends, socialization, excitement, drama, fun (Funk et al., 2004); and commitment to the club (Mahony et al., 2002). Furthermore, research uses combined scales for measuring satisfaction with CFC Rijeka services such as team play (Matsuoka et al., 2003; Yoshida and James, 2010); food and beverage, discipline, cleanliness and parking availability (Wakefield and Sloan, 1995); employee interaction, comfort, atmosphere (Yoshida and James, 2010). For measures related to identification, research uses scales established by Donavan et al. (2005); loyalty (attitudinal and behavioural) is measured using scales previously established by Kunkel et al. (2013); Tachis and Tzetzis (2015); Biscaia et al. (2013); Koenigstorfer et al. (2010). Processing of the results was performed by IBM SPSS Statistics ver 24 software, using univariate and bivariate statistical methods.

4. Empirical data and analysis

4. 1. Research sample

Among total number of 155 respondents, 81.3% of them are CFC Rijeka members, while 78.7% are annual ticket holders. Among the respondents, there are 42.6% who watch the CFC Rijeka games from the east stand of "Rujevica" stadium while 26.4% of the respondents watch them from the west stand of the stadium. Largest number of respondents is between 30-39 years old (44.5%). As expected, male population is predominant with 94.2% of the respondents, while female make up 5.8% of the sample. When it comes

to the education of the respondents, largest percentage (40.6%) of them completed high school education. Majority of the respondents are employed 88.4%, while 45.2% of the respondents are married.

4.2. Research results

Table 1 shows values related to the respondents' motives of attendance at the CFC Rijeka sports game.

Table 1: Motives of attendance at the CFC Rijeka sports game

Motive	Average score	Standard deviation	Average in total
Football commitment			
First and foremost, I consider myself as a football fan	4.17	1.02	3.72
My interest in football have led me to CFC Rijeka	3.26	1.24	
Commitment to the club			
I attend matches to express my support towards CFC Rijeka	4.65	0.89	4.62
I consider myself a loyal fan of CFC Rijeka	4.61	0.91	
Compared to the feelings I have for other football clubs, CFC Rijeka is extremely important to me	4.61	0.98	
Local community pride			
I support CFC Rijeka because it represents the entire City of Rijeka and Primorsko-goranska county	4.46	1.03	4.08
Having a successful club like CFC Rijeka in the first league transmits a picture of a successful local community	3.7	1.25	
Aesthetics of the game			
I enjoy watching CFC Rijeka play over any other football club	3.72	1.16	3.49
I like watching CFC Rijeka because their style of play contains elements of modern and attractive football	3.26	1.01	
Escape			
I like to attend CFC Rijeka matches because they allow me to get away from my daily routine	3.71	1.18	3.56
CFC Rijeka matches provide me with anescape from reality and everyday routine, at least for a short time	3.41	1.27	
Seeking achievement			
When CFC Rijeka wins, I feel like I won	4.17	1.08	4.36
When CFC Rijeka wins, I feel happy	4.54	0.94	
Spending time with friends			

Attending CFC Rijeka matches allows me to hang out with my friends	4.15	1.04	3.92
An important reason why I attend CFC Rijeka matches is to spend quality time with my friends	3.69	1.13	
Socialization			
By attending CFC Rijeka matches, I have an opportunity to meet people with similar interests like mine	3.63	1.08	3.61
I enjoy interacting with other visitors at CFC Rijeka matches	3.58	1.04	
Excitement			
I like excitement associated with CFC Rijeka football matches	4.31	0.92	4.19
I consider CFC Rijeka matches as very exciting	4.06	0.94	
Drama			
I like CFC Rijeka matches in which the result of the match is uncertain untill the end	3.15	1.12	3.23
A tense match between CFC Rijeka and a rival team is more interesting for me than the match in which one team is extremely dominant over other	3.31	1.22	
Fun			
CFC Rijeka football matches offer affordable entertainment	2.88	1.02	3.02
CFC Rijeka football matches are good value for money	3.15	0.96	

Source: research results

According to Table 1, the main motive for respondents to attend CFC Rijeka match is their attachment and emotional connection with CFC Rijeka with an average score of = 4.62. Second most important motive is seeking achievement through a club success with the average score of = 4.36. Third highest rated motive is excitement experienced at CFC Rijeka matches with the average score of = 4.19. Least rated motives in this research are drama with the average score of only = 3.23 and fun (= 3.02).

When it comes to the attitudes of respondents related to CFC Rijeka sports games as an integral service, the results are not overly encouraging from the perspective of CFC Rijeka as a service provider. Values related to the respondent satisfaction with CFC Rijeka match as an integral service are shown in the table below (Table 2).

Table 2: Attitudes of respondents related to CFC Rijeka sports games as an integral service

Satisfaction	Average score	Standard deviation	Average in total
Team play			
I am satisfied with the performances of CFC Rijeka in the season 2017/2018	1.97	0.9	2.18
CFC Rijeka plays every game firmly and with maximum engagement	2.39	0.85	
Food and beverage			
I enjoy food and beverages offered at the Rujevica stadium	1.70	0.91	1.60
Rujevica stadium offers a wide selection of food and beverages	1.49	0.73	
Employee relationship			
Employee attitudes at Rujevica stadium indicates that they understand the needs of the fans	1.97	0.87	2.07
Fans can rely on the professionalism and knowledge of the staff at the Rujevica stadium	2.16	1	
Discipline			
CFC Rijeka make sure that aggressive and irritable fans are under control	3.08	1.02	3.24
Aggressive and irritable fans are closely watched at the Rujevica stadium	3.40	1.17	
Cleanliness			
Auxiliary facilities (bar and toilet) at the Rujevica stadium are clean	3.77	1.03	3.86
Corridors and exits at the Rujevica stadium are clean	3.94	0.9	
Comfort			
Corridors at the Rujevica stadium are wide enough to withstand the crowds	3.75	1.05	3.48
Seats at the Rujevica stadium are comfortable	3.20	1.07	
Parking			
Rujevica stadium has sufficient parking	2.13	1.12	2.19
It is easy to get out of the CFC Rijeka parking lot after a game	2.27	1.15	
Atmosphere			

Atmosphere at the Rujevica stadium is exactly as it should be at a football match	3.08	0.98	2.88
CFC Rijeka understands that the atmosphere is very important for the visitors of the match	2.68	1.17	

Source: research results

Table 2 shows that only three elements of CFC Rijeka integral service are somewhat satisfactory rated, those are cleanliness of the stadium and accompanying facilities rated with an average score of = 3.86; stadium comfort = 3.48; discipline at the stadium = 3.24. All other elements of the service CFC Rijeka integral service are rated very low which leads to the conclusion about the overall poor service served by CFC Rijeka. Overall average satisfaction of respondents with integral service served by CFC Rijeka is quite low with the overall average score of only = 2.69.

Values related to the identification of the respondents with CFC Rijeka are presented in the table below (Table 3).

Table 3: Identification of the respondents with CFC Rijeka

Identification	Average score	Standard deviation
I consider myself a true and real CFC Rijeka fan	4.55	0.93
I am very interested in others opinion about CFC Rijeka	3.35	1.23
When somebody criticizes CFC Rijeka, I take it personally	3.44	1.25
CFC Rijeka wins are an extremely important factor for me	4.13	1.12
When I talk to other about CFC Rijeka, I usually say WE (CFC Rijeka and me), not they (CFC Rijeka)	4.14	1.17

Source: research results

Identification of the respondents with CFC Rijeka according to the Table 3 is quite high considering the overall average score of all items related to identification with the club is = 3.92.

Attitudinal loyalty of the respondents is presented in the following Table 4.

Table 4: Loyalty of the respondents

Attitudinal loyalty	Average score	Standard deviation
I would watch CFC Rijeka match no matter which club they play against	4.63	0.95
I would never switch loyalty towards CFC Rijeka, even if my close friends are fans of some other club	4.71	0.93
I would be committed to CFC Rijeka independently of the quality of its players	4.67	0.91
CFC Rijeka is an extremely important factor in my life	4.12	1.04
I intend to attend CFC Rijeka matches in the future	4.41	1.05

Source: research results

Table 4 shows that respondents are highly loyal when it comes to their attitude towards the CFC Rijeka. Total average score related to the respondent's attitudinal loyalty is very high = 4.51.

When it comes to behavioural loyalty, situation is similar as 75.5% of the respondents have attended more than 15/18 CFC Rijeka home matches in the season 2017/2018. Furthermore, 89% of the respondents follow reports related to CFC Rijeka daily (Internet, television, radio etc.). Merchandise purchase is the only indicator related to behavioural loyalty which isn't so positive from the perspective of the CFC Rijeka because only 32.3% of the respondents buy merchandise (jerseys, scarves etc.) related to the club several times during a year. Everything listed above points to the fact that respondents are quite behaviourally loyal to CFC Rijeka, which is of great importance for the club in terms of revenue, sponsorship, atmosphere at the game etc.

5. Results and discussion

Overall score related to average satisfaction with certain elements of CFC Rijeka sports game as an integral service is = 2.69, while the overall average measured score related to attitudinal loyalty of the respondents is = 4.51. Following table (Table 5) shows correlations between attitudinal loyalty variable whose result are presented in table 4 and satisfaction variables whose scores are presented in table 2.

Table 5: Correlations between attitudinal loyalty variable

	Attitudinal loyalty in total	
	Pearson correlation	Significance
Satisfaction in total	0,198*	0,013
Team play	0,009	0,914
Food and beverage	-0,246**	0,002
Employee relationship	-0,184*	0,022
Discipline	0,355**	0,000
Cleanliness	0,525**	0,000
Comfort	0,377**	0,000
Parking	-0,067	0,405
Atmosphere	0,103	0,203

Note: *correlation significant at 0.05, **correlation significant at 0.01

Source: research results

Table 5 shows very weak correlation between total value of attitudinal loyalty and total value of satisfaction (0.198*). It can be concluded that satisfaction of the respondents with services served by CFC Rijeka does not significantly affect their attitudinal loyalty; furthermore, especially if we are aware that there are 75% of respondents who attend 15/18 home games in the 2017/2018 season. Satisfaction or better said - dissatisfaction of the respondents with CFC Rijeka services doesn't affect their attitude towards CFC Rijeka, as well as their actual attendance of the matches. Research results are consistent with Yoshida et al. (2015) who claim that satisfaction is not an important prerequisite of fans loyalty to a sports club. If, on the other hand, we look deeper and analyse the connection between attitudinal loyalty and partial elements of the match as an integral service, then it can be pointed out that there are certain elements of satisfaction that are positively related with attitudinal loyalty such as stadium cleanliness (0.525**); stadium comfort (0.377*); discipline (0.355**), all three items are statistically significant. In accordance with the analysis, first auxiliary hypothesis AH1 can be partially confirmed.

Analysing items related to identification of the respondents with overall average score of = 3.92 and claims related to attitudinal loyalty with average score of = 4.51, table 6 shows the correlation between them.

Table 6: Correlation attitudinal loyalty

		Attitudinal loyalty
Identification	Pearson correlation	0,760**
	Significance	0,000
	Number of respondents	155

*correlation significant at 0.05, **correlation significant at 0.01

Source: research results

From Table 6 can be seen that there is a positive correlation (0.760**) between identification and attitudinal loyalty variable, which is statistically significant. This is an extremely high relationship, and it can be concluded that there is a positive correlation of the respondent's identification on their psychological loyalty towards the club. Furthermore, previous data related to behavioural loyalty (75% of the respondents attended 15/18 home matches in one season, 89% follow reports related to the club daily) leads to a conclusion that respondents are behaviourally highly loyal towards CFC Rijeka. Before mentioned may indicate that there is a connection between fans identification and their loyalty towards the club. Conclusion stated above fits into Bodet and Assollant (2011); Murrel and Dietz (1992) research. In accordance with the above, second auxiliary hypothesis PH2 is confirmed.

Furthermore, it is expected that basic motive of respondents' attendance at CFC Rijeka sports games is their commitment towards the club with an average score of = 4.62. This is supported by the claims of Wu et al. (2012) according to which success or failure of the club has an exceptional impact on fans behaviour, further Branscombe and Wann (1991); Mahony et al. (2002) point out that fans tend to choose clubs that are more successful because in that way there is a greater chance of satisfying motive such as seeking achievement through the clubs success (= 4.36). Excitement with CFC Rijeka sports game is the third highest rated motive for attending CFC Rijeka sports games with score of = 4.19, this motive is also viewed as a part of Sumino and Harada (2004) research. Local community pride is the fourth highest rated motive with an average score of = 4.08. Stated motive is also recognized by Decrop and Derbaix (2010). Furthermore, this motive is important as through this motive CFC Rijeka can influence identification of a larger number of people who want to support their region (city, region, etc.) through cheering for CFC Rijeka. Socializing with friends (= 3.92) and socialization in general (= 3.61) are also significant motives for the respondents and are also recognized in the works of Wann et al. (1999); James and Ross (2004); Pritchard et al. (2009). Furthermore, there are some motives which are quite low rated such as aesthetics (= 3.49), drama (= 3.23) and entertainment (= 3.02). Namely, some researchers such as Mahony et al. (2002) look at drama and aesthetics as very important motives for fans attending the stadium, also they point out that clubs cannot influence satisfaction of these motives. They explain this through an example that it is very difficult to satisfy fans wishes

related to drama and aesthetics in a situation when their team is losing 0-4 at their home pitch. Furthermore, entertainment was mentioned as a motive by James and Ross (2004); Pritchard et al. (2009), building on this research, it can be concluded that respondents in this research are not satisfied with the amount of entertainment they get at CFC Rijeka sports game.

When it comes to the satisfaction of the respondents with partial services at CFC Rijeka sports games, it should be mentioned that food and beverage offer is extremely low rated with an average score of = 1.60. To emphasize the importance of this element, it should be noted that one of the main motives for attending sports games is spending time with friends and socialization. According to Macintosh (2007) employee relationship is one of the most important factors influencing fans loyalty. It should be noted that in this research there is a strong dissatisfaction of the respondents with club's employee relationship with the average score of = 2.07. This information is worrying due to the importance of the fans perceptions about relationship quality. Respondents in this paper are also dissatisfied with parking as an element rated with an average score of = 2.19. Importance of this element was also recognized by Bitner (1992); Snodgrass et al. (1988). Discipline (= 3.24) and comfort (= 3.48), which are recognized in the research of Erogu and Machleit (1990), should also be highlighted as an important factor influencing fans satisfaction. Silva and Casas (2017); Bauer et al. (2008); Yoshida and James (2010) emphasize atmosphere as a significant factor of sports event as an integral service. Namely, these authors believe that the fans are active parts of the game which is supported by the fact that singing and cheering indirectly affects pitch happenings.

Finally, based on previous a hypothesis "Understanding determinants of a fans loyalty affects the development on the fan-club relationship" is confirmed.

Research results revealed that satisfaction doesn't affect loyalty in terms of highly identified fans which is in line with Yoshida et al. (2015). Furthermore, there is a strong correlation between fans identification and their loyalty which is previously established through the paper of Bodet and Assollant (2011); Murrell and Dietz (1992). This paper establishes importance of understanding fans loyalty determinants in order to improve relation between fans and the club. According to values related to motives of attendance it can be argued that three lowest rated motives of attendance at CFC Rijeka sports games (aesthetics, drama and fun) are not important for CFC Rijeka fans, however, they can also point out the fact that CFC Rijeka sports games simply do not abound in aesthetics, drama or fun. Namely, it should be noted that Croatian Football League (HNL), in which CFC Rijeka competes, is quite uncompetitive as Građanski nogometni klub Dinamo Zagreb (GNK Dinamo Zagreb) is immeasurably financially stronger and well organized than any other club in the league. Therefore, it can be assumed that in a league where there is not any balance of power, drama and fun can't be present. Furthermore, bearing in mind that all the other clubs except GNK Dinamo Zagreb invest very meagre sums of money in the competitiveness of the teams, it could be expected that matches do not abound in aesthetics or quality due to the lack of quality players.

5.1. Managerial implications

Bearing in mind the previous results shown in table 1, it should be noted that in order to meet consumer motivation, club should permanently invest primarily in maintaining the competitiveness of the first team in relation to the other clubs which are competing in the league since seeking achievement through a club's success and excitement are very important motives according to the research. Local community pride as a high rated motive could be an opportunity for CFC Rijeka managers to expand the fan base by awakening pride and identification in those parts of the Primorsko-goranska county where there is a lack of fans through promotional activities (posters, prize games, free tickets, and transport for school children etc.). Another major improvement could be done in terms of better food and beverage offer knowing the importance of the socialization for the fans and keeping in mind that focal point of socialization before and after the match is bar. It means that CFC Rijeka managers should expand beer offer at the stadium as it is commonly known that football fans are beer lovers. Furthermore, CFC Rijeka could connect motive such as local community pride with beverage offer. With that in mind CFC Rijeka managers should enable local wine producers (of which there are many in the Primorsko-goranska county) to organize the promotion of their wines before and after CFC Rijeka sports game. Also, the club could organize a restaurant within the stadium that would overlook the field, from which fans could enjoy food, drinks and the game as well; furthermore, it would allow fans to enrich their gathering with friends or other fans in general. CFC Rijeka should also invest sources in creating a better and more stimulating atmosphere that will have double effect, both on the players and the fans. Club management could encourage the atmosphere through cooperation with an organized group of fans called "Armada Rijeka".

6. Conclusions

Importance of the fans is widely recognized at the spectator sports market, and it is best illustrated by the statement of Shank (2005) who points out that if the match is the heart of a sports industry, then a fan is the blood that fills that heart. One of the basic features of a sports market is the fact that consumers don't change suppliers, furthermore, fans dissatisfaction with integral service experienced by a favourite club, will not excessively affect their loyalty towards the club. This is proven throughout this research with regards to the dissatisfaction of the respondents with CFC Rijeka sports games as an integral service. Namely, respondents are dissatisfied with almost every element of the service such as the game itself, catering offer, parking, atmosphere and even the attitude of the club employees towards them. Notwithstanding, respondents have shown extremely high loyalty towards the club. Furthermore, there are some elements of integral service that indicate connection between satisfaction and loyalty such as stadium cleanliness, comfort and discipline. It can be clearly concluded that loyalty of the respondents in this research is ultimately completely independent of their satisfaction. CFC Rijeka certainly has space for developing better relationship with its own consumers primarily through deliver of higher quality

services. Service satisfaction certainly affects consumer loyalty, although it seems has no affect when it comes to high identified fans that are examined in this research.

Some limitations are identified, such as focus on only one sport club, hence further research could focus on various football clubs to be more relevant. Also, as it focuses on identified fans, so future research should be conducted on-site before an important CFC Rijeka match that will attract not only highly identified individuals, with the aim of better accessing the real impact of fans satisfaction with integral service to their loyalty towards CFC Rijeka.

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CHAPTER 28

Indebtedness and Growth of the Transition Countries of the EU: When Public Debt Affects Negatively on Economic Growth?

Joško Marić[1]

Abstract

Government's borrowing during the current pandemic increases level of indebtedness. Low interest rates help to ensure cheaper way to protect economies, but debt will remain elevated for years to come. The question is how big burden of indebtedness some of the countries can afford to shield their economies and is there a point where indebtedness might negatively affect economic growth?

The focus is on transition countries of the EU since they faced more challenges during transformation of planned economies into market economies. This paper investigates impact of public debt on economic growth analysing public debt and GDP data from 1995 to 2020 for 11 member countries of the EU: Bulgaria, Croatia, Czechia, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovakia and Slovenia. The main result, for this group of countries, is a threshold of 75 percent public debt to GDP ratio, to elaborate, when public debt reaches a threshold of 75 percent economic growth is negative. If the 2020 as a pandemic year is excluded from the analysis a threshold is higher, 78 percent public debt to GDP ratio. Moreover, the analysis also shows the higher level of indebtedness the lower economic growth.

Key words: *Economic Growth, Public Debt, Transition Countries.*

JEL classification: *H63, O43, O47.*

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1. Introduction

In a period of extreme uncertainty caused by the global *coronavirus* pandemic, one of the most important economic issues is how to stabilise and stimulate growth. Croatia, like the other EU transition countries, has faced several demands over the past 30 years, including increased indebtedness to overcome downturns and boost economic growth. Economic growth is the most important indicator of the state of a particular economy, so the question arises as to what affects that growth and how it can be financed. The general conclusion is that borrowing is justified if it delivers a higher return than the cost of financing. Therefore, public debt is considered a stimulator of economic growth and a way to maintain a balanced budget because it allows the state to implement the desired socio-economic policy, investment and provision of public services that would be difficult or impossible in the event of non-indebtedness, but only to a cost-effective level.

When defining public debt, some authors describe it as a liability of the state to creditors (Leko and Jurković, 1998: 232; Bajo, 2003: 1). Public debt is the total amount of money borrowed by the government to finance previous budget deficits (Kolačević and Hreljac, 2011: 209). The existence of a budget deficit implies a lack of public revenues (state collection of taxes, contributions, customs duties, fees and taxes) in relation to public expenditures (state expenditures arising from the payment of pensions, social assistance, subsidies and grants)[2] which encourages public indebtedness which, consequently, affects the economy. The existence of public debt is common to all countries of the world because it represents a source of funds needed for the implementation of various projects.

Smilaj (2004: 339) distinguishes the growth and development of the economy. She looks at qualitative growth as a result of the growth of macroeconomic aggregates, the development of industry, the transition from secondary to tertiary sector of activities and, finally, the increase of economic welfare which she considers to be the most significant measure of development. She concludes that a strong correlation between public debt and economic development cannot be established. The increased end-product development may be the result of greater use of existing capacities or increase in capacities themselves (increase in efficiency) (Schiller, 2005: 334).

The size and development of the economy can be measured. According to Stutely (2007: 42), there are three key measures which indicate economic activity, namely: gross domestic product (GDP), gross national product (GNP) and net national product (NNP). Of these concepts, GDP is the most popular indicator used to compare the size of an economy. Blanchard (2011: 24) notes that a country whose GDP is twice the GDP of another country is also economically twice as much developed. Economic growth represents the growth of a country's potential GDP or output and is considered to be the most important factor associated with long-term success (Samuelson and Nordhaus 2005: 556, 557).

2 Contrary to the budget deficit is the existence of a surplus.

The size of the economy represents the current state of activities from previous periods. This success is also influenced by the accumulated level of deficit. If fiscal policy is sustainable, it significantly stimulates aggregate economic activity and, conversely, continued growth of public spending and investment above the optimal level of public debt in GDP, increases the risk of a negative impact on economic growth and development, especially if the borrowing is not associated with projects with strong developmental action.

The public debt to GDP ratio is expressed by the following relation (Kovačević and Hreljac 2011: 210):

$$\frac{B_t}{Y_t} = \frac{B_{t-1}}{Y_{t-1}}(1 + r - g) + \frac{(G_t - T_t)}{Y_t} \qquad \textbf{1.}$$

where Y_t stands for the GDP of period, and *g* for the GDP growth rate, i.e.:

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = \frac{B_{t-1}}{Y_{t-1}}(r - g) + \frac{(G_t - T_t)}{Y_t} \qquad \textbf{2.}$$

According to Jošić (2008: 180) the fundamental reason for institutional sector borrowing (monetary authorities, the state, banks and other sectors) is the imbalance between the national savings fund and investment in the economy. Financing the budget deficit with debt, up to a certain level, increases disposable income, which in turn affects the reduction of interest rates (with an unchanged money supply). If the interest rate on debt is lower than the GDP growth rate, the country can run a primary deficit while keeping its debt ratio constant (Becker et al., 2010: 110).

In order to explain the impact of public debt on economic growth, the subject of this paper is the analysis of economic growth in relation to the level of indebtedness of transition countries which are members of the EU. In that regard, the aim is to see which of these countries have done well in the transition process, which countries have achieved higher economic growth rates and how they have done it. This paper also tries to define the level of indebtedness up to which the transition countries of the EU achieve positive economic growth.

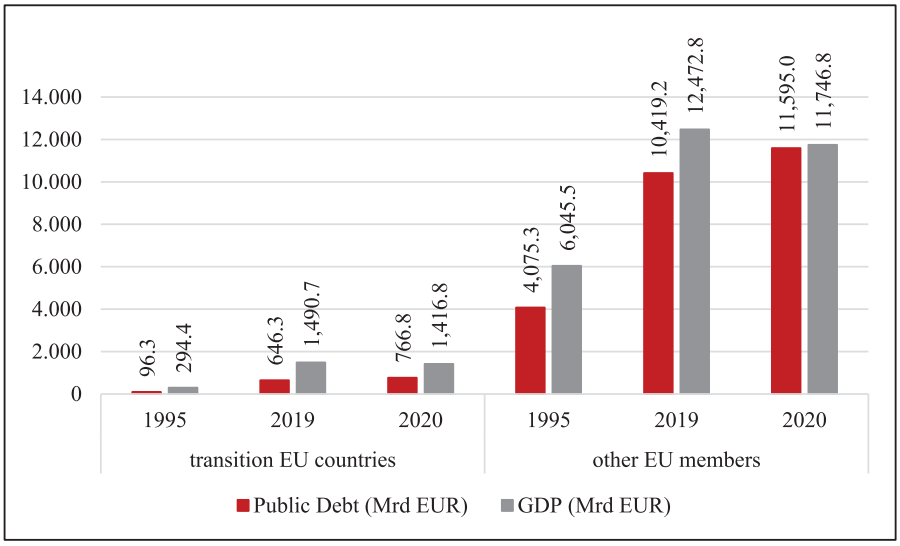
2. GDP Growth of EU Transition Countries

At the beginning of the transition process, economic growth of these countries was conditioned by the growth of domestic consumption. The growth in consumption resulted in an increase in imports, and consequently in the current account deficit. The deficit could be offset in two ways: by net capital imports or by decreasing foreign exchange reserves. As foreign exchange reserves are one of the fundamental factors governing the stability of the national currency, the solution was found in borrowing (Mihalj, 1999: 200). In the period between 1995 and 2019, public debt in the European transition countries grew by 571%, with an increase from 33% to 43% of the public debt

to GDP ratio. At the same time, the public debt of other EU member states grew by 156%, with an increase in the ratio of public debt to GDP from 67% to 84% (European Commission, Ameco Database 2021).

