Smart Governments, Regions and Cities

Editors

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EFRI Faculty of Economics and Business

SMART GOVERNMENTS, REGIONS AND CITIES

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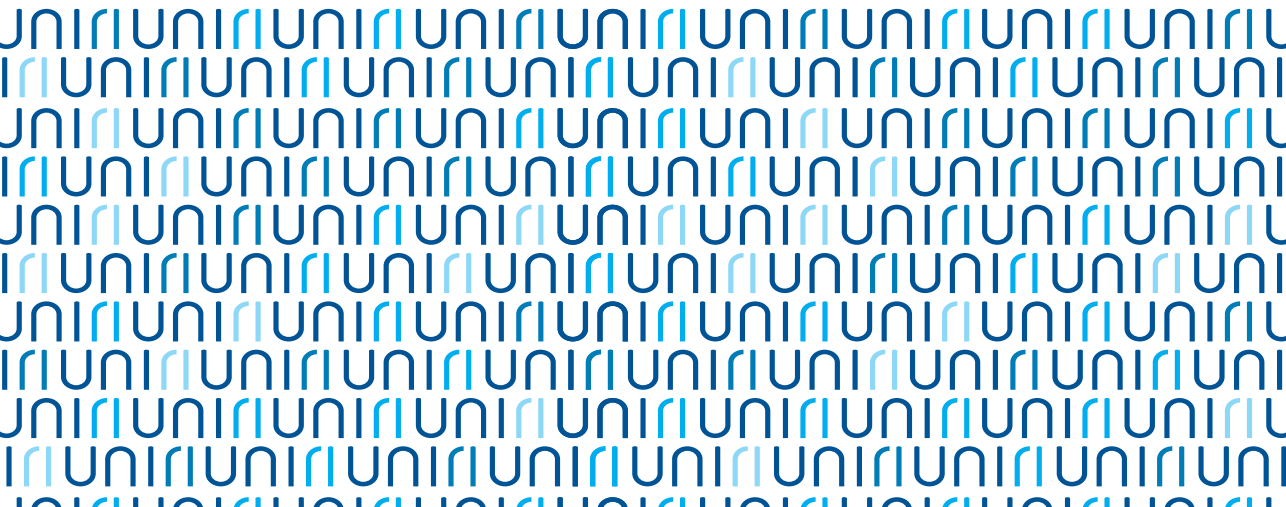

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FACULTY OF ECONOMICS AND BUSINESS

Rijeka, 2020

Faculty of Economics and Business

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FOREWORD

The second scientific conference entitled Economics of digital transformation was held under the topic „Smart governments, regions and cities“. This research monograph provides scientific results of hard work, discussions, reviews and comments before, during and after the conference. The main goal of the Conference and, thus, of this research monograph, was to study effects of digital transformation on public sector, through all tiers of government – central, regional and local. Also, not less important goal was to research global, national and sub-national dynamics in the field of fiscal, monetary, industrial, business and other affairs.

The Conference was held from 2nd to 4th of June, 2019 in Opatija, Croatia (www.edt-conference.com). During the three days of the Conference more than 50 researchers mostly from European region contributed with their presentations. We are particularly proud of the results of our doctoral workshop where numerous young researchers presented their work. Besides papers published within this monograph, eleven papers from the Conference was also published in Proceedings of Rijeka Faculty of Economics:Journal of Economics and Business.

We are deeply grateful to our 2019 keynotes starting from distinguished professor Robert J. Barro, Paul M. Warburg Professor of Economics at Harvard University, Nicholas C. Zingale, Associate Professor and Director, Institute of Applied Phenomenology in Science and Technology, Maxine Goodman Levin College of Urban Affairs, Cleveland State University, Chen Ying, National University of Singapore, Faculty of Science, Singapore and Eugenio Leanza from the EIB.

We are also very grateful to Boris Vujčić, Governer of the Croatian National Bank and Ante Žigman, President of the Board of the Croatian Financial Service Supervisory Agency, Zagreb, Republic of Croatia for their active participation and support.

Finally, we are immensely grateful to our contributors, reviewers, members of programme and organization board, partner universities and sponsors, as well as our students that always receive many complements for their knowledge, manners and hospitality.

Rijeka, January 2020

Editors

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INTRODUCTION

This research monograph consists of twenty scientific papers which cover wide range of topics that share common effects of digital transformation transcending through all these issues with different causes and concequences. The papers cover dynamics of labour market, behavioural studies within digital environment and effects on business performance, administrative and accounting changes within EU and through different sectors of economy, industry 4.0, fiscal, monetary and financial phenomena under digital disruption as well as wide range of topic of the smart city concept such as legal issues, strategical framework, risk identification and many other.

We believe that the research presented within this monograph provides theoretical and practical basis for the formation of policies needed to improve the scientific and technological position of individual countries in the context of digital transformation. In general, this research monograph presents a valuable contribution to scientific literature in the field of research of the development of smart cities concepts and effects and challenges of digitization and digital transformation, taking into account social, ecological and other constraints as key segments of the future development of the global “knowledge based” economy and society.

We are also happy to point out that numerous authors of scientific contribution in this monograph are PhD students and young researchers. We are particularly grateful for their participation and efforts which resulted in publication of their valuable scientific research.

Finally, we also hope that the papers published in the monograph will be useful to many new students and researchers as well as practitionares and wider audience. We will certainly continue with our efforts to increase number and quality of our contributions, as well as to disseminate these research results as much as we can. Until our new conference in 2020 we wish you enjoyable reading of our scientific production in 2019!

CHAPTER 1

Consequences of Unfair Job Promotions in Companies

Barbora Baisa[1]

ABSTRACT

Companies, particularly large organizations with several hierarchical levels, often need to fill a vacant managerial position to maintain efficient operations. When the decision is to use internal resources rather than hire a candidate from the outside, companies usually fill the position by promoting a lower-ranking employee. The promotion to the managerial level comes with an increase in salary, a change in professional duties, and a shift in the career path and in the company hierarchy. Since all of these are usually perceived as desirable, a promotion can cause strong emotional reactions both from the employee who was promoted and from employees who were not. If the promotion of an employee to a managerial position is perceived by the non-promoted employees as undeserved or unfair, the non-promoted ones might become demotivated and might decrease their productive effort. A decrease in productive efforts and other unethical behaviors are often difficult to measure in the workplace. Experimental economics provides a suitable tool for studying (i) the behavior of individuals under controlled conditions when promotions perceived as unfair happen in companies; (ii) the reactions of promoted and non-promoted individuals; and (iii) the changes in productivity. The analysis of the information gathered via conducted laboratory experiment shows that when remuneration of employees is perceived as unfair their productivity decreases. Moreover, experimental design studying the reaction of promoted versus non-promoted employees was proposed to be able to deepen the knowledge of unfair job promotions in companies.

Key words: Job promotion, reciprocity, experiment, gift exchange, fairness

JEL classification: C91, D03, J33

1. Introduction

Frequently, companies/owners are in need to promote some of their employees to the managerial positions to maintain the functioning of the company. The promotion to the manager level brings along the increase in the salary, a shift of the status, change in the job duties and a shift in one's carrier path and in the company hierarchy.

In many cases, people who are in charge of the selecting the employees for the promotion might perceive their qualities differently than colleagues or peers of the employees considered to be promoted to managers. Therefore, after the promotions, two simplified situations might happen: Employee who was not promoted

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is of the opinion that the one promoted deserved to be promoted (hereinafter "fair promotion"). An employee who was not promoted is of the opinion that the one promoted did not deserve to be promoted (hereinafter "unfair promotion").

In such a situation a question arises whether the productive effort and performance of the non-promoted employee declines and how. The expected decline might be caused by the demotivation of the non-promoted employee to exert any effort or by willingness to punish the organization as the profit of organization is in the determined by the employees' productive effort.

In addition to observing the behavior of the non-promoted employee, it will be possible to monitor whether the promoted one decides to change the effort and performance exerted when he or she is of the opinion that the promotion was not fair.

Research questions

Within my research I will seek answers to the following questions in the area of post-promotion effects:

- Do non-promoted employees provide lower effort to the employer if they believe the promotion was unfair?
- Is the performance of employees lower when their remuneration is perceived as unfair compared to employees whose remuneration is fair?

2. Literature review

A central problem that is often being faced by companies is how to gain the desired amount of effort from their employees. Such a problem is usually in the literature described as the Principal-Agent problem (where the employer assigning the wage, job etc. to employees is in the role of the Principal and employees exerting effort for determined wage are in the roles of Agents) and could be experimentally tested by using the gift-exchange game as described e.g. in Akerlof (1982); Fehr et al. (1998); Maximiano et al. (2007).

As the effort is costly for agents, the theoretical prediction for the profit-maximizing agents is to exert the minimum effort or rather no effort at all if possible for any wage offered or determined. However, conducted laboratory experiments (e.g., Fehr, Falk (1999); Fehr et al. (1993); Charness, Kuhn (2007); Gächter, Thöni (2010)) show strong evidence of a reciprocal behavior of workers (agents) towards their employers (principals) even in anonymous, one-shot games supporting the statement that fairness and reciprocity are highly important at labor markets.

One of the motivation theories regarding the motivation of employees to exert the productive effort towards their employer is the theory of justice derived from the "equity theory" presented by Adams in 1963 (Ambrose, Kulik, 1990).

This theory belongs to the field of social relations and draws on the theory of social exchange, the theory of dissonance and the theory of social comparison and laid the foundation for organizational justice theory.

According to Vaculík (2006) individuals expect justice within the relationships, meaning the proportion of inputs they put into the relationship and the outputs that it will be the same for both the partners. Therefore, if the proportion is not the same (one partner is in a “loss” or “profit” position) the relationship is labelled as unfair.

An existence of an imbalance when an employee feels that his entry / return ratio is unfair compared to others (what he invests in the organization and what he gains from it in comparison to what others are investing and gaining on other positions) is a source of tension, demotivation, etc. It might also lead to adjutancy of the situation by lowering the effort and performance to counterbalance for this inconsistency and injustice. (Moorhead, Griffin, 1989).

The theory of justice further suggests that fairness in remuneration, motivates employees to perform and, on the contrary, injustice has a demotivating effect. Moreover, the theory of justice suggests that people are motivated to get what they perceive as a fair reward for their efforts and not to get as much as possible, i.e. they do not try to maximize their profit. (Arnold, et al., 2007.) The impact of the theory of justice on the organization could be observable on employees’ satisfaction, absenteeism and turnover. (Robbins, SP, et al. 2010)

As stated by Maximiano et al. (2013), agents are exerting higher effort in exchange for higher wages, even if the wages are not directly determined by the individual who is benefiting from the exerted effort. However, they found that wage–effort relation is less strong when wages of the agents are determined exogenously. Therefore, the role of the principal who assigns the remuneration to the agents seems to be relevant when conducting these types of laboratory experiments.

In addition to the absolute amount of the salary, the relative amount in comparison with peers (other agents) plays a crucial role when agents deciding on how much effort to exert for the wage obtained. As described by e.g. Festinger (1954); Falk, Knell (2004); Clark, Senik (2010) people in many real-life situations are influenced by social comparison, comparing themselves with others who are in similar positions (i.e. their peers), evaluating their situations and assessing the fairness of the own outcomes.

As for the experimental economics literature, Ho, Su (2009) showed in the ultimatum game with one leader and two followers that people tend to express peer-induced fairness concerns comparing their peers’ outcomes as a reference point to their own potential payoffs. According to their observations, peer-induced fairness present between the two followers was two times greater than the distributional fairness observed between the leader and the follower while the second follower was strongly averse to the lower offer from the leader when compared it to one offered to the first follower.

Similarly, Gächter, Thöni (2010) observed that subjects of the experiment who were given lower wage than their colleagues significantly decreased their effort in comparison to a situation when equal wages were set. Thus, perceived fairness in the salary distribution might influence a decision of employees on how much effort to exert in their jobs if not e.g. directly enforceable by the employer.

The further reason for individuals to start exerting a lower effort might be the dis-couragement and demotivation after a tournament-based promotion. McGee, McGee (2015) observed in their stylized effort designed tournament that regardless the pos-sibility of winning under the output rule-based tournaments subjects who lose in tournaments decided on random basis significantly decreased their post-tournament effort when compared to their effort exerted in output rule tournaments

Conversely, Johnson, Salmon (2016) found that individuals perceived randomly allocated win in the tournament in the same way as a meritocratic tournament. They conducted a two agents experiment where promotions to the boss roles were based on relevant job-related activities, activities irrelevant to job performance or on a random basis. Apart from the decrease in the productive effort (assessed as a discouragement from losing the tournament), non-promoted agents could choose to use a strategic sabotaging towards their new bosses – promoted agents.

Therefore, it is not unreasonable to assume that when an employee perceives the promotion of the colleague as unfair or undeserved he or she will tend to decrease the productive effort. As such a behavior could be hardly monitored in the workplace, the experimental economics provides a great opportunity to study the behavior of individuals in a controlled setting and monitor the consequences of the unfair promotion processes.

Nalebuff and Stiglitz (1983) are also discussion the impact of unfair treatment and remuneration on workers who then becomes discouraged or demoralized. This could lead to decreased productivity and even punishment is not working: “A problem with penalties is that they can become self-perpetuating. The loser becomes demoralized, fails to continue competing, and thus continues to lose.”

The literature on how individuals assess the fairness of mechanisms determining outcomes consist of e.g. Bolton, Brandts, and Ockenfels (2005) demonstrating that individuals consider the fairness of the procedure generating an offer in an ultimatum game, supported by the theoretical characterization of such preferences by Trautmann (2009).

3. Methodology

To collect and analyze the data, the method of the laboratory experiment is used. As described in Smith (1994) an immense number of reasons as to why

economists conduct experiments could be found in the literature. Some of the most significant could be presented as follows: Test a theory or discriminate between theories; Explore the causes of a theory's failure; Establish empirical regularities as a basis for a new theory; Compare environments; Compare institutions; Evaluate policy proposals; The laboratory as a testing ground for institutional design.

The principles of experiments in economics are described e.g. by Cassar, Friedman (2004): (i) adequate financial incentives for participants of the experiment (payment immediately after the experiment); (ii) clear and unambiguous instructions and truthfulness of the information provided; (iii) anonymity of the participants; (iv) control over all relevant variables.

3.1. Research Question 1

Within the experiment to answer the first research question, I intend to design a setting where one Employer (Principal) and two Workers (Agent1, Agent2) will be interacting. In Stage 1, each Agent will be presented with a real effort task to perform. After that, in Stage 2, both Agents will be asked to express their beliefs on the selection process with respect to the results performance in the Stage 1. Subsequently, the Principal chooses which of the Agents is to be promoted to the higher position (AH) and which of them remains in the lower position (AL).

Meanwhile with use of the strategy method, as described e.g. in Brandts, Charness (2011), Agents are asked to select how much productive effort are they willing to put in order to increase the payoff of the Principal. Both Agents are supposed to reveal their choices for the hypothetical situations of being promoted to the higher position or not. Thanks to the use of the strategy method it is possible to generate a relatively big amount of results at low cost as well as gain the data for all possible alternatives.

After the selection process, the Principal distributes the previously known determined wages to the Agents (the wage of the Agent in the higher position is supposed to be significantly higher than the wage of the agent in the lower position).

For this experiment the basic payoff functions are as follows:

$$y_P = ae^p_{AH} + be^p_{AL} - w_{AH} - w_{AL}$$
$$y_{AH} = w_{AH} - e^p_{AH}$$
$$y_{AL} = w_{AL} - e^p_{AL}$$

where y_P ; y_{AH} ; y_{AL} are payoffs of Principal, Agent promoted to the higher position and Agent remaining in the lower position respectively; w_{AH} and w_{AL} are wages of Agent in higher and lower position ($w_{AH} > w_{AL}$); e^p_{AH} is productive effort of the Agent in the higher position; e^p_{AL} is productive effort of the Agent in the lower position; a; b are constants.

The evidence that people assess their relative position and the social comparison is an important feature when monetary incentives are not present was observed by Charness et al. (2014). Within their laboratory experiment, they found out that one third to one half of participants was willing to spend part of their payoff to affect their relative ranking with no positive effect on their payoff.

The experiment will contribute to the large group of laboratory experiments using the gift exchange game (e.g. Charness, Kuhn (2007); Fehr et al. (1998); Maximiano et al. (2007, 2013) aiming to support their findings that the effort exerted by individuals is correlated with the level of wage obtained. Moreover, this set of experiments will show how the effort which Agents are willing to exert changes when the promotion process is fair in comparison with the unfair one.