The impact of the current epidemic, which has slowed or lock downed economies has resulted in additional public debt growth for the purpose of raising funds for the economy to function, so that the public debt in transition countries, compared to last year, further increased by 19%. Compared to last year, public debt in other member states increased by 11%. In addition, GDP has fallen and the public debt to GDP ratio has further deteriorated, reaching 54% at the end of 2020 for transition countries and 99% for other member states. The consistency of public debt growth, sometimes even acceleration, occurs even though many countries tried to manage debt growth. The resources used vary among countries, but they produce the same result – a high level of inefficiency (Pistor, 2012: 140).

Figure 1: Public debt and GDP of EU members



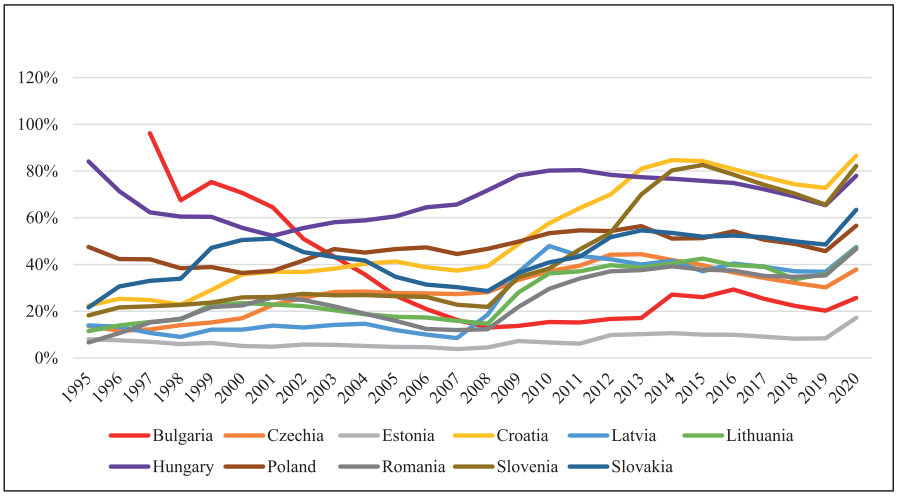
Source: European Commission, Ameco Database (2021)

The Maastricht Treaty defines the criterion for the upper limit of debt as being 60% of GDP, which should be respected by EU members, as well as by candidate countries. In addition, the maximum deficit of 3% per year is prescribed. The situation of indebtedness in the individual EU Member states is not in line with the treaty. Of the EU transition countries, the following stand out: Croatia, Slovenia and Hungary, recorded a debt to GDP ratio of 86.6%, 82.2% and 78.0% respectively. Across the other EU member states, Greece has the highest debt to GDP ratio at 207.1%, Italy 159.9% and Portugal

135.1% (European Commission, Ameco Database 2021). In 2020, a total of 16 EU Member States had excessive public debt ratios. In 2019, that number was 11.

According to the same source, the countries with the lowest debt to GDP ratios were Estonia 17.2%, Luxembourg 25.4% and Bulgaria 25.7%. Mihaljek (2006: 6,24) points out that the pre-accession transition countries had less developed economies with higher manufacturing productivity growth rates and lower national debts than individual Eurozone members, which means that according to the Maastricht criteria, transition countries will have to tighten their fiscal policies to achieve sustainability and, consequently, exchange rate stability. The figure below shows the public debt of EU transition countries in the period from 1995[3] to 2020.

Figure 2: The public-debt dynamics (% of GDP) of EU transition countries from 1995 to 2020



Source: European Commission, Ameco Database 2020

It is evident that by 2019 most countries recorded an increase in public debt relative to GDP. The exceptions are Bulgaria, Hungary and Poland. Bulgaria and Poland have reduced their debts by implementing macroeconomic policy measures such as supply-side management measures, including fiscal, monetary and exchange rate responses, and can be partly explained by EU accession, which in 2004 and 2007 resulted in a post-accession *boom* in increasing cash flows (Pistor, 2012: 140-141). According to Reinhart and Rogoff (2010) a high inflation rate and an increase in public debt is a characteristic of developing countries which is a characteristic of EU transition

3 The source does not contain data on Bulgarian public debt until 1996.

countries at the beginning of the transition process.

Despite the absolute growth of public debt in the European transition countries, the debt to GDP ratio is lower than in other EU member states. All the countries observed met the criterion of debt permitted by the Maastricht criteria except for Croatia, upon accession to the European Union. In most of the observed countries, the debt to GDP ratio grew significantly after 2008, which is a result of the financial crisis.

Trends in state finances are specific to each member state. Becker et al. (2010: 107) note that Greece has taken advantage of the adoption of the common currency, by keeping nominal GDP growth stable with low interest rates on public debt (convergence of euro area interest rates). By contrast, Bulgaria's approach is different, after price stabilisation and the introduction of the currency board based on the euro, the interest rate on public debt declined to a level that was similar to that in Greece. However, Bulgaria adopted a policy of fiscal balance which led to a steady decline of its public debt to GDP ratio. Indeed, in the years with exceptionally high growth rates of GDP, Bulgaria ran fiscal surpluses.

The increase in public borrowing is also a result of the reduced income associated with the privatisation process. Through the privatisation of state-owned companies, transition countries hoped to be able to finance public needs. As privatisation did not bring the expected revenue (nor the expected momentum in the economy), transition countries were forced to borrow more, which resulted in increased public debt (Haramija and Njavro, 2016: 521). Insufficient accumulation of funds, along with investment growth, required additional funding, which EU transition countries sought abroad. In addition, the financial crisis in the second half of the 2000s required additional sources to finance the economy.

Among other countries, the financial crisis in 2008 affected the economies of EU transition countries, widening the gap between them and other EU members. The most pronounced period of borrowing was from 2009 to 2014, since this was a period when austerity measures were implemented, when debt in all countries, except Hungary, grew continuously. In some countries, an increase in public debt was more pronounced, e.g. in Slovenia (134%) and Bulgaria (94%). In the same period, the Croatian public debt grew by 77%, which was the third highest increase amongst EU transition countries (Matošec and Globan, 2015: 7). Becker et al. (2010: 110-113) note that until the global financial crisis, most EU transition countries had fiscal deficits even when economic growth rates were high. However, these deficits were not significant in terms of a greater growth in public debt. Bridging the crisis period by additional borrowing in order to preserve or stimulate economic growth was also detected in 2020, when all observed countries recorded an increase in public debt.

Economic stability in the years since the start of the transition process has marked economic growth, increased investment and a decline in unemployment. After joining the European Union, transition countries became more open to developed western markets, which further strengthened their

economies. The financial crisis has upset the balance of public finances, disrupting the stable path of public debt reduction in most of the observed countries. Becker et al. (2010: 106) note that at the height of the crisis in 2010, most Central, Eastern and South-Eastern European countries faced problems with placing government bonds. Haramija and Njavro (2016: 516) argue that most transition countries lacked real economic growth by 2012, only individual countries have[4] achieved a higher rate of GDP than in 1989.

Compared to 1995, the GDP of the European transition countries in 2019 increased fivefold. However, together with the general uncertainty experienced in 2020, there was low economic activity and a negative economic growth rate of 5% compared to the year before. Some countries such as Croatia, Hungary and the Czech Republic also recorded significant economic declines.

In the initial years of the transition process, which includes the period until the end of the century, the slowest, and only negative growth rate was recorded in Bulgaria, whose economy relied on the primary and obsolete secondary industry sector and exports oriented mostly to Serbia, a country that during 1990s, in addition to the transition process, also had to deal with the economic blockade implemented by the West. In addition to Bulgaria, the problem of the primary industry sector is also recorded in Romania (Cornia, 2012: 302-303). In addition, both countries faced several economic crises that led to declines between 1996 and 1997 in Bulgaria, and 1997 to 1999 in Romania. (Uvalić, 2012: 366). In the early 2000s, Bulgaria achieved higher growth rates by balancing fiscal stability.

Slower economic growth during the transition process also takes into account the relative distance from Western Europe; the closer the country is, the less negative impact it has on its growth rate (Gros and Steinherr, 2004), from which it follows that Bulgaria is the most distant transition country within the EU and, accordingly, the Bulgarian economy in the first years of transition process is one of those having the lowest average annual growth rates. The same statement can be used for the first years of the transition process during which more distant countries (Bulgaria, Croatia, Romania and Slovakia) experienced the lowest growth rates, but it certainly cannot be used in the years following 1999.

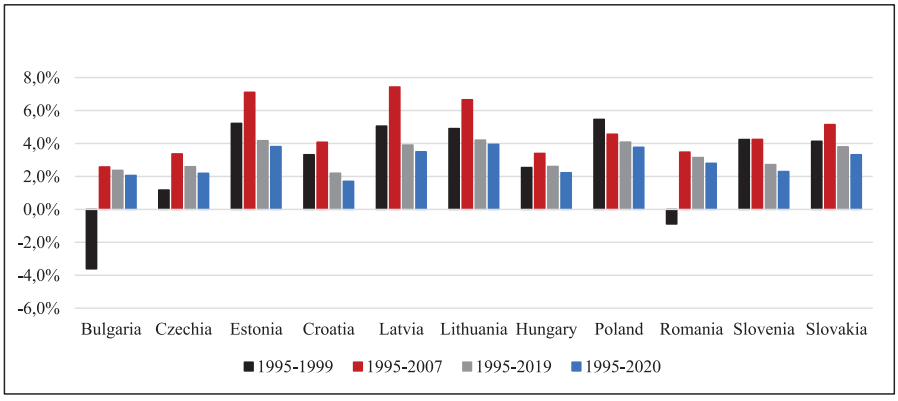
After a modest decline between 1989 and 1992, production and employment have been steady in the Czech Republic, Hungary and Slovenia and growing in Slovakia. The latter has become a significant multinational manufacturing operating platform in the automotive industry and other manufacturing sectors. These countries have also shown the importance of structural changes in foreign trade[5] (Cornia, 2012: 304). The EU accession process has helped countries to achieve higher levels of competitiveness and facilitated easier foreign capital inflow, but a fiscal policy within the prescribed criteria

4 Czech Republic, Estonia, Latvia, Lithuania, Poland and Slovakia.

5 Between 1989 and 2007, exports/GDP grew from 45% to 80% in the Czech Republic, 36% to 80% in Hungary, 20% to 40% in Poland and 28% to 86% in Slovakia.

should have continued, nonetheless. By joining the Eurozone, member states lose the ability to pursue an independent monetary policy, so in order to ensure balance, the emphasis is on a fiscal policy that leads to limited public spending, a prerequisite for fiscal discipline and macroeconomic stability. Experiences from Hungary have shown that, due to accession to the EU, the growth of the fiscal deficit can reverse the positive trend. In contrast to Slovakia, a similar trend whose fiscal policy has remained stable has occurred in the Czech Republic and Poland. (Mihaljek, 2006: 24-25). By adhering to the principle of fiscal discipline, Member States resort less to unsustainable debts, which ultimately will not lead to a potential recession or difficulties in managing their own liabilities.

Figure 3: Average annual growth rate of real GDP of EU transition countries until 2020



Source: European Commission, Ameco Database (2021), author's work

Higher levels of public debt until the financial crisis are the result of several factors: (1) lower level of development of transition economies, (2) easier access to developed markets with higher exchange of resources after EU accession and (3) disruption of financial markets. With the arrival of the crisis, growth rates fell. An excessively harsh austerity policy not only reduces growth and increases unemployment but can also delay the desired medium-term reduction of the debt to GDP ratio (Horn et al., 2012: 10). The advantage of austerity fiscal policy is that it leads to more rational public expenditure. Such a policy may lead to the necessary cuts for improving the efficiency of the public sector.

3. Literature review

Through the analysis of GDP and central government debt trends in 44 countries, Reinhart and Rogoff (2010) find that a high public debt to GDP

ratio (above 90%) in developed and developing countries is associated with particularly low output growth. Much lower levels of debt to GDP ratios (60%) are associated with unfavourable growth outcomes for developing countries. Canner, Grennes and Kohler-Geib (2010) concluded that the public debt to GDP ratio in developing countries is lower than in developed countries (64% in developing countries and 77% in all observed countries)[6].

By analysing 92 low- and middle-income countries over a period of 28 years, Presbitero (2012) concludes that public debt has a negative impact on output growth until it reaches 90% of GDP. Above this threshold, the impact of debt on economic growth becomes irrelevant. This nonlinear effect can be explained by country specific factors, as excessive debt has only been recorded in countries with sound macroeconomic policies and stable legal environment. By observing GDP growth rates per capita and public debt of 38 countries with a population of more than 5 million inhabitants over a period of 37 years, Kumar and Woo (2010) come to the conclusion that the indebtedness ratio above 90% reflects nonlinearity with a significant negative impact on economic growth.

In one of the few studies of the indebtedness cut-off point, Fetai et al. (2020) have come to debt to GDP ratios threshold for the European transition countries in accordance with their geographic affiliation. Debt to GDP ratio threshold for transition countries of Central Europe (including Croatia) is 81.60%, Eastern Europe 71.90%, and for the Western Balkans 58.20%.

4. Empirical data and analysis

For the purposes of the analysis, data collected by the European Commission were used. The author analysed the level of real GDP and trends in public debt, i.e. the public debt to GDP ratio for the European transition countries, namely for the Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovakia and Slovenia in the period from 1995 to 2020. Data relating to Bulgaria refer to the time span between 1997 and 2020, so the total number of observations is 284. Observations were classified into 3 categories of public debt: (1) debt ratio lower than 30%, (2) debt ratio higher than or equal to 30% and less than 60%, and (3) debt ratio higher than or equal to 60%. This analysis is based on the histogram of public debt to GDP and tracks the analysis made by Reinhart and Rogoff (2010). The total number of observations per category is shown in the table below.

6 This survey covers 101 world economies in the period between 1980 and 2008 and 7 of the 11 transition countries.

Table 3: Number of debt observations for EU transition countries

	<30%	>=30% <60%	>=60%	Number of observations
Bulgaria	16	3	5	24
Czech Republic	14	12	0	26
Estonia	26	0	0	26
Croatia	5	11	10	26
Latvia	14	12	0	26
Lithuania	15	11	0	26
Hungary	0	5	21	26
Poland	0	26	0	26
Romania	16	10	0	26
Slovenia	14	4	8	26
Slovakia	2	23	1	26
Total	122	117	45	284

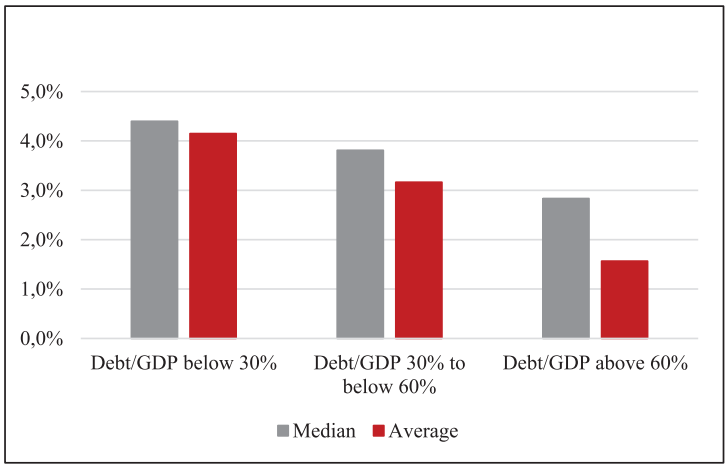
Source: European Commission, Ameco Database (2021)

The average growth rate of an individual country is calculated as an average of all annual growth rates of that country, while the average rate per category (average) is calculated from the observations of all countries included in certain category. The median of each category represents the middle value of observed annual growth rates (in a sorted ascending list) of each category.

5. Results and discussion

To highlight the impact of the current epidemiological situation on economic growth, the results obtained by 2019 are presented first. The number of observations per category that include observations as of 2019 is: 120 for the category of debt ratio below 30%, 112 for the category of debt ratio higher than or equal to 30% and below 60% and 41 od debt ratio higher than or equal to 60% (total of 273 observations).

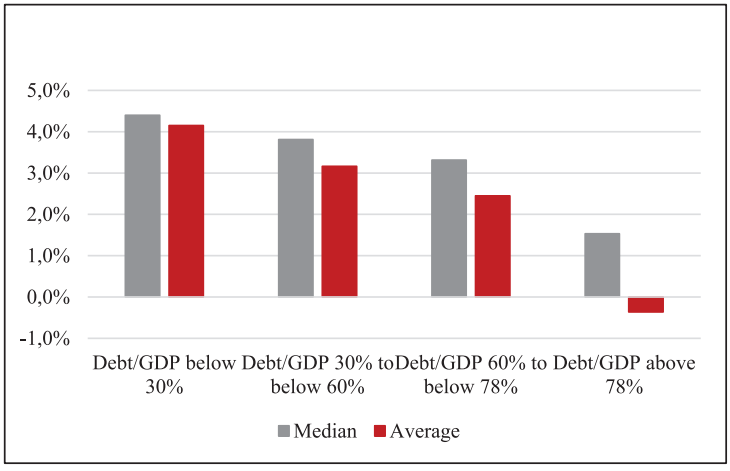
Figure 4: Public Debt and Growth (2020 excluded)



Source: European Commission, Ameco Database (2021), author's work

Average growth rates decrease as the level of indebtedness increases. Further research on the impact of public debt to the economy of transition countries may include additional countries such as the transition countries of the former Soviet Union and the countries of the Western Balkans.

Figure 5: Public Debt and Growth (2020 excluded) - threshold

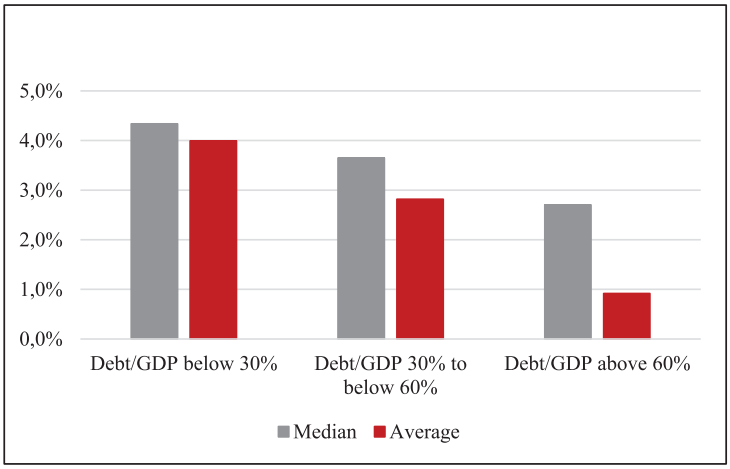


Source: European Commission, Ameco Database (2021), author's work

The debt threshold after which real GDP decreases in EU transition countries is 78%. As the level of indebtedness rises above 78% (and more), GDP decreases.

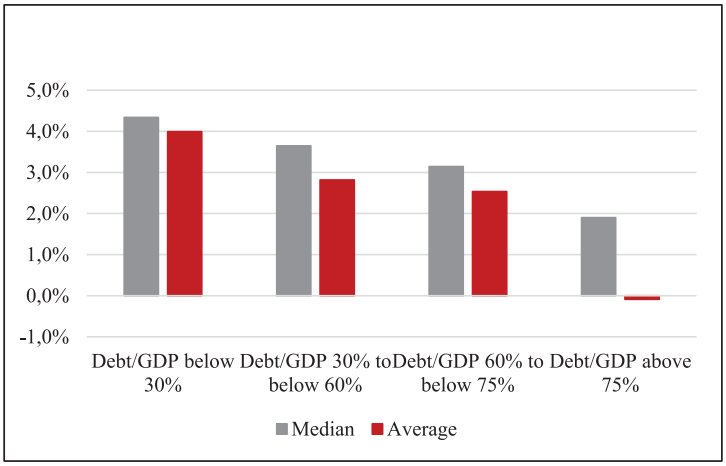
If the observation for 2020 is included, the following results are obtained.

Figure 6: Public Debt and Growth (2020 included)



Source: European Commission, Ameco Database (2021), author's work

Figure 7: Public Debt and Growth (2020 included) - threshold



Source: European Commission, Ameco Database (2021), author's work

The threshold point after which there is no economic growth in EU transition countries is 75%. The impact of the crisis is obvious. In the period when the economy is not able to realize the projected output, financing through debt is required to ensure a satisfactory level of production. This is a situation that not only the European transition countries, but also other countries of the world have dealt with for a good part of last year. The result was a threshold lower than the one achieved in the period before the pandemic.

6. Public Debt and Growth – Croatia

Despite the fact that in the period from 1989 to 2008 Croatia achieved particularly high amount of foreign direct investment (23 billion USD) compared to other Western Balkan countries, it is extremely low compared to other Balkan countries (Bulgaria 41 billion, Romania 58 billion) (Uvalić, 2012: 377). Higher GDP growth rates are partly the result of investment, so the lower amount of investment in Croatia compared to Bulgaria and Romania, having in mind other impact factors, is results in lower GDP growth rates. Even though the transition process is largely completed, most transition countries face the problem of increased public debt. Compared to the Central European and Baltic transition countries, lower growth rates in Balkan transition countries are the result of three factors (Uvalić, 2012: 391-392): (1) political events, i.e. military conflicts and unrest which were related to the dissolution of Yugoslavia, (2) delayed support and prolonged EU accession, which is evident from the second longest accession negotiations between the EU and Croatia and a series of blockades that were resolved in the process and (3) application of inappropriate economic policies.

Šimović (2017: 20-21) distinguishes four phases of public debt development and bond issuance process in Croatia. The first phase represents the beginning of the transition process and covers the period before 1997. Despite the impact of wartime events, this phase does not place Croatia in a passive position in the domestic market. Resolving the problem of old foreign currency savings, renovating facilities and helping companies to coverbank obligations have affected the growth of public debt and the bond issuance process.

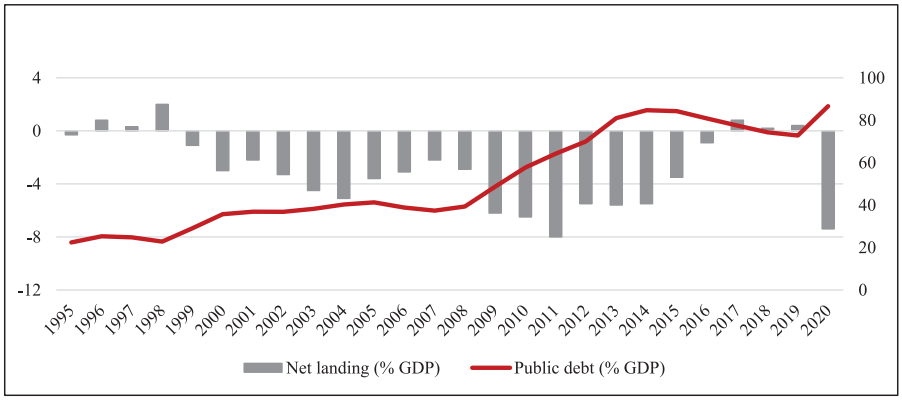
After the first phase in 2000 began significant investments in infrastructure and tourism, which lasted until the financial crisis. A significant inflow of foreign capital in the period up to 2008 stimulated domestic consumption, which contributed to significant increase in imports and the creation of a foreign trade and current account deficit with a simultaneous increase in foreign indebtedness. (Buturac, 2017: 5).

The third phase lasted from 2009 to 2014 and is characterized by the explosion of the budget deficit and growth of public debt. In the recession period (2008-2014) public debt grew at an unstoppable pace, averaging 12.0% per year (Buturac, 2017: 9). Due to the financial crisis, there was a lack of investment, which resulted in further decline of Croatia's economy. Same as in Greece, slow progress in implementing the appropriate policy by the authorities resulted in one of the longest bottoming out of the recession

among EU members. While in previous periods the deficit was mainly funded through selling public assets (mostly state-owned enterprises) or borrowing in domestic and foreign markets, and since a significant part of state-owned enterprises has already been privatized, in recent years the deficit has been funded through borrowing (Buturac, 2019: 180).

Since 2015, Croatia is recording economic growth. Economic recovery and certain measures in the field of fiscal policy (tax reform), create the environment for the start of next phase, the phase of fiscal consolidation and stabilisation of public debt (Šimović, 2017: 21). Reducing government expenditures and achieving the surplus in the period from 2017 to 2019 speaks in favour of positive effects of fiscal policy.

Figure 8: The public-debt dynamics and budget surplus/deficit in the Republic of Croatia from 1995 to 2020



Source: European Commission, Ameco Database (2021), author's work

At the same time, the trend of budget surplus at the end of 2019 was recorded in Bulgaria (1.9 pp of GDP), the Czech Republic (0.3 pp of GDP) and Slovenia (0.5 pp of GDP). A new crisis caused by the global *coronavirus* pandemic has once again pushed Croatia into additional borrowing. Based on previous, Croatian National Bank made a forecast saying that as if the last six years of reducing the public debt to GDP ratio never happened. At the end of 2020 public debt amounted to 86.6% of the GDP, or 13.8 pp more than at the end of last year.

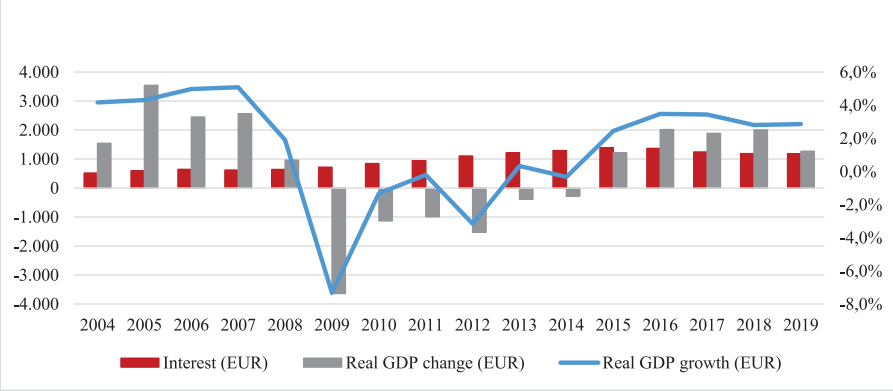
The growth of public debt during periods of recession is the result of increased public spending by which the state is trying to support economic activity. Debt relief to economic entities is not typical of the public sector, which in this period is looking for a way to finance emerging needs.

Škrinjarić and Orlović (2017) conclude that Croatia belongs to the group of indebted countries because the GDP growth rate cannot keep up with the interest rate. In the analysis covering the period from 2000 to 2016, they

conclude that the ratio of government debt to GDP less than 60% is not significant, while above that level it is significant and negative. They further emphasize that Croatia is in a situation of exceeded reference range, which poses additional challenge for economic policy makers.

The sustainability of public finances based on the principle that the growth rate of production must be higher than the interest rate in periods of instability (crisis) is usually not visible in practice. In Croatia, this became apparent after the crisis. In the period from 2009 to 2014, real GDP growth was negative while interest expenditures increased.

Figure 9: Change in real GDP and interest expense in the period from 2009 to 2019



Source: European Commission, Ameco Database (2021), Ministry of Finance, author's work

The GDP growth in the period before the crisis showed that previous investments were profitable, which justifies the economic growth that in the period before the crisis, in absolute terms, was higher than in the years observed so far., Crisis disrupted the trend, until 2016. Despite the fact that since 2016 the amount of economic growth can be characterized as favourable given that it exceeds accrued interest, the convergence of the variables in 2019 shows that economic growth does not justify (or justifies it to a lesser extent) previously undertaken indebtedness.

In the last two years, Croatia has been borrowing at the lowest interest rates in its history, which is primarily a consequence of increased liquidity in international financial markets and a result of positive economic trends and progress in resolving fiscal imbalances. In addition, a public debt management strategy has been adopted, which contains concrete measures regarding debt reduction and financing costs. (Šimović 2017, 24). Although public debt levels remain high, the steps taken to reduce debt which could greatly undermine economic stability are encouraging.

7. Conclusions

Investments that drive economic growth result in a demand for financial resources that countries, in the absence of their own resources, meet by borrowing. In both the transition period and the period that followed it, the transition countries recorded an increase in indebtedness. In the years after the crisis, some countries exceeded the debt ceilings prescribed as a condition for acceding to the EU. In the following years applying a more restrictive policy these levels were decreased. The emergence of a *coronavirus* crisis has led to an additional increase in indebtedness that future generations will have to repay. Borrowing beyond the break-even point will have consequences for all generations because the current illiquidity will result in a lowered credit rating that affects the cost of future borrowing. Moreover, in the long run due to debt repayment future generations will have less disposable income.

This paper presents the trend of indebtedness in transition countries with an emphasis on determining the growth rate threshold that justifies previous borrowing. Thus, the analysis of 11 countries concluded that the indebtedness rate threshold is lower due to the outbreak of *coronavirus* epidemic and is 75%. When 2020. data is not included, the indebtedness rate threshold of the observed countries is 78%.

Of course, indebtedness of all countries is not the same. Certain countries better bear the burden of indebtedness by achieving higher rates of return. Economic growth in Croatia compared to other observed countries is the weakest, which is a result of several factors: the war in the initial phase of transition, the implementation of inadequate policies, the highest tax burden and excessive dependence on consumption. However, in the upcoming period the level of indebtedness above the threshold poses new challenges in creating fiscal policy and maintaining credit ratings and economic stability.

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CHAPTER 29

Italian Digital Transformation Team: the relevance of the digital awareness

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Abstract

Our research is aimed at highlighting some key elements of the successful path designed by the Italian Digital Transformation Team. With this goal, we propose a qualitative study.

The Italian Digital Transformation Team, appointed in September 2016, is made of professionals with specific technical expertise and important managerial skills. Indeed, a proper approach to the digital transformation cannot be based only on the development of technology but it needs the right competencies. As noted by Nadkarni and Prügl (2021), technology and actor are the two aggregate dimensions of digital transformation.

Through the analysis of our case study, we emphasize the relevance of the human capital within the digital transformation that, as already pointed out in the literature, is a phenomenon that interests IT evolution as well as processes, people, policies, and leadership of all organizations around the world, regardless type, size, area of business. In order to implement a suitable digital transformation is essential to develop a proper digital awareness: the boundary between opportunity and abyss of digital transformation

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passes through the digital awareness that is a key element not yet in-depth considered.

Key words: *digital awareness, digital transformation, human capital, skills, public sector*

JEL classification: *O32, O33, O38, M15*

1. Introduction

As widely accepted and overwhelmingly proved by the Covid-19 crisis, digitalization is pervasive and transversal, and it is strongly affecting business and work (Cantoni and Mangia, 2018; Caputo et al., 2021; Gabryelczyk, 2020; Garzella et al., 2021; Kudyba, 2020; Lombardi et al., 2020). At a time when the planet is fighting against a major viral pandemic, we undertake the goal of to demonstrate the potentiality of another viral, yet positive, contamination: the digital contamination.

At this stage, there is a double hybridation: the digital dimension contaminates and is contaminated by all the other disciplines. Being the most pervasive and innovative phenomenon of all time, it must be interpreted almost like languages, algebra or universal music. In both the public - on which we will come back more extensively, later in the case study- and private sectors, on one side, managers, lawyers, economists, computer scientists and decision makers must work together in order to leverage the digital technology opportunities and achieve concrete results, especially in complex areas, while on the other side, they must continue to do their job by exploiting their specific skills. Thus, it is essential to mature and acquire an overall digital awareness.

As argued by Švarc et al. (2020), digitalization increases the relevance of intangibles, forcing to invest huge efforts into digital transformation e.g. the economic and societal effects of digitization and digitalization (OECD, 2019). Capurro et al. (2018) state that, in this era, the indispensable entrepreneurial insight must be combined with strategic management of data and information systems, highlighting that the sum of these elements becomes the linchpin of the strategy generation process.

Whether we accept it or not, all individuals are impacted by the digitalization's effects (Morrone et al., 2020; Švarc et al., 2020) even though society, as a whole, is not yet fully aware. Based on these premises, Attias and Cristofari (2015) developed the theory of the digital philosopher: "*as everyone is able to understand, since the existence of humans, fundamental concepts related to food, health, transport and what moves around these topics, today must be the same for information technology, even without necessarily being an insider*".

In fact, digital transformation represents a challenge for individuals, firms and national economies with an impact on technological, social and cultural changes as well as on business models (Attias, 2015; Mancini et al., 2017; Smit et al., 2016). It is not a case that the Italian Recovery Plan (PNRR) that provides investments for more than 200 billion euros, earmarks about 50 billion for the first mission on Digitization and Innovation.

Unfortunately, in Europe, not all countries can boast good results concerning digital skills. For example, the Digital Scoreboard, that illustrate some key dimensions of the European information society allowing the comparison of progress across countries, over time, points out that the Cypriot, Italian, Latvian, Romanian and Bulgarian labour force (employed and unemployed)

with at least basic digital skills represents less than 50% against the European average of 66.2%; good percentages refer only to Iceland, Norway, Netherlands, Finland and the United Kingdom that record an active labour force with at least basic digital skills higher than 80% (European Commission, 2019a). Concerning the indicator "above basic level of digital skills" of employed and unemployed, the European average is 38.7%, with the maximum value recorded by Icelanders (65.7%) and the minimum by Bulgarians (12.1%) (European Commission, 2019b). Moreover, it is worth noting that the Digital Scoreboard (European Commission, 2019c) shows that ICT professionals with at least basic digital skills represent 100% of individuals only in few countries e.g. Norway, Slovenia, Greece, Croatia, Iceland and Spain; the average value of the European Union is 82.2%. In no country, ICT professionals with above basic digital skills represent the whole (European Commission 2019d).

Nevertheless, in 2020 Western Europe gets on the podium (with North America and Eastern Asia) in the ranking of digital competitiveness factors that are knowledge, technology and future readiness (WDCR, 2020).

Recommendation of the European Parliament and Council of 18 December 2006 (2006/962/EC) includes digital competence[5] among eight key competences[6] for lifelong learning: *those which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment*. In particular, the listed key competences are:

5 It is defined as follows: Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.
Essential knowledge, skills and attitudes related to this competence:
Digital competence requires a sound understanding and knowledge of the nature, role and opportunities of IST in everyday contexts: in personal and social life as well as at work. This includes main computer applications such as word processing, spreadsheets, databases, information storage and management, and an understanding of the opportunities and potential risks of the Internet and communication via electronic media (e-mail, network tools) for work, leisure, information sharing and collaborative networking, learning and research. Individuals should also understand how IST can support creativity and innovation, and be aware of issues around the validity and reliability of information available and of the legal and ethical principles involved in the interactive use of IST.
Skills needed include the ability to search, collect and process information and use it in a critical and systematic way, assessing relevance and distinguishing the real from the virtual while recognising the links. Individuals should have skills to use tools to produce, present and understand complex information and the ability to access, search and use internet-based services. Individuals should also be able use IST to support critical thinking, creativity, and innovation.
Use of IST requires a critical and reflective attitude towards available information and a responsible use of the interactive media. An interest in engaging in communities and networks for cultural, social and/or professional purposes also supports this competence.

6 Competences are defined here as a combination of knowledge, skills and attitudes appropriate to the context.

1. *Communication in the mother tongue;*
2. *Communication in foreign languages;*
3. *Mathematical competence and basic competences in science and technology;*
4. *Digital competence;*
5. *Learning to learn;*
6. *Social and civic competences;*
7. *Sense of initiative and entrepreneurship;*
8. *Cultural awareness and expression.*

Twelve years later, in the Recommendations n. 2018/C 189/01, the Reference Framework updated the above-mentioned key competences, leaving only the digital one in the same position and with the same label as shown below:

1. *Literacy competence;*
2. *Multilingual competence;*
3. *Mathematical competence and competence in science, technology and engineering;*
4. *Digital competence;*
5. *Personal, social and learning to learn competence;*
6. *Citizenship competence;*
7. *Entrepreneurship competence;*
8. *Cultural awareness and expression competence.*

The position of Digital in the ranking is not by chance; it is in the middle between the subject required for the literacy in a broad sense and transversal skills required to live and grow in society as it became even more evident during the Covid-19 pandemic. Indeed, digital competence is one of a kind since it is, at the same time, both an independent subject matter and a tool for learning and working. We can easily assess this distinctive characteristic in the labour market: e-competence is often a requirement in the job posting and, at the same time, it is essential for the job search process that is mostly online (Guitert et al., 2020).

The duo “pandemic-digitalization” is causing a faster than expected revolution in the private and public organizations. The World Economic Forum (2020) estimates that in the next 3 years, the global world of work will generate 133 million new employment opportunities while displacing 75 million jobs; more than 75% of Italian organizations have a similar forecast (Unioncamere, 2020). A reskilling process of human resources is thus inevitable.

This premise helps us to introduce the present research that has the goal to highlight the centrality of digital competence for the success of the organizations in a world where everything is getting digitalized.

Digital awareness and basic digital skills are indispensable for everyone, workers or just private citizens. But this is not enough. In the unavoidable digital transformation process, organizations need to consider not only e-skills but also e-leadership. Private firms as well as the public sector need e-leaders able of thinking digitally; this kind of professional figures must be involved in the design and implementation of strategy. Indeed, if organizations do not change approach - that is if managers are not able to combine the opportunities of digital technology with the ability to change-, are doomed since in order to succeed, they need the right approach to deal with the digital transformation. However, this principle remains not so apparent as it is so not indisputable that more should be invested in digital skills. Indeed, what we wish to highlight is that digital awareness is a necessary step for a correct digital transformation and that it must be fully included in the context of strategic governance. Obviously digital skills, digital awareness and their correlation are extremely vast and constantly evolving topics but we limit to analyse only a few aspects.

This paper is organized as follows. Section 2 focuses on the literature concerning intellectual capital and digital competences. Section 3 expounds the relevance of digital competence for a successful business. Section 4 proposes a case study useful to highlight the relevance of digital awareness. Section 5 discusses the main outcome of the analysis in order to wrap up our main conclusions.

2. Literature review

2.1. Intellectual capital

The strong and deep innovation that characterized the XXI century affects, among the others, the importance of intellectual capital (IC) within the organizations (Lombardi et al., 2020). Indeed, academics and practitioners are increasing the study of IC (Agostini et al., 2017; Demartini and Paoloni, 2013; Guthrie et al., 2012; Kianto et al., 2014; Rastogi, 2000; Zambon et al., 2019) that is a strategic driver; even though research is still fragmented (Martín-de Castro et al. 2019), many authors agree on the potentiality played by IC in the value creation and development of competitive advantage and, more generally, in the success of national economies (Abdulaali, 2018; Cohen and Kaimenakis, 2007; Duodu and Rowlinson, 2021; Garzella, 2000; Iacuzzi et al., 2020; Iazzolino and Laise, 2016; Lerro et al., 2014; Martín-de Castro et al., 2019; Obeidat et al., 2017; Paoloni et al., 2020). Among others, the European Commission, World Bank, Japan Ministry of Economy, Trade and Industry and Australian Department of Industry, Science, Energy and Resources have highlighted the weight of IC in fostering innovation and improving organizations' competitiveness in a knowledge-intensive economy.

There is an abundance of intellectual capital's definitions (Choong, 2008), but we adopt the following definition: the integration of human capital (HC), structural capital (SC) and relational capital (RC) (Bontis, 1998; Edvinsson and Malone, 1997). The first component is made up of human resources, and refers to their explicit and tacit knowledge, competences, skills, functional

experience, education background, capabilities, aptitude, and characteristics (Asif, 2020; Hafeez and Aburawi, 2013; Nicholson and Kiel, 2004). The second one refers to resources of organizational structures and processes. Thus, it is not only the organizational and technological capital but includes management philosophy and practices, organizational culture and training processes (Keenan and Aggestam, 2001), etc. In other words, SC can be defined as the combination of the non-human knowledge, software systems and distribution networks useful for building the appropriate organizational structure. It includes, for example, databases, organizational charts, process manuals and strategies (Bontis et al., 2000). Finally, the third one is composed of intrinsic value and knowledge concerning relationships with stakeholders (Edvinsson and Malone, 1997; Inkinen, 2015).

With specific regard to the innovation, Subramaniam and Youndt (2005) found that human capital and relational capital positively influence radical innovative capabilities while structural capital positively influence the incremental innovative ones. Bontis et al. (2000) argue that *organisations with strong structural capital will have a supportive culture that allows individuals to try new things, to learn, and to fail*.

2.2. Digital competences

In the XXI century, the relevance of the digitalization is evident and undeniable, and digital competence becomes a fundamental factor for both personal development and creative and innovative workforce. As noted by Bilozubenko et al. (2020), *information and communication technologies have an important structural and organizational value, making a significant contribution to economic growth and social progress*. One of the main challenges of the current historical period is building up mindset and competences fit for the "digital way of working" (Maedche, 2016; Murawski and Bick, 2017). Even though the centrality of digitalization is a widely and well discussed, scrutinized and shared topic, we cannot say the same for digital awareness that is something broader and not yet properly studied.

Indeed, digital awareness is a relevant yet still largely unexplored aspect in the process of the planet's digital transformation, firstly and foremost, from a philosophical-cultural point of view. Digital awareness should not be measured by the ability to use a device, as mistakenly done. This assumption has led to the misconception that, since they were able to use a device from an early age, digital natives had the necessary digital skills (in terms operationally defined with the DigComp framework) to use digital technologies cognizantly. The same misapprehension has led digital immigrants e.g. those who were not "born with technologies" but had to learn them, to believe that the transition consisted only in being able to use technology. If this issue is not approached with "daily humility", companies go bankrupt, inefficiency is generated in public entities, fulfilling jobs are not found and education system cannot reach the right targets. Digital divide still persist and are actually deepening; the digitally excluded is no longer the one that does not have access to the Internet or does not have the technologies to access it (Fuggetta, 2018), but those who do not know how to consciously use neither

the network nor the technologies. Basically, the digitally excluded are those who do not have the basic digital skills (Solimine, 2014). Accordingly, Attias et al. (2017) define the digital divide as *a multidimensional, multidisciplinary and constantly evolving concept, the definition of which must be dynamic and flexible, since it should adapt to and absorb the continuous changes and numerous innovative opportunities which are offered by the enabling technologies for the digitisation […]*. As remarked by Fuggetta (2018), digital immigrants have great responsibilities since on the side, they should be able to embrace the novelty, the freshness, the positive and enthusiastic ingenuity of the digital natives and, on the other side, help them to develop the maturity that goes far beyond a superficial easiness in using ICT tools. Therefore, to build a widespread digital awareness, it is paramount to find a balanced win-win between digital natives and digital immigrants, by enhancing the potential and contributions of each generation.

After assuming the digital competence importance for jobs and positive development of organizations, we wish to emphasize the need to provide proper and progressive training. It would be useful to introduce coding classes as well as courses to teach computational thinking, skills and the use of digital applications starting with the primary school (Amor Almedina and Serrano Rodríguez, 2019; Morrone et al., 2020) in order to create a real and inherent digital awareness. Specialised teachers should teach digital education at all school levels, at the universities, in the business and non-profit organizations, in the private association of young and elderly and in the public sector, with a view of a lifelong learning approach (Gavrilyuk and Kuznetsov, 2018; Heinecke et al., 2019; Iacono, 2020; Martínez Heredia and Rodríguez-García, 2018). School systems should hire competent instructors of digital and, at the same time, should help traditional subject teachers to carry on their classes with the help of digital technologies.

It is important to point out that the digital competence should assist and be complementary with the teaching/learning of other key competences that are *equally important, because each of them can contribute to a successful life in a knowledge society* (European Parliament and the Council, 2006); in the digital age, it is even more necessary to develop "traditional" skills and contextualize them in the digital world.

Literature is rich of digital competences' definitions and categorizations based on different criteria (Attias et al., 2017; Cahen and Borini, 2020; Carretero et al., 2017; Ferrari, 2012; Heinecke et al., 2019; Iacono and Marzano, 2014). Attias et al. (2017) recognize three main kinds of digital competences in a constant evolution:

- e-competence of ICT insiders;
- e-competence of those who use digital technologies in their daily job;
- e-competence of those who use digital technologies in their everyday life, without knowledge or awareness and any specific expertise.

Iacono and Marzano (2014) introduce a new framework to better understand the issue. On the one hand, there are the basic and indispensable digital

competences - which are the prerequisite for working in a modern organization and enabling all competences, not only digital-, and “use” - which is the competence required to middle management to fully carry out their activities in a digitalized organization -, on the other side, there is the transformational ability – so to speak – that managers should have to leverage digital technologies in order to pursue innovative initiatives.

When defining and classifying e-competences, a strong emphasis should have the dimension of e-leadership (Avolio et al., 2000; Li et al., 2017, 2016). A European Commission report (2015) states that *e-Leadership is of crucial importance for companies and industry to excel in their business operation. e-Leadership is key to using new digital technologies for innovation and transformation, managed in a relevant organisational context and embedded in the business strategy. e-Leadership skills are the skills required of an individual to initiate and achieve digital innovation.* It includes Strategic Leadership, Business Savvy and Digital Savvy. Avolio et al. (2000) defines e-leadership *as a social influence process mediated by Advanced Information Technology to produce a change in attitudes, feelings, thinking, behavior, and/or performance with individuals, groups, and/or organizations. E-leadership can occur at any hierarchical level in an organization and can involve one-to-one and one-to-many interactions within and across large units and organizations*.

This preliminary analysis helps us to introduce the key point: in the era of digitalization, almost all jobs and thus all organizations -not only the new ICT-based ones- are impacted and transformed by digital: this trend will be more and more persistent.

‘Thinking digital’ thus is not a nice-to-have- but is essential. The e-leader thinks and acts digitally. In this scenario, we pose the problem of how to interpret the current context in relation to a changing cultural and technological situation. The e-leader is aware that the direction of change supported by technology is neither deterministic nor neutral but choices are dictated by the vision and mission to be pursued.

Digital natives often find themselves having to face this new reality, if we do not strengthen their competences sufficiently, we risk turning the opportunity provided by the innovation into an abyss (Fuggetta, 2018). We risk having digital natives that are digitally uncognizant. Thus, the digitalization of most economic sectors requires new approaches in the education, training, formation and management of innovative human capital (Tolstykh et al., 2018).

2.2.1. E-leadership

In recent years, the approach to e-leadership - a skill that the European Commission strongly encourages - aims to ensure that the digital exits the niche of ICT specialists and quickly pervades all economic sectors, penetrating deeply into the processes and strategic and operational functioning of organizations.

The basic idea of the e-leadership approach is that anyone with responsibility for directing and managing teams and organisational units, in addition to the specific competences required by the sector/role (as detailed in Section 3 for ICT profiles), should possess the key competences to act with awareness in the current economic and social context where digitalization is pervasive and digital technologies are essential.

Indeed, it is not by chance that the model of e-leadership skills is built around the full integration of soft, relational and managerial skills with specific ones. The latter include a full understanding of how the digital can be used for organizational and operational objectives, and innovation, with a profound impact on production, delivery, management, communication and marketing. This expertise accompanies the irreversible phenomenon whereby every job will require digital skills, becoming necessary for companies at the two most critical moments:

- after the start-up period (3-5 years) when a flexible but evolved form of the organization becomes necessary;
- in the transformation-regeneration that may avoid the transition from the maturity stage to the decline stage (Agenda Digitale, 2014).

Yet, if e-leadership is vital for the private sector, it is even more so for the public. In fact, it is the only way for the public sector to maintain its relevance and keep fulfilling its mission of serving citizens; it is the only way to assure a successful digital transformation of the public administration, which, at this point, is not only necessary but inevitable.

The strong attitude of the e-leader to “see” the change is translated into the ability to think and implement projects that unhinge old mental schemes and innovate organizational processes (Iacono and Deplano, 2015).

In the framework for e-leadership competencies, AgID guidelines (AgID, 2018) indicate five areas of expertise:

- culture and knowledge of the digital world;
- individual interpersonal and communication skills (soft skills);
- organizational leadership: organizational skills and change management competences;
- managerial skills in the context of the organization;
- competences for the fulfilment of the organizational mission and digital processes (in the case of the public sector with regard to e.g., open government, e-government, digital citizenship).

With these skills, the e-leader ‘thinks and acts digitally’, and he is able to interpret the current evolving context.

3. Conception of analysis

Even though the relationship between intellectual capital and digital transformation is a young stream of research - still not fully investigated by the literature -, the relevance of human capital, structural capital and relational capital in the digital transformation, is blatantly clear. With specific regard to HC, we wish to remind that already fourteen years ago, digital competences were considered necessary for employment (European Parliament and Council, 2006). If digital competences are essential for finding a job broadly speaking, in almost every kind of organization, ICT roles are increasing in terms of number and value in any organization. Statista (2016) reports that from 2011 to 2018, in the United Kingdom, the number of employees in the IT, software and computer services economy increased of about 250.000 units. Indeed, in the digital age, almost all roles and professions (e.g., teachers, researchers, lawyers, doctors, accountants and so on) - even if not digital native - are contaminated by Information & Communication Technology (Rubino et al., 2019); thus everybody is unavoidably forced to gain digital competences in a short time (Morrone et al., 2020). Gerasimenko and Razumova (2020) noted that digital technologies are becoming a corporate key success factor and that their use requires changes in management processes and in the organization of managers' work (Tippins and Sohi, 2003). A worker without digital skills, even if he or she can find a role within an organization, will certainly have difficulty in finding a fulfilling one. To clear the way for possible misunderstanding, we do not claim that all individuals should become digital experts but that all individuals should be able to understand at least the technical terminology of digital technologies (e.g. cloud computing, blockchain, cybersecurity, artificial intelligence, machine learning, etc.) and be at least digital cognizant.

As known, business management can be divided into strategic and operational; Galeotti (1995) states that the first one concerns determining the basic characteristics of the process of iteration of the organization with the environment, as well as the material and organisational structure suitable for providing the best support, while the second concerns the proper use of the realised structural system of operating conditions. He attributes to strategic management, ideas, decisions and operations able to define, create and modify the business system; this includes investment, innovative and learning processes throughout which competences and tangible and intangible resources are accumulated, sedimented and stratified. To operating management, he attributes ideas, decisions and activities able to efficiently run the business system. Hence, if we apply this paradigm to our model, within an organisation, it is not enough developing appropriate digital skills and competences but it is essential developing a favourable environment for business survival and growth that is based on digital awareness.