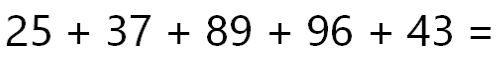
Two experiment variations will be conducted. Within the baseline, a random selection process and neutral language in the experiment instructions will be used. The treatment, using again neutral language in the experiment instructions, will let the Principal choose who is to be promoted to the higher position and obtain a higher wage. Within the treatment, thanks to use of the strategy method, both fair and unfair promotions are observable.

3.2. Research Question 2

To answer the second research question, another experimental design is proposed. The design of the second experiment is established on the (Niederle, Vesterlund 2007). Two experiment variations are to be conducted. Within the baseline (replication of Niederle, Vesterlund 2007), subjects are remunerated individually according to their performance. This type of remuneration is perceived by the participants as fair remuneration. Within the treatment, the participants are for all the tasks divided into the teams of four and their performance and payoff is divided among all the members of the team. This remuneration scheme is perceived by the participants as unfair.

The main task of the experiment is adding up sets of five 2-digit numbers.

Image 1: An example of the a group of five 2-digits numbers to be calculated.



Source: Author.

3.2.1. Control session

At the beginning after introduction of the instruction, subjects have one minute for the practicing round (to add up sets of five 2-digit numbers). This part does not influence their payoff nor the following stages.

Then subjects should solve the following tasks:

Task 1 – Piece Rate: Participants are solving the 3-minute adding up sets of five 2-digit numbers. The payoff for this task (if selected for payment) is CZK 10 (approximately EUR 0,5) per correct answer.

Task 2 – Tournament: Participants are solving the 3-minute adding up sets of five 2-digit numbers. The payoff for this task (if selected for payment) is as follows: subjects are randomly paired with another participant of the session. The participant who solves more correct problems receives CZK 20 (approximately EUR 1) per correct answer and the other participant received null (in case of ties both of them received CZK 10 - approximately EUR 0,5 - per correct solution).

Task 3 – Choice of the payment scheme: Prior to the performance of the task same as in previous rounds, subjects are asked to select whether they prefer the piece rate payoff, i.e., CZK 10 for correct answer, or the tournament payoff.

If the tournament payoff is chosen the participant receives CZK 20 per correct answer if the number of correctly answered solutions in this task exceeds the number of correctly solved tasks in task 2 of randomly chosen opponent, otherwise the participant receives null (in case of ties the participant receives CZK 10 per correct answer).

Thus, in the tournament payoff in the task 3 the performance of subjects who choose the tournament payoff is compared to the randomly assigned performance of another subject from the task 2. In other words, the choice of the tournament payoff of one subject could not affect a payoff of anybody else.

Subsequently, the short questionnaire, measurements of confidence and risk assessment and the results of participants are presented. The individual remuneration scheme is perceived by the participants as fair.

3.2.2. Treatment

The treatment session consists of the same stages as described in the control session. However, the team payoff is used for the remuneration. This remuneration scheme is perceived by the participants as unfair.

During stages one to three subjects are performing the same tasks as in the control session; however, their payoff is evenly divided among the team. In other words, if one of the tasks 1 to 3 is chosen for payment then payoffs of all members of the team are put together and evenly divided among all members of the team of four.

4. Empirical data (documentation background) and analysis

Due to the budget constraints only set of experiments regarding the Research question 2 has been conducted yet.

The experiment was conducted at the Masaryk University with 44 subjects (22 males and 22 females) recruited via hroot (Bock, O., et al., 2014) and the experiment was programmed in otree (Chen, D. L, et al., 2016). Each of the participants received a CZK 50 (approximately EUR 2) show-up fee. Moreover, participants were told that one of the first three tasks would be randomly chosen for payment at the end of the experiment.

By paying the tasks randomly I decreased the chance that subjects would focus only on some of the tasks. At the beginning of each session, subjects were randomly seated at computers. Participants were informed regarding rules of the tasks only immediately before each of the stages. Subjects were not informed of their relative performance and payoff during the session. They were informed only of their absolute performance on each task, (number of correctly calculated tasks).

Subjects were not allowed to use mobile phone nor calculator and the sets of numbers were drawn randomly. After submitting an answer, a new equation occurred together with information whether the previous calculation was solved correctly. Tasks to measure risk preferences and confidence of participants were added after performing the main tasks as well as the basic questionnaire regarding gender, age, nationality etc.

Each session lasted about 45 minutes, and participants earned on average CZK 190 (approximately EUR 8).

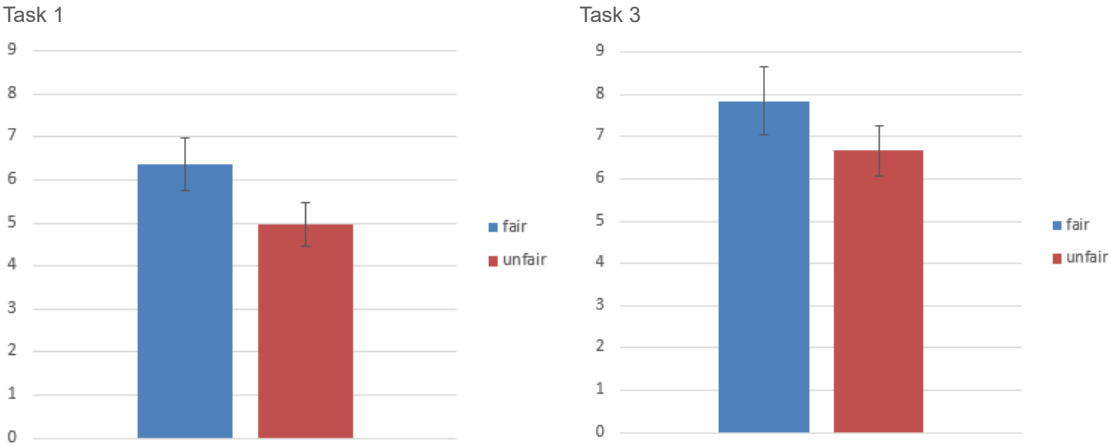
5. Results and discussion

As for the overall performance in adding up task, participants of fair and unfair treatment solved on average 6.35 and 4.96 problems respectively under the Piece Rate (Task 1), under the Tournament (Task 2) they solved 6.55 and 6.63 problems, and 7.85 and 6.67 problems on average when choosing the payment scheme (see the Figure 1, Figure 2, and Figure 3).

Even though the difference in the performance is observable in Task 1 and Task 3 (see the Figure 1 and Figure 3) it is not significant in any of the cases (Task 1: $p = 0.087$; Task 2 $p = 0.932$; Task 3 $p = 0.238$). Statistical non-significant result may be due to a small number of subjects in the sample.

From the Figure 1 and Figure 3 it could be observable, that when the remuneration perceived as fair by participants their performance is better under the fair remuneration scheme compared to the unfair one.

Figure 1 and Figure 3: Average performance of participants in the Task 1 and Task 3 respectively. (Bars indicate mean +- the standard error).



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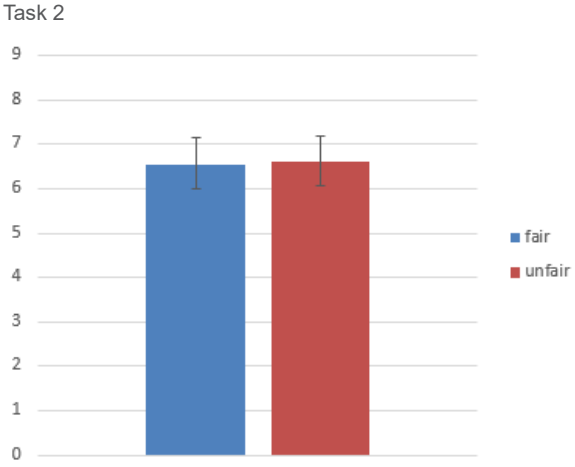
From the Figure 2 almost no difference in performance could be observable under the fair remuneration scheme compared to the unfair one.

Figure 2: Average performance of participants in the Task 2. (Bars indicate mean +- the standard error).



Source: Author

To conclude, it could be suggested that using the fair remuneration scheme in organizations is boosting the performance of employees. The remuneration of employees perceived by them as unfair might lead to demotivation and decrease in the performance and productive effort.

However, according to the statistical analysis (probably due to a small number of subjects in the sample) the hypothesis that the remuneration perceived as fair by employees would increase the performance could not be confirmed.

5.1. Statistical analysis

Basic descriptive statistics were used to characterize the sample data set. Statistical significance of differences categorical parameters was assessed using the two-sided t-test for continuous variables (moreover, there were no cases when the conclusions of the t-test differed from those of a Mann-Whitney test). All statistical tests were performed at the significance level of $\alpha = 0.05$.

5.2. Limitations of the study

There are important limitations in this study that need to be addressed. Firstly, as the sessions consisted of 20 (24 for the control session) participants the detailed statistical analysis of all questioned parameters and their comparison among sessions could not have been carried out. Thus, more observations are needed to bring additional insights.

6. Conclusions

Generally, observation of the productive effort provided by employees to the employer inside the companies is very hard to even impossible. Especially, when it comes to larger companies with complex hierarchical structure and a large amount of employees. However, it is in the best interest of the companies to pay attention to such a behavior and its causes as it might become significantly costly when employees become demotivated and decide to decrease productive effort.

In order to observe the behavior of individuals related to exerting productive effort, in particular, after the promotion process happens, two series of laboratory experiments are suggested above.

From these experiments, it should be possible to study how the willingness to exert productive effort by individuals differs when the remuneration obtained is unequal among two agents and how this amount changes when the promotion process is perceived as fair versus unfair.

Furthermore, a set of experiments regarding the question whether a performance of employees decrease when their remuneration is perceived as unfair compared to employees whose remuneration is fair has been conducted.

From the analysis of the data collected, it could be suggested that using the fair remuneration scheme in organizations is boosting the performance of employees. The remuneration of employees perceived by them as unfair might lead to demotivation and decrease in the performance and productive effort.

However, according to the statistical analysis (probably due to a small number of subjects in the sample) the hypothesis that the remuneration perceived as fair by employees would increase the performance could not be confirmed as the differences were not statistically significant.

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CHAPTER 2

People's habits in the digital environment as a prerequisite for successful business performance on Facebook

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ABSTRACT

With more than 2.3 billion monthly active users, Facebook is the leader in social networking today. It is a platform with a lot of business potential, and it plays an important role in building a public image of a brand. Faculties have also recognized this opportunity to attract or retain students, alumni, employees, and partners. However, in order to test the profitability of using Facebook for business operations, a prior investigation about the target audience's habits is needed. This paper suggests a method to test prerequisites for successful business performance for faculties on Facebook. The research was conducted on three different faculties in 3 different countries: Croatia, Slovenia, and Japan. Through the online survey, 150 participants, who were representing the target audience of these faculties, were asked to present their opinions and habits related to digital technology and Facebook. Do they use Facebook? How much time do they spend on Facebook daily? Are they willing to give out their private data and location information? What do they expect from faculties on social networks? It is important to answer these questions in order to create an optimal communication strategy. According to the comparative analysis of the research results, different audiences have different habits and preference. However, faculties' presence on Facebook is still highly recommended, with the main focus on organic reach and long-term relationship with the target audience.

Key words: Facebook, Facebook in business, social networks, faculties on social networks, digital marketing

JEL classification: M15, M2, M3, L86, O33

1. Introduction

In today's fast-changing world, it is evident that social media have become an integral part of our everyday lives. People use social networking sites all around the world, for personal and professional reasons (Pajtinkova Bartakova et al., 2017). Unlike one-way brand-consumer communication on traditional media,

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social media support two-way communication between firms and clients. That means that firms have less control over their reputation and public image; clients have more control over the information, and sometimes they are even content creators. Besides the challenges that social networks bring, the number of social media users is growing every day, which makes these platforms a fertile ground for business opportunities. Only Facebook had 2,38 billion monthly active users in the first quarter of 2019 (Statista, 2019). Some of the examples of business operations a company can conduct on social media are: building brand awareness, targeted advertising, communication with clients and developing relationships, market research, crisis communication, urgent announcements, increasing traffic on website, increasing direct sales, cooperation with other companies or brand promoters, customer support, recruitment.

Educational institutions have also recognized the benefits of social media. In the online world where access to information is easy, social networks are considered a powerful tool for universities to reach and attract students, their parents, alumni, staff, and partners (Peruta and Shields, 2016). According to Rutter et al. (2016), interactivity and reactivity on social media have a positive impact on recruitment success and brand acceptance. However, even though the number of scientific papers about communication, doing business and advertising on social media is growing (Knoll, 2016), very little is known about testing prerequisites for successful business performances on Facebook, especially in the field of higher education.

The aim of this paper is to fill this gap in knowledge and suggest an appropriate method for testing prerequisites for successful business performance for faculties on Facebook. Fulfillment of these prerequisites was tested by a 30-questions survey related to participants' technology possession, habits in the digital environment and opinions about social media. The research was done on three faculties, and for the purpose of this paper they are going to be named A, B and C: A = Faculty of Economics and Business (Rijeka, Croatia), B = Faculty of Administration (Ljubljana, Slovenia) and C = The International College of Liberal Arts (Kofu, Japan). Namely, one of the authors either studied or visited those faculties as a part of her student-exchange program in the second year of Master degree. The research was conducted on 150 participants who had characteristics of the target audience for these faculties: their students and employees.

We investigated the validation of the working hypothesis H1: *The target audience's habits in the digital environment fulfill the prerequisite for successful business performance on Facebook for the faculties A, B, and C* through six sub-hypotheses:

H1a. The target audience of faculties A, B, C owns at least one device needed to access Facebook.

H1b. The target audience of faculties A, B, C has a Facebook account.

H1c. The target audience of faculties A, B, C spends at least 15 minutes daily on Facebook.

H1d. The target audience of faculties A, B, C supports their presence on Facebook.

H1e. The target audience of faculties A, B, C voluntarily gives access to their personal data and location information to Facebook.

H1f. The target audience of faculties A, B, C doesn't use ad-blocking software plug-ins.

Additionally, the main questions this research is aiming to answer are: Which technology does target audience possess? How do target audience access the Internet? Does the target audience prefer Facebook over other social networks, and how much time do they spend on Facebook? Do they visit places on Facebook where the adverts and posts are shown? Are users willing to publish their private data on Facebook? Does the target audience use ad-blocking software plug-in? What does the target audience think about presenting a faculty on Facebook? It is crucial to answer these questions in order to test the validity of the working hypothesis. Data were analyzed by statistical methods: mode, median (for qualitative data), and mean (for quantitative data).

2. Literature review

The literature review was limited to highly cited papers from impactful academic journals and their relevant references. Those papers contain the title, abstract, or keywords as search terms such as Facebook, social media, Facebook for Business, Facebook advertising, and the combination of terms social networks/ faculties, Facebook/faculties.

2.1. Social media – definition, challenges, opportunities

Social networks are used by online communities of people sharing common interests. Members can enjoy free online services that encompass various forms of communication, interaction, sharing media, blogs, short messages, news and more, with the main goal - socialization. The most accurate definition of social media might be the one by Kietzmann et al. (2011), which says that "Social media employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content". According to Kaplan and Haenlein (2010), social networking as we understand it today started around 1959, with the creation of "Open Diary", a web-community of online diary writers.

This concept of doing business threatens established business models, such as printed newspapers and TV advertising (Hennig-Thurau et al., 2010), and makes firms face many challenges. Namely, until social networking became popular in the business world, companies could have had a much higher level

of control over their reputation, achieved through carefully planned press and public relation strategy (Kaplan and Haenlein, 2010). It is evident that interactive digital media platforms brought many changes to the way firms communicate with their customers (Hanna et al., 2011). What makes social media different from other types of media is the possibility of individuals to publicly share their opinions and reviews about firms, which makes customers want firms to listen, react, and respond. Therefore, firms have to decide if they want to get involved in the communication or ignore it. Both choices can have impacts and consequences (Kietzmann et al., 2011).

On the other hand, the development of new media created opportunities for new business models, and social media plays an important role in brand reputation and communication strategy. It created new ways to reach the target audience, communicate with them, and track their online behavior (Hennig-Thurau et al., 2010). It should be noted that targeted advertising sometimes face low acceptance due to privacy concerns (Knoll, 2016). Another example of using social media for business is in the recruitment process (Pajtinkova Bartakova et al., 2017) as an easy way to reach potential employees. However, lack of understanding sometimes leads to missed opportunities. To make it understandable what social networks are and how to engage target audiences, Kietzmann et al. (2011) developed a framework of social media functionality called “The honeycomb of social media”. The framework consists of seven social media building blocks: presence, sharing, identity, relationships, reputation, groups, and conversation. These features should help firms to understand their social networks landscape. It should be noted that nowadays social networking sites have additional features, such as direct sales option. After the main features of social media being understood, user experience is the next thing to focus on. Research by Estes et al (2009) used various methods such as usability testing, eye-tracking, field studies, and diary studies to make design guidelines for providing a high level of user experience on social media.