In sum, we cannot ignore the "new" reality. *Lönnqvist and Mettänen (2005)* highlight the relevance of IC in most types of organizations; this includes employees' knowledge and skills, immaterial properties, organizational resources, and business processes. The World Economic Forum (2016) estimated that about *65% of children entering primary school today will*

ultimately end up working in completely new job types that don't yet exist.

Consequently, the roles that, until a few years ago, were relevant only in the ICT Department, are becoming more strategic and closer to the CEO. Digital and soft skills' integration - which is at the basis of the concept of e-leadership - seems to be the best practice; in the organizations, the ICT c-level jobs are increasingly strategic. The Chief Information Officer (CIO) more often coincides with the CEO and, in any case, no CEO can now ignore the understanding of the continuous digital transformation process of the managed organization. ICT jobs are now in a very high number; some examples: Chief Information Officer, Chief Digital Officer, Chief Technology Officer, Chief Security Information Officer, Chief Data Officer, Digital Architect, Cloud Computing Architect, Cloud Computing Integrator, Data Driven Decision, Business Intelligence, Data Scientist, Open Data Expert, Internet of Things, Big Data Expert, Digital Marketing Manager, Analytics Director, Web Analytics Manager, e-Reputation Manager, Artificial Intelligence, Machine Learning, Blockchain, Cyber Security, Industry 4.0.

The Chief Information Officer (CIO) does not only provide the right technology but he or she is involved in both the strategic definition of business and change management process and manage resources to assure the daily operation of information systems. Due to the increasing role of ICT within the organizations, the CIO is one of the key C-suite roles, and more often is appointed as Chief Operating Officer (COO) and Chief Executive Officer (CEO) (Babin and Grant, 2019). A survey on the "Global CIO strategic influence/executive committee membership 2017" (2018) concerning CIOs worldwide from 2005 to 2017, shows the increasing involvement in the executive committee (from 38% of 2005 to 62% of 2017). *The role of the CIO is shifting from just IT to that of a leader who can drive business performance* (IBM Institute for Business Value, 2013). Two research streams can be identified in the IT governance literature: IT governance at managerial-level, and IT governance at board of directors-level (Jewer and McKay, 2012). Yet, despite the increasing interest, a Caluwe and De Haes (2019) shows that the involvement of boards in governing digital assets is still low.

However, CIO is not the only C-level strongly related to the ICT. Other examples are:

- Chief Technology Officer (CTO) who occupies the highest position associated with technology responsibilities, monitoring technological advances, evaluating technological aspects of major strategic initiatives, and selecting profitable new technologies to apply within the organization to increase productivity and to promote competitiveness.
- Chief Information Security Officer (CISO) who has the responsibility to define and implement the best organizational model able to ensure adequate data and technology security. To do this, CISO works on risk mitigation, introducing appropriate controls and standards in compliance with the security regulations. More particularly, he or she is accountable for cybersecurity, disaster recovery and business continuity management, identity and access management, privacy, risk management, design of

security architectures.

- Chief Data Officer (CDO) who has the responsibility for data management strategy based on two pillars: data science and data analytics.

As for this last role, data is becoming more and more the key resource for the functioning of all organization, and its use is strategic. Currently, organizations are recognizing the value of data, striving to manage them efficiently, effectively and safely. No organization can survive without proper use of data, making essential data scientists, business intelligence analysts and big data experts: all jobs that are becoming increasingly common and crucial. These professionals, who are no longer confined to the research labs, should add to their technical competences, the so-called soft skills.

4. Case study: Digital Transformation Team

An interesting case study concerning digital cognizance and skills is the Digital Transformation Team (DTT).

The Digital Transformation Team was established in September 2016. It worked as an independent entity until the end of 2019, when its responsibility was transferred to the "Minister for Technological Innovation and Digitalization", currently the "Minister for Technological Innovation and Digital Transition". The structure was composed of about 30 experts with managerial and IT skills, mainly recruited outside the public sector, and a supporting administrative team of 1 manager and 7 civil servants with a specific expertise in procurement. The technical team consisted of the following resources: Chief Technology Officer, Chief Information Officer, Open Source Project Leader, Technical Project Manager, Program Manager, Mobile Developer, Chief Data Product Manager, Chief Data Officer, UX designer, Service Designer, Cybersecurity expert, Data scientists, Cloud & Data Center expert, Content Designer, Big Data Engineer, Full Stack Developer, Software Developer, UX/UI Developer, Data Protection Officer, Software Architect, Machine Learning Engineer, Site Reliability Engineer / DevOps Engineer, Digital Communication experts, e-payments experts, European and Italian Regulatory affairs expert. All these professionals had both specific technical expertise and strong managerial skills.

The Digital Transformation Team oversaw the creation of the Italian "operating system" e. g. building simpler and more efficient services for the citizens, the Public Administration, and businesses, through innovative digital products. With this goal, the Team mainly focused on the digital transformation of the public sector as a vehicle for simplification and transparency of the administrative processes and bureaucracy, by developing existing programs and implementing new ones. In particular, the Team:

- supported and supervised the Agency for Digital Italy (AgID), fostering and finalizing the long overdue publication of the Three-year Plan for Digital Transformation, through a structured managerial approach;
- launched the operations on the enabling platforms that were at a standstill

(e.g., the national registry, digital payments and digital identity), with rigorous actions to move forward and complete the projects, introducing structured mechanisms and processes, along with recruiting those with specific technological and managerial skills;

- worked on rethinking, designing, and launching some services which, due to their utility and frequency of use, have important repercussions on the life of citizens;
- conceived the app io.italia.it that allows citizens to interact with the Public Administration, paving the way for other administrations in innovating digital services for citizens.

The mission of the Team included the goals of making public services for citizens and private and public organizations accessible in the simplest way, through mobile devices, with a secure, scalable and highly reliable architecture based on clearly-defined application interfaces (APIs) as well as to make available data easily accessible to support the definition and implementation of more effective policies and timely decisions.

The team was able to start a real transformation, introducing a new inspirational model thanks to their digital cognizance and skills. The Team achieved various results (e.g., SPID, PagoPA, IO, Repubblica Digitale) but, more important, it set in motion the cultural change.

5. Discussion and conclusions

The boundary between opportunity and abyss of digitalization passes through the digital awareness that is cross sectoral and affects all organizations regardless of size and sector.

As stated by the European Commission (Digital Economy and Skills, 2020), a strong digital economy is vital for innovation, growth, jobs and competitiveness. Today, organizations which are cognizant and aware of the digital dimension - for example, those that implemented an effective digital transformation or have a significant presence on the web - undoubtedly have a greater chance of success. The dramatic experience of the pandemic has forced a better understanding and has significantly contributed to increase the digital awareness, not only among digital experts, but also among the population as a whole. For this reason, at this time, when we are all trying to defend ourselves form the virus contamination, we should foster digital contamination in all sectors of the society. In the organizations, where different professionals have a constructive dialogue on digital technology, it is easier to face and overcome the new challenges, since they are better prepared.

Widespread digital awareness, and better digital skills and competences – both as an independent subject of study and a tool for learning other subject matters – combined with conscious e-leadership allow organizations to be flexible, resilient, modular, healthier, more transparent, while preventing, at the same time, the depletion and obsolescence of the human resources.

It is no coincidence that we talk about ethics, culture and philosophy. Today, the lack of adequate skills and proper 'digital awareness' does not only weaken democratic, social and economic institutions but it also reduces the ability of the society and organisations to grow, transform and adjust.

Accordingly, the advancement of the e-leaders within the organizations, were they public or private, proves the willingness to use emerging technologies in order to enable smarter internal organisation, improve the quality of skills, foster talents, promote a better work life and last but not least, contribute to sustainable development.

It is our firm conviction, and we would like to emphasise it, that in a modern and innovative country this process should start from the highest institutional levels.

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CHAPTER 30

CONTRIBUTION OF EUROPEAN INNOVATION SCOREBOARD TOWARDS EUROPEANIZATION OF INNOVATION POLICIES

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Abstract

The European Commission in order to ensure an achievement of the set its' strategic goals and to support policy-makers in designing and improving innovation policies has introduced different mechanisms for vertical policy coordination and horizontal policy learning. The Europeanization of innovation policies has been conducted through framework programmes and soft regulation in innovation policy with instruments, such as the Open Method for Cooperation (OMC) and International benchmarking. While policy learning and its instruments have the potential to lead to better governance and convergence of outcomes in the EU, there are reservations that they contribute more towards competition or imitation. The objective of this paper is to provide a structured insight about the potential and limitations of the international benchmarking of national innovation systems, as a tool for transnational policy learning and Europeanization. Through literature review on the strengths, weaknesses, opportunities and threats of European Innovation Scoreboard (EIS), a SWOT analysis has been conducted. The conclusion is that benchmarking has a great potential as a policy learning tool and could positively contribute towards good governance and Europeanization through convergence of concepts. However, this depends heavily on the capability and learning capacity of country's institutions. The paper analyses the impact of Covid19 on the Europeanization of innovation policies and on national innovation systems. According EIS, all New Member countries in European Union have certain improvement in Summery Innovation Index scores, thus showing some convergence, but the Covid19 crisis negative impact is not captured well by the EIS.

Key words: *Europeanization, Innovation policy, International benchmarking.*

JEL classification*: O380, H110.*

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1. Introduction

Since the beginning of the Covid 19 crisis, the EC has been supporting research and innovation and has pledged €1.4 billion to the Coronavirus Global Response, of which €1 billion comes from Horizon 2020. In times of crises, including the COVID 19, EU and national governments are under increasing public pressure to evaluate and measure results and outcomes of public policies, programs and actions, including in the research and innovation area, inter alia due to the need:

- to better allocate the increasingly scarce public resources;
- to justify increasing investments in innovation;
- for accountability and transparency in spending tax-payers' money; and
- to make decisions for future innovation policies and programs.

In the past six decades, the European Union (EU) influences various national public policies of member and candidate countries and it is considered that the Europeanization of public policies comprises of processes beyond the change triggered by the implementation of EU decisions at the domestic level, but encompasses "processes of (a) construction (b) diffusion and (c) institutionalization of formal and informal rules, procedures, policy paradigms, styles, 'ways of doing things' and shared beliefs and norms which are first defined and consolidated in the making of EU public policy and politics and then incorporated in the logic of domestic discourse, identities, political structures and public policies" (Saurugger and Radaelli 2008: 213). However, Radaelli (2004) further explains that Europeanization is not a synonym for convergence, and if it leads to any convergence it could be a convergence of paradigms and ideas of good practice - an ideational convergence, or even to the higher degrees of convergence that are at the level of decisions and outcomes.

In 2001, the European Union set the founding principles of good European governance, such as openness, participation, responsibility, effectiveness, and coherence, systemized in the White Paper on European Governance adopted by the European Commission (EC) (Kopric and Kovac, 2018). Likewise, in their study on the EU governance, Zito and Schout (2009) conclude that in the initiation of the governance 'turn' around 2000, integration theories shifted from macro theories towards analysing the micro processes in EU decision making. Following the enlargement there has been a profound examination and shift of the EU governance from hierarchical steering (legislation) towards learning-driven instruments such as the Open Method for Cooperation (OMC), international benchmarking and agencies or network governance. Thus, this new network governance crosses subnational, national, European and international levels and involves many stakeholders with the aim that, through knowledge transfer and a process of collective learning, convergence with the benchmark emerges. The OMC is a procedure for defining policy objectives at the European level while leaving member states discretion to determine their own policy objectives and practices and is considered as a postmodern "new mode of governance" using in particular

"soft" or nonhierarchical means to achieve policy objectives that transcends the classic forms of state intervention based on legislation and/or financial incentives (Tommel and Verdun, 2009). When the EU uses this facilitated coordination as a mode of governance it operates like a forum for discussion, a platform for policy transfer and cooperation among members that is producing opportunities for learning and diffusion of good practice (Radaelli, 2004).

At the same time, there is an increasing interest among scholars in the concept of governance in Europe due to the latest developments in the administration of public policies, the growth of the hollow state and the new broader definition of the "public". According to Fredrickson (2011) the key theories about governance among public administration scholars are defining governance as follows:

1. a synonym for public administration and policy implementation, where the theory is attempting to unify the various intellectual threads running through a multidisciplinary literature into a framework that covers this broad area of government activity;
2. managerialist movement, or
3. a body of theory that comprehends lateral and interinstitutional relations, the decline of sovereignty, and a general institutional fragmentation.

The widely acknowledged governance characterized concepts encompass post-NPM, New or Neo- Weberian State and Good Governance; however the Good Governance as an umbrella concept has been recognized as a key doctrine in public administration theory (Kovac and Gajduschek, 2015). According to Kovac (2015) good public governance is considered as the conciliation of interests and regulation of relations in a society with the aim to pursue broadly recognized values and interests. This postmodern good governance theory includes flexible compositions of connected network of actors as opposite to traditional and Weberian hierarchical model. Furthermore, UNDP (2002) emphasizes that good or democratic governance refers to governing systems which are capable, responsive, inclusive, and transparent, with meaningful and inclusive political participation, including more people in the decisions which shape their lives. Rhodes (1997) concludes that governance refers to governing with and through networks, and introduces the term network governance. Moreover, under network governance he considers public sector change that aims to improve coordination between government departments and the multifarious other organizations, and second, that the hierarchic (Westminster) model of responsible government and strong executive is no longer acceptable.

Additional key aspect of the new public governance modes is that they are required to generate new forms of democratic accountability in the context of transfer of sovereign state powers to the EU; transfer of power from parliaments to executive authorities; privatized delivery of public services, and other similar processes (Kovac and Gajduschek, 2015). As openness and transparency are two of the most highlighted principles of good European governance, both at national and supranational (EU) level, public

participation becomes a key tool in accomplishing those principles (Rakar, 2017). Herewith Rakar (2017) notes that the literature on the subject generally claims that public participation in rulemaking is supposed to enhance the democratic legitimacy of adopted decisions that could achieve the required level of democratic legitimacy for rulemaking. As EU is a multi-level and global governance organization (GGO) it is suffering from an accountability shortage, and in order to retain some level of democratic legitimacy it should adhere to the principles of representation, participation, equality, constitutional basis, transparency, and a rational basis for decisions (Fredrickson, 2011). As the EU multi-level governance system involve many different actors with differing levels of power there is a complex legitimacy of governance processes and legitimacy could be: output effectiveness for the people, input participation by the people and throughput with the people, analyzed in terms of their efficacy, accountability, transparency, inclusiveness and openness to interest consultation. Unlike input and output, which affect public perceptions of legitimacy both when they are increased or decreased, throughput tends to be most salient when negative, because oppressive, incompetent, corrupt or biased practices throw not just throughput but also input and output into question. (Schmidt, 2013). However, in order to ensure meaningful public participation, the EC distinguishes different levels for participation (access to information, consultation, and active involvement) and their relationship with the policy cycle phases: policy formulation, policy realization and policy learning, where EC recognizes the importance of participation in all phases (CDDG, 2016).

Similarly as in most of policy areas the new principles of the good European governance were reflected in the innovation policymaking in EU. Thus, through the OMC and international benchmarking such as European Innovation Scoreboard (EIS), EC increased the application of soft regulation in innovation policy, aiming at steering the economy and society through transnational policy learning, that differ from the classical legal and binding instruments. Herewith, we use the definition of Borrás and Conzelmann (2007) where soft regulation or soft modes of governance are based on voluntary and non-sanctioning forms of public action, where state and non□ state actors interact in extensive networks to solve complex social problems. In this context, “Europeanization might be observed less in the convergence of policy solutions and more in a tendency to frame national policy problems and solutions through an EU lens, with due regard for their potential impact in other member states” (Beveridge, 2012: 29).

The innovation policy in EU has the roots in science and technology policies and programs since the 1950s, and it has matured in a new public policy separate of research and technology development (RTD) policy in the past three decades. This happened shortly after the Oslo Manual (1992) guidelines for innovation policy-makers, when the first strategic documents were published by the European Commission (EC) having in focus explicitly the importance of innovation for EU (Green Paper on Innovation, 1995 and Action Plan for Innovation in Europe, 1996). As Bucar (2015: 135) explains these documents have “...provided for the first time a common analytical and political framework for innovation policy in Europe. But it was the

Lisbon Agenda for Jobs and Growth (known as Lisbon Strategy), adopted by the European Council in 2000, that clearly put innovation as one of the most important common policy objectives." The Lisbon Agenda aimed at making the EU the most competitive world region by 2020. However, putting innovation at the core of the EU policymaking process requires measures that can improve leadership, ownership, accountability, coordination and governance in innovation policymaking, such as i.e. public participation and policy-learning, soft instruments.

2. Literature review

In 2002 Barcelona the European Council set an ambitious target for the member countries for Research and Development (R&D) intensity: R&D and innovation investment of 3 per cent of each country's GDP by 2010. The expansion of innovation policies in EU and the Europeanization of the policy area by the European Commission is confirmed also by the continuous growth of expenditures on research, technological development and innovation (RTDI) and its increasing share in the EU budget. With the realization of the first major policy initiative, the First European Framework Programme on RTDI and the framework programmes that followed including the latest Horizon 2020 and Horizon Europe, the policy field became the second largest Europeanized policy area in budgetary terms in the late 1990s. The launch of the Lisbon Agenda and the European Research Area (ERA) policy in 2000 and the Innovation Union Flagship Initiative in 2010, introduced a new phase of deepening and broadening cooperation in matters of RTDI policy in Europe. The framework programmes became a central source of European research and innovation funding where Member States gave up direct control over the distribution of these funds (Nauwelaers and Wintjes, 2008).

In the spirit of good European governance the Lisbon agenda, and the consequent EC strategic documents on innovation: the Green Paper on the European Research Area, Innovation Union 2020, "Open Innovation, Open Science, Open to the World" promote public participation. The Lisbon objectives is believed to be achieved only by an economy geared to innovation and a society fully committed to it, where an "open dialogue" later reframed as "participation" became a means to achieve this goal. The discourse on public participation emerged with FP5 and became institutionalized with FP6 and FP7, focused on the inclusion of different publics in dialogues, debates, and deliberations as means for contributing to decision-making. While public participation had initially been conceived and promoted as a way to build legitimacy of research policy decisions by involving publics into decision making processes, it is also promoted in the end of the 2000s as a way to produce better/more knowledge and innovation by involving publics into knowledge and innovation-making processes, and thus building legitimacy for science and technology as a whole. In this regards, EC strategic documents have been crucial in the evolution of the discourse and the increase of public participation in all phases of the innovation policy cycle (Macq et al., 2020).

The current institutional governance of innovation policy at EU level is too

complex and diverse, while Horizon programmes are centrally managed on EU level and besides EIT and EIC, which implement the programmes centrally; there are also other institutions involved such as the European Investment Bank (EIB) that supports RDI investments and the European Investment Fund (EIF) that supports cross-border venture capital. Additionally, the Directorates-General (DG), a policy department in the EC in charge of the centralized innovation programmes is the DG for Research and Innovation (RTD) working closely with other DGs such as ENTR, CONNECT, MOVE, ENV, ECFIN, REGIO and EAC due to the fact that innovation is overarching objective in the different EU policies. The involved DGs are responsible for developing, implementing and managing EU innovation policy, law and funding programmes. On the national level, there is also a harmonization of national innovation policies within EU and as Bucar (2015) concludes this Europeanization is especially vivid in the programmes of Europe 2020/Innovation Union and unification of the policies and instruments for the two areas, where common approach is suggested for the financial perspective 2014-2020, with a stress on Strategy for Smart Specialisation as a precondition for the Structural Funds (SF). EC suggested to members with lower R&D and innovation investments to employ SF for the research infrastructure at the national level as well as sources of co- financing joint European research infrastructure. The Europeanization of the innovation policies has been closely related with the EU cohesion policy and ability to draw on the SF, especially since the financial perspective 2007-2013 stressed the promotion of RTD and innovation, so most of the countries designed specific shared managed programmes and consequently implemented measures in this area to be co- funded from the SF.

In addition to the centrally and shared managed programmes, since the 2000s, EC increased the application of soft regulation in innovation policy, through instruments, such as OMC and International Benchmarking, through EIS. Nauwelaers and Wintjes (2008) further explain that the EU soft policies in the field of innovation are a related to the fact that innovation falls under the responsibility of the Member States and there is no formal possibility for the European Authorities to impose such a convergence in policy, but there are soft and more informal methods of coordination should lead to convergence in the outputs, such as the Barcelona objective of 3% R&D intensity by 2010. Europeanisation of RDI policies had positive and negative implications on national policies, especially in new member countries.

Many authors (Kincso et al., 2012; Bucar, 2015; Bucar and Stare, 2009; Pelle, 2015) study the effects of Europeanization of innovation policies in new member countries and come to the same conclusions that Europeanization's positive influence is evident in awareness raising, transfer of innovation policy concepts and practices, but in many cases it resulted with imitation of policies instead of tailor-made policy mixes. In this regards, Radaelli (2004) states that that effective policy transfer requires more than governance architectures like the OMC, referring to the need of a robust networks of stakeholders that facilitate the adoption of new policies at home, a strong civil society, and administrative political capability to consciously modify, edit, and adapt foreign experience to national circumstances. In absence of the aforementioned

conditions OMC's potential in terms of Europeanisation is limited. Bucar (2015) further explains that it is the governance of the innovation policy which is responsible to take into consideration the specific features of the national framework for innovation as well as the institutional and policy set-up at the EU level. The lack of experience and tradition in innovation governance limit the ability of new member states to successfully integrate transferred EU policies to the national specifics. Therefore we can talk of about the imitation of the policies with still insufficient learning process in the adaptation of the policies to the specific needs and capabilities of each individual country and its circumstances.

The soft policy instrument OMC has been shaping European innovation policy and programmes since 2000 to ensure an achievement of the Lisbon Strategy goals by member states thorough vertical policy coordination and horizontal policy learning. Among other scholars, Knill and Lenschow (2003) consider OMC as positive tool for joint policy learning and cooperation on a voluntary basis that create some degree of policy convergence. They find OMC as the most fundamental departure from the hierarchy model in EU regulation as the regulatory responsibility is entirely located at the national level and EU's new governance function in facilitating coordination and mutual learning among national policy-makers. In this regard, Olsen (2008) states that governance by networks is characterized by long-term commitments trust, and reciprocity, with civil society organizations as a link between society and government and it is a move from centralized, hierarchical government toward democratic legitimacy. Thus, network proponents demand a corrective to the conventional view of politics and government as centered on formal-legal institutions. Regarding OMC, Bruno et al. (2006: 532-533) in their study conclude "...the process of Europeanization is not limited to the direct impact of legislation or to spillover effects. Another mode of governance has been developing over several years, in a pragmatic way and in a non-binding form. This new form of governance operates through the institution of a process of co-ordination between the member states, which allows them to elaborate a consensus on a common path that will then be implemented at the national level in different policy fields".

According to Jacobbsen (2004) the OMC as a soft system of governance related to language use and knowledge making, includes: joint language use (Eurodiscourse); the building of a common knowledge base (including collection and standardization of statistics); the strategic use of comparisons and evaluations; the systematic editing and diffusion of knowledge, combined with social pressure and time pressure. Consequently, these measures together constitute a system of governance with the potential to transform the practices of the member states and thus add to the integration process, albeit by a partly different kind of dynamic than regulation and integration by hard law.

Nauwelaers and Wintjes (2008) state that OMC acts as a trigger for international policy learning, and significantly so in the area of innovation, in the European innovation policy OMC is a soft method of governance using non-binding methods and voluntary moves from Member States, where

peer reviews, comparisons and benchmarking are main tools used, and the EU' role is to offer a platform for exchanges rather than enacting laws. The authors argue that the transnational learning methods are increasingly used for innovation policy making in Europe and became a formal element in the EU policy regarding the governance of research and innovation as Member States are invited to make full use of transnational policy learning and cooperation.

On the other side, next to OMC, benchmarking, as a tool for policy learning, has been promoted greatly as a learning method in innovation policy by EC in the 2000s (European Innovation Trendchart, ERAWATCH, Policy Benchmarking workshops, European Innovation Scoreboard). One of the biggest advocates of policy learning via benchmarking, Lundvall and Tomlinson (2002) have emphasized its importance to the EU in the face of rapid developments of new technologies and proposed "intelligent benchmarking", a systematic process of international benchmarking of NIS and policy learning method focused on learning by interacting. As benchmarking origins from the business sector, "... transposed to policy, the ultimate goal of benchmarking would similarly be to introduce changes in policy practices, so that improved policy performance happens as a result. In a mechanistic fashion, the way to do it would involve analyses and comparisons with best performing countries and borrowing from those models" (Nauwelaers and Wintjes, 2008: 9). However, the authors add that in the realm of innovation policy, there are fundamental problems with the idea of a transfer of practice from the "best in class" model due to the fact that innovation policy is context-dependent and there is no universal best practice policy in innovation. Furthermore, what is important is the policy mix, not each individual policy instrument, as it is the interaction between various instruments, as well as with their surrounding environment, that will influence the innovation outcomes.

Many authors criticize the OMC and the increasing practice of intergovernmental benchmarking, the authors Dominique et al. (2013) in their study on international benchmarking conclude that despite its popularity, it is more often employed to steer political agendas, policy-makers resist to adopt the 'lessons' of international comparisons, often on the basis of claims of exceptionalism and the appeal of rankings and best practices can gloss over important contextual factors that inform the policy learning process, crowding out other valuable modes of policy learning. While Bruno (2006) argues that OMC and especially the intergovernmental benchmarking constantly urges decision-makers to hit the top of the charts, therefore it is far from being neutral in purpose and effect, as it lays the foundation for building a "competitive Europe" which unites Member States through competition.

Arrowsmith et al. (2004) argue that benchmarking offers actors a means of resolving the horizontal and vertical collective action, it has assumed a vital role in the EU's OMC with its focus on the identification and dissemination of 'best practice' through mutual learning, yet benchmarking must be looser at EU level, and perhaps ultimately viewed as a complementary not an alternative form of regulation. The European Innovation Scoreboard (EIS) has been the main tool for benchmarking performance of the NIS and comparative

assessment of the innovation success among EU member countries for the past two decades.

3. Methodology/Method/Model/Conception of analysis

The paper's research question is whether the international benchmarking within the European Innovation Scoreboard, as a soft measure and policy learning tool could positively contribute towards Europeanisation and good governance in innovation policies? Thus, to answer this question, this paper analyses the potential and limitations of the international benchmarking and European Innovation Scoreboard (EIS), as the main tool for international benchmarking of national innovation systems of the EU member countries, and a tool for transnational policy learning.

In the first stage of the research in order to structure, analyze, interpret and draw conclusions regarding the key challenges and strengths of international benchmarking of NIS we perform a detailed SWOT analysis. In this paper, we mainly focus on the analysis of the benefits and limits of EIS as a benchmarking tool for innovation policy learning and the opportunities and threats of its use for policy-makers. Through literature review on the strengths, weaknesses, opportunities and threats of EIS, international benchmarking and policy learning, and based on the critical review (analysis, synthesis, induction and dedication methods) a SWOT analysis has been conducted (description method) capturing the key aspects of the EIS as a policy learning tool.

EIS has direct influence on the innovation programs and policies on supranational level in EU (ex. EIT RIS program) and it has been used as a policy learning tool on national level. According to Schibany and Streicher (2008), EIS has established itself as probably the most widely watched benchmarking tool in the discussion of European technology policy, and although there is a process of convergence in innovation performance in Europe, the possibilities of short-term influences by policy on the variables measured by the EIS are limited. Paasi (2005: 24) in her research summarizes the key findings by Overdevest and Ludlow about the most important aspect of EIS, as an EU benchmarking exercise that is: "the shared objective of the Lisbon European Council for Europe to become the world's most dynamic and competitive knowledge-based economy and to strengthen social cohesion among member states by 2010. In particular the Lisbon policy objectives are to be realized by using the OMC in all concerned policy areas through a set of activities for supporting learning and coordination and benchmarking indicators and exchange of best practices." She further states that EIS has focus on research and innovation policies for approaching the Lisbon policy objectives and is a benchmarking instrument that aims to support transnational policy learning in the area of European innovation policy. However, EIS methodology and the benchmarking in general have been subject to many critics due its quantitative approach and limitations, but also the misuse and misinterpretations of the country rankings.

In the second stage of the research, the empirical analysis is focused on the results and information that EIS, as benchmarking tool, provides when assessing the impact of Covid 19 on the Europeanization of innovation policies and the impact on national innovation systems. In order to conduct the analysis the Summary Innovation Index (SII) scores for the Central and Eastern Europe (CEE) or "new member" (NM) countries are analysed in the period between 2014 and 2021.

3.1. SWOT analysis

3.1.1. Strengths and weaknesses

The benefits of international benchmarking are emphasized by Arundel and Hollanders (2008), which conclude that it is an 'early warning' system for potential problems, has capacity to track changes in national strengths and weakness and is useful to monitor and compare the success or failure of the innovation system by policy-makers.

The limitation of benchmarking tools, where EIS belongs, is discussed by other authors regarding their use as a main device for policy monitoring and benchmarking that adds to the common tendency for one-size-fits-all approaches to innovation policy and its methodology that ignores the wide variety of economic structures among the countries under analysis (Mamede, 2017). Nauwelaers and Wintjes (2008) further elaborate benchmarking limits as it involves the use of "benchmarks", understood as best practices or best performers. But because of the diversity of innovation trajectories, there are no such benchmarks available. It is difficult to learn from comparing, when information on impacts of policies is missing.

Benchmarking as policy learning tool, have some limitations that they do not provide "best practice" for innovation policy, but on the other side their strength is their "learning-by-interacting" process for policy-makers, who are then pushed to analyze their own policy practices in the light of the practices deployed elsewhere (Tomlinson and Lundvall, 2001). According to Nauwelaers and Wintjes (2008), such benchmarking tools are source for policy learning based on policy experiences of others and a source of codified knowledge for policy learning within and across systems, which is key for improving innovation policy in Europe. They believe that the collaborative exercises are a positive-sum game, where all participants can gain, and progresses made in one country do not occur at the expense of the others. One of the key strengths, as mentioned by the authors, is that is supported by qualitative analyses and relies on codified information through the use of indicators, and by the reliance on experts rather than peers in the process. The EIS publication as an expert report, endorsed by policy-makers, presenting a diagnosis of the situation for each Member State and generic orientations for policy improvements (generally, no precise policy recommendations are offered) is adding to its popularity. Further, they emphasize its awareness-raising effects on the importance of conducting sensible analyses and evaluations of policies, in countries where the evaluation culture is weak, the pressure it creates for improvements in innovation policy on policy-

makers that could lead to policy changes. In 2015 Bucar will conclude that EIS develops governance capability and improved functioning of the NIS, as good governance represents the ability of the policy-makers to identify good practice and policy from the EU (or elsewhere) and to transfer it in a way that takes into account specific local circumstances.

On the other side, EIS as the international benchmarking tool, is popular due to its peer acceptance, usefulness for communication and benchmarking purposes (OECD, 2008); it is simple (the number of indicators is limited), transparent (publicly available methodology and dataset) and has continuity and tradition (published since 2000 and comparable results between editions) and is effective as a communication device to put innovation on the political agenda (Arundel et al., 2008; Hollanders and Cruysen, 2008). Nevertheless, as a composite indicator it has shortcomings in the methodology and the risk that once used and accepted, its abuse makes it become policy target and lose its meaning as a tool to explain certain realities (OECD, 2008; Edquist and Zabala- Iturriagagoitia, 2015; Edquist et al., 2018).

Edquist and Zabala- Iturriagagoitia (2009) put an accent to EIS positive side that it provides an evidence base for policy action and has important policy implication. They claim that EIS is important as basis for the design and implementation of innovation policies as the comparison among countries aids policy-makers in the identification of systemic problems to be solved and it can help policy-makers to find those benchmarks they can learn from according to their countries' structural similarities and failures. However, they also argue that it is not possible to discern if the performance observed for a particular indicator is too high or too low, as optimal innovation intensities cannot be defined.

There are also authors researching the benchmarking and EIS impacts that see the negative effects in ranking that lead to "naming and shaming" (Grupp, 2006) or the underestimated complexity of the process behind the simple number in EIS (Cherchye et al., 2004). Others emphasize the required high levels of strategic policy intelligence, which are not always readily available, and its result relates more to capacity building and the creation of a mutual learning environment, than to short-term results in terms of practical policy changes. 'This might be considered as insufficient by policy-makers interested to see concrete results, as direct outcomes of their efforts.' (Nauwelaers and Wintjes, 2008). In general, the policy learning is hampered by the fact that the different political contexts in Europe shape the implementation, evaluation and appreciation of certain policy instruments (Radaelli, 2005).

3.1.2. Opportunities

The potential of benchmarking, including EIS, as a policy learning tool has been emphasized by many authors, especially its positive contribution towards good governance, in identifying good practices and policies from the EU and towards Europeanization (Radosevic, 2004; Bučar and Stare, 2009). Edquist and Zabala-Iturriagagoitia (2009) believe that EIS is useful in identification of systemic failures, by balanced used with qualitative approaches.

When reflecting on the benchmarking in innovation, Nauwelaers and Wintjes (2008) put an accent on the importance of the effective policy learning in the area of innovation policy when combined with tacit sources of knowledge and intra-system learning and the resulting conceptual convergence: diffusion and wider adoption of the concept of innovation system as a background for policy; and increased legitimacy of innovation as a policy area. The authors believe in the well-informed exchange of experiences between policy-makers, in order to widen the range of policy options, open new windows of opportunities, improve the understanding of framework conditions under which policy operate, learn from successful experiences, and ultimately provoke changes in own policy practices. The international benchmarking tools, including EIS could contribute towards coherence between systems across the EU and could help in the search for effectiveness and coherence within the daily reality of multi-level governance.

3.1.3. Threats

Many authors warn about the threats in EIS application as policy learning and benchmarking tool such as policy-makers' lack of experience and tradition in innovation governance that limits the ability to successfully integrate transferred EU policies to the national specifics. Thus, there is an imitation of the policies with still insufficient learning process in the adaptation of the policies to the specific needs and capabilities of each individual country and its circumstances (Bucar, 2015; Suurna and Kattel, 2010). On the other side there are scholars that criticize the EIS methodology and selection of the indicators, and they argue that countries can increase their innovation performance by improving the efficiency of their innovation process without having to increase their innovation inputs contrary to the EIS expectations (Hollanders and Cruysen, 2008, Edquist and Zabala-Iturriagagoitia, 2009, 2014c, 2015; Mahroum and Al- Saleh, 2013; Edquist et al., 2018).

In addition, according to Hollanders and Cruysen (2008) countries differ in their state of economic development and in their industrial specialisation patterns. Not all countries need to invest as heavily in innovation as some of the innovation leaders do; other strategies for improving economic well-being might be more realistic for those countries. The authors emphasize that wider socio-economic factors, governance and market indicators; provide relevant information for policy-makers about the environment for innovation. Additionally, they conclude that measurement of changes in innovation performance over time provide valuable information about progress in country's innovation performance, impacts of innovation policies on aggregate performance and progress against national reform programmes under the Lisbon strategy. Nauwelaers and Wintjes (2008) furthermore conclude that external pressure (from other systems at national or EU level) can be a limitation to internal policy learning within national or regional innovation systems. They find policy-makers' lack of strategic policy design capabilities and practices: to create a link between innovation system diagnosis, the definition of overall strategic goals and priorities, and the elaboration of instruments responding to the stated priorities, as major challenges in the

benchmarking outcomes.

The detailed SWOT analysis of international benchmarking in general and EIS as specific policy learning tool and the results are presented in the Table below. With this analytical framework, we systematically assess their influence for innovation policies design and their potential. As a basis for the SWOT analysis we start with the key findings in theory and practice regarding the positive and negative sides of benchmarking and EIS, and the potential and limits as policy learning tools. We analyze the strengths and weaknesses of EIS from three perspectives: quantitative, benchmarking and policy learning tool. With the analysis below we prove the hypothesis that benchmarking and EIS could provide multifold benefits for policy learning and Europeanisation. However, it is further concluded that the hypothesis is valid if certain pre-conditions are fulfilled, such as combined use with other policy learning methods, learning capability of the policy-makers and adequate application of the gained knowledge.

Table 1: SWOT analysis of international benchmarking of NIS in general and EIS, as a specific tool

Strengths (de lege lata=AS IT IS):	**Weaknesses (de lege lata=AS IT IS):**
- index that is simple to understand for the European citizens, experts, journalists and policy-makers; - endorsed tool and EIS ranking of countries by policy-makers on national and supranational level; - diagnostic tool for potential problems in the NIS; - provides an evidence base for policy action; - aids policy-makers in the identification of systemic problems; - aids policy-makers in the identification of suitable benchmarks to learn from in the innovation policy design; - increases collaboration between policy-makers coming from different countries; and - develops governance capability and improved functioning of the NIS.	- adds to the common tendency for one-size-fits-all approaches to innovation policy; - uses “benchmarks” understood as best innovation practices or best innovation performers where there are no such benchmarks available; - leads to publicly criticizing the underperformers; and - relates more to capacity building and mutual learning than to practical innovation policy changes in short-term.

Opportunities (de lege ferenda=IN FUTURE):	Threats (de lege ferenda=IN FUTURE):
- good governance in innovation; - Europeanization through convergence of concepts and objectives and coherence between NIS in EU; - early identification of systemic failures; and - effective policy learning in the area of innovation policy when combined with tacit sources of knowledge and intra-system learning.	- imitation of innovation policies among peers - due to inexperience in innovation governance of national policy-makers and lack of strategic policy design capabilities and practices; - misleading results in the benchmarking due to lack of information in EIS about the efficiency of NIS, wider socio-economic factors, governance and market indicators and/or measurement of changes in innovation performance; and - pressure from the EU on national policy-makers that can be a limitation to internal policy learning.

Source: author's summary

4. Empirical data (documentation background) and analysis

The empirical analysis is focused on the results and information that EIS, as benchmarking tool, provides when assessing the impact of Covid 19 on the Europeanization of innovation policies and the impact on national innovation systems. In order to conduct the analysis the SII scores for the 11 CEE or NM countries and EU average are analysed in the period between 2014 and 2021. The focus is on the NM countries because their EIS results in time could provide information on the convergence towards the EU average and towards the best performing countries in EU. Thus, it is expected that improvement in their scores over time and with fast pace is an indicator of convergence and better integration in terms of the innovation policies and performance. The data is gathered from the European Commission (2021) European Innovation Scoreboard 2021 dataset. In the analysis the time series of normalised SII scores for each country are presented and the country scores relative to EU average in 2020 and in 2021. The hypothesis is that the EIS will show the convergence and Europeanization of NM countries, however that the Covid 19 crises will affect the SII scores negatively.

5. Results and discussion

According to the SII scores presented in the Table 2 below, all NM countries have improved SII scores in the period 2014-2021 with different speed, that is an indicator of certain convergence. All NM countries, except Estonia in 2021, lag in innovation performance improvement since 2014 compared to the EU average. Therefore the hypothesis is confirmed that EIS showcases Europeanisation and convergence in EU.

However, SII scores for most of the NM countries, except Latvia and Slovakia, in 2021 show improvement compared to 2020 and s relative to EU average. Thus suggesting that the Covid 19 crisis does not have negative impact on the SII scores of NM countries. These results fail to prove the hypothesis of negative impact of Covid 19 on the innovation performance scores of the NIS presented in EIS, that may be due to several reasons:

- EIS does not considers time lag, that might show higher negative impact in the coming year(s);
- The values of some the EIS indicators in 2021 edition are not up to date and are calculated based on available data for pre-Covid 19 year;
- The selection of indicators in the EIS does not capture Covid-19 impact and the impact of other global crises and/or
- The methodology of SII does not measure innovation performance of NIS accurately.

Table 2: EIS Summary Innovation Index for NM countries 2014-2021

Country	Normalised scores								Relative to EU in 2014	Relative to EU in 2014
Year	2014	2015	2016	2017	2018	2019	2020	2021	2020	2021
EU	0.467	0.473	0.477	0.482	0.487	0.506	0.513	0.526	109.8	112.5
Bulgaria	0.200	0.215	0.213	0.220	0.217	0.219	0.230	0.234	49.1	50.1
Czechia	0.391	0.402	0.404	0.403	0.407	0.425	0.431	0.441	92.1	94.4
Estonia	0.434	0.434	0.415	0.392	0.386	0.486	0.502	0.600	107.3	128.3
Croatia	0.265	0.269	0.274	0.279	0.290	0.302	0.319	0.366	68.3	78.2
Latvia	0.212	0.228	0.243	0.240	0.259	0.287	0.287	0.261	61.4	55.9
Lithuania	0.286	0.295	0.309	0.359	0.378	0.391	0.427	0.430	91.3	92.1
Hungary	0.330	0.338	0.340	0.337	0.337	0.329	0.341	0.357	73.0	76.4
Poland	0.240	0.246	0.254	0.267	0.274	0.286	0.295	0.308	63.2	65.9
Romania	0.145	0.146	0.146	0.154	0.162	0.155	0.155	0.164	33.1	35.1
Slovenia	0.456	0.464	0.466	0.471	0.467	0.458	0.439	0.470	93.8	100.5
Slovakia	0.304	0.313	0.319	0.324	0.304	0.321	0.335	0.332	71.6	71.0

Source: EC, European Innovation Scoreboard 2021

The analysis of the EIS in terms of Covid 19 crises and its impact, has certain limitations and should be considered just as a starting point for furthermore thorough analysis in order to understand and measure the impact. Also, the future analysis should include at least statistical data for the key indicators in 2021. Nevertheless, the analysis is showcasing the shortcomings of EIS

and its methodology, as also identified by the aforementioned authors and scholars, to capture the impacts of negative unexpected global events and shocks on innovation performance of NIS especially to provide information in time.

6. Conclusions

With this paper we provide additional insights in the significance of international benchmarking as a tool for policy learning and its potential positive contribution towards Europeanization and good governance in innovation policies, through the literature review.

Based on the SWOT analysis we could conclude that benchmarking in general and EIS as a specific tool have significant importance in innovation policy learning, policy design and measuring progress on the EU and national level. The key EIS strengths are its popularity, simplicity, transparency, participatory approach, peer acceptance and few decades tradition in performance measurement of NIS heavily supported by the EC. The EIS as a benchmarking tools has many strengths related to: diagnostics of potential problems in NIS, evidence-based innovation policy actions and the identification of systemic problems to be solved and benchmarks to learn from according to their countries' structural similarities and failures. Benchmarking in general develops governance capability and improved functioning of the NIS. Thus, it has a great potential as a policy learning tool and could positively contribute towards good governance, Europeanization through convergence of concepts and objectives and coherence between NIS in EU, early identification of systemic failures and effective policy learning in the area of innovation policy when combined with tacit sources of knowledge and intra-system learning.

The benefits of benchmarking and EIS for national innovation policies depend heavily on the capability and learning capacity of country's institutions and policy-makers to implement well the gained policy knowledge by combining it with other qualitative methods and intra-system learning. The crucial factor for the both to be considered as an effective policy learning tools is that the knowledge that they provide is not just to be applied by policy-makers, which is very important, but also in its application to take into consideration the national context and specifics.

However, benchmarking and EIS should be carefully used as they have their shortcomings too, especially as showcased in the case of EIS incapability to capture the negative effects of Covid 19 global crises on the NIS (as per the results of the empirical analysis above). EIS is insufficient as a sole tool in innovation policy learning and design, for further Europeanization of innovation policies, therefore EC should encourage and support the lagging countries to implement the findings of EIS in their NISs, especially by supporting the process of best peers identification and the capacity building in the innovation instruments selection. The methodology of SII, as a composite indicator has its own shortcomings that have been identified by this paper and by many researchers since its launch. Therefore the analysis here indicates that there

is a necessary revision of SII, especially in terms of the selection indicators, data accuracy and consistency and time lags.

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CHAPTER 31

INVESTMENT PORTFOLIO OPTIMIZATION USING ALTERNATIVE INVESTMENTS

Filip Škunca[1]

Abstract

Institutional investors are being faced with the long-standing environment of historically low interest rates which has significantly decreased their investment returns. Therefore, the question of the investment portfolio structure is becoming important as ever. Modern portfolio theory, first introduced by Harry Markowitz in his 1952 paper, attempted to provide an answer to this question. Despite its popularity, several criticisms of the same have appeared and one of the most common relates to the normal distribution assumption. As one of the many alternatives to the Markowitz model, the multi-moment portfolio optimization model was developed using a multicriteria optimisation method known as polynomial goal programming. This scientific paper will present the mentioned model and use it to solve the problem of optimizing the investment portfolio that contains a combination of several traditional (equity, bonds) and alternative investment classes (hedge funds, managed futures). It is believed that alternative investments, due to their low correlation with the yields of traditional asset classes, can have a major positive effect on risk diversification and attaining higher investment yields. Optimization results indicate that including alternative investments in fact improves risk and return of the investment portfolio. Further on, portfolios optimized by multicriteria optimization proved to be the more efficient, compared through a relevant performance measure that incorporates higher moments, than portfolios optimized by the Markowitz model. All the calculations and optimizations have been performed in R programming language.

Key words: *Multicriteria optimisation, alternative investments, polynomial goal programming, higher moments, hedge funds, managed futures, R programming language*

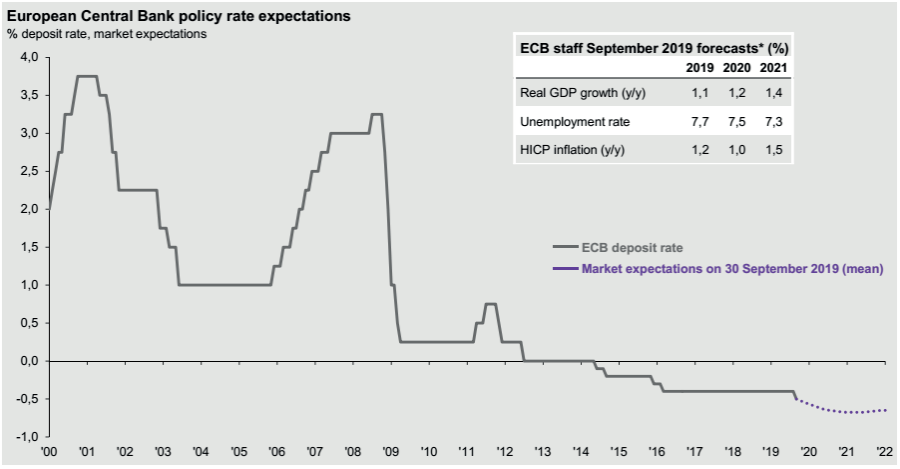
JEL classification: *JEL_C61, JEL_D81, JEL_G11*

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1. Introduction

The problem of long-standing environment of historically low interest rates is one of the main macroeconomic features of the last decade of the EU economy. Low interest rates have significantly reduced the returns of institutional investors, and "forced" them to invest in risky forms of assets. Given such a situation, it is necessary to determine whether investors are adequately compensated by higher potential returns, therefore the question of the structure of the investment portfolio is becoming increasingly important.

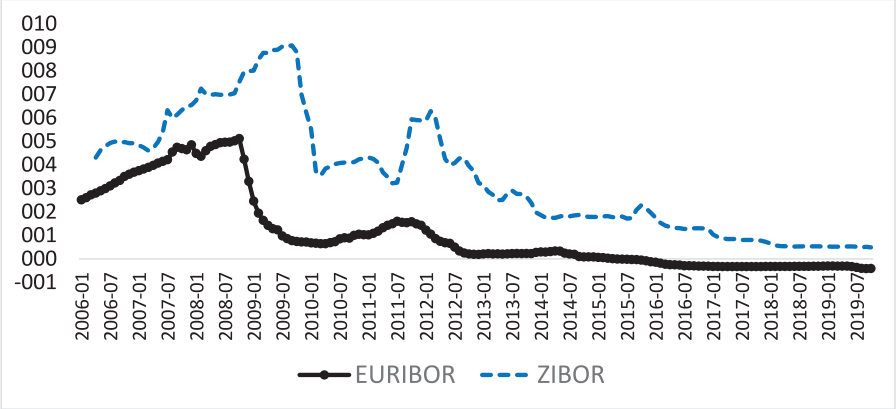
Graph 1: Reference interest rates in the EU



Source: Bloomberg, European Central Bank, J.P. Morgan Asset Management. *Forecasts are made by ECB staff. HICP is the Harmonised Index of Consumer Prices. Market expectations are calculated using OIS forwards. Past performance is not a reliable indicator of current and future results. *Guide to the Markets - Europe.* Data as of 30 September 2019.

Current expectations imply accommodative monetary policy and long-term negative policy rates in Europe and same applies for Croatia also.

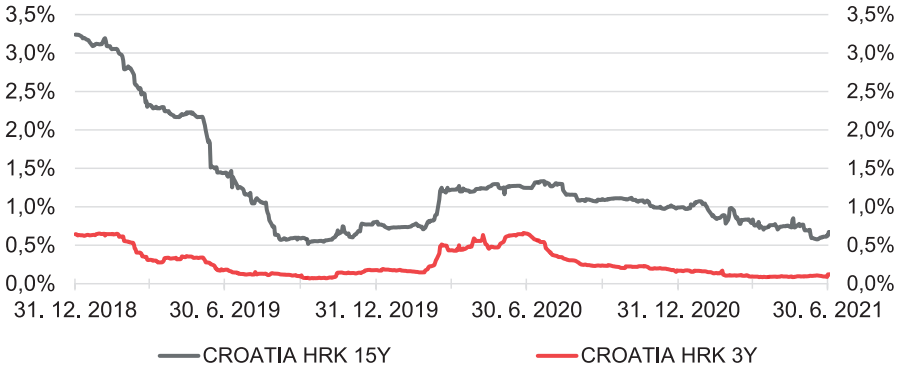
Graph 2: Reference interest rates in Croatia



Source: ECB, HNB

Since interest rates are continuously decreasing, so are the returns on government bond market which is of high significance to institutional investors like insurance companies and pension funds.