Additionally, Kaplan and Haenlein (2010) point out that “being active” and choosing the “right” media is a prerequisite for success. Every social networking site attracts a certain group of audience, and it is recommended to be active wherever the potential customers are present. However, according to Estes et al. (2009), too frequent posting might be annoying for users. Few other suggestions for successful business performance are mentioned: making sure that employees have access to social media; being interesting and knowing the preferences of the target audience; being humble and use the social networks before doing business on it; being honest and unprofessional.
Estes et al. (2009) also suggest that more casual business communication on social media leads to better user experience, but not always; for some services, such as BBC, customers prefer highly professional communication even on social networks. Knoll (2016) brings up topics such as eWOM (Electronic Word of Mouth or viral advertising) and targeting audience through influencers. Eventually, even though managers need to understand audience’s demand for

new multimedia content (Hennig-Thurau et al., 2010), the presentation on social media should be integrated with the communication on traditional media (Kietzmann et al., 2011).

2.2. Faculties on social networks

In today's competitive market, social media is considered an effective method for faculties to attract or retain students, alumni, community members, and partners. Along with recruitment, engagement on social media increases a student's sense of connection to their school (Peruta and Shields, 2016). A study by studentPOLL from 2013 suggests that influence of social media in the college search process is increasing, especially among prospective students. Also, among participants, Facebook was a predominant social media site. In addition to gathering information and impressions about colleges, participants also declared that they rely on social media when getting insights into the social environment and kinds of students who attend a certain college (Hesel, 2013). When it comes to the frequency of posting on Facebook, a study by Peruta and Shields (2016) suggests that schools which are posting more often get less overall post engagement. Moreover, a study which examined how the Office of the President at the University of Florida utilized Facebook indicates that messages which contain emotions and humor are efficient in developing relationships with students and generating engagement (Thelen and Linjuan Men, 2018).

A study by Rutter et al. (2016) indicates that interactivity of universities on social media is a key to successful student recruitment and brand validation. Namely, those universities that quickly respond to queries are more likely to generate better engagement with potential students. Yet, universities with lower reputation can't rely on social media to reach the level of institutions with a much higher reputation. In conclusion, due to the high competition between universities to recruit high-quality staff and students, branding is extremely important. For that reason, universities are using tools and techniques from the corporate sector, such as social media.

2.3. Facebook for business: overview and applications

In order to understand the principles of using Facebook in business operations, one should be familiar with some of its basic terms described in this subchapter. Unlike a Facebook profile, which is intended to be used by a physical person, a Facebook page is used for business purposes (Facebook Business, 2019). However, only users who have a Facebook profile can create and manage a Facebook page. A page can be used to promote a person, firm, place, subject or event, and it can be indexed by Internet search engines. Other users or firms can check information and exchange instant messages with a company via a Facebook page. Content posted on a Facebook page appears only in the News feed of page followers unless the content is sponsored. The News feed is the

name for Facebook's homepage, where most of the adverts are shown. It consists of posts and stories from other Facebook users or pages, including paid adverts if a user has the characteristics of the targeted audience. Users can click, like, share or comment on Facebook posts. The success of a Facebook campaign is calculated through the reach of the post. The reach can be organic (natural) or paid ("boosted"). Models that are often used as an efficiency measurement of campaigns on Facebook and other social networks are CPC (Cost Per Click) and CPM (Cost per "mile", or 1,000 impressions).

One of the most powerful Facebook business tools is detailed audience targeting for advertising campaigns. Namely, a company can choose the audience to which a certain post will be shown by these options: „Custom audience" (detailed selection of the characteristics of the targeted audience by specifying age, gender, location, their interests, and patterns of behavior), „People who like your page" (Page fans), „People who like your page and their friends", „Pixel code" (tracking users that have visited certain URL address), „Lead ads" (individually choosing Facebook users by their ID/e-mail/telephone number connected to their Facebook account). After defining the target audience, budget, and duration of a campaign, an advert is going through a review process to make sure it matches Facebook advertising guidelines. With Facebook adverts, a company can promote a business, get more "Likes" on their post or Facebook page, lead users to a specific website, or even make direct sales (Facebook Business, 2019). During and after a campaign, an overview of the ad performance is available, which gives an insight about how the target audience is responding to a certain advert, grouped by age, gender, location, and other characteristics. Facebook Insights can serve as a basis for planning future campaigns because it also presents the time of the day the target audience is most likely to be active (Facebook Business, 2019).

In addition to lower cost of promoting a firm on Facebook over non-virtual media, Dehghani and Tumer (2015) highlight other advantages of using this platform, such as the possibility to influence users' brand perceptions and purchase intentions by other users in Facebook groups. That indicates a switch from push advertising to trust based advertising. Since Facebook offers its users to see who else liked or shared a certain content, it may be considered as "instant check of brands credibility" (Dehghani and Tumer, 2015). Another feature which makes Facebook an effective marketing tool is the ability of ad personalization. With access to the big amount of users' data that Facebook provides, this advertising strategy of individually customizing content has been increasingly utilized (Tran, 2017).

2.4. The privacy paradox

The rapid growth of digital technologies increased the concern about users' information privacy and its protection. With more and more business being done online, personal data has become extremely valuable. The data can be used

for many purposes such as targeted advertising or content personalization. However, it is important to understand the limits for individuals related to the amount of given data and control over it (Prince, 2017). According to Prince, people are seriously concerned about the privacy of data about their physical identity and financial records, and less concerned about information related to their virtual identities

As already mentioned, the biggest advantage of social media over traditional media is the possibility of easily reaching the target audience, which would be impossible if they don't personally give out their private data, or allow a platform to collect it. Facebook offers several privacy options when publishing a content: "Public"; "Friends"; "Friends of friends"; "Only me"; "Custom". When registering, a user is required to publish only name and surname, date of birth, and email address. Publishing any other information is up to users themselves. What makes Facebook advertising so effective is the fact that it collects and uses various information, even if the sharing setting is set to "Only me". But, even though users often claim they are very concerned about their privacy, they almost don't do anything to actually protect their personal data. This phenomenon is called the privacy paradox (Barth and de Jong, 2017). Prince (2017) assumes that the asymmetry of information can influent privacy settings of an individual. Namely, individuals who are better informed about the possibilities of misusing of personal data are more likely to choose not to disclose their private information. His study also indicates that, in order to increase individuals' trust, firms might have to allow customers to have control over their private data in marketing activities.

3. Methodology

The online survey was used to collect empirical data. The survey was distributed among students and employees via faculties' portals and social network sites. It consisted of 30 questions. The survey was anonymous. The original language of the survey was Croatian, but in order to conduct surveys in the countries where the official language is Slovenian or Japanese, the survey was translated into English. Respondents were advised to seek help in case of any unclearness related to the questions.

Since most of the data were qualitative, statistical methods mode and median were used to analyze it. For quantitative data, statistical method mean was used. In the conducted research, the primary goal was to learn about participants' habits and opinions related to the Internet and social networks, particularly Facebook. Their attitudes, actions and willingness to publish information about themselves are the basis for testing prerequisites for the success of business operations on Facebook for the faculties where they study or work. Apart from the primary goal, part of the research also refers to creating ideas about the ideal concept of public communication on social networks for faculties.

The population of this research was the audience with which these faculties are likely to communicate with on social media. A simple random sample of 150 participants – 50 in each country were representing the population. Data collection was performed in the period from January 2017 to June 2017, on students and employees of three different faculties which we named A, B, and C: A=Faculty of Economics and Business (Rijeka, Croatia), B=Faculty of Administration (Ljubljana, Slovenia) and C= The International College of Liberal Arts (Kofu, Japan).

Several types of answers were offered: filling the text, multiple choice answer, checkboxes, ranking, short answers. The questions were divided into five sections: 1. Demographic data; 2. Habits of the respondents; 3. Social networks; 4. Facebook; 5. Presentation of a faculty on Facebook. In the first section, respondents were asked to give basic demographic information about themselves such as age and gender. The following five questions were referred to the habits of the respondents, and the main focus was on Internet access, devices and time spent on the Internet. Furthermore, in the third section respondents were asked about social networking habits and preferences. The following group of ten questions was about respondents' habits on Facebook. Responses in the last section can serve as an inspiration for creating an ideal concept for presenting a faculty on Facebook. The questions were carefully designed to test the working hypothesis, and written in a simple language.

4. Empirical data and analysis

In this chapter, the analysis of the survey results will be presented, section by section. Complex data will be analyzed with a table or graph.

4.1. Section 1. Demographic data

Below are presented responses of the first group of questions:

150 students and faculties' employees participated in the survey; 50 participants from each country;

At each faculty, the majority of respondents were between 20 and 30 years old. 27 women and 23 men participated in the research at the faculty A, 24 women and 26 men participated at the faculty B, while 30 women and 20 men participated in the research conducted at the faculty C;

Every respondent on every faculty at which the research has been conducted has at least a high school education level;

Among Croatian (A) respondents, 36 out of 50 are employed, in Slovenia (B) 14 out of 50 respondents are employed, 8 out of 50 respondents are employed in Japan (C).

4.2. Section 2. Habits of the respondents

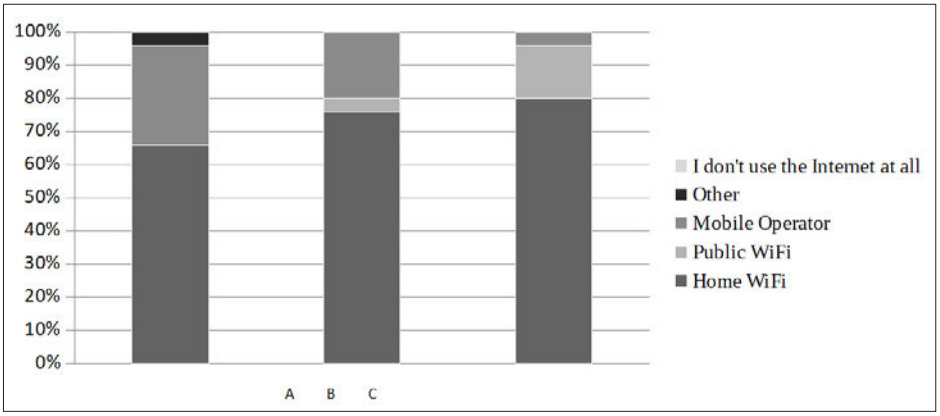
Below are presented responses of the second group of questions:

To the question “Do you own a desktop/laptop computer?”, 100% of respondents in at all three faculties responded positively;

To the question “Do you own a smartphone or tablet?”, only one respondent at the faculty C does not have a smartphone or tablet and all the other respondents do;

Responses to the question “How do you usually access the Internet?” are presented in the graph below:

Figure 1: Responses to the question „How do you usually access the Internet?„



Source: Survey results

Responses to the question “How much time you usually spend on the Internet daily?” show that participants at all three faculties spend mostly between one hour and five hours surfing the Internet (28 out of 50 users at the faculty A, 36 out of 50 at the faculty B and 38 out of 50 at the faculty C).

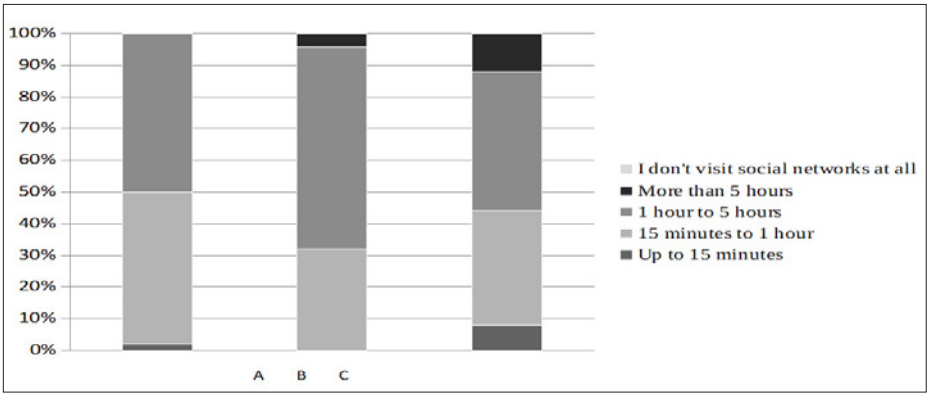
According to the responses to the question “Which device you usually use to connect to the Internet?”, it is obvious that the most widely used device for accessing the Internet in all three countries is smartphone (30 of 50 respondents at the faculty A, 32 out of 50 respondents at the faculty B and 34 out of 50 respondents at the faculty C) followed by a personal computer or laptop.

4.3. Section 3. Social networks

Below are presented responses of the third group of questions:

Responses to the question “How much time do you spend on social networks daily?” are presented in the graph below:

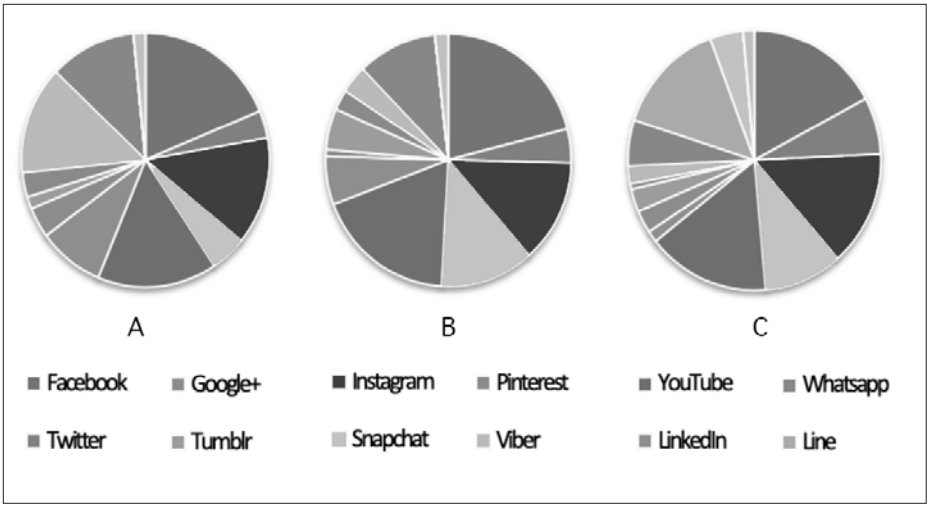
Figure 2: Responses to the question „ Answers analysis for the question „How much time do you spend on social networks daily?"



Source: Survey results

Responses to the question "Which social network(s) do you use?" (possibility of multiple choice) are presented in the graph below:

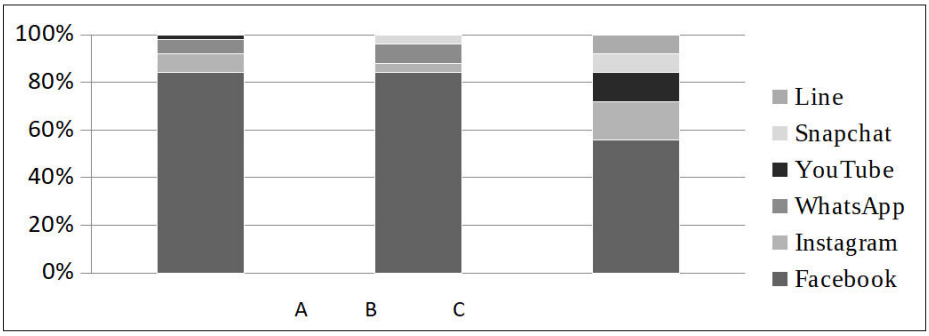
Figure 3: Responses to the question „ Which social network(s) do you use?"



Source: Survey results

Responses to the question "In your opinion - Which social network is the most popular?" (respondents were asked to write their answers) are presented in the graph below:

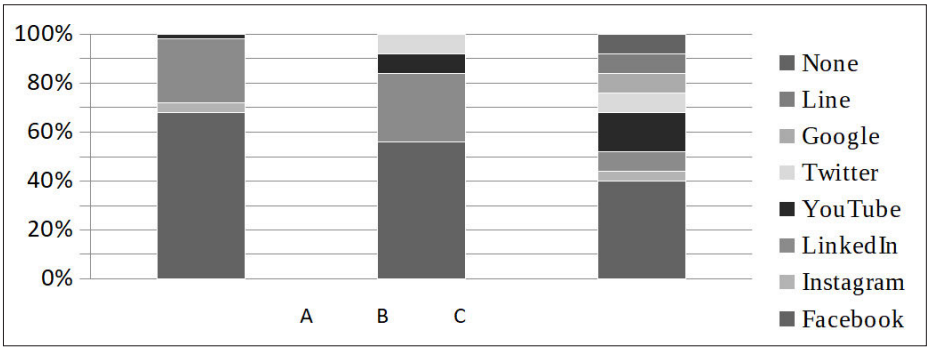
Figure 4: Responses to the question „In your opinion - Which social network is the most popular?"