Graph 3: Croatian government bond yields



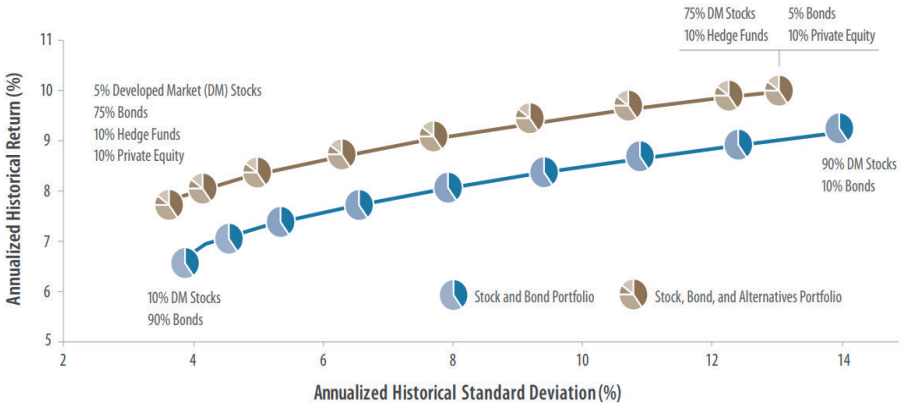
Government bond yields in Croatia are constantly getting lower which impacts upper mentioned investors with high portfolio allocation in bonds. A possible solution to this problem is the inclusion of alternative asset classes in the investment portfolio which can reduce the impact of low interest rate environment on the decline of insurance company's investment returns. Main reason why this could be a viable solution is low correlation of alterative investments with traditional forms like bonds and stocks (hence the name *alternatives*). Hedge funds and futures as alternative forms of investment are widely accepted, especially by institutional investors (Schneeweis and Georgiev, 2002). This theory is confirmed by the long-run correlation coefficients between the Credit Suisse Hedge Fund Index, which is one of the representative indices of the Hedge Fund industry, and the typical comparable stock and bond market index, as shown in the table below.

Table 1: Correlation matrix of hedge funds with traditional asset classes (1994-2015)

Financial index	*Credit Suisse Hedge Fund Index*	*MSCI AC World GR* (global stock market index)	*Barclays Global Aggregate TR* (global bond market index)
Credit Suisse Hedge Fund Index	1		
MSCI AC World GR	0.5677	1	
Barclays Global Aggregate TR	0.2776	-0.0059	1

Hence, optimal allocation of the investment portfolio to available forms of assets (stocks, bonds, etc.) is a continuous challenge to every investor. Modern portfolio theory, first introduced by Harry Markowitz in his 1952 paper (Markowitz, 1952), attempted to provide an answer to this question. This theory has enabled the quantification of expected returns and risks that draw attention to the risk not only of an individual security, but the risk of the entire portfolio, as well as the importance of diversification.

Graph 4: Efficient frontier with and without the inclusion of alternative investments



Source: Wells Fargo Investment Institute (data from January 1, 1990 - June 30, 2018)

The aim of inclusion of alternative investments is to reduce risk and increase expected return simultaneously. In other words, the inclusion of alternatives completely pushes the whole efficient frontier upwards. It is indisputable that the inclusion of additional traditional asset classes (e.g., money, foreign bonds, foreign stocks, deposits, etc.) also achieves positive effects on the performance of the investment portfolio. However, such an approach usually only increases the number of possible portfolios at the same or approximately similar efficient frontier.

Despite the popularity of this theory, as well as the most famous model of portfolio optimization, the so-called Markowitz's model, there appeared to be several criticisms on the account of the same. One of the most common critique is the normal distribution assumption. If the yields follow the normal distribution, it is sufficient to use the first two moments of the distribution (return and standard deviation). However, financial series are commonly characterized by asymmetric leptokurtic distributions, which was observed as early as the 1960s (Mandelbrot, 1963; Fama, 1965).

As one of numerous alternative models that upgraded the Markowitz model,

a multi-moment portfolio optimization model was developed that aimed at solving the problem of time series non-normal distribution. In such a model, besides first two moments, third and fourth moments of distribution are also considered, i.e., skewness and kurtosis. Athayde and Flores (2004) explain that investors prefer higher values of odd portfolio moments (expected return and skewness), while striving for lower values of even moments (risk manifested in standard deviation and kurtosis) to reduce losses and achieve higher absolute returns.

To calculate the third and fourth moments of the portfolio, it is necessary to calculate the coefficients of skewness for each type of investment separately, as well as the coefficients of co-skewness for each pair of assets. The same applies to calculation of coefficients of kurtosis and co-kurtosis. Described model can be considered as a problem of multicriteria (non-linear) programming in which the conflict of goal functions occurs. This problem differs significantly from simpler optimization problems such as Markowitz's model (optimization of one goal function). The model with multicriteria optimization is optimized so that in the first step, each goal function is optimized individually, on the same set of possible solutions. In this way, an efficient point is achieved, which consists of the optimum of individual optimization subproblems, i.e., maximum of 1st and 3rd moments and minimum 2nd and 4th. After that, the deviation from the obtained optimums from the first step is minimized (Škrinjarić, 2013). The described optimization method is in theory called polynomial goal programming.

The aim of this paper is to present the theoretical background of the model and use it to try to solve the problem of optimizing the investment portfolio that contains several traditional (stocks, bonds) and alternative assets classes (hedge funds and futures).

The paper is structured as following. Section 2 gives a brief literature review on the multicriteria model and where was it used for solving investment portfolio allocation problems. Section 3 shows the theoretical basis of the optimization method used in the paper, i.e., the polynomial goal programming (PGP). Fourth Section focuses on empirical analysis while Section 5 showcases final optimisation results along with the findings discussion. Section 6 concludes main points of the paper.

2. Literature review

If we look at the papers dealing with portfolio optimization and considering the higher moments of distribution, they started to appear in the late 1990s and 2000s, and today there are still not many of them. The first to empirically evaluate the selection of an efficient portfolio using higher moments was Lai (1991) when he presented a polynomial goal programming approach in solving the problem of portfolio optimization. In his paper, he optimized the portfolio considering the first three central moments of distribution, i.e., the expected return, variance, and skewness, and took only a few stocks into the analysis. Subsequently, certain authors evaluated international stock portfolios by including higher moments into optimization like Prakash et. al.

(2003), Yang and Hung (2010) and Kemalbay et al. (2011) using the same approach as Lai (1991).

As for papers dealing with the (multicriteria) portfolio optimization using alternative investments and higher moment, Kat (2004) tested the impact of selected alternative investments on the return and risk of the investment portfolio and tried to quantify the optimal weight of alternative investments in a portfolio consisting exclusively of traditional asset classes (bonds, stocks). Berényi (2002) was one of the first to use polynomial goal programming (PGP) to determine the set of the mean–variance–skewness–kurtosis (MVSK) efficient funds of hedge funds. Davies et al. (2009) also used polynomial goal programming for multi-criteria optimization on a portfolio consisting of hedge funds, bonds, and stocks. Jaggi et. al. (2011) also tested and concluded that including alternative investments provides benefits for the investor. Anson et. al. (2007) as well as Bergh and Rensburg (2008) used polynomial goal programming to confirm that MVSK multicriteria optimization gives better overall results than MV (mean-variance) optimization (i.e., Markowitz's model). Jurczenko et. al. (2006) deal solely with the theory and methodology of mean–variance–skewness–kurtosis optimization and have dedicated a whole book to multi-moment asset allocation problem.

Škrinjarić (2013) is one prominent domestic paper dealing with higher moments where multiple stocks from Zagreb Stock Exchange were selected and then portfolio was optimized using optimization model with higher moments. Research showed that using higher moments significantly changed the portfolio structure and the efficient frontier. Besides the mentioned paper, other Croatian authors mostly deal with the Markowitz's model in solving portfolio optimization problems. Štimac (2012) is also a rare domestic paper dealing with optimizing a portfolio that consists of alternative investments and pension fund returns index (Mirex index A, B and C) as part of the doctoral thesis research.

3. Methodology

The most common approach to multi-moment portfolio optimization is to use a model in which all four moments are optimized at once. For this reason, we say that it is a multi-criteria optimization because the investor considers more than one goal function, i.e., more criteria. In the case of portfolio optimization with the first four moments, the model consists of minimizing two goal functions (variance and kurtosis) and maximizing the remaining two goal functions (return and skewness) with standard limitations of non-negative share of asset classes in the portfolio and sum of individual assets:

$$\max_{w_i}\left[E\left(R_P\right) = \sum_{i=1}^{I} w_i E\left(R_i\right) \right]$$

$$\min_{w_i}\left[\sigma_P^2 = \sum_{i=1}^{I}\sum_{j=1}^{I} w_i w_j \sigma_{ij} \right]$$

$$\max_{w_i}\left[S_{Pr} = \frac{\sum_{i=1}^{I}\sum_{j=1}^{I}\sum_{k=1}^{I} w_i w_j w_k s_{ijk}}{\sigma_P^3} \right]$$

$$\min_{w_i}\left[K_{Pr} = \frac{\sum_{i=1}^{I}\sum_{j=1}^{I}\sum_{k=1}^{I}\sum_{l=1}^{I} w_i w_j w_k w_k k_{ijkl}}{\sigma_P^4} \right]$$

with constraints

$$\sum_{i=1}^{I} w_i = 1$$

$$w_i \geq 0, \quad i \in \{1,2,...,I\}. \qquad (M)$$

This is a problem in which there is a conflict of goal functions. This problem differs significantly from simpler optimization problems such as the Markowitz model (optimization of a single goal function). In multi-criteria optimization, there are several approaches to solving such problems, with each approach having its advantages and disadvantages. This paper will use one of the standard approaches to portfolio optimization with higher moments that was previously mentioned, *polynomial goal programming*.

Multicriteria programming refers to the simultaneous optimization of several functions of the goal – criteria (Lukač i Neralić, 2012):

$$\max f_1(\mathrm{x})$$
$$\max f_2(\mathrm{x})$$
$$\ldots$$
$$\max f_{\mathrm{k}}(\mathrm{x})$$
$$\boldsymbol{x} \in S,$$

where f_i, $i \in \{1, 2, \ldots, k\}$ represent the objective functions (criteria), $\boldsymbol{x}$ is a vector of unknown variables x_1, x_2, …, x_n, and $S = \{\boldsymbol{x} \mid {}^{g_j}(\boldsymbol{x}) \geq 0, j \in \{1, 2, \ldots, m\}\}$ a compact set of possible solutions. All objective functions can be placed in one vector function $\boldsymbol{z}(\boldsymbol{x})$, to write the problem of multicriteria programming more compactly:

$$\max \boldsymbol{z(x)}$$
$$\boldsymbol{x} \in S,$$

If some functions need to be minimized, such a problem can be reduced to a maximization problem as follows:

$$\min f_k(\boldsymbol{x}) = -\max\left(-f_k(\boldsymbol{x})\right)$$

The two most common types of multicriteria optimization models are compromise and goal programming. **Compromise programming** is based on minimizing the distance of the point $\boldsymbol{x} \in S$ from the reference point which is usually the ideal point $\boldsymbol{x}^*$. Different metrics are used to measure the distance. Thus, the initial problem of maximization *k* of the goal functions on the set of possible solutions is reduced to the problem of minimizing the distance of the value $f_i(\boldsymbol{x})$, $i \in \{1,2,...,I\}$, from the ideal value $f_i(\boldsymbol{x}^*)$:

$$\min\left(\sum_{i=1}^{k}\left|f_i(\boldsymbol{x}^*) - f_i(\boldsymbol{x})\right|^p\right)^{\frac{1}{p}}$$
$$\boldsymbol{x} \in S.$$

The absolute value of the distance from the ideal point is minimized, where *p* refers to the order of the metric used. The most used are L_1 (*p* = 1), L_2 (Euclidean, *p* = 2) or L_∞ (Chebyshev) metrics. Weights λ_i can also be included in the analysis if the decision maker considers certain criteria or moments more important than others. Then the following problem is formed:

$$\min\left(\sum_{i=1}^{k}\lambda_i\left|f_i(\boldsymbol{x}^*) - f_i(x)\right|^p\right)^{\frac{1}{p}}$$
$$\boldsymbol{x} \in S.$$

Goal programming as opposed to compromise, instead of an ideal point, uses a given point $g = (g_1, g_2, ..., g_k)$ as a reference, which can be missed or exceeded. If the marks d_i^+ for exceeding and d_i^- for failing the *i*-th goal, the following problem is formulated:

$$\min\sum_{i=1}^{k}\left(d_i^+ + d_i^-\right)$$
$$f_i(\boldsymbol{x}) - d_i^+ + d_i^- = g_i, \quad i \in \{1,2,...,k\},$$
$$\boldsymbol{x} \in S,\ d_i^+, d_i^- \geq 0, \quad i \in \{1,2,...,k\}.$$

Multicriteria programming began to be used in the field of finance relatively late, in the late 1980s. Since it is often considered as non-linear programming problem, with several conflicting criteria, and given the development of computers so far, it is not surprising that only in 1988 this type of programming was first applied in the field of finance (Škrinjarić, 2013).

Multicriteria programming as a multi-moment portfolio optimization tool consists of two steps. In the first step, each goal function is optimized individually, on the same set of possible solutions. In this way, an efficient point is obtained which consists of the optimum of the individual optimization subproblems ($E^*(R_p)$, *, S_p^*, K_p^*). This step is described by the model *(M)*. After that, the deviation from the mentioned point is minimized (Šego et al., 2018):

$$min\, M = \left|\frac{d_1}{E^*\left(R_P\right)}\right|^{\lambda_1} + \left|\frac{d_2}{\sigma_P^{2*}}\right|^{\lambda_2} + \left|\frac{d_3}{S_{Pr}^*}\right|^{\lambda_3} + \left|\frac{d_4}{K_{Pr}^*}\right|^{\lambda_4},$$

with constraints

$$\sum_{i=1}^{I} w_i E\left(R_i\right) + d_1 = E^*\left(R_P\right)$$

$$\sum_{i=1}^{I}\sum_{j=1}^{I} w_i w_j \sigma_{ij} - d_2 = \sigma_P^{2*}$$

$$\frac{\sum_{i=1}^{I}\sum_{j=1}^{I}\sum_{k=1}^{I} w_i w_j w_k s_{ijk}}{\sigma_P^3} + d_3 = S_{Pr}^*$$

$$\frac{\sum_{i=1}^{I}\sum_{j=1}^{I}\sum_{k=1}^{I}\sum_{l=1}^{I} w_i w_j w_k w_k k_{ijkl}}{\sigma_P^4} - d_4 = K_{Pr}^*$$

$$\sum_{i=1}^{I} w_i = 1$$

$$d_m \geq 0, \quad m \in \{1,...,4\}$$

$$w_i \geq 0, \quad i \in \{1,2,...,I\}. \ (F)$$

The parameters λ_i, $i \in \{1, 2, 3, 4\}$, represent the investor's preferences related to returns, risk, skewness and kurtosis of the portfolio, *p* metrics for measuring distances, while the variables d_m represent the distances of portfolio moments obtained from model optimization (*F*) from the optimal portfolio, i.e. point ($E^*(R_p)$, *, S_p*, K_p*).

The introduction of investor's preferences in the analysis indicates the importance of trade-off. A higher assigned value to a particular moment means that the investor prefers exactly that moment in relation to the others. In this paper, it will be assumed that investors have the same preferences in terms of moments and the model (F) can be written without λ_i parameters. The models in (M) and (F) will be optimized using the selected asset forms described in the next section.

4. Empirical data and analysis

In this chapter, previously described model is applied to optimize a portfolio containing assets classes, which are approximated by a relevant market index. A total of 4 assets classes were taken, which are related to:

1. Bonds - the asset class is represented by the *CROBIS Index*,
2. Stocks - asset class is represented by the *CROBEX Index*,
3. Hedge Funds - the asset class is represented by the *Barclay Hedge Fund Index*,
4. Managed futures - the asset class is represented by *the Barclay BTOP50 Index*.

The data sources for 1st and 2nd asset classes are Zagreb Stock Exchange (www.zse.hr), and for the 3rd and 4th assets data sources is the Barclay Hedge database. Available at: https://www.barclayhedge.com/.

For the mentioned variables, data on market indices monthly returns in the period from 2010 to 2019 were used. Thus, a total of 120 observations were obtained for each variable.

All calculations and optimizations were performed in R programming package. Based on the data used, monthly returns were calculated, as well as data on variance, skewness coefficient and kurtosis coefficient for each index.

Considering that 4 asset classes were included in the analysis, a total of 4 expected returns, 10 variances and covariances, 20 skewness and co-skewness coefficients and 35 kurtosis and co-kurtosis coefficients were calculated. Analysis and calculations involving higher moments become more complex with increasing number of variables (e.g., number of stocks), in this case the number of asset classes. In other words, as the number of variables increases, the number of co-moment coefficients to be calculated increases at an accelerated rate (Šego et al. 2018). However, due to the symmetry of

the coefficients, if we have N variables, we need to calculate

"only" $\binom{I+2}{3}$ skewness and co-skewness coefficients and $\binom{I+3}{4}$ kurtosis

and co-kurtosis coefficients (Škrinjarić, 2013). Accordingly, the general co-skewness coefficients are calculated by the formula

$$s_{ijk} = E\left[\left(R_i - E(R_i)\right)\left(R_j - E\left(R_j\right)\right)\left(R_k - E(R_k)\right)\right]$$

while the co-kurtosis coefficients are calculated according to the record,

$$k_{ijkl} = E\left[\left(R_i - E(R_i)\right)\left(R_j - E\left(R_j\right)\right)\left(R_k - E(R_k)\right)\left(R_l - E(R_l)\right)\right]$$

Usually, in the literature, formulas for portfolio skewness and kurtosis are written as follows (Škrinjarić, 2013):

$$S_P = E\left[R_P - E\left(R_P\right)\right]^3 = \sum_{i=1}^{I}\sum_{j=1}^{I}\sum_{k=1}^{I} w_i w_j w_k s_{ijk}$$

and

$$K_P = E\left[R_P - E\left(R_P\right)\right]^4 = \sum_{i=1}^{I}\sum_{j=1}^{I}\sum_{k=1}^{I}\sum_{l=1}^{I} w_i w_j w_k w_k k_{ijkl}$$

that is, relative skewness and kurtosis

$$S_{Pr} = \frac{E\left[R_P - E\left(R_P\right)\right]^3}{\sigma_P^3} = \frac{\sum_{i=1}^{I}\sum_{j=1}^{I}\sum_{k=1}^{I} w_i w_j w_k s_{ijk}}{\left(\sum_{i=1}^{I}\sum_{j=1}^{I} w_i w_j \sigma_{ij}\right)^{\frac{3}{2}}}$$

where the potentiated standard deviation was used as the scaling factor. It is recommended to use relative measures to normalize higher moments in this way, which allows comparability with other models. Furthermore, the covariance of returns between the two variables *i j* is given by the expression (Škrinjarić, 2013).

$$cov\left(R_i, R_j\right) = E\left[\left(R_i(t) - E\left(R_i\right)\right)\left(R_j(t) - E\left(R_j\right)\right)\right] =$$

$$= \frac{1}{T}\sum_{t=1}^{T}\left(R_i(t) - E\left(R_i\right)\right)\left(R_j(t) - E\left(R_j\right)\right).$$

With the calculation of portfolio skewness and kurtosis, and covariance between the observed asset classes, the expected portfolio return $E(R_P)$ is calculated as the weighted arithmetic mean of the return on the individual asset classes that make it up, where the weights are w_i:

$$E\left(R_P\right) = \sum_{i=1}^{I} w_i E\left(R_i\right).$$

Portfolio variance is given by:

$$\sigma_P^2 = \sum_{i=1}^{I} w_i^2 \sigma_i^2 + 2 \sum_{\substack{i,j=1 \\ i \neq j}}^{I} w_i\, w_j cov\left(R_i, R_j\right),$$

which can also be noted as

$$\sigma_P^2 = \sum_{i=1}^{I} \sum_{j=1}^{I} w_i w_j \sigma_{ij}.$$

The standard deviation is the positive second root of variance. In the following section, the results of the multicriteria optimization model using the polynomial goal programming method are presented.

4.1. Descriptive statistics

Table 2: Descriptive statistics of observed asset classes in the analysis (monthly changes)

Asset class	Bonds	Stocks	Hedge funds	Managed futures
Index	CROBIS	CROBEX	Barclay Hedge Fund	BTOP50
Expected return	0,0016	0,0001	0,0040	0,0008
Standard deviation	0,0099	0,0369	0,0148	0,0189
Skewness	0,6017	0,5396	-0,6491	0,0158
Kurtosis[2]	3,9022	3,5638	1,0070	-0,0727
Jarque-Bera test	83,3773	69,3290	13,4958	0,0314
p-value	0,0000	0,0000	0,0012	0,9844

Source: Author's research

2 The data refers to excess kurtosis since the reference formula in Excel calculates the kurtosis by subtracting 3 from the kurtosis coefficient. In other words, for normal distribution the excess kurtosis is 0.

The results of descriptive statistics indicate that the return is highest for Hedge funds, while the risk, expressed through the standard deviation, is highest for stocks. It is also seen that the skewness coefficient and excess kurtosis for most of the observed variable returns are non-zero, suggesting that their returns do not follow the normal distribution.

This was further confirmed by the *Jarque-Bera* test, which indicated that at the level of statistical significance of 1% we reject the hypothesis (H0) on the normal distribution of returns for bonds, stocks, and hedge funds, while in the time series of managed futures returns, we cannot reject the null hypothesis since returns can be considered normally distributed. This further justifies the use of a model that will consider more higher moments.

After calculating the descriptive statistics, the following are the matrices of co-moments, i.e., covariances.

Table 3: Matrix of variances and covariances

	Bonds	Stocks	Hedge funds	Managed futures
Bonds	0,0000983			
Stocks	0,0001267	0,0013625		
Hedge funds	0,0000286	0,0002498	0,0002180	
Managed futures	0,0000157	-0,0000024	0,0000312	0,0003560

Source: Author's research

Following the matrix of covariances, it is interesting to look at the empirical correlation coefficients of the observed asset classes to gain insight into the intensity of the correlation of the subject variables.

Table 4: Correlation coefficients of observed asset classes

	Bonds	Stocks	Hedge funds	Managed futures
Bonds	1,0000			
Stocks	0,3463	1,0000		
Hedge funds	0,1955	0,4584	1,0000	
Managed futures	0,0838	-0,0035	0,1120	1,0000

Source: Author's research

From the observed asset classes, hedge funds and stocks have the highest correlation coefficient, which can be explained by the fact that the observed index of hedge funds is dominated by those who predominantly use equity markets to implement investment strategies. Stocks and managed futures have the lowest or negative correlation, which means that their returns move in the opposite direction. Futures returns are least correlated with the returns of other asset classes, which leads to the conclusion that as a form of alternative investments they have significant diversification potential.

4.2. Multicriteria portfolio optimization using goal programming

Portfolio optimization by the described multi-criteria model was performed in two phases. In the first phase, the problems of maximizing the expected return, minimizing variance, maximizing the skewness coefficient, and minimizing the portfolio kurtosis coefficient were separately optimized:

$$P_1\begin{cases} max\ E^*(R_P) = \sum_{i=1}^{I} w_i E(R_i) \\ wit\ constraint \\ \sum_{i=1}^{I} w_i = 1 \\ w_i \geq 0, \quad i = 1,2,\dots,I. \end{cases}$$

$$P_2\begin{cases} min\ \sigma_P^{2*} = \sum_{i=1}^{I}\sum_{j=1}^{I} w_i w_j \sigma_{ij} \\ wit\ constraint \\ \sum_{i=1}^{I} w_i = 1 \\ w_i \geq 0, \quad i = 1,2,\dots,I. \end{cases}$$

$$P_3\begin{cases} max\ S_P^* = \frac{\sum_{i=1}^{I}\sum_{j=1}^{I}\sum_{k=1}^{I} w_i w_j w_k s_{ijk}}{\sigma_P^3} \\ wit\ constraint \\ \sum_{i=1}^{I} w_i = 1 \\ w_i \geq 0, \quad i = 1,2,\dots,I. \end{cases}$$

and

$$P_4\begin{cases} min\ K_P^* = \frac{\sum_{i=1}^{I}\sum_{j=1}^{I}\sum_{k=1}^{I}\sum_{l=1}^{I} w_i w_j w_k w_k k_{ijkl}}{\sigma_P^4} \\ wit\ constraint \\ \sum_{i=1}^{I} w_i = 1 \\ w_i \geq 0, \quad i = 1,2,\dots,I. \end{cases}$$

Based on four separate optimization problems, an efficient point is obtained, which is the starting point for the second phase of optimization:

$$(E^*(R_P), \sigma_P^{2*}, S_{Pr}^*, K_{Pr}^*) = (0.0040, 0.000071, 0.5321, -0.0969).$$

Thus, the efficient point consists of the maximum possible return, the minimum possible variance, the maximum skewness coefficient, and the minimum kurtosis coefficient.

A brief comparison of the optimization results of all four models is given in Tables 4 and 5. Table 4 indicates the optimal values of individual optimization problems. Some moments are either the biggest or the smallest in relation to other optimization problems, which leads to a deterioration in the value of other moments.

Table 5: Moment values of 4 portfolios obtained by optimization from the first phase

Moments	Portfolio			
	1	2	3	4
Return	0,0040	0,0020	0,0001	0,0010
Std.Dev.	0,0148	0,0084	0,0368	0,0178
Skewness	-0,6491	-0,1751	0,5321	0,0046
Kurtosis (Excess)	1,0070	1,2843	3,3841	-0,0969

Source: author's calculation in the R package software

The following table shows the weight structure of optimized portfolios from the first phase of optimization. Final structure of all four portfolios differs significantly, given the requirements that the investor imposes on the moments of the portfolio. If an investor only required maximizing the expected return, then he would invest everything in Hedge funds. On the other hand, seeking a combination of investments that will minimize risk leads to a significant change in structure. In that case, bonds would have the largest weight. In the portfolio with the maximum skewness, stocks would have the largest weight, while for the portfolio with the minimum kurtosis, these would be managed futures.

It is possible to add in the optimization additional constraints on the asset classes weight limits so that optimized portfolios would contain a certain amount each class, but such a restriction was not used in this paper.

Table 6: Asset class weight structure in portfolios obtained by optimizing the problem P1 - P4 (first phase)

Asset class	Weights			
	P_1	P_2	P_3	P_4
Bonds	0,00	0,63	0,006	0,000
Stocks	0,00	0,00	0,994	0,014
Hedge funds	1,00	0,22	0,000	0,050
Managed futures	0,00	0,15	0,006	0,942

Source: author's calculation in the R package software

5. Results and discussion

After the first, the second phase of multicriteria optimization was carried out. In it, the distance from the efficient point

$$(E^*(R_P), \sigma_P^{2*}, S_{Pr}^*, K_{Pr}^*) = (0.0040,\ 0.0084,\ 0.5321, -0.0969)$$

was minimized where in this model equal weights are assigned to each moment ($\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 1$). It is possible to change the set of preferences to put more weight on a particular moment according to the investor's preferences.

The results are given in Table 6. A point is obtained

$$(E(R_P), \sigma_P^2, S_{Pr}, K_{Pr}) = (0.0020, 0.0085, -0.28783, 0.8714)$$

and the individual distances of the obtained moments in relation to the efficient point are shown. The largest distance from the reference point is manifested in the kurtosis coefficient, while the smallest distance is manifested in the standard deviation and is almost 0.

Table 7: The values of the moments of the optimal portfolio obtained by multicriteria optimization (second phase)

Moment	Value	Distance	Value
Return	0,0020	d_1	0,0019
Std. Dev.	0,0085	d_2	0,0001
Skewness	-0,2878	d_3	0,8199
Kurtosis (Excess)	0,8714	d_4	0,9683

Source: author's calculation in the R package software

The following table shows the structure of the portfolio thus obtained. The largest weight in the portfolio belongs to bonds, followed by hedge funds and futures, with stocks being completely squeezed out. The expected monthly return of the MVSK[3] optimal portfolio would be 0.2%, with a risk level of 0.85% (standard deviation), while the skewness coefficient of such portfolio would be -0.29 and the kurtosis coefficient 0.87.

Table 8: Structure of the optimal portfolio obtained by multicriteria optimization (second phase)

Asset class	Weight
Bonds	0,57
Stocks	0,00
Hedge funds	0,24
Managed futures	0,19

Source: author's calculation in the R package software

To assess the efficiency of the MVSK portfolio, the Omega efficiency measure first introduced by Keating and Shadwick, 2002 is used. Omega measure is suitable for assessing portfolio efficiency in cases where the distribution of portfolio returns does not follow normal distribution. The measure was further used in the works of Bhaduri et al. (2005) and Abrams et al. (2012). A higher value of the Omega measure indicates higher portfolio efficiency.

If we use the Omega measure to compare the MVSK portfolio with the portfolios obtained from the first phase of multicriteria optimization where maximum or minimum values of the first four moments are calculated, and in which the classic Markowitz optimization is used, it is evident that MVSK portfolio is more efficient. The only exception is the portfolio with a maximum return where the only type of investment is hedge funds, but such a portfolio is not realistic given that investors in practice tend to diversify and disperse allocation in several possible asset classes.

3 Mean-Variance-Skewness-Kurtosis (MVSK)

Table 9: Comparison of Markowitz (MV^4) and multicriteria (MVSK) optimization

Moment values	Multicriteria optimization	Markowitz optimization			
	MVSK	MAX return	MIN risk	MAX skewness	MIN kurtosis
Return	0,0020	0,0040	0,0020	0,0001	0,0010
Std.Dev.	0,0085	0,0148	0,0084	0,0368	0,0178
Skewness	-0,2878	-0,6491	-0,1751	0,5321	0,0046
Kurtosis (Excess)	0,8714	1,0070	1,2843	3,3841	-0,0969
Omega measure	1,8626	1,9930	1,8588	1,0539	1,1484
Sharpe ratio	0,2420	0,2694	0,2392	0,0019	0,0560
Jarque-Bera test	5,4533	12,4100	8,8601	62,9220	0,0474
p-value	0,0654	0,0020	0,0119	0,0000	0,9766

Source: author's calculation in the R package software

The normality test showed that the portfolio MVSK, MIN risk and MIN kurtosis, with a significance level of 1%, can be considered normally distributed allowing the use of Sharpe ration for portfolio comparison which considers only the first two moments of distribution. According to Sharpe ratio, MVSK portfolio is still considered most optimal.

In this problem of multicriteria optimization, equal importance is attached to all portfolio moments ($\lambda1 = \lambda2 = \lambda3 = \lambda4 = 1$). Continuation of the analysis can be carried out through further optimizations of models in which investors give different importance to the moments and then a comparison through relevant efficiency measures (Sharpe, Omega measure). Namely, there are investors in the capital market with different preferences, and this model allows them to implement optimization in accordance with their preferences. In previous papers that consider the change in the weight of preferences, there are no large differences in the results, but when giving higher weights to individual moments of the portfolio, they increase or decrease (depending on which moment is observed) at the expense of decrease and/or increase of other moments (i.e., *trade-off*).

6. Conclusions

Prolonged historically low interest rates are diminishing institutional investor's returns. Due to their low correlation with traditional asset classes, alternative investments seem like a viable alternative to this problem. In this paper, a problem of multi-criteria portfolio optimization is presented and solved. The type of optimization in question is used in a situation when the time series

4 Mean-Variance (MV)

of the observed variables do not follow the form of normal distribution, which makes it possible to bridge the assumption of normality from the classical Markowitz optimization model. In this case, the use of multicriteria optimization makes sense since most variables do not follow the normal distribution as determined by the Jarque Bera test.

This form of optimization is specific given that there is a conflict of the goal function. In other words, the first and third moments are maximized at the same time and the second and fourth moments of return distribution are minimized. The first phase of optimization involves minimizing or maximizing each of the goal functions separately on a compact set of possible solutions. The optimal values of each problem form the reference point for the second phase of optimization in which the distance from the mentioned point is minimized. It is also possible, during the optimization itself, to arbitrarily choose the investor's preferences regarding individual moments, which then affects the values of the moments.

The optimization results indicate that stocks would not be included in the portfolio with available asset classes at all, but that bonds would have the largest weight in the portfolio, followed by hedge funds and futures. Also, the efficiency of optimized portfolios was further assessed through the Omega measure which is useful and applicable in a situation where the distribution does not follow the normal form, whereby the measure in the portfolio evaluation considers all 4 moments of the distribution.

A portfolio optimized by multicriteria optimization proved to be the most efficient compared to portfolios optimized by the Markowitz model. Future analysis and research could go in the direction of varying investor preferences and including additional forms of assets in optimization.

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CHAPTER 32

Role of government guarantee measures in COVID-19 crisis

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Abstract

The paper tries to provide conclusions on the importance of government guarantee measures as one of the major forms of fiscal response for alleviating economic downturn coming from the economic shutdown caused by COVID-19 pandemics. We draft available fiscal interventions and provide theoretical argumentation on their relevance in contemporary crisis. Comparative overview of the extent and scope of EU fiscal interventions with special attention to provision of guarantees provides solid base for evaluating effectiveness of EU member state fiscal response. We particularly address case of Croatia where significant fiscal response provided a bridge to compensate lack of commercial bank support and circumvented potential liquidity crises. Based on this structure, the paper provides conclusions in regards to justification of such fiscal spending as well as policy recommendations.

Key words: *government, fiscal response, guarantee measures, COVID-19, EU*

JEL classification: *E62, G23, H81*

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1. Introduction

Financial instruments are one of the most efficient ways to use financial resources to achieve the goals of encouraging small and medium enterprises. By targeting projects that are potentially economically viable, financial instruments provide investment support through loans and guarantees with the possibility of combining it with interest rate subsidies. Financial instruments help to mobilize additional public and private sources of funding to address market failures. Given the current economic situation and the growing scarcity of public resources, financial instruments are expected to play an even more significant role in the future.

This paper presents overview of use of financial instruments in form of favourable loans and credit guarantees as an instrument of insurance and state intervention in the sector of micro, small and medium enterprises through HAMAG-BICRO in the Republic of Croatia. The same mechanism can apply to the whole of the European Union, where financial instruments as such are considered a form of financial assistance.

In this paper, we also deal with speed of intervention in terms of changes of conditions and types of programs that is essential for the placement of financial instruments by analysing the time before COVID-19 pandemics, in relation to the number of approved loans and guarantees in the same period after the pandemics. Demmou et al. (2021) present substantial risks coming from insolvency and debt overhang following the COVID-19 outbreak. They argue that swift and decisive response of policy makers across OECD countries helped companies to prevent realisation of such risks. The aim of this research is to determine the extent to which financial instruments, loans and guarantees as government incentives are an effective measure that should help entrepreneurs in simpler and more favourable financing in the market through banks or direct borrowing from HAMAG-BICRO. The aim of this paper is to determine the impact of the measures themselves and on a county basis, whether the provision of insurance and more favourable financing has restored the level of investment after COVID-19 compared to pre-COVID19 time.

The main hypothesis of the paper is that rapid intervention in the changes in conditions and types of programs are important for the market placement itself as well as for the efficacy of the overall mechanism. This thesis is confirmed by comparing the number of approved loans and guarantees today and in the same period before the meeting. In such way, we show efficiency as a measure to stimulate local economic development by encouraging entrepreneurs in conducing investment.

The first part of the paper briefly explains the purpose and goal of financial instruments that are increasingly important in encouraging investments of micro and medium-sized enterprises in the Republic of Croatia and throughout the European Union, proving that they provide easier access to external sources of financing. The thesis will try to confirm or reject the analysis of the area of investment by comparing the same time before the pandemic, during and after the covid pandemic. In this way, we will get

an answer if or how efficiently we can influence the development of local environments. Each EU Member State should have stimulated its economic system by providing a well-organized system of support and incentives through financial instruments within a clearly defined development strategy, as well as appropriate instruments for its implementation. The second and third chapters show us what these measures were and to what extent. The second part of the paper refers to financial instruments implemented in the Republic of Croatia.

2. Literature review

In terms of the role of government in curbing the negative effects of COVID-19 pandemics, it is important to provide a general context of the pre-pandemic economic situation in EU member countries, particularly within the context of monetary policy trends as well as very different fiscal positions of individual countries. It is well known that, despite of harmonisation of monetary policy in euro zone and, indirectly, in other EU member countries, there are different real monetary positions of individual countries which comes as a side-effect of fiscal policy. In other words, in these circumstances, the fiscal policies across EU define real monetary policy outcomes. As Aguilar et al. (2020) state, it is important to remind that sovereign yields present a key benchmark when determining financing costs both for firms and financial institutions. Thus, part of the monetary intervention was based on keeping the overall credit rating of the country stable, which is important for keeping the financial market calm and other part was more directly channelled by enabling liquidity for the banks to lower their cost of funding, as well as reducing the risk of borrowing. However, if we observe the dynamics on the market, we can notice that maintaining the overall market stability was successful but boosting efficient transmission mechanism through the banks was only partially accomplished. Without fiscal intervention, through government financial intermediaries like HAMAG BICRO in Croatia, the results of the monetary efforts would be questionable. In terms of specific instruments, the European Central Bank focused on asset purchase programmes and longer-term refinancing operations with a triple aim (Aguilar et al., 2020): ensuring that the overall stance of its monetary policy was sufficiently accommodative; underpinning the stabilisation of the financial markets to safeguard the monetary policy transmission mechanism; and providing ample liquidity, especially to keep bank lending flowing. Also, we are aware that this paper considers short-term economic outcomes which come from saving the companies from sudden economic shock. However, it is worthwhile to note that there are both positive and negative consequences of government actions, which, in this case come in form of a credit boom. Jorda et al. (2013) and Dell'Aricia et al. (2016) warn that credit booms may lead to different forms of vulnerabilities such as looser lending standards, excessive leverage and asset price bubbles and, in general, financial crises. Therefore, there are looming possibilities that credit boom initiated by government to curb this crisis might be an assumption for the next financial crisis coming as an outcome of current remedy. However, Bertay and al. (2014) find that lending by state banks is less procyclical than lending by private banks, especially in

countries with good governance. It seems that lending by state banks in high income countries is even countercyclical which comes from their useful role in stabilizing credit over the business cycle and period of financial instability. Though, the study shows that track record of state banks in terms of credit allocation remains disappointing.

In their study based on OECD economies, Demmou at al. (2021) find that businesses face two major types of risks. First one relates to widespread distress and increase in leveraging which come as outcomes of economic shock which diminished actual and expected sales and profits and necessary injection of liquidity that increased company's leverage ratios. Second one is based on negative effect of debt overhang on investment. This is related to the fact that higher levels of corporate debt reduce future investment. But, in addition, we can argue that both crisis and borrowing used for preventing the insolvency and default curbed current investment process. In that sense, the main findings of the study show that the decline in firm's profits due to pandemics in OECD countries range between 40% and 50% of business-as-usual profits and around 7-9% of otherwise viable companies became distressed in terms of book value of the equity becoming negative. Also, these percentages are heterogeneous depending on the sector and type of company. Hospitality, Entertainment and transport sectors were most severally hit, as well as young, small and low productivity companies.

OECD (2021) update on the outcomes of government financing support programs for businesses state two major issues important for final success of the countercyclical measures against the latest financial crisis. Firstly there is a need for continued or broader support for companies that face continued financial constraints due to the further waves of COVID-19 infections and associated confinement measures, and, secondly, with the increasing vaccine rollouts and economic recovery prospects, policymakers will need to ensure that exit strategies fit into a holistic toolkit of policies to ensure a resilient economic recovery that does not undermine market functioning or financial stability. The study proposes five major activities which would secure long-term sustainability of government programs. These are tailoring restructuring procedures, mostly geared to larger companies; strengthening insolvency regimes; the need to address excessive leverage in the system; longer term considerations ad creating adequate financing markets for non-investment grade corporates and SMEs and sustainability and climate related considerations in government support programmes. There are number of studies which stress the importance of improving the insolvency regimes on macroeconomic frameworks (Carcea Carpus, 2015, Bricongne, et al., 2016), as well as studies which argue that firms with higher share of short-term debt reduce their investment more after the crisis (Kalemli-Ozcan et al., 2019).

The most widespread type of financial instruments on the market fall into the category of guarantees or loans. A credit guarantee is an insurance instrument by which the beneficiary of the guarantee (bank / leasing) secures its claims in the event that the entrepreneur fails to fulfil its obligation which is the subject of the guarantee. The characteristic of the guarantee is subsidiarity, which means that the creditor can demand fulfilment of the obligation from

the guarantor only when he has failed to settle with the main debtor. Banks use it as one of the collateral.

The very efficiency of guarantee systems brings many positive effects, the most important of which are the reduction of negative selection associated with market failures, helping poorer sections of entrepreneurs who can not give the bank any collateral in the form of assets. The guarantee issued by HAMAG-BICRO falls into the category of state guarantee and as such is in principle easier to convert into liquid assets in collection than, for example, real estate, which is common in the form of loan proposals and collateralization. On this topic, the European Investment Fund conducted a survey in 2017 on the types and fees of the guarantee schemes themselves that are applied in European practice. They identified five that are considered the most important: (1) fee in percentage of loan value, (2) fee that depends on risk assessment, (3) fee for processing credit application, (4) fee for unused part of credit line and (5) fee for participation in the guarantee scheme (one-time-initial or annual).

Among the types of loans that are encouraged, it is expected to highlight loans to micro, small and medium enterprises, then financing of start-ups and companies in activities that are intensive in research and development, lending in agriculture and lending to companies owned by young entrepreneurs. The range of risk coverage ranged between 34% and 81% (guarantees that were most often applied were pari passu characters), for a period of 10-15 years. As expected, the most common market failure that the schemes sought to address was the lack of collateral. The most common credit intermediaries - partners (who also most often performed credit analysis and forced collection) were banks, leasing companies and other financial intermediaries.

At the time of the EIB survey, guarantee schemes did not have a strong impact on the European credit market. The greatest impact was recorded in the southern EU countries - in Italy 2.1% of GDP, in Portugal 1.8% and in France 0.8% of GDP. The absolute amount of loans granted through similar schemes at Union level was € 64 billion, representing 0.5% of EU-27 GDP in 2015. This is an almost insignificant part of total loans to companies in the developed part of the Union, ranging from 60% of GDP in France to 140% of GDP in the Netherlands (excluding the countries with large deviations, Ireland and Luxembourg).

3. Conception of analysis

On 30 June 2016, the Croatian Agency for Small Business, Innovation and Investment and the Ministry of Regional Development and European Union Funds signed a Financing Agreement for the implementation of financial instruments under the Operational Program “Competitiveness and Cohesion” 2014-2020.

Based on the above, HAMAG-BICRO announced the ESIF Micro and Small Loan Programs. The ESIF Micro Loans program is divided into micro investment loans and micro working capital loans and the program is intended

for micro and small entrepreneurs. Loans are always intended for micro, small and medium entrepreneurs. They help to mobilize additional public and / or private sources of funding to address market failures. Given the current economic situation and the growing scarcity of public resources, it is expected that loans will play an even more significant role in the future, especially since the conditions for obtaining them are much more favourable than bank loans. Loans as a type of financial instrument are limited in amount, but the fees are extremely low or non-existent, which makes it easier for start-up companies to place on the market without a lot of costs incurred by the first debt.

In order to create infrastructural preconditions for the accelerated development of entrepreneurship, as well as the economic development of the Republic of Croatia, in the period of transition to an open market economy it is necessary to provide logistical assistance from central government bodies and local governments. Since the beginning of the implementation of the loan and guarantee program, HAMAG-BICRO has approved over 8,000 loans in the amount of HRK 2.8 billion and over 450 guarantees in the amount of HRK 1.8 billion. Over HRK 6.7 billion of investments were encouraged through approved financial instruments, and over 9,500 new jobs were created (HAMAG-BICRO internal database).

In order to see the results of placing favorable loans and guarantees on the market and its structure, an analysis was made according to gender, counties and sectoral activities. The observed period is the first five months over a period of three years; before, during and after the covid pandemic. The goal of the instruments in the observed period was to quickly adapt to the needs of entrepreneurs in the market and reallocation of European funds from investment to trade, all in accordance with the needs of the market that required fast cheap and easily accessible funds.

4. Empirical data and analysis

As a member of the European Union, the Republic of Croatia has the opportunity to use funding mechanisms but also to learn from the examples of those countries that have passed the same or similar path on the path of successful development of a market economy. The European Commission sees entrepreneurship as acting on opportunities and ideas, and turning them into financial, cultural or social value. European Entrepreneurship Policy aims to support companies, especially SMEs, throughout their life cycle, promoting entrepreneurship education at all levels, as well as encouraging certain groups with entrepreneurial potential and then through development finance.

The right framework for using ESI funds to support financial instruments is based on:

1. Regulation (EU, Euratom) 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union amending Regulation (EU) No 182/2011 1296/2013, (EU) no. 1301/2013, (EU) no. 1303/2013, (EU) no. 1304/2013, (EU) no. 1309/2013, (EU) no. 1316/2013, (EU) no. 223/2014, (EU) no. 283/2014 and

Decision no. 541/2014 / EU and repealing Regulation (EU, Euratom) no. 966/2012 and

2. Regulation (EU) no. 1303/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund, and repealing Council Regulation (EC) No 1782/2003. 1083/2006.

The instruments are defined in Article 2 (29) of Regulation (EU) 2018/1046 as a measure of EU financial support provided from the budget in order to achieve one or more specific EU policy objectives. Such a measure may take the form of an equity or quasi-equity investment, loan or guarantee, or other risk-sharing instrument, and may be combined, as appropriate, with other types of financial support, shared management or the European Development Fund (EDF).). Article 37 of Regulation (EU) no. 1303/2013 points out that support through financial instruments is based on ex ante analysis which established market dysfunction or sub-optimal investments. Managing authorities may grant financial contributions to instruments established at EU level and managed directly or indirectly by the European Commission (EC), or instruments established at national, regional, transnational or cross-border level and managed by the MA or managed by bodies and, finally, the instruments by which such a contribution is combined with the financial products of the European Investment Bank.

Commission Delegated Regulation (EU) No 480/2014 of 3 March 2014 amending Regulation (EU) no. Regulation (EU) No 1303/2013 of the European Parliament and of the Council establishing common provisions for the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions Fund, the Cohesion Fund and the European Maritime and Fisheries Fund (hereinafter: Commission Delegated Regulation (EU) No 480/2014) lays down criteria for the selection of bodies implementing the FI. Article 7 (1) of Commission Delegated Regulation (EU) No 480/2014 provides for the minimum conditions to be met by the FI implementing body while Article 7 (2) of Commission Delegated Regulation (EU) no. Regulation (EC) No 480/2014 provides that, when selecting a body referred to in paragraph 1, managing authorities shall take into account the nature of the FI to be implemented, that body's previous experience in implementing similar FIs, the expertise and experience of proposed team members and its operational and financial capacity and the minimum criteria for selecting that body. Managing authorities, bodies implementing funds and bodies implementing financial instruments respect the applicable law, in particular on state aid and public procurement. The general legal framework governing the area of financial instruments is much broader.

In the Croatian context, the Ministry of Regional Development and European Union Funds has been designated as the Managing Authority for the Operational Program “Competitiveness and Cohesion” 2014-2020. Article 5 (1) of the Regulation on bodies in the Management and Control Systems of the European Social Fund, the European Regional Development Fund and the Cohesion Fund, regarding the objective “Investment in growth and jobs” (Official Gazette Nos 107/14, 23/15, 129/15, 15/17, 18/17, 46/21, 49/21) (hereinafter: the Regulation), in conjunction with Article 5, subparagraphs 2 and 3. Act establishing the institutional framework for the implementation of the European Structural and Investment Funds in the Republic of Croatia in the financial period 2014-2020 (hereinafter: the Act) (Official Gazette 92/14). The Ministry entrusts the Croatian Agency for Small Business, Innovation and Investment (hereinafter: HAMAG-BICRO) with the implementation of financial instruments - in particular the implementation of SME lending programs (hereinafter: SMEs) and the issuance of guarantees in accordance with Article 38 (4). (a) and Article 38 (4) (b) (ii) of Regulation (EU) No 182/2011. 1303/2013. This created a legal basis for the start of preparations for the implementation of FI with the aim of contributing to reducing the existing gap in the debt market for SMEs in the Republic of Croatia in order to reduce the difficulties that these companies face.

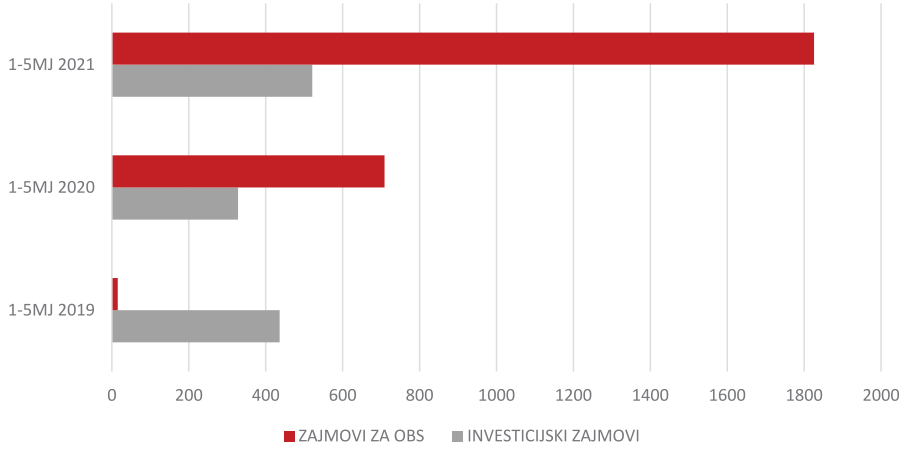
4.1. Loans

Following the signing of the Financing Agreement between the MRRFEU and HAMAG-BICRO in October 2016, the implementation of the ESIF micro and small loans program began. In addition to the ESIF financial instruments, in September 2018, in cooperation with the MoES, the programs of the Financial Instruments for Rural Development were launched, when the financial instruments Small Loan for Rural Development and Micro Loan for Rural Development were presented.

In March 2020, a new financial instrument COVID-19 working capital loan was established through measures of the Government of the Republic of Croatia, and within the package of assistance to micro, small and medium enterprises due to the epidemic caused by the coronavirus.

During the first years of loan implementation, investment loans take precedence over the number and amount received. Thus, in the first 5 months of 2019, over 95% of the 758 applications received were related to applications for investment loans. With the beginning of the COVID crisis and the introduction of the new financial instrument COVID-19 loans, the number of received applications for the first five months of 2020 is 8 times higher than the same period a year earlier, and received 6,235 applications in the amount of 2.3 billion kuna. With the introduction of the new instrument and the new situation on the market, the number of applications for working capital loans is growing (87% of the number received). In the first five months of 2021, the situation is not significantly different. Of the 2,376 loan applications received, 78% relate to working capital loans.