Source: Survey results

Responses to the question "Which social network is the best for presenting a company?" (respondents were asked to write their answers) are presented in the graph below:

Figure 5: Responses to the question „Which social network is the best for presenting a company?"



Source: Survey results

To the question "Does the "unprofessional" social network profile make the bad impression about the company?", 96% of respondents at the faculty A answered "Yes", 80% of respondents at the faculty B answered "Yes", and 64% of respondents at the faculty C answered "Yes";

4.4. Section 4. Facebook

Below are presented responses of the fourth group of questions:

Based on the responses to the question "On a scale of 1 – 5, how would you describe a simplicity of Facebook usage?" (1 means "Very Complicated", while 5 means "Absolutely Simple"), an average mark of the simplicity of the usage of Facebook is 4,46/5 among respondents at the faculty A, 4,28/5 among respondents at the faculty B, and 3,96/5 among respondents at the faculty C;

According to the responses to the question “On a scale of 1 – 5, how much do you trust in data privacy on Facebook?” (Score 1 means “I do not trust at all”, while 5 means “I have complete confidence”), an average mark of trust in data privacy on Facebook is 2,06/5 among respondents at the faculty A, 2,4/5 among respondents at the faculty B, and 2,52/5 among respondents at the faculty C;

Responses to the question “Which personal information have you published on Facebook?” are presented in the table below:

Table 1: Responses to the question „Which personal information have you published on Facebook?”

	A	B	C
Your real name	Public	Public	Public
Gender	Public	Public	Public
Date of birth	Friends	Friends	Public
E-mail	Friends	Friends	Friends
Mobile phone number	Friends	Not published	Not published
City of residence	Friends	Public	Friends
Education/work	Friends	Friends	Friends
Interests, activities, sport	Friends	Friends	Friends
Events of interest	Friends	Friends	Friends
Important life events	Friends	Friends	Friends

Source: Survey results

Based on the responses to the question “How much time do you spend on Facebook daily?”, it can be concluded that respondents most often answered “15 minutes to an hour” (40% of respondents at the faculty A, 44% of respondents at the faculty B and 65% of respondents at the faculty C) or “1 hour to 5 hours” (34% of respondents at the faculty A, 56% of respondents at the faculty B and 16% of respondents at the faculty C), while at faculty A and C some participants (less than 30%) spend less than 15 minutes on Facebook;

According to the responses to the question “Do you check your News feed?”, it is obvious that the respondents normally check Facebook’s News feed, mainly saying “Yes, often” (15% or more) and “Yes, sometimes” (40% or more) at all three faculties;

Responses to the question “Do you write reviews (about companies/products/events) on Facebook?”, are mainly “No, never” (More than 30% for participants at all three faculties), few users still prefer to express their opinions publicly – “Sometimes” (less than 10%) or “Often” (less than 3%);

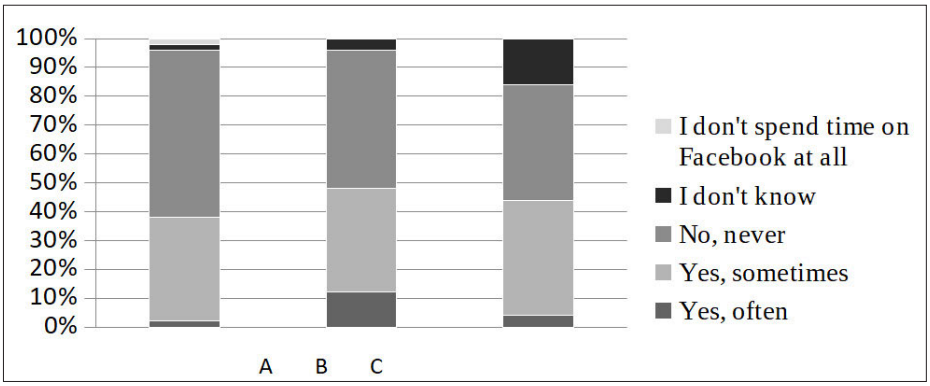
Based on the responses to the question “On a scale of 1 – 5, how important it is for companies to have a Facebook Page?” (1 means “Not important at all”

while rating 5 means “Absolutely important”), an average mark of importance is 4,06/5 (faculty A), 3,88/5 (faculty B) and 3,72/5 (faculty C);

According to the responses to the question “Where do you usually check information about the company?”, Most of the participants still prefer getting information from the company’s website (76% at faculty A, 88% of respondents at faculty B and 84% of respondents at faculty C). However, some of the respondents prefer Facebook business pages (18% of respondents at faculty A, 4% of respondents at faculty B, and 12% of respondents at faculty C);

Responses to the question “Do you show your location while sending messages/ posting photos?” are shown below:

Figure 6: Responses to the question „Do you show your location while sending messages/posting photos?”



Source: Survey results

According to the responses to the question “Do you do anything to hide Adverts (ad-blocking Software Plug-in) on Facebook?”, the largest number of participants using “AdBlock” applications belongs to the group from faculty B (28 out of 50 respondents), while the answer “Yes, sometimes” is the most common answer at the faculty A, and at the faculty C, 20 participants vote for “No, never” and 20 for “Yes, sometimes”.

4.5. Section 5. Presentation of a faculty on Facebook

Below are presented responses of the fifth group of questions:

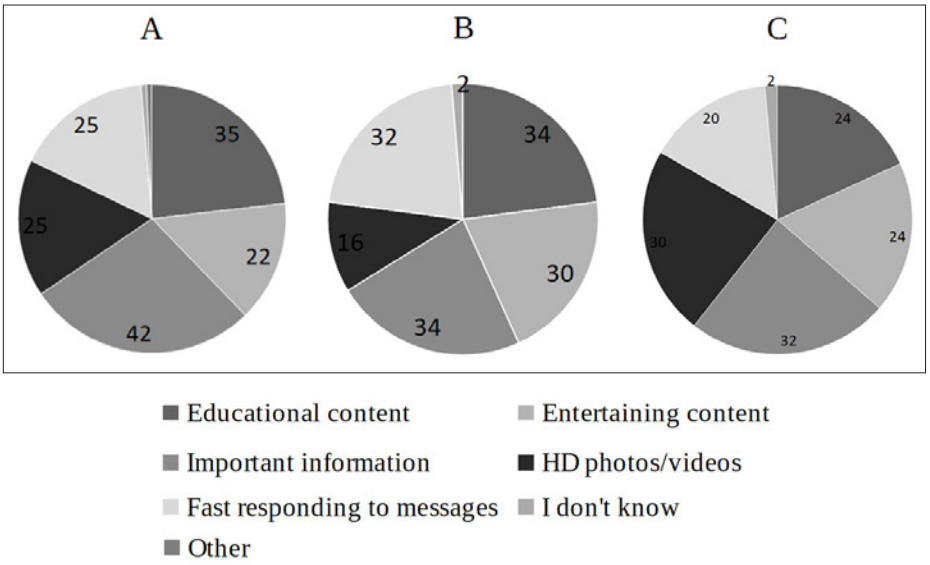
On the question “In your opinion, do universities need to have a Facebook Page”, more than 70% of all participants gave a positive answer;

Based on the responses to the question “Can “good” Facebook Page increase the reputation and popularity of a faculty?”, positive opinion share 39 out of 50 respondents at faculty A, 34 out of 50 respondents at faculty B and 48 out of 50 respondents at faculty C;

To the question “Can “unprofessional” Facebook Page lower the reputation and popularity of a faculty?”, most of the respondents at all three faculties stated that a bad presentation on Facebook could definitely ruin the overall picture of the faculty (39 out of 50 respondents at faculty A, 22 out of 50 respondents at faculty B, and 36 out of 50 respondents at faculty C);

Responses to the question “In your opinion, which should be the main features of a Facebook Page of a faculty?” are shown below:

Figure 7: Responses to the question „In your opinion, which should be the main features of a Facebook Page of a faculty?”



Source: Survey results

In the final question, participants were asked for their advice, opinions, and comments regarding the successful and professional presentation of faculties on social networks. Below are presented the answers:

“Reviews of professors and courses.”

„Announcement of future events such as guest lectures and workshops.”

„Current updates, contact information, and legal information. The link to other social networks and the existing website.”

„A high-quality and modern website, linked to social networks, displaying relevant information. Engagement in communication.”

„Highlighted relevant information, offers, and program of the faculty and the possibilities for students when they graduate.”

„I would hire successfully graduated student at that faculty as a Facebook page manager.”

„All the activities that raise the reputation of the university, such as conferences, guest lectures, successful alumni students, successful students, professors. Lots of complementary content in video clips, pictures ... “

„Announcements like lecture timetable, professor’s absence, schedule changes…”

„Quick notification for students about changes in timetable/exam terms, respond to inquiries sent to Inbox quickly and professionally, presenting events at the faculty via Facebook. The content must be professional - the text must be proof-read and meet the language standards, the images must at least be of good quality. Professionally and approachable, not arrogant and unkind.”

„More Announcements about student organizations events.”

„Announcements about events, opportunities, important information. When changing any of the rules, post exactly which change is made and for what reason; whether it is decided by an educational institution or a government.”

„Multilingual site.”

„Educationally oriented and constantly refreshed. I look forward to announcements about current events at the faculty as well as on public/national issues.”

„More video content.”

5. Results and discussion

Results presented in the previous chapter are of a great significance when it comes to evaluation of prerequisites for successful business performance on Facebook for the faculties which participated in this research. It is important to have insights into the habits and attitudes of their targeted audience in order to create an optimal communication strategy on social networks. Based on the analysis of the responses, the discussion will explain how and why the answers are related to estimating the validation of each of six sub-hypotheses. The discussion is presented below.

Sub-hypothesis H1a. The target audience of faculties A, B, C owns at least one device needed to access Facebook.

In order to reach the target audience on Facebook, they need to possess certain technology: PC, laptop, smartphone or a tablet computer. 100% of the respondents own one or more devices needed to access Facebook. Also, participants mostly connect to the Internet via smartphone, and Facebook is available as a smartphone application. That indicates that this sub-hypothesis is not rejected.

Sub-hypothesis H1b. The target audience of faculties A, B, C has a Facebook account.

In order to establish brand-consumer communication on Facebook, the target audience needs to use Facebook. Facebook is convincingly the most used

social networks platform, used by 96% of all participants. It should be noted that participants use other social networks as well, such as YouTube, Instagram, Viber, and Line, so their importance shouldn't be ignored. Users find Facebook easy to use, which indicates that its user experience is on a high level. Also, most of the participants are of the opinion that Facebook is the most popular social network, which is not a surprise since it has the highest number of total users among all the social networks, and the number is growing steadily. Also, responses analysis reveals that most of the students or employees on all three faculties visit Facebook News feed often or sometimes, a web place where all the posts and adverts are shown. That indicates that this sub-hypothesis is not rejected.

Sub-hypothesis H1c. The target audience of faculties A, B, C spends at least 15 minutes daily on Facebook.

In order to track the target audience's behavior on Facebook, they need to spend at least 15 minutes daily on Facebook. According to the survey results, in all three countries, participants daily spend mostly 1 to 5 hours on the Internet and social networks, and 15 minutes to 1 hour (A, C) or 1 hour to 5 hours (B) on Facebook. That indicates that this sub-hypothesis is not rejected.

Sub-hypothesis H1d. The target audience of faculties A, B, C supports their presence on Facebook

In order to raise a brand reputation, the target audience needs to consider Facebook "the right place" for presenting a business. Even though participants still prefer getting information about the company on their web site, Facebook is convincingly at the top of the list of the best social networks for presenting a company, followed by social networks LinkedIn and YouTube. Most of the participants share the opinion that faculties should be present on Facebook, and that their communication should be professional in order to build a faculty's reputation. However, the faculties shouldn't rely on e-Word of Mouth, as participants mostly never write reviews on Facebook. Additionally, "unprofessional" social network profile makes a bad impression of the company for most of the users. That indicates that this sub-hypothesis is not rejected.

Sub-hypothesis H1e. The target audience of faculties A, B, C voluntarily gives access to their personal data and location information to Facebook.

In order to conduct targeted advertising campaigns on Facebook, the target audience has to give out their personal data and location information. As already indicated in the literature review, people sometimes behave paradoxically about data protection. Namely, question no. 18 proves that even after declared relatively low trust in data privacy on Facebook in question no. 17, participants still voluntarily publish most of their personal data. However, the success of location-based targeted advertising is questionable, since most of the participants (A, B) declared that they never show their location information.

Also, it should be noted that location-based advertising sometimes can be affected by the network. Namely, while using free public networks (which is more popular among participants from Japan), the usage of some of the services such as Facebook might be limited due to network security. This may be a problem in the situation when the selected target audience is based on a narrowly defined user location; if the users are connected to the Internet via a public network, there is a possibility that ads will not even reach them, due to the inability to use Facebook. That indicates that this sub-hypothesis is not rejected, but it should be noted that location-based targeted advertising is limited.

Sub-hypothesis H1f. The target audience of faculties A, B, C doesn't use ad-blocking software plug-ins.

In the case of using the ad-blocking plug-in, the target audience might not see adverts on Facebook. Apparently, most of the participants of this research (especially in Slovenia) are familiar with these browser extensions which hide sponsored content on social media. Namely, more than 50% of participants are using it, which indicates that this sub-hypothesis is rejected, and advertising on Facebook is not likely to be successful for these faculties.

Additionally, in order to plan a strategy for communication on Facebook, an insight into the target audience's opinions and preferences is needed.

The different audience is attracted by different content on social media. It is not enough to follow the latest trends in social media communication, actual insight into the target audience's preferences is needed. For that reason, the last two questions of the survey are valuable and significant. When asked to write their ideas, advice, opinions, and comments for the successful and professional presentation of faculties on social networks, many creative answers were given. They can serve as an inspiration for creating a communication strategy on Facebook for these faculties.

6. Conclusions

The results of the conducted research indicate that most of the business operations on Facebook for faculties A, B, and C are likely to be successful, such as reaching an audience on Facebook, brand-consumer communication, tracking the target audience's behavior, rising brand reputation, and targeted advertising. On the other hand, research results indicate that the success of advertising on Facebook is questionable. Opportunities for location-based targeted advertising are limited because of participant's habits. However, the working hypothesis is not rejected; prerequisites for successful business performances on Facebook for faculties which participated in the research are likely to be fulfilled. Possible solutions to the challenges that faculties face are building long-term relationships and focusing on organic reach. Faculties should also be aware that different audiences have different preferences, and it is crucial

to investigate them in order to create an optimal communication strategy. With little adjustments, this method can be as well used in testing prerequisites for obtaining business success on Facebook for other types of businesses as well. However, the limitations of this research should be mentioned. Firstly, the data was collected in 2017, which makes the research less accurate. Secondly, due to the limited time and financial resources, the number of participants couldn't have been bigger. Therefore, the suggestions for future research are: using more recent data; including more participants into research; make broader cross-cultural research; group data by students and employees; find out if the target audience is likely to be influenced by social media influencers. An additional suggestion for future direction is using the different instrument for data collection, such as smartphone application which marks clicks, scrolls and time spent on Facebook. However, this way of getting insights into the target audience's behavior has privacy concerns. This paper will hopefully encourage other researches to continue contributing to economic science in the field of business on social media, one of the most powerful communication tool in the world of the digital economy.

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CHAPTER 3

Policy and legal challengens in implementing smart cities

Francesco Gaspari[1]

ABSTRACT

The paper aims at identifying the current main issues potentially hindering the further implementation of smart cities, putting forward some proposals to overcome them.
In particular, in its first part, the work focuses on the main problem concerning smart city, namely its definition. In fact, currently there is no legal (i.e. binding) definition of smart city, and the paper proposes a holistic approach, with a view to embracing not only an economic view of the smart city concept, but also other dimensions, e.g. the human, social, environmental, cultural, and digital dimensions.
In its second part, the paper analyses more deeply the main challenges hindering the implementation of smart cities: financing, infrastructure, digital divide.
The paper concludes upholding that access to the Internet as well as digital literacy and awareness should be qualified as fundamental rights with a crucial role played by the public sector.

Key words: smart city, digital divide, digital infrastructure, digital agenda, smart cities financing

JEL classification: K23, K32, K38

1. Introduction

The implementation of smart cities, which represent a new paradigm of urban development, entails a significant digital transformation, that in turn will have an unprecedented impact on people's lives and activities.

If there is no doubt that smart cities bring certain advantages, it is likewise unquestionable that this new model comes with some challenges, including financing, digital divide and access infrastructures, both digital and physical.

However, under a legal and regulatory point of view, the first and most important problem in addressing the smart city topic is its definition. Indeed, currently a legal (or legislative) definition of smart city does not exist. One should therefore, before entering *in medias res*, focus on this preliminary aspect. In this respect, the paper proposes a holistic approach, with a view to embracing not only an

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economic view of the smart city concept, but also other dimensions, e.g. the human, social, environmental, cultural, and digital dimensions.

Moreover, the paper aims at putting forward some proposals to overcome the above mentioned issues. In this regards, a possible solution is that access to the Internet as well as digital literacy and awareness are qualified as fundamental rights with a crucial role played by the public sector.

2. Conceptualizing a smart city

The smart city (or community[2]) concept has been used in different fields and, only recently, it has started to be investigated under a legal point of view. Such an expression is increasingly mentioned in legislative acts, documents (planning acts, agendas, strategies, roadmaps) – both at domestic and European Union levels – indicating specific policies to implement.

Traditionally, the concept of "city" does not fit into the legal studies, which instead opt for other concepts, like "municipality" or "district", much more uniforming.

Currently, a legal (or legislative) definition of smart city does not exist, with the consequence that such a concept is relevant especially under a sociologic point of view (Ferrara, 2015: par. 2.5).

This makes "smart city" a fuzzy and multifaceted concept. As a consequence, different attempts to give a certain degree of clarification to the concept of smart city have been made.

Some scholars outline the importance of an "integrated approach" to the phenomenon (Chourabi et al., 2012). Other scholars point out that in the scientific community, as well as in the EU documents, *smart city* is identified in the *sustainable city* (Ferrara, 2015: par. 1), while others outline that, although originally based on Information and Communication Technologies (ICTs), today smart cities go beyond that, and include all aspects concerning environment and energy, more efficient urban transport systems, better waste disposal systems. The smart city concept therefore implies a better use of resources and less polluting emissions (Ferrara, 2015: par. 2.1; European Commission, 2018).

In this respect, some scholars observe that smart city definitions rely on different dimensions, all to be taken into account, such as the digitalization process, the new urban governance, the development of innovative services and infrastructures, the sustainable development, but also the human capital, the social relationships, the attention towards natural resources, the quality of life, the so-called user-centricity (Eger, 2003: 50; Hollands, 2008: 309; Caragliu, Del Bo, Nijkamp, 2011: 65; Carley, Jenkins, Small, 2001).

In spite of their multifaceted concept, one shall note that smart cities have been conceived within the multilevel digital agenda, with the consequence to give

2 The *smart community* concept is generally used if the relevant urban area is wider than a city (Ferrara, 2015: par. 1).

paramount importance to the digitalization processes. As a result, digital agenda binds to the urban agenda above all under an organizational point of view.

With regards to the definition given by the European Commission (2013a: 5), smart cities are *"*systems of people interacting with and using flows of energy, materials, services and financing to catalyse sustainable economic development, resilience, and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society*"*.

This definition shows some limits, as it appears to represent a list of targets rather than a closed conceptualization of the idea (Gori, Parcu, Stasi, 2015: 1).

Other studies and reports set parameters (or indexes) to "measure" (and classify) the city smartness.

The *Smart Cities Index*, for instance, identifies 19 indexes[3], while others identify six macro-areas of intervention within a smart city: smart economy, smart people, smart governance, smart mobility, smart environment, smart living (Giffinger et al., 2007).

More recently, such six features or dimensions of a smart city have been mentioned also within the working definition adopted in a European Union Parliament study (2014: 9 and 17), in which "a Smart City is one with at least one initiative addressing one or more of the [mentioned] six characteristics".

A different approach is taken, and a different definition of smart city is adopted, by the European Economic and Social Committee (EESC, 2015), according to which the smart city development model is based on the coexistence and simultaneous integration of six enabling pillars[4]. Unlike the EU Parliament document, the EESC opinion tends to a stricter approach of smartness, as "[t]he coexistence of these six pillars should be considered a standard and indispensable component of a strategic smart city project" (EESC, 2015: 1.6).

Such reports – in which the competitiveness, the productivity, the entrepreneurial attitudes and skills take on a key role – contain sociological concepts and

3 The *Smart Cities Index*, whose latest version dates back to 2017, was built on data gathered by the app *EasyPark*. The "smartness" of cities has been measured by *EasyPark* cross-referencing data from different sources and taking into account 19 parameters, and namely: Smart Parking; Car Sharing Services; Traffic; Public Transport; Clean Energy; Smart Building; Waste Disposal; Environment Protection; Citizen Participation; Digitalization of Government; Urban Planning; Education; Business Ecosystem; 4G LTE; Internet Speed; Wifi Hotspots; Smartphone Penetration; Living Standard; How the City is Becoming Smarter. The 2017 report is available at https://easyparkgroup.com/smart-cities-index/.

4 Namely: (1) technologies and tools for energy efficiency and integration of renewable sources; (2) dissemination of technology platforms and connectivity to set up the new digital service systems; (3) new digital services to improve the quality of life and work of the public and businesses; (4) upgrading of infrastructure and urban redesign; (5) education and training of individuals, businesses and the public sector in digital skills; (6) an economically and financially viable model for investment: Point 1.5.

provide general targets and guidelines for innovative public policies development (Ferrara, 2015: par. 2.5).

Measuring the smartness of cities in the light of such indexes seem to be not sharable, as basically deny the heterogeneity of places development, putting forward the efficiency of technical solutions applicable everywhere, in every single geographical context, even if with minor adaptations.

Within this perspective, the urban issue is part of the global market that can be addressed and solved through a pack of technological solutions to be sold. In this framework, smart cities are seen as "drivers for development of a new European industrial policy" (EESC, 2015: 1.4 and 2.8). Consistent with the neo-liberal single thought, city rankings and benchmarking analysis list the "degree" of cities smartness, upholding a single path (or model) of development.

The smart city concept cannot be limited to digitalization or exclusively linked to environmental concerns. Such concept implies an out-and-out revolution in the way of conceiving the relationship between humans, environment/territory and artificial intelligence/automation.

Therefore, for a city to be smart it should increase the wellbeing and the quality of life, making possible the configuration of a real *right to city* (Auby, 2013), intended not only as a sustainable city (e.g. energy efficiency), but also in a wider sense, and namely the right to live well in a city. In this respect, smart cities are seen as the post-modern vision of well-being (Ferrari, 2017: 15-16). Therefore, this implies significant social aspects to be taken into consideration when it comes to dealing with smart cities.

Within this scenario, digitalization is just a part (*recte*: an instrumental part) of the revolution, being crucial the human and social dimensions of such radical change.

The Uber case seems to confirm this approach, in the sense that a smart city cannot be an application ("*app*") only.

On 25 November 2014, the US District Court for Nevada issued an order against Uber Technologies Inc., blocking the company from operating unregulated in Nevada. In particular, the injunction based on concerns that Nevadans could be at risk as a result of the company's refusal to follow state laws regulating commercial motor carriers and passenger transportation services.

Uber upheld that it operates as a technology company, not a transportation-services company subject to Nevada regulations, which apply to taxis or commercial motor carriers[5].

The Uber system (or business model) implies however deep changes in lifestyles and mobility opportunities (Bodiroga-Vukobrat, Martinović, 2019), through the potential extension of users of non-scheduled "public" services, the flexibility of supply, the possible substitution or integration with scheduled

5 See https://lasvegassun.com/news/2014/nov/25/judge-reno-taking-nevada-uber-legal-fight/.

transport services, the reduced use of private means of transportation, of congestion, of pollution and the cost of mobility.

Also the European Court of Justice (ECJ, case C-434/15) has recently issued a judgment within a preliminary ruling concerning Uber systems Spain SL. The European Court qualifies the service provided by the company not only as "an intermediation service"[6]. According to the Court, such intermediation service "must […] be regarded as forming an integral part of an overall service whose main component is a transport service and, accordingly, must be classified not as 'an information society service' […], but as 'a service in the field of transport'", as regulated by the EU relevant legislation (ECJ, case C-434/15: par. 40). More recently, other cases involving Uber have reached the European Court by means of preliminary reference procedures[7].

In the Uber France case (C-320/16), the request has been made in proceedings before a criminal court in a private prosecution and civil action brought against Uber France SAS, in relation to the illegal organisation of a system for putting non-professional drivers using their own vehicle in contact with persons who wish to make urban journeys. The European Court, recalling the Uber Spain case of December 2017, concluded that also Uber France is a system that concerns a "service in the field of transport" (par. 27).

It is therefore clear that information technology and data are merely instrumental to innovative mobility services and, more in general, to the implementation of cities that must have very different features to be deemed as smart.

In other words, the smart city concept may only be explained through a multifaceted or system approach (Fracchia, Pantalone, 2015, 3-4), that takes into account many dimensions, starting with the human and social one, and including the environment, the digitalization, territories, institutions, etc. Such dimensions complement each other and form the concept of smart city.

3. The main challenges in the implementation of smart cities

The advantages offered by smart cities come with some challenges, including financing, digital divide and access to infrastructures, both digital and physical.

3.1. Financing

The financial crisis has had a major impact on the capacity of European businesses and governments to finance investment and innovation projects (Communication from the Commission, 2010: 3.2).

6 According to the Court, an "intermediation service" consists "of connecting, by means of a smartphone application, a non-professional driver using his or her own vehicle with a person who wishes to make an urban journey: par. 37 of the judgment.

7 Uber France, Uber Black (Germany), and Uber Belgium. However, the Uber Belgium case was dismissed as manifestly inadmissible (order of the Court (Eighth Chamber) of 27 October 2016, case C-526/15), while Uber Black was removed from the Court's register (President's Court order of 12 April 2018, case C-371/17).

The development of infrastructures required to implement smart cities implies significant financial commitments (OECD, 2019: 39), that appear to be difficult not only in the light of the current budgetary constraints of central and local governments[8], but also taking into account the limits laid down by the EU State aids regulation (Articles 107-109 of the Treaty on the Functioning of the European Union).

Currently, in the implementation of urban agendas and smart cities related policies the risk is that local governments opt for the simplest, less costly and rather narrow way of smart lampposts and of info-mobility, and thereby missing the possibility – offered by the new paradigm of smart cities – to have a huge impact on *progress* and not only on *development* (Gaspari, 2018).

The EU financial tools include three different groups, depending on their respective features: (i) direct management programs (e.g. Horizon 2020, COSME, LIFE+); (ii) structural funds; (iii) EIB tools. According to some scholars (Auby, De Gregorio, 2015, 978), among the financial tools for the development of smart city projects may be included also the European Fund *for* Strategic Investment (EFSI), set up recently, particularly for projects showing higher risks. EFSI is managed by the European Investment Bank.

A very important role is played by structural funds. In fact, actions aimed to "sustainable urban development" are included among the initiatives fundable by the European Regional Development Fund (ERDF). Regulation (EU) No 1301/2013[9], that makes provision for the ERDF for the period 2014-2020, lays down that sustainable urban development is undertaken through "Integrated territorial investment" (Article 7), as referred to in Article 36 of Regulation (EU) No 1303/2013[10], or through a specific operational programme, or through a specific priority axis in accordance with point (c) of the first subparagraph of Article 96, par. 1 of Regulation (EU) No 1303/2013.

According to the EU cohesion policy, it is of crucial importance to strengthen and facilitate community-led local development with the involvement of local actors/stakeholders representing socioeconomic interests of relevant territories. This is shown by the fact that Regulation (EU) No 1301/2013 dedicates the entire Chapter II (Articles 32-35), of Title III, of Part II to "Community-led local development".

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8 *The Stability and Growth Pact* (SGP), outlined by a resolution and two council regulations in July 1997, and the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union (also referred to as TSCG or Fiscal Stability Treaty), signed on 2 March 2012, just to mention the most significant ones.

9 Regulation (EU) No 1301/2013 of the European Parliament and of the Council of 17 December 2013 on the European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal and repealing Regulation (EC) No 1080/2006.

10 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 1083/2006.

Therefore, in the light of the EU cohesion policy, among different financial instruments[11], a key role is called to be played by the public-private partnership (PPP) (EESC, 2015: 2.8.2), as well as by project financing (Juričić, 2019) and by "Innovation partnerships", pursuant to Article 31 of Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC (Castelli, 2018). In this respect, a specific relevance may assume Article 62 of Regulation (EU) No 1303/2013, laying down that "The ESI Funds may be used to support PPP operations. Such PPP operations shall comply with applicable law, in particular concerning State aid and public procurement".

However, the limit of such financial instruments is at least twofold. On one side, Metropolitan Cities enjoy resources that are generally out of reach of other local territories. On the other side, although financial funding (*in primis* for ESI Funds) comes from different Union instruments, it is nonetheless strictly linked to individual project capabilities and to thematic objectives[12], therefore very specific, and this entails the risk of losing the whole (or holistic) dimension of the new smart city idea.

Moreover, significant risks affecting security or public order may derive from foreign direct investments, directed to finance smart city projects (for instance, infrastructures).

Until recently (March 2019) there was no comprehensive framework at Union level for the screening of foreign direct investments on the grounds of security or public order, while the major trading partners of the Union had already developed such frameworks. This legislative vacuum has been recently filled in with Regulation (EU) 2019/452[13], which provides legal certainty for Member States' screening mechanisms on the grounds of security and public order, and to ensure Union-wide coordination and cooperation on the screening of foreign direct investments likely to affect security or public order (Articles 1, par. 1, and 3, as well as whereas 7).

According to Regulation 452, in determining whether a foreign direct investment may affect security or public order, "*it should be possible for Member States and the Commission to consider all relevant factors, including the effects on critical infrastructure, technologies (including key enabling technologies) and inputs which are essential for security or the maintenance of public order, the disruption, failure, loss or destruction of which would have a significant impact in a Member State or in the Union*" (Article 4, par. 1 and whereas 13).

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11 On innovative financial systems concerning social infrastructures, with particular reference to *education, housing* and *health* see the recommendation and proposals contained in the HLTF report (2017)

12 Article 9 of Regulation (EU) No 1303/2013, cit., identifies eleven thematic objectives of the programming of the ESI Funds 2014-2020.

13 Regulation (EU) 2019/452 of the European Parliament and of the Council of 19 March 2019 establishing a framework for the screening of foreign direct investments into the Union (O.J. 21 March 2019, L 79 I/1). This Regulation enters into force on 11 October 2020 (Article 17).

Such Regulation sets up a cooperation mechanism (Articles 6 and 7), that should only be used for the purpose of protecting security or public order (whereas 18). Such mechanism – enhanced through contact points established by the Member States and the Commission (Article 11 and whereas 26 and 27) – enables Member States to cooperate and assist each other where a foreign direct investment in one Member State could affect security or public order in other Member States. Each Member State may submit requests for information, replies and comments, which should also be forwarded to the Commission. In its turn, the Commission may, where appropriate, issue an opinion within the meaning of Article 288 TFEU to the Member State in which the investment is planned or has been completed (Articles 1, par. 1, 9, as well as whereas 16). However, the final decision in relation to any foreign direct investment undergoing screening or any measure taken in relation to a foreign direct investment not undergoing screening remains the sole responsibility of the Member State where the foreign direct investment is planned or completed (whereas 17).

Other important legal and policy issues may jeopardize the implementation of smart cities, among which access infrastructures, both digital and physical.

3.2. Access to digital infrastructures. Fast broadband as a universal service

The implementation of smart cities and communities requires a re-definition of infrastructures, above all those having social relevance, both physical (e.g. route networks, cycle routes, housing, schools) and digital (e.g. internet fast and ultra fast broadband).

Such infrastructures represent the pre-requisite to allow that all can enjoy the advantages of smart cities (and communities), and not only the well-off segment of the society.

In this respect, also the United Nations, among the principles for the implementation of the *New Urban Agenda* (NUA, 2016), adopted in Quito (Ecuador)[14], identifies the principle of "providing equal access for all to physical and social infrastructure and basic services"[15].

It is therefore necessary to intervene in order to re-define, re-qualify and possibly create public physical infrastructures, having the connectivity as a aim, which implies that separate and different elements are connected, meaning that they enter into a physical or functional relationship between each other.

The urban connectivity hence entails that elements forming a territory (e.g. urban areas, middle cities, small towns, productive settlements, inland and rural areas,

14 The NUA is formed by two documents: the *Quito Declaration on Sustainable Cities and Human Settlements for All* and the *Quito Implementation Plan for the New Urban Agenda*.

15 See in particular the *Quito Declaration on Sustainable Cities and Human Settlements for All,* cit., point 14(a). See also the commitment to promote "equitable and affordable access to sustainable basic physical and social infrastructure for all, without discrimination", taken on by Member Parties in the *Quito Implementation Plan for the New Urban Agenda*, cit., point 34.

cycle routes pedestrian streets/routes, interports, urban hubs) enter into relationship between each other to form a system, namely an interconnected relational and settlement space. This objective may be achieved within smart cities (and more in general within smart communities), also thank to new technologies (IoT) and, therefore, through the combined operation of both physical and digital infrastructures.

In this respect, the European Commission (2013b) refers also to the *iCity*, the city as a system of innovation (*innovation ecosystem*). The Commission defines systemic innovation "as an interconnected set of innovations, where each influences the other, with innovation both in the parts of the systems and in the ways in which they interconnect" (European Commission, 2013b: 3). The Commission further specifies that "Innovation as system links the citizens (People) with the built environment (Place) and public organizations and policy-makers (Public) through business(Private) - creating an interactive innovation ecosystem of the city" (European Commission, 2013b: 8).

However, physical infrastructures are the pre-condition for the implementation of smart cities, as these could not operate without digital infrastructures[16]. In this respect, the European Commission observes that the development of high-speed networks today is having the same revolutionary impact as the development of electricity and transportation networks had a century ago (European Commission, 2010b: par. 1).

The Commission points out that "[t]he benefits of the digital society should be available to all" and raises questions about "how best to meet demand for basic telecom services in today's competitive markets, what role universal service could play in achieving the objective of broadband for all, and how universal service should be financed" (European Commission, 2010b: par. 2.6.2). In 2010, the Commission envisaged the possibility to modify the universal service regulations, possibly putting forward proposals in regard to the Universal Service Directive (European Commission, 2010b: par. 2.6.2).

Surprisingly, in 2011 the Commission decided not to change the basic concept, principles or scope of EU rules on Universal Service[17] to include mobile telecommunications services and broadband connections at EU level (European Commission, 2011).

The aim of the Commission is to avoid "the imposition of a disproportionate burden on the sector or undue market distortion", also because "consumers have widespread affordable access to mobile communications services" and therefore the Commission concludes that "there is no risk of social exclusion and no need to include those services in the universal service obligations" (European Commission, 2011).

16 Digital Connectivity is considered as a social right in the EU: see https://composite-indicators.jrc.ec.europa.eu/social-scoreboard/.

17 Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive).

The stance taken by the Commission does not impede Member States to include broadband connections in their national universal service obligations, as it occurs for Finland, Malta and Spain, that have provided for a minimum broadband speed in national law (European Commission, 2011).

In this respect, in a 2015 case, the European Court of Justice recognized the possibility that special tariffs and the financing mechanism provided for in Articles 9 and 13, par. 1(b) of the Universal Service Directive (Directive 2002/22/EC) apply to internet subscription services requiring a connection to the Internet at a fixed location (but not to mobile communication services). Member States may therefore legitimately provide the internet access as a universal service, falling within the relevant definition pursuant to the EU law (ECJ, case C-1/14).

More recently, the Commission has (again) changed its view and decided to put forward a proposal to modify the EU legislation on universal service within the Proposal establishing the European Electronic Communications Code (European Commission, 2016).

On 17 December 2018, Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast)[18] and Regulation (EU) 2018/1971 of the European Parliament and of the Council of 11 December 2018 establishing the Body of European Regulators for Electronic Communications (BEREC) and the Agency for Support for BEREC (BEREC Office), amending Regulation (EU) 2015/2120 and repealing Regulation (EC) No 1211/2009 were published on the Official Journal.

In the Explanatory Memorandum accompanying the Proposal for a Directive, the Commission, after having outlined the potential positive effects that universal connectivity may bring to the single market, to the territorial cohesion and to ability of undertakings to produce in an efficient way and to provide innovative and competitive services, recognizes that "[c]onnectivity can play an essential socioeconomic role in preventing isolation and depopulation and in linking peripheral with central regions of the EU", even if "[t]he situation of Member States with regard to connectivity differs quite significantly" (European Commission, 2016: par. 2).

The same Explanatory Memorandum points out that the Proposal complements existing sector-specific regulation and it is coherent with Directive 2014/61/EU (Broadband Cost Reduction Directive), with which it provides a comprehensive set of rules facilitating the roll-out of broadband infrastructures (European Commission, 2016: par. 1).

18 The new European Electronic Communications Code entered into force on 20 December 2018. According to Article 124 of such Directive, "Member States shall adopt and publish, by 21 December 2020, the laws, regulations and administrative provisions necessary to comply with this Directive".

The new Code – as stressed in the Proposal's Explanatory Memorandum – "aims at modernising the universal service regime […] focusing on the basic universal service broadband, which would be defined by reference to a dynamic basic list of online services usable over a broadband connection". The Commission added that the intervention of Member States "should focus on affordability of available connectivity rather than on the deployment of networks, for which better tools exist" (European Commission, 2016: par. 5). The introduction of a universal service "ensure that all consumers have access at an affordable price to an available adequate broadband internet access […]" (whereas 214, Directive 2018/1972).

In the light of such framework, Article 84 (on "Affordable universal service"), par. 1, Directive 2018/1972 lays down that "Member States shall ensure that all consumers in their territories have access at an affordable price, in light of specific national conditions, to an available adequate broadband internet access service and to voice communications services at the quality specified in their territories, including the underlying connection, at a fixed location"[19].

Unlike the Proposal, the new Code makes provision for a specific commitment for Member States. In fact, Article 79, par. 1, of the Proposal laid down that Member States "ensure that all end-users in their territory have access at an affordable price […] to available functional internet access and voice communications services at the quality specified in their territory, including the underlying connection, at least at a fixed location".

According to Article 84, par. 3, Directive 2018/1972 each Member State has to define "the adequate broadband internet access service for the purposes of paragraph 1 with a view to ensuring the bandwidth necessary for social and economic participation in society". Such a definition is however not without constraints, given that it has to be done by Member States "in light of national conditions and the minimum bandwidth enjoyed by the majority of consumers within the territory of that Member State, and taking into account the BEREC report on best practices" (Article 84, par. 3, as well as whereas 219, Directive 2018/1972).

This will significantly delay the social and economic participation to the society by some Member State users (for instance the Italian ones), taking into account the recent data published by the EU Commission on the implementation of fast and ultra fast broadband[20].

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19 An "affordable price" means "a price defined by Member States at national level in light of specific national conditions": whereas 219, Directive 2018/1972.

20 According to the Digital Economy and Society Index (DESI), domestic report on Italy 2018, as far as connectivity is concerned (that embraces different indexes, among which "Fixed Broadband Coverage ", "Ultrafast Broadband Coverage") Italy has an overall score equals to 52,8, ranking at 26th among the EU Member States. This report is available at https://ec.europa.eu/digital-single-market/en/scoreboard/italy. The Digital Economy and Society Index "is a composite index that summarises relevant indicators on Europe's digital performance and tracks the progress of EU Member States in digital competitiveness": https://ec.europa.eu/digital-single-market/en/desi.

With the aim of ensuring affordable universal services, Article 85, par. 2, Directive 2018/1972[21] empowers Member States, with regards to consumers with low-income or special social needs, including older people, end-users with disabilities and consumers living in rural or geographically isolated areas, to take appropriate measures. In this respect, Member States can provide those consumers with direct support for communication purposes, which could be part of social allowances or vouchers for, or direct payments to, those consumers. Alternatively, or in addition, Member States could require providers of such services to offer basic tariff options or packages to those consumers (whereas 219, Directive 2018/1972; European Commission, 2016: par. 5).

In accordance with the principle of subsidiarity, it is for the Member States to decide on the basis of objective criteria which undertakings are designated as universal service providers (whereas 231, Directive 2018/1972).

Article 90 of the new Code (Directive 2018/1972)[22] makes provision for the financing of universal service obligations.

In the light of those EU initiatives, Italy is implementing broadband internet access as a universal service (Italian Media Safeguards Authority, 2016 and 2017).

However, smart cities are not only a massive digital infrastructure (Hollands, 2008: 310, 316). Ensuring broadband connectivity does not suffice, given that a system of public connectivity (SPC), similar to that envisaged in Italy[23], seems to be necessary, as urban policies shall ensure, among other things, social and territorial cohesion, the broadband SPC is of paramount importance for the social inclusion. This is the reason why the SPC should be provided in all public urban spaces (e.g. parks, squares, streets).

A similar system has been developed in some European cities, like Geneva, where, for several years, the local government has been allowing city-users (and therefore not only citizens) to have access to the local wi-fi network for free. Such a network – identified as "((o)) Geneve Ville" – covers a number of public urban spaces, among which squares, parks, and more in general areas managed by the City. To get access to the network, users only need to go through an identification process. This process consists in obtaining a code via sms through a mobile (also pre-charged) local number. Once the request has been submitted and the user registered (this registration lasts six months) the connection operates automatically[24].

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21 The same provision was included in the Commission's Proposal (European Commission, 2016: Article 80).

22 The same provision was included in the Commission's Proposal (European Commission, 2016: Article 85).

23 The system is regulated by Articles 72 ff. of Legislative Decree 7 March 2005, No 82. The SPC is a network that connects Italy's government agencies, allowing them to share and exchange data and information resources.

24 On such a system see http://www.geneva.info/free-wifi/, as well as http://www.ville-geneve.ch/themes/environnement-urbain-espaces-verts/acces/.

Within this perspective, ensuring consumers with low-income or special social needs to have effective access to the Internet is instrumental to avoid social exclusion of those people[25]. In this respect, Directive 2018/1972 lays down an obligation on Member States, which "shall ensure that all consumers in their territories have access at an affordable price" (Article 84, par. 1). The main issue stemming from this provision is that Member States have to provide that access in light of their "specific national conditions" (Article 84, par. 1), with the consequence that – very likely – the access conditions may significantly vary from State to State, thereby determining social discriminations.

3.3. Digital divide

The most important (if not outright decisive) obstacle to the full implementation of smart cities is digital divide (or digital skills or literacy or awareness).

The expression "digital divide" was coined to underline the fact that disparities in access to and proficiency in ICT – especially between socio-economically advantaged and disadvantaged children – may threaten social and national cohesion, as they impede full participation in work and reduce political efficacy for population groups that are left behind on the analogue side of the divide (OECD, 2015:124).

As has been outlined by the Organisation for Economic Co-operation and Development (OECD), digital inequality refers to differences in the material, cultural and cognitive resources required to "to make good use of ICT" (OECD, 2015:124; OECD, 2001).

The European Commission points out that "[p]eople's enjoyment of digital technologies, be it as citizens, consumers or workers, is marred by privacy and security concerns, by insufficient internet access, insufficient usability, by lack of relevant skills or by lack of accessibility for all" (European Commission, 2010b: par. 1).

In the flagship initiative "A digital agenda for Europe", the Commission stresses the necessity to "promote internet access and take-up by all European citizens, especially through actions in support of digital literacy and accessibility" (European Commission, 2010a: 15-16; European Commission, 2010b: par. 2.4). The aim set by the Commission "is to deliver sustainable economic and social benefits from a Digital Single Market based on fast and ultra fast internet and interoperable applications, with broadband access for all by 2013, access for all to much higher internet speeds (30 Mbps or above) by 2020, and 50% or more

25 According to the definition by the European Commission, social exclusion "is a process whereby certain individuals are pushed to the edge of society and prevented from participating fully by virtue of their poverty, or lack of basic competencies and lifelong learning opportunities, or as a result of discrimination. This distances them from job, income and education opportunities as well as social and community networks and activities. They have little access to power and decision-making bodies and thus often feeling powerless and unable to take control over the decisions that affect their day to day lives" (European Commission, 2004: 10).

of European households subscribing to internet connections above 100 Mbps" (European Commission, 2010a: 15-16; European Commission, 2010b: par. 1).

The fight against the digital divide cannot be won ensuring that only fifty percent of European households subscribe internet broadband connections.

It is not clear the destiny of the other fifty percent of European families; it is likely that those people will continue to live as if the online environment was none of their business.

However, over the last decade the number of European people that have never used the Internet has decreased.

According to data published by the EU Commission, in 2010, 150 million Europeans – some 30% – had never used the internet, because "they have no need" or because "it is too expensive". As has been outlined by the Commission, "[t]his group is largely made up of people aged 65 to 74 years old, people on low incomes, the unemployed and the less educated" (European Commission, 2010b: par. 2.6).

In 2017, 43% of the EU population had an insufficient level of digital skills, while 17% of the EU population had no digital skills at all, the main reason being that they did not use the internet or did so only seldom (DESI - Human Capital, 2018: 8).

In an historic phase in which the ageing rate is high (and also the demand of goods and services related to such phenomenon, including the health and welfare provisions, are consistently increasing), the importance and the social functions of *e-learning/e-education*, of *e-government*, or the chances offered by *e-health* (including telerescue and domotics) for the improvements of quality life or, in some cases, to make a decent life possible and true are evident (European Parliament, 2017a: whereas E) and F)).

The issue of digital illiteracy is crucial also taking into account other internet-use related aspects (e.g. *e-commerce*), as more and more daily tasks "are carried out online, from applying for a job to paying taxes or booking tickets, using the internet has become an integral part of daily life for many Europeans" (European Commission, 2010b: par. 2.6).

The European Commission outlines that "[b]ridging this digital divide can help members of disadvantaged social groups to participate on a more equal footing in digital society (including services of direct interest to them such as eLearning, eGovernment, eHealth) and to tackle their disadvantage through increased employability" (European Commission, 2010b: par. 2.6). And this is the reason why digital competence is one of the eight key competences which are fundamental for individuals in a knowledge-based society (European Commission, 2010b: par. 2.6).

However, EU citizens expectations are frustrated, as ICTs do not deliver their promise of better public services, as pointed out by the European Commission (European Commission, 2010b: par. 1).

It is therefore clear that the digital divide problem cannot be solved merely with the internet connection (that concerns access (in)equalities), given that, as stressed by the OECD, "[e]qual access […] does not imply equal opportunities (equity)" (OECD, 2015: 125). In this respect, the OECD outlines that "even when opportunities to learn about the world, practice new skills, participate in online communities or develop a career plan are only a few clicks away, students from socio-economically disadvantaged backgrounds may not be aware of how technology can help to raise one's social status" (OECD, 2015: 125). However, equal access represents an essential pre-requisite for the digital literacy in the strict sense (that concerns digital use) of all.

An e-society cannot exist irrespective of the full overcome of the digital divide.

4. Some proposals. Internet access and digital literacy and awareness as fundamental rights

So far digital divide and internet access issues have not been properly addressed at the European Union level, and there are large discrepancies among Member States.

This is clearly shown by recent data published by the European Commission (DESI, 2018), according to which different cluster of countries can be identified. Some countries are high-performing (like Finland), but many belong to the low-performing cluster of countries (namely: Romania, Greece, Bulgaria, Italy, Poland, Hungary, Croatia, Cyprus and Slovakia) (DESI - Italy, 2018: 2). In particular, there are large disparities across EU Member States in terms of use of Internet services. In some States (Romania, Bulgaria and Italy) the use of internet services is very low (DESI – Use of Internet services, 2018). These disparities are identified also with regards to the connectivity dimension, where some States (Romania, Greece, Bulgaria and Italy) have the lowest scores on the index.

Ultrafast broadband is available in 57% of European homes. Also in this regards, disparities among Member States are significant, as in Malta, the Netherlands, Belgium and Portugal more than 90% of homes have access, while in Croatia just over 30%, in Italy only 20% and in Greece such networks do not yet exist (DESI – Connectivity Broadband, 2018).

Wide discrepancies among Member States exist also with regards to digital public services (DESI – Digital public services, 2018)[26], as 14 Member States

26 According to the Report, the digital public services dimension consists of six indicators: the eGovernment users measured as a percentage of those internet users who need to submit forms to the public administration (the eGovernment users indicator); the extent to which data that is already known to the public administration is pre-filled in forms presented to the user (the pre-filled forms indicator); the extent to which the various steps in dealing with the public administration can be performed completely online (the online service completion indicator); the degree to which public services for businesses are interoperable and cross-border (the digital public services for businesses indicator); the government's commitment to open data (the open data indicator); and the percentage of people who used health and care services provided online without having to go to a hospital or doctors surgery (the eHealth services indicator) (DESI – Digital public services, 2018: 3).

(including Croatia) are above the EU average (58.5%), while Italy, the Czech Republic, Greece and Germany perform below 40%.

Also data regarding digital skills are impressive, given that, as we have already noted above, in 2017, 43% of the EU population had an insufficient level of digital skills, and 17 % had none at all, as they did not use the Internet or barely did so (DESI – Human capital, 2018: 8).

Compared to 2016, the share of EU citizens without basic digital skills went down by 1% (to 43%). There are still major disparities across Member States. According to such data, the share of people with at least basic digital skills ranges from 29% in Bulgaria and Romania to 85% in Luxembourg and 79% in the Netherlands (DESI – Human capital, 2018: 8).

The European Commission notes that "these figures imply serious risks of digital exclusion in a context of rapid digitisation" (DESI – Human capital, 2018: 8). Moreover, a recent study has highlighted that "[a] lower education level explains a considerable proportion of mortality risk, although with differing effects by geographical area and cause of death*"* (Petrelli, Frova, 2019: 12).

In the light of such data and studies, it would be necessary to undertake different actions, having not only infrastructural character, but also – and above all – educational nature, aiming at promoting a widespread awareness of digital technology.

In this respect, it is entirely sharable the stance taken by the EU Parliament, which recommends to the EU institutions and Member States "to invest in digital literacy and awareness-raising about digital rights, privacy and data protection among citizens, including children" (European Parliament, 2017b: point 4)[27]. Similarly, the Council of Europe (2017: point 9) recommends that, "[t]o help individuals understand the implications of the use of information and Personal Data in the Big Data context, the Parties should consider information and digital literacy as an essential educational skill" (Council of Europe (2017: point 9). Moreover, various reports have been issued by the United Nations that refer to the Internet as a human right and promote active intervention by public authorities and states in order to achieve access to the Internet for all (Pollicino, 2019).

A significant intervention of public powers is, therefore, necessary and smart cities represent the opportunity to lower the number of people excluded from enjoying technologies and the digital society. In this respect, the European Commission observes that "[t]he digital society must be envisioned as a society with better outcomes for all. The deployment of ICT is becoming a critical element for delivering policy objectives like supporting an ageing society, climate change, reducing energy consumption, improving transportation efficiency and mobility, empowering patients and ensuring the inclusion of persons with disabilities" (European Commission, 2010b: par. 2.7). In this perspective,

27 The statements specifically regard big data, but can be expanded to cover the digital education in general.

some scholars outline that “technology has to be utilizable and understandable by the communities that it is supposed to serve […], and that ordinary people and communities need to have the skills necessary to utilize ICTs” (Hollands, 2008, 310; Evans, 2002).

The public intervention required to achieve those objectives cannot be conceived to increase digital skills for innovation and growth only[28], but it should have the improvement of quality life as a primary objective. Such improvement goes especially through the social inclusion[29], which includes access for all citizens to basic resources, social services, the labour market and the rights “necessary to participate fully in economic, social and cultural life and to enjoy a standard of living and well-being that is considered normal in the society in which they live” (European Commission, 2004: 10; Barca Report, 2009, 29).

Social inclusion policies “should focus so far as possible on those factors that are outside the control of the individual” (Barca Report, 2009, 30) and, as such, requires public interventions (*exogenous interventions*) (Barca Report, 2009, 32).

This clearly shows as broadband internet access and digital literacy are fundamental rights (Frosini, 2015), as those at risk of poverty and social exclusion must be put in condition to “gain the opportunities and resources necessary to participate fully in economic, social and cultural life” (European Commission, 2004: 10). In this respect, the social inclusion through broadband internet access and digital literacy plays a crucial role, as it “ensures that they have greater participation in decision making which affects their lives and access to their fundamental rights” (European Commission, 2004: 10). A lack of intervention of public bodies may lead to a breach of Article 14[30] of the European Convention of Human Rights (ECHR)[31] – and Article 1[32] of its Protocol No. 12[33] – where it is referred to the expression “other status”, which the European Court of Human Rights has interpreted widely, to be considered as a “personal” and/or “social” condition (European Court of Human Rights, 2010: par. 70; European Court of Human Rights, 2009: para. 53-54).

28 This is instead the rationale of the European Commission (2010b: par. 2.6.1).

29 Social inclusion has been defined as the “extent to which, with reference to multidimensional outcomes, all individuals (and groups) can enjoy essential standards and the disparities between individuals (and groups) are socially acceptable, the process through which these results are achieved being participatory and fair” (Barca Report, 2009: 29-30).

30 According to which “The enjoyment of the rights and freedoms set forth in this Convention shall be secured without discrimination on any ground such as sex, race, colour, language, religion, political or other opinion, national or social origin, association with a national minority, property, birth or other status”.

31 Signed in Rome on 4 November 1950 and intered into force on 3 September 1953.

32 According to which “The enjoyment of any right set forth by law shall be secured without discrimination on any ground such as sex, race, colour, language, religion, political or other opinion, national or social origin, association with a national minority, property, birth or other status”.

33 Signed in Rome on 4 November 2000 and intered into force on 1 April 2005.

5. Conclusions

The advantages offered by the smart city model come with some challenges. Different obstacles hinder the development of smart cities, among which financing, access infrastructures, both digital and physical, digital divide.

Each of those factors affects, at different degrees, the implementation of the smart city idea. Those challenges have not been properly handled at the European Union and domestic levels, and large discrepancies exist among Member States.

The underlying problem, common to all the above-mentioned limits, is based on a balancing of conflicting interests. On one hand, the necessity that all may enjoy technology and the digital society – with the aim of fostering social and territorial cohesions (making the exercise of fundamental rights possible) and thereby overcoming or significantly reducing inequalities – entails the strengthening and further development of multilevel digitalization policies.

On the other hand, the different risks stemming from technology (digital divide), that can jeopardize primary goods (social inclusion), require to slow down the development of digitalization policies, at least until those risks can be deemed as acceptable. As has been pointed out by the EU Commission, judging what is an "acceptable" level of risk for society is an eminently political responsibility. Decision-makers faced with an unacceptable risk and public concerns have a duty to find answers (European Commission, 2000: point 5)[34].

Specific and appropriate multilevel legislative/regulatory solutions are therefore required. Those solutions shall balance different (if not opposite) interests (on one side, public/State and, on the other side, private/market) in a way not to leave the public sphere playing a mere marginal role, thereby jeopardizing the public interest(s).

34 Although this communication refers to scientific uncertainty and the precautionary principle, it may be deemed as having a broader reach.

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CHAPTER 4

Macro-evaluations contribution to greater accountability of policy impacts assessments in Europe (EU member states administrations overview and practice)

Filip Hrůza[1], Stanislav Volčík[2]

ABSTRACT

With increase of complexity in global economies demands on good governance and evidence-based policy-making are continually growing. To be able to understand to the complex space of flows and processes and to respond appropriately within various ways of policy-making, growing usage of macroeconomic evaluation and methods are recognized both in academics and public administration practice. The mainstream seems to be focused prevalently on European funds and associated issues. However, current practice shows much wider use. The aim of this paper is to explore the usage of such very specific approaches and analytical tools by European public administrations nowadays and to identify and describe its contributions to their policy evaluations. The main methods used for the purpose of this paper are literature review, descriptive analysis and content analysis. The contribution and originality of this paper is in gathering and completing the picture about macroevolutions use by public administration bodies across Europe for evidence-based policy-making based on available knowledge and information (secondary data) and from own experience (primary data). The paper also tries to answer what lessons public administration are and can possibly be learned when using such evaluation techniques. The outcomes of the research show various usages of macroevaluations from many perspectives (purpose, institutional background, modelling approach, deepness, policy recommendations etc.). Therefore current practice shows that different evaluation tools provide different outcomes so each tool enriches policy-makers with different point of view when assessing particular public policy or programme. The paper provides descriptive policy view on the use of macroevaluations.

Key words: Macroevaluations, Policy-making, Public administration, Modelling, Impact.

JEL classification: C50, F62, J18

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1. Introduction

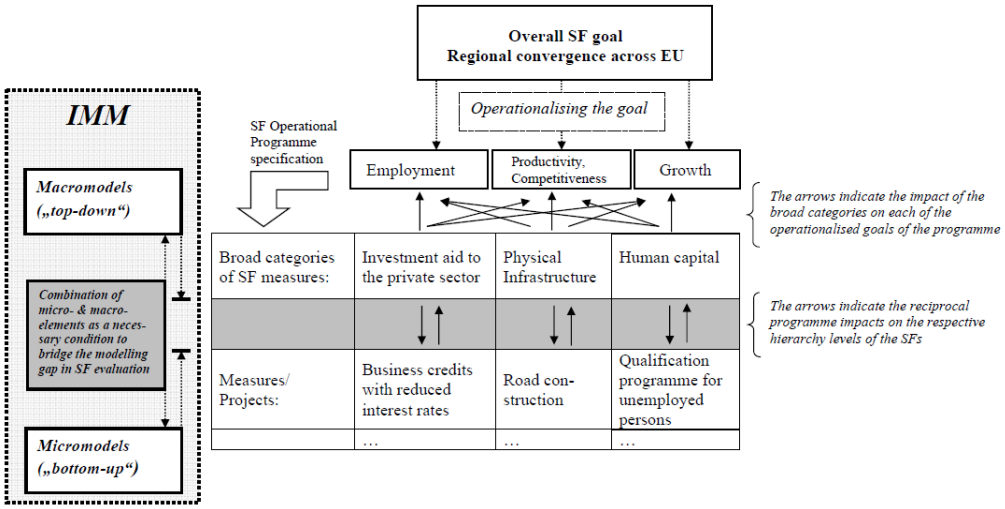
The definition of macroevaluations in this paper involves tools starting from basic econometric tools and finishing by specific macroeconomic modelling (DSGE etc…). The use of macroevaluations in research as well as in practice is wide: evaluation of effects or impacts of different national or international public policies, structural reforms or any public interventions. Model outcomes provide to policy-makers unique and very specific view of how planned and targeted interventions could possibly influence the economics from the macroeconomic perspective, unlike the microevaluations which provide more focused detail on effects and imacts of the interventions but lack global perspective. Based on current experience there is no ideal method or approach and the use of both approaches outcomes together is the ideal way to complete the puzzle of the impact evaluation as much as possible while achieving the accountability in policy-making. But the current development in policy evaluation practice show greater emphasis and use of microevaluations, mainly because of its easily readable and usable outcomes within various policy-making processes in comparions with macroevaluations which development, maintenance and interpretation potential is more complicated and demanding. Therefore we can see over the EU very different stages of evaluation culture from this perspective and different practice. According to Bradley et al. (2005) when large-scale public policy or investment programmes are realized and also evaluated, different modelling tools are required to identify and assess the micro and macro policy impacts towards the improvement of the evaluation process and decision-making process in the public sector at all. Eriksen and Qvigstad (1985) were already talking about the way the macroeconomic models are directly integrated in the administration as they are considered useful and integral part of economic policy administration within the daily routines of the relevant administration (identified and demonstrated on the case of Norway and its Ministry of Finance to the given period).

The current development of macroevaluation use in practice by european national public institutions is prevalently focused on the European Structural and Investment Funds effects and impacts on their economies or their parts. According to the specific topics and issues beeing solved and the methods and tools used by the national administrations there can be seen strong direct or in-direct influence by European Commission which has its own approach to this specific issue. Firstly, the model QUEST is developed and maintained by DG ECFIN, secondly, the model RHOMOLO is developed and maintained by DG JRC. The outcomes of these models are regularly the parts of EC reports and other relevant publications analyzing EU policies and ESIF use. Furthermore, these models outcomes can be outsourced by EU member countries administrations to achieve the accountability concerning the use of ESIF in particular EU member state. But the current practice also shows that there are different approaches to this issue more or less specific (econometrics, HERMIN, etc…).

There are also different forms of use of models and their outcomes: 1. own model-own outputs (Bulgaria, EC, Poland etc.); 2. used model-own outputs (Czech Republic etc.); used model-used outputs (Slovakia etc.). This practice is usually influenced also by the fact whether the model is derived and adjusted to country specifics (eg. HERMIN, QUEST…) or the country administration uses own original model (eg. ITEM, SIBYLA…).

Different approaches are associated with different costs and benefits from the perspective of variability, knowledge, experience, finance, expertise level etc… Therefore we can on one side identify those countries where macroevaluations are not used at all or just occasionally and on the other side countries wheher macroevaluations are integral part of traditional evaluation techniques in public policies assessments (eg. Denmark, Germany, Great Britain etc…).

Figure 1: Integrated Micro- and macro approach (IMM) for EU Structural Funds (SF) analysis



Source: Bradley et al. (2005)

The aim of this paper is to explore current state of usage of such very specific approaches by European public administrations and to identify and describe its contribution to their policy evaluation by sheding the light and completing the picture about use of macroevaluations by public administration bodies within the EU.

2. Literature review

The use of macroevaluations can be identified in following main specific policy fields: structural reforms, partial policy changes, macroeconomic predictions, ESIF and other financial tools belonging to the EU budget.

2.1. Structural reforms

Varga et. al. (2013) are developing a semi-endogenous growth model for analysing the intertemporal effects of structural reforms in Southern European countries (Italy, Spain, Portugal and Greece), meanwhile the results show that structural reforms yield significant economic gains in the medium and long run. Vogel (2011, 2012a) used model QUEST to assess the impact of structural reforms on external positions in monetary union.

2.2. ESIF

Assessment of ESIF and other financial tools belonging to the EU budget and their impacts on economy has been long time the subject of number of research and analysis. First assessments and analysis of ESIF´s and their impact on economics revealed within 1990s. Gaspar and Pereira (1992) or Fuente et. al. (1995) analysed the impacts of structural funds and cohesion policy in EU. Then Dall´erba and Galo (2003) or Cappelen et al. (2003) dealt with evaluation of structural funds impacts in terms of convergence of regions. Previously mentioned analysis were using econometric methods and thank to the methods used they confirmed the significant positive impact of the structural funds on the economic performance of the examined regions. Mohl and Hagen (2009, 2010) in their evaluation of EU funds impacts enrich the existing knowledge by regional decay through the application of data sets with NUTS2 territorial units, differentiation of EU financial flows according to individual sub-objectives or the inclusion of spatial spill effects between regions. The main stream of the relevant literature is identifying or estimating positive effects of structural funds or the Cohesion Fund through the partial influence of existing macroeconomic conditions and institutional or political environment (Guillaumont and Chauvert 1999, Martin 2003, Cappelen et al. 2003, Marzinotto 2012) or other relevant variables like research, development, innovation and transport infrastructure (Ferrara et al. 2017) or through productivity improvements (Varga and in ‘t Veld 2011a, Varga and in ‘t Veld 2011b). Some other studies have pointed out the positive impact of SF on economic growth with moderate effects on convergence between countries or regions (Pellegrini et al., 2013, Maynou et al., 2014) or some other with different estimated extent of impacts on different levels, eg. regional and national (Bouayad-Agha 2013). On the other hand there has been also stream of research and analysis which did not confirm the positive impact of EU funds on particular national or regional economies, usually by identifying the potential or hypothetical relationships associated with drawing of EU funds not significant (Dumciuviene et al. 2015, Brzakova and Kraft 2017), or identified rather neutral or even negative impact (Vyrostova 2016).

Apart from econometric analysis also structural macroeconomic models are used to evaluate the impact of EU funds on GDP growth, level of investment, the dynamics of the labour market and labour productivity, etc. For example, HERMIN prevalently used in past, or recently used models QUEST

and RHOMOLO, which provide the view on the impact of EU funds from a different angle (Mogila et al. 2010, Bradley and Untiedt 2012). Džupka and Hudec (2008) evaluated the influence of SF at the regional level of Slovakia using the HERMIN model. Zaman (2008), in case of Romania, assessed the impact of the SF on the development of foreign trade at various levels of the drawdown absorption using the HEROM model and concluded strong impact on export. According to the results of the model, the GDP per capita in 2020 should achieve 75-80% of the EU-27 average as a result of SF spending, which means 15 precentage points higher value than with the scenario without SF. Fortuna et al. (2016) analyzed the impact of the EU funds on the Azores region in terms of GDP, employment and family welfare in different income groups, using the AzorMod computational model of the general equilibrium (so-called CGE model). The impact simulation of EU fund revenues reduction within the period 2002-2013 showed that there would be a steady fall in demand, private and (especially) public consumption, which would be reflected by the immediate fall of GDP by almost 2%. Varga and in't Veld (2009, 2011b) conducted an analysis of the impact of EU Cohesion Fund spending in 2000-2006 through the enhanced QUEST III R & D model. Based on the simulations, they showed the effect on GDP for the 27 member states during the examined period and also pointed out its usefulness for economic growth through the disintegration of the Cohesion Fund on the individual sub-categories (so-called intervention areas).

2.3. Other

The experience of other authors shows also on other purposes of use such models. Pataracchia et al. (2013) works with DSGE model for analysing housing sector, Roeger W. and in 't Veld J. (2013) use DSGE model to analyse the costs of higher socereign risk premia or Pagano et al. (2012) work with DSGE model factors affecting economic inbalances. Raciborski et al. (2012) with the help of DSGE model studied the impact of a securities transaction tax (STT) on financial trading, stock prices and real economic variables. Roger et al. (2010) with the use of QUEST model evaluated the effect of fiscal consolidation changes on the German economy. Varga, and in't Veld (2011) through DSGE modelling proceeded the assessment of potential macro-economic impact of fiscal transfers.

3. Methodology/Method/Model/Conception of analysis

The nature of this research determines the research methods used in this paper, which are based on either primary data (structured interviews or questionnaires) or secondary daty (literature review). The reason of choosing both type of data and methods was that the examined space is very heterogenous and we wanted to complete the picture about specific field of evaluations where the practice differs case by case, country by country. The sample was defined by relevant national public administration bodies which are expected to use such

methods or approaches according their specific agenda (Government Office, Ministry of Finance, Ministry of Economy, Ministry of Regional Development, Ministry for EU funds and other relevant), but we are aware of limitations of this sample according to the fact that in certain countries we can identify also other type of bodies which are not primarily focusing on economics and finance within their core agenda but where the evaluation and policy culture is well developed and in their cases there could be also identified the use of macroevaluations. The structured questionnaire was directed to relevant national administration bodies where we were able to find relevant direct contact or if not, we contacted the front desk office. As we started to address the offical public administration bodies within the May 2019, we are still in the process of gathering the data so the outcomes presented in this paper are not final yet and will be updated.

4. Empirical data and analysis

From the primary and secondary data analysis we found out that the main fields in which the macroevaluations are used by public administration institutions are structural reforms, policy evaluations, macroeconomic predictions or eventually also ESIFs. As the structural reforms were mostly identified among the areas analysed by macroevaluations, the more in-depth research revealed the main issues as various policy fields, eg. taxation, subsidy scheme, fiscal consolidation etc. From our own experience we also focused our research perspective on how (in which mode of processing) the macroevaluations are processed for the purpose of public administration practice? The empirical findings from both type of sources show that all the variety is used ranging from completely in-house to completely outsourcing, but the option of partly in-house (own employees, not own model) is prevailing, followed by complete out-sourcing and last but not least completely in-house. It is logical because to maintain this very specific analytical ability completely in-house, it demands very high not only investment but also operating costs. If the government wants to dispose of this unique analytical capabilities it requires to hire and keep high-profile employees with strong relevant macroeconomic or DSGE modelling experience and build or buy relevant model which the employees will be able to not only develop but also maintain in the long term. Because of these high demands and standards the public administrations usually choose rather the mixed models and the usual frequency is occasional (in relation to a specific goal or request).

The frequency of using such (evaluation) methods or its outcomes in public administration is often determined also by the level of its obligation within the complex process scheme (administrative, legislative or regulatory processes or frameworks) or the administrative culture. Based on the analysis we can distinguish two main groups. First group contain those cases where the use of macroevaluations is non-binding or for the purpose of ad-hoc analysis. The latter group is represented by those administrations where the use of macroevaluations is demanded by other processes or administrative or management aspects as mentioned previously. From the available examples we can identify

following cases like a part of the budgeting process (evaluation of policy outcomes/outcome targets) or part of the regulatory process (RIA). As the macroevaluation analytical approach is quite specific the potential benefits or also disadvantages perceived by the public administration representatives could play crucial role in their motivation to work with such methods or their outcomes and therefore to support them as individual methodological approach within the whole system of public administration methods and tools used to plan, manage, control or evaluate to reach the main goals of the government and the administration.

In the following part we tried to shed the light on the motivation to use these methods and tools. The main arguments in favor of this approach were defined as the improvement (evidence based) of policy formulation and legislation, getting macro results, providing extra insight into the process, the knowledge of the impact of envisaged measures, getting bigger picture on the impact of ESIF implementation to potentially adapt interventions or to inform general public with state of the play of ESIF implementation. Among the disadvantages or limits were identified following arguments: The users of simulation results may not understand that every simulation depends on many assumptions and do not fully understand how to interprete the results. Results are simplified into a single number (or a bunch of them), disclaimers get lost along the way. We may perceive accuracy and the scope of outcomes. Namely, the connection between ESIF monitoring data and collection and monitoring of data connected to wider socio-economic context is still missing, i.e. needs to be developed yet. Therefore, until the proper link between two systems is fully established, accuracy and reliability of outcomes is uncertain.

Last but not least was the analysis of the potential cooperation in this specific field which requires higher level of expertise between public administration practice and university research. From the responses received and through the analysis of secondary data we identified this type of collaboration frequent on occasional or regular basis.

Table 1: Country overview

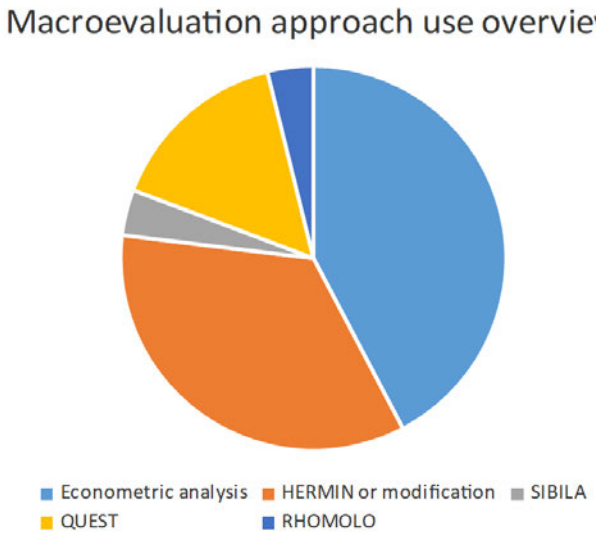
Country	Institution (Year)	Model used	Period analysed
Albania	Central Bank	Econometric analysis, Keynes expanded model	1992-2001
Austria	The Federal Ministry for the Civil Service and Sport (2019)	basic econometric analysis (e.g. panel regression analysis), Different approaches	
Bulgaria	(2012)	SIBILA (inspiration from HERMIN, QUEST or ECOMOD)	2014-2020
Czech Republic	Ministry for Regional Development (2006)	HERMIN	2004-2006
	Government Office (2017)	Econometric analysis	2004-2015
	Government Office (2018)	QUEST, RHOMOLO	2007-2016
Denmark	Ministry for science, innovations and education (2014)		
	Danish Agency for Science, Technology and Innovations (2011)	Difference in differences	
	Danish Agency for Science, Technology and Innovations	Regression (probit model)	
Estonia	Ministry of Finance (2006)	HERMIN	2004-2006
Germany	Regional Government of Saxony-Anhalt	HERMIN	2000-2006
	Ministry of Finance (2010)	HERMIN	2000-2020
Great Britain	Ministry of Finance (2010)	Regression	
	Ministry of Finance (2013)	Difference in differences	
Holland	Ministry of Finance (2016)	Econometric analysis	
Italy	Ministry of Finance (2001)	HERMIN	2000-2006
	Ministry of Finance (2011)	QUEST III	
Lithuania	Ministry of Finance (2011)	HERLIT	2004-2006 2007-2013
	Ministry of Finance (2016)	Econometric modelling	2007-2015
	Ministry of Finance (2017)	Econometric modelling	
Latvia	Ministry of Finance (2007)	HERMIN	2004-2006, 2007-2013
	Ministry of Finance (2008)	Adjusted HERMIN	2004-2006, 2007-2013
	Ministry of Finance (2011)	HERMIN	2004-2006, 2007-2013
Hungary	Central Bank (2017)	Propensity score model, Neyman-Rubin causal model, probit model	

Malta	Ministry of Finance (2015)	Econometric model	
Poland	Ministry of Finance (since 2002 on regular basis)	HERMIN	
Portugal	Ministry of Finance (2017)	QUEST III	
Romania	Ministry for EU Funds (2014)	R-GREM and HEROM	2014-2020
Slovakia	Government Office + Academy of Science (2016)	HERMIN	2007-2015
Slovenia	The Institute of Macroeconomic Analysis and Development of the Republic of Slovenia (2019)	basic econometric analysis (e.g. panel regression analysis), QUEST, LMM	
Sweden	Ministry of Finance + National Institute for Economic Research (2015)	Models overview	

Source: Authors

The analysis also showed that main concrete macroevaluation methods used by public administration are prevalently basic econometric analysis followed closely by HERMIN and its modifications (HERLIT, HEROM etc.). The model QUEST is also frequently used. The rest of methods were identified as marginal as you can see from the figure 2.

Figure 2: Macroevaluation approach use overview



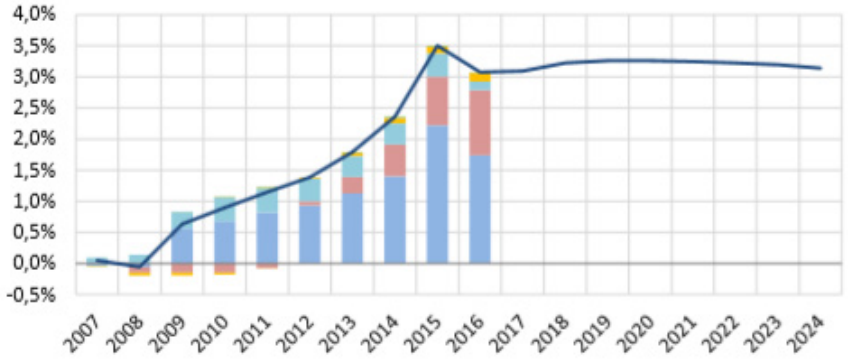
Source: Authors

Based on the primary and secondary data and information it can be identified that various research studies and analysis based on the macroevolution principles are realized in the academic environment or the public administration institutions such as the official EU institutions (DG JRC, DG REGIO, DG ECFIN) or by official public institutions of EU member states. One of the most recent examples of such outcomes prepared by EU institutions is Monfort et al. (2017)

using the QUEST III model to assess the impact of structural funds on GDP, trade balance, labor productivity or real wages of individual EU countries. The Ministry of Finance of Latvia (2007) prepared an ex post analysis of the macroeconomic impacts of the EU funds for the 2004-2006 programming period and an ex-ante analysis for the period 2007-2013 with the use of five-sector HERMIN model. For example, there we identified the effects on aggregate demand of 2.4-4.5% of GDP and on aggregate supply 1-6.5% of GDP over the period 2004-2006.

In the Czech Republic, evaluation studies focusing on monitoring and process evaluations are still predominant and studies using quantitative or model methods are not very frequent. The last mentioned approaches are for example in the Czech case by Kejak and Vávra (1999) or MMR (2006). In the first mentioned paper, the authors modified the HERMIN model for the conditions of the Czech Republic in order to evaluate different alternatives of the development of the Czech economy during the 2000-2006 programming period. The goal of this study was to identify the impacts of EU funds on the macroeconomic development of the Czech Republic through expenditures on physical infrastructure (therefore eg. investments in human capital or direct public aid to the private sector were not the subject of this analysis). In another mentioned case MMR (2006) used the HERMIN model for the ex-ante evaluation of the programs' impacts on the macroeconomic situation in the Czech Republic during the 2007-2013 programming period. As can be seen, quantitative studies on the evaluation of EU funds impact are still scarce in the Czech Republic. We are currently finishing the project focusing on the evaluation of ESIF impacts in the Czech Republic with the use of different methods and approaches (econometrics, QUEST, RHOMOLO) which helps us and potential users of these information to understand what are the impacts associated with ESIF implementation or how are there impacts influencing partial fields of interventions (infrastructure, HR, research and development, private sector, technical assistance) thank to the unique features of chosen macroevaluation approaches (see Figure 3).

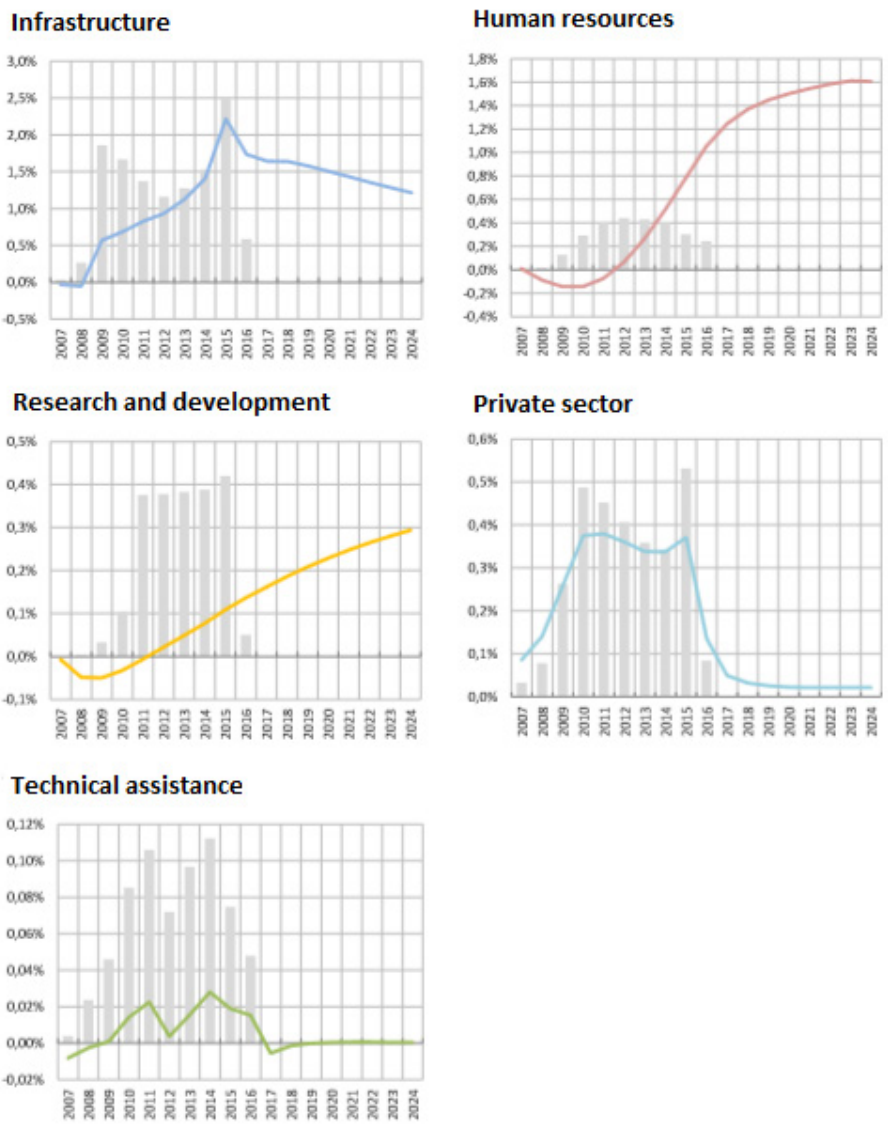
Figure 3: The impact of ESIF on GDP (difference against the basement)



Source: The Office of the Government of the Czech Republic (2018)

Following figures are showing different impacts and their dynamics of various fields of interventions. Meanwhile the prevailing volume of ESIF is under the chosen national strategy directed to the infrastructure, the dynamics of these interventions are identified by the used model as limited in the time. On the other hand human resources and research and development, which are very productive mainly in the long term as an investment (see Figure 4), are usually underestimated within the setting up the ESIF.

Figure 4: Impact dynamics of individual types of interventions on GDP (with the use of model QUEST III R&D)



Source: The Office of the Government of the Czech Republic (2018), CNB, MRD

Lithuanian Ministry of finance (2016) conducted the evaluation of structural funds impacts on creating of new jobs and other macroeconomic indicators within the time period of 2007-2015[3]. While the positive impact of structural funds on the growth of nominal GDP in comparison with zero scenario was identified, the influence on prices was marginal in relation to deflator and CPI. The formulation of policy recommendations followed because the comparison