Graph 1: Number of loans approved

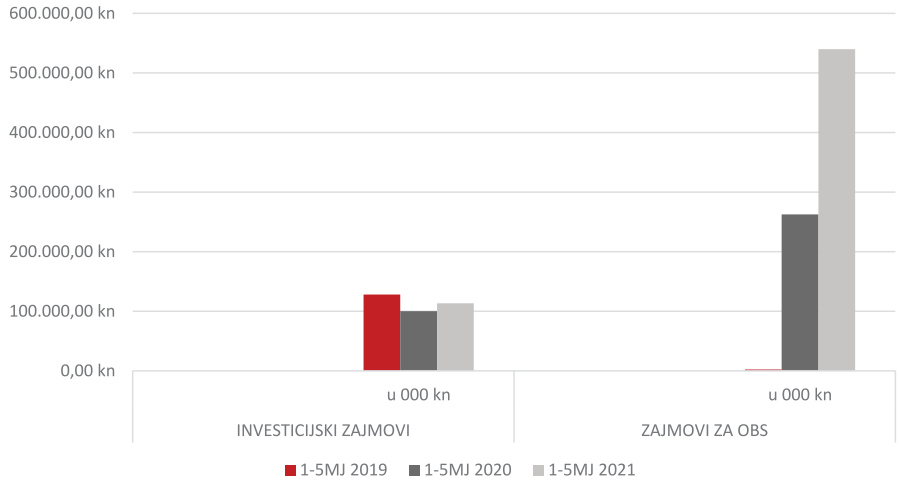


Source: HAMAG-BICRO

The introduction of the new instrument, which affected the increased number of loans received, also led to a higher number of approved loans. In the first five months of 2020, 1,037 loan applications in the amount of HRK 359 million were approved, which is an increase of 130% compared to 451 applications approved in the same period a year earlier. Furthermore, during the first five months of 2021, 2,347 loan applications were approved in the amount of HRK 572.6 million (an increase of 126% compared to the same period in 2020). The largest number of approved loans, 77% of them, are COVID-19 loans.

Working capital loans in the first five months of 2019, ie before the beginning of the crisis, accounted for only 2% of the amount of approved loans, while in the first five months of 2021 they accounted for 94% of the amount of approved loans.

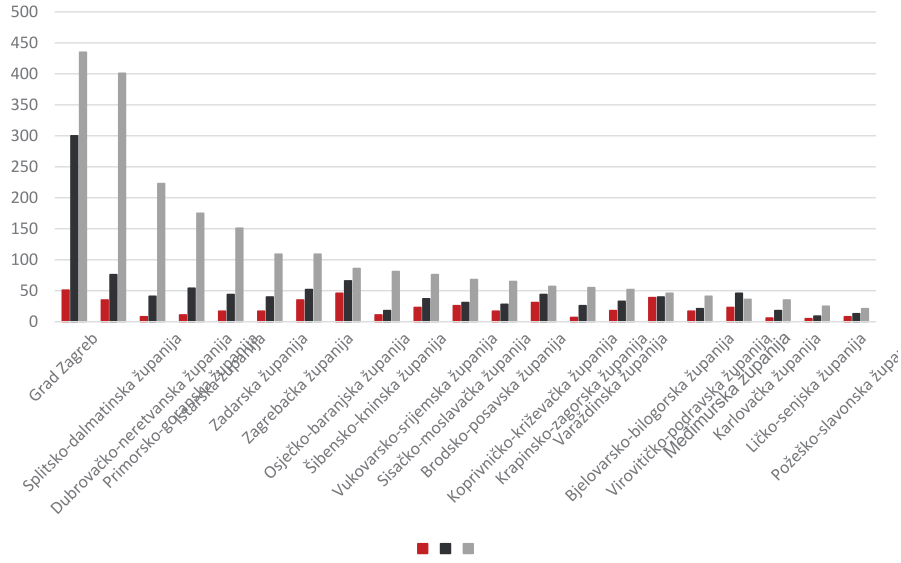
Graph 2: Loans approved (amount)



Source: HAMAG-BICRO

In the number of approved by the county, the City of Zagreb leads with 51 approved loans from 1.1. to 31.5.2019. 300 approved (growth of 488% compared to the same period in 2019) in the first five months of 2020 and 435 approved (growth of 45% compared to the same period in 2020) in the first five months of 2021.

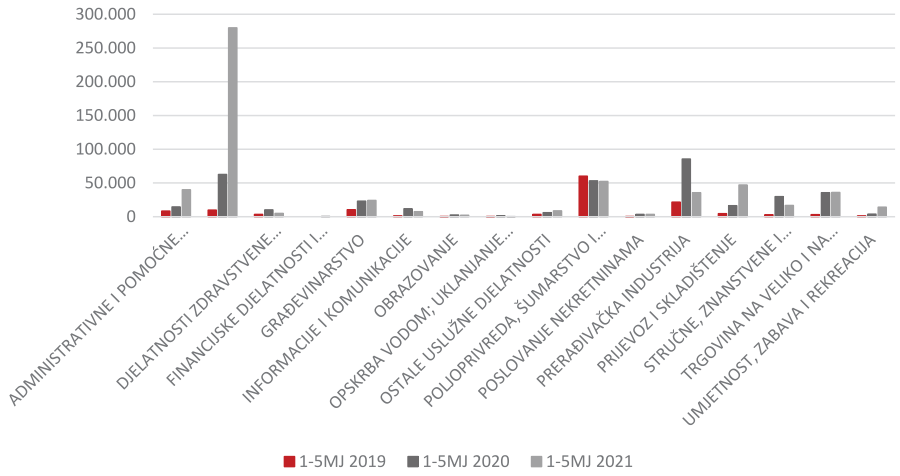
Graph 3: Number of approved loans by counties



Source: HAMAG-BICRO

Loans granted by sectors of activity in the period from 1.1. to 31.5.2019. show that in terms of the number of cases and the amount of loans in kuna, the sector of agriculture, forestry and fisheries leads with 200 approved cases in the amount of 60 million kuna, which is a consequence of intensifying the implementation of rural development programs. In the same period in 2020, the sector of accommodation and food preparation and serving activities took precedence with 191 approved cases in the amount of HRK 63 million. The continuation of the covid crisis in 2021 affects a significant number of approved loans for the sector of accommodation and food preparation and serving, which is one of the most affected by the crisis. In the first five months of 2021, 1,130 loans in the amount of HRK 280 million were approved for this sector, which is 48% of the total approved loans.

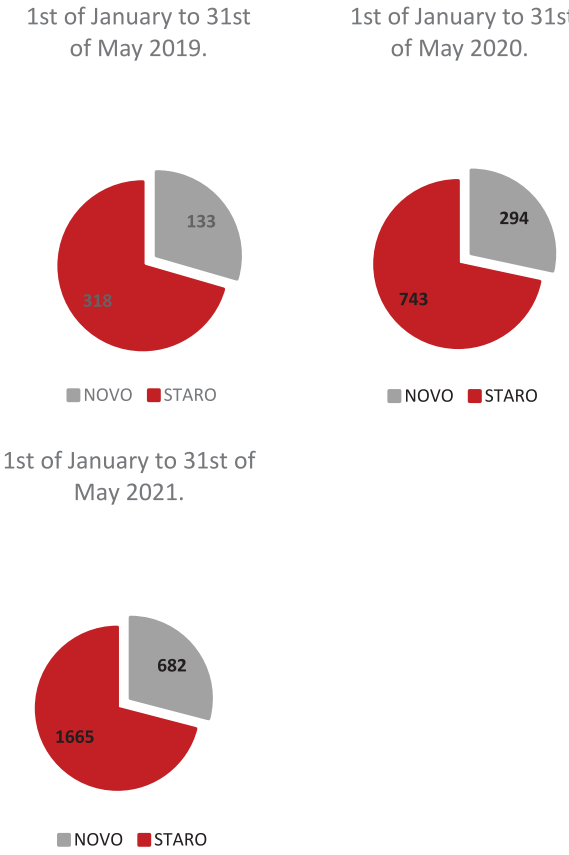
Graph 4: Amount of approved loans by sectors of activity in 000 kuna



Source: HAMAG-BICRO

During the observed periods, the age of the companies granted the loan has not changed significantly and is always in favor of the old companies in the ratio of 70-30.

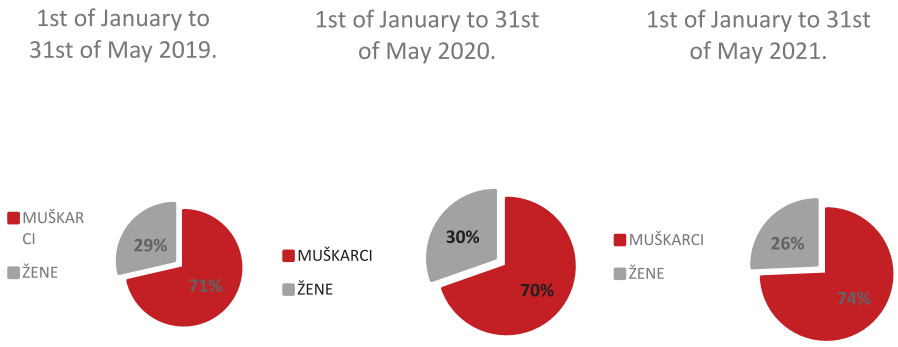
Graph 5: Number of approved loans according to the age of the company



Source: HAMAG-BICRO

Looking at the gender of the owners of the companies to which the loan was approved, and in the observed periods, a significant advantage in favour of men is visible (70-74% of those approved).

Graph 6: Number of approved loans by sex of owner



Source: HAMAG-BICRO

4.2. Guarantees

HAMAG-BICRO's individual guarantees to support the start-up and development of entrepreneurial projects have been recognized by financial institutions as a key instrument for transferring risks that financial institutions are not prepared to take. Financial instruments of individual and portfolio guarantees enabled greater availability of loans and leasing, reduction of interest rates, reduction of required security instruments, which affected employment growth, increased private investment and increased the number of small businesses receiving support.

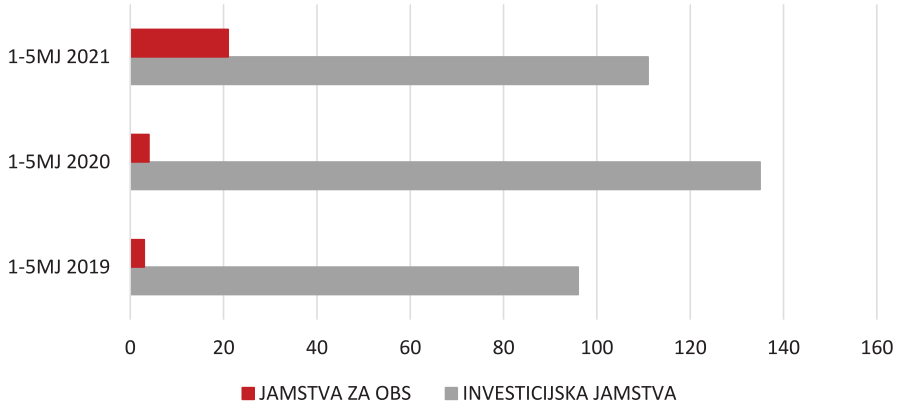
ESIF guarantees for investment loans, and primarily guarantees with interest rate subsidies, were in the beginning of the implementation of the program more represented than guarantees for OBS. Before the beginning of the covid crisis, 368 requests for guarantees in the amount of HRK 1.5 billion and for the amount of loans in the amount of HRK 2 billion were received. Of the total number received, 72% referred to guarantees with interest rate subsidies and for investment loans. The number of guarantees granted with an interest rate subsidy correlates with the number of loans received at 72% of the total number of loans granted.

Thus, in the first five months of 2019, 97 guarantees were received (including portfolio guarantees) for the requested amount of HRK 251 million and for the loan amount of HRK 372 million. 95% of the number of guarantees received relate to guarantees for investment loans. If we look at the period of the first five months of 2020 and the beginning of the covid crisis, the ratio of guarantees for investment loans and those for current assets (OBS) is changing (growing) to 12% of the number received. From 1.1. to 31.5.2021. The number of received guarantees for current asset loans increased to 26% (including portfolio guarantees for OBS).

From 1.1. to 31.5.2019. 99 guarantees in the amount of HRK 285.6 million were approved and HRK 410.7 million for bank loans. The majority of approved guarantees (97%) relate to guarantees for investment loans. In the

first five months of 2020, the ratio of guarantees for investment loans and those for working capital loans is no different and also amounts to 97% in favor of the investment loan guarantee. Looking at the approved guarantees for investment loans, 85% of the approved ones are ESIF limited portfolio guarantees. The continuation of the COVID pandemic affects the growth of approved working capital guarantees, which in the first five months of 2021 accounted for 16% of the number approved. The adjustment to the market and the new situation changed the ESIF limited portfolio guarantee program, which enabled the issuance of a working capital guarantee.

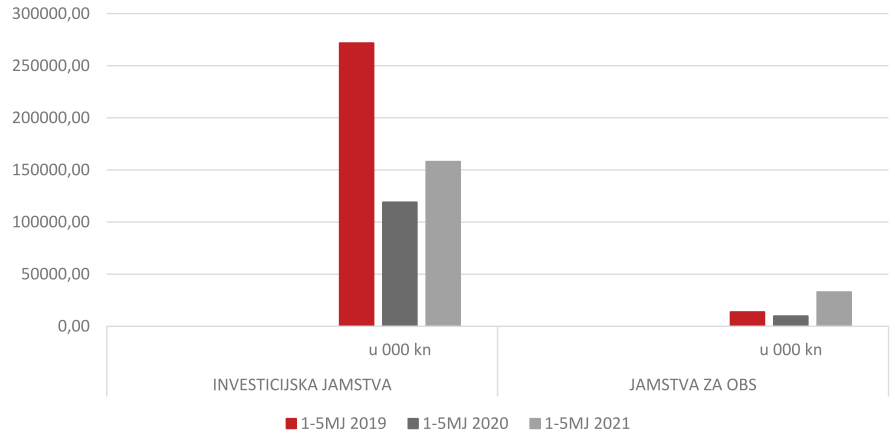
Graph 7: Number of guarantees approved



Source: HAMAG-BICRO

From the above we can conclude that the COVID pandemic did not have a significant impact on the share of approved guarantees for investment loans, which still make up the majority of approved guarantees (84% of the number of approved guarantees for the first five months of 2021).

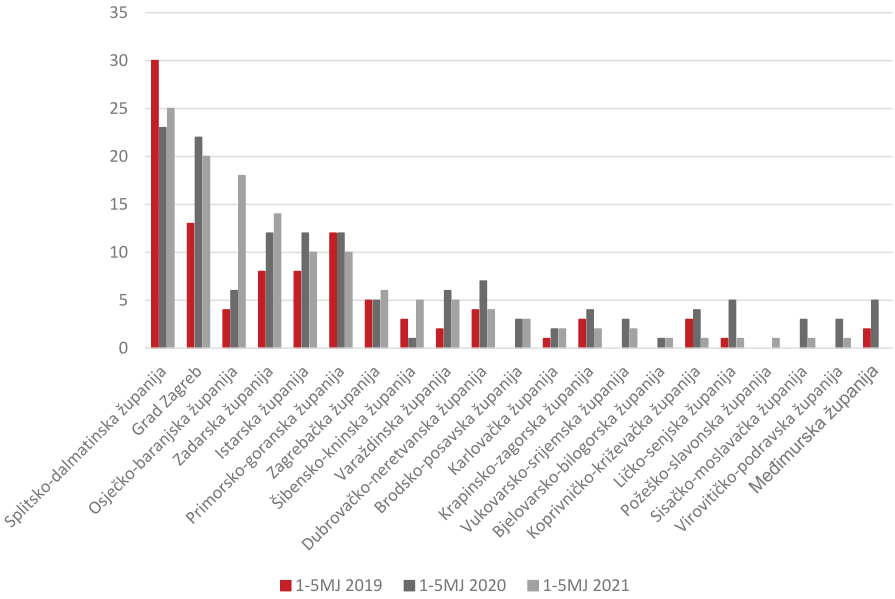
Graph 8: Approved guarantees (amount)



Source: HAMAG-BICRO

In the number of approved by the county, the Split-Dalmatia County leads with 30 approved guarantees from 1.1. to 31.5.2019. 23 approved in the first five months of 2020 and 25 approved in the first five months of 2021.

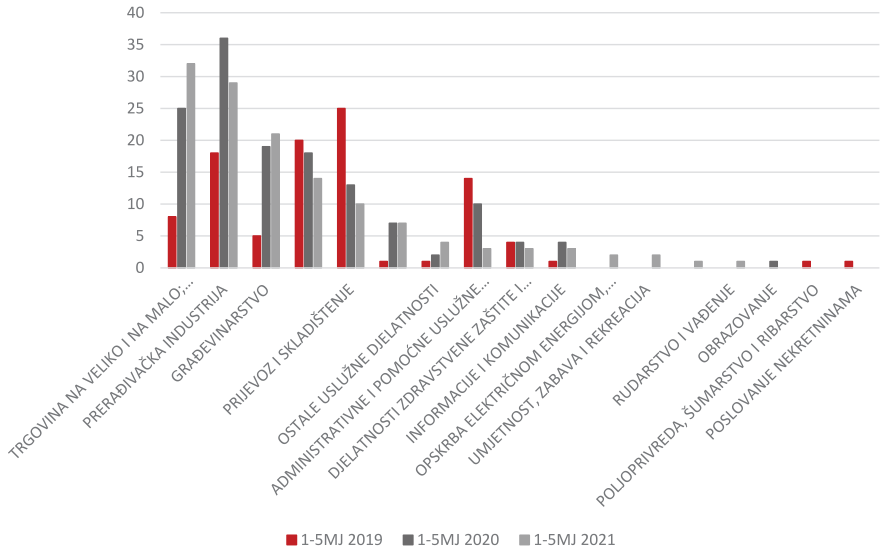
Graph 9: Number of approved guarantees by counties



Source: HAMAG-BICRO

Approved guarantees by sectors of activity in the period from 1.1. to 31.5.2019. show that in terms of the number of cases and the amount of guarantees in kuna, the transport and storage sector leads with 25 approved guarantees in the amount of HRK 83.6 million and for bank loans in the amount of HRK 114.5 million. In the same period in 2020, the manufacturing sector takes the lead with 36 approved guarantees in the amount of HRK 43 million. In the first five months of 2021, 32 guarantees in the amount of HRK 24 million were approved for the wholesale and retail trade sector, and HRK 34 million in the amount of HRK 34 million for bank loans.

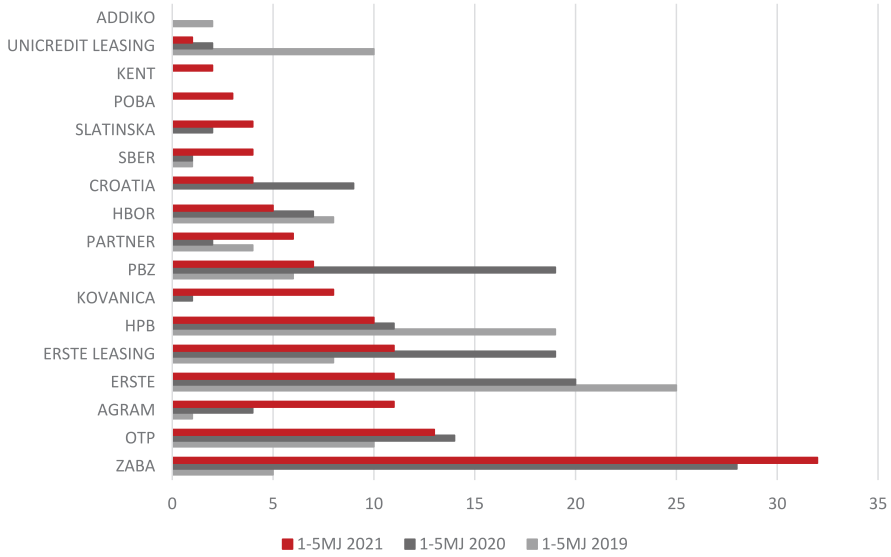
Graph 10: Number of approved guarantees by sectors of activity



Source: HAMAG-BICRO

For the period 1.1. Until 31 May 2019, the largest number of guarantees was granted for loans from Erste Steiermärkische Bank d.d. in the amount of HRK 79.7 million and for loans in the amount of HRK 116.3 million. In the first five months of 2020, the largest number of guarantees was approved for loans from Zagrebačka banka d.d. in the amount of HRK 17.7 million and for loans in the amount of HRK 26.7 million. Primacy of Zagrebačka banka d.d. will continue in the first five months of 2021 with 32 approved guarantees in the amount of HRK 26.6 million for loans in the amount of HRK 39.3 million.

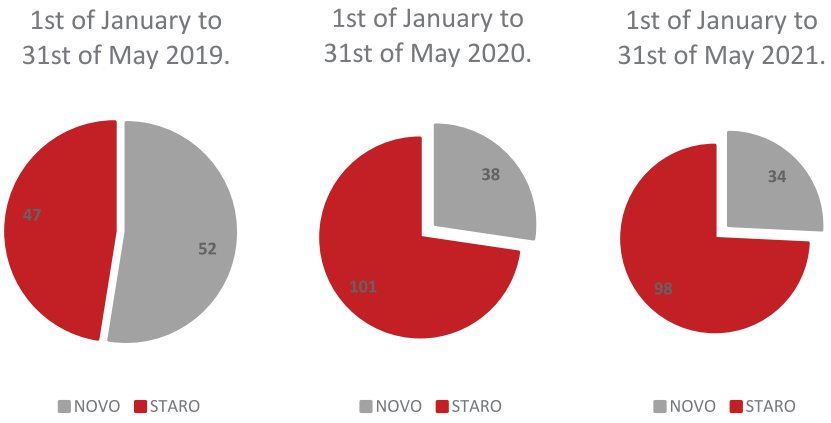
Graph 11: Number of approved guarantees by banks



Source: HAMAG-BICRO

In the first five months of 2019, ie before the beginning of the covid crisis, 53% of approved guarantees referred to new companies. During the same period in 2020, the situation changed and 73% of approved guarantees referred to old companies. This trend continued in the first five months of 2021, when old companies accounted for 74% of the total approved.

Graph 12: Number of approved loans by age of the company



Source: HAMAG-BICRO

5. Results and discussion

The sudden outbreak of the COVID-19 crisis in March 2020 increased the importance of guarantee schemes. Some countries (eg Italy, France, Spain, Germany) have allocated significant public funds for such programs, making them potentially the most important response to the crisis. At the time of completion, it is too early to draw conclusions about the effects of these interventions. The first data show that intervention guarantee schemes in the EU could have affected the growth and maintenance of credit activity in the current course of the COVID-19 crisis and the preservation of jobs. The question now is whether guaranteed lending activity will help the economy out of the crisis.

Croatia fits into the wider European trend. In Croatia, the existing similar schemes, which are implemented through HAMAG BICRO, have been significantly expanded. However, others are limited by the amount of individual loans, the fragmentation of guarantee programs, costs, legal and regulatory ambiguities, and demanding administrative processes. All this potentially reduces the effects of financial instruments and calls for the use of room for improvement. This can be achieved through a dialogue between representatives of guarantee providers and private creditors in order to more flexibly apply credit guarantee schemes so that they can quickly adapt to changes in credit demand and ensure positive effects on business growth and development.

An analysis of the results of approved applications through HAMAG-BICRO (Internal database) in the Republic of Croatia showed that working capital loans in the first five months of 2019 accounted for only 2% of the total amount of approved loans, while the year after the corona crisis in the first five months of 2021 percent jumped to 94% of the amount of all approved loans. If we add to the number of approved loans the number of covid-19 loans as a special measure introduced during the state lockdown, the number of loans received increased 8 times in the first five months compared to the same period a year earlier. With regard to guarantees, the situation is known to be different, given that the majority of approved loans in 2019 (97%) were guarantees for investment loans. at the level of the year before. Only in 2021, analysing the data, we can see a slight increase in loans with a guarantee for working capital.

Long-term results will be seen and analysed only at the time of the expiration of the time in which entrepreneurs will properly repay or not their obligations that arose during the lockdown. It will also be possible to analyse in more detail individual counties and the activities themselves and their impact. Financial Agency (www.fininfo.hr) made an analysis of the operations of entities in 2020 based on annual financial reports submitted by the end of May 2021, and they resulted in the five most affected activities: Travel agencies and travel organizers, tour operators, accommodation, food preparation and service activities and beverages, metal production, wholesale and retail of motor vehicles and motorcycles. Whether such an order will remain in the analysis of payments will be seen in the coming years.

6. Conclusions

The sudden outbreak of the covid-19 crisis has sparked additional demand for credit guarantees and loans to maintain liquidity. At the very beginning of the crisis, in March 2020, the question arose whether the free credit market could respond to the sharp rise in demand for loans, especially those for working capital, in conditions of escalating risk due to the unprecedented crisis. This analysis shows the current use of guarantee programs through 2019 and discusses the adjustments that need to be made for similar programs to play an important role in stimulating the exit from the economic crisis. The analysis showed that credit guarantee schemes expanded after the outbreak of the 2008/09 crisis. However, before the outbreak of the covid crisis did not have a significant impact on the credit market in the EU. The corona crisis has sharply increased their importance in response to the threat of market failures caused by the escalation of all types of risks. Therefore, it is important to distinguish the role and design of schemes that serve to eliminate market failures that are permanently present regardless of the state of credit and business from schemes that serve to overcome shorter escalations of market failures in recessions. It is now necessary to focus on the second case in order to give impetus to the exit from the crisis, and this requires greater flexibility of guarantee schemes.

The application of financial instruments has already proven its short-term effect and confirmed its justification. The number of employees has not decreased due to the introduction of measures to preserve jobs, which were promptly introduced by the governments of all EU countries, including the Republic of Croatia. The companies also stabilized in the short term with working capital provided as COVID19 loans through HAMAG-BICRO, thus giving them time until health changes occur in a market that no one could influence or predict.

The analysis of data shows that rapid intervention through the placement of financial instruments and their rapid transformation in certain segments such as interest rates has shown a significant impact on the financial market allowing entrepreneurs easy and cheap borrowing and thus preserving jobs within their company. Equally, the same measures affected local stability by not changing the number of employees into unemployed, because entrepreneurs could keep their companies as stable as possible by favourable borrowing until the first time they were able to work smoothly.

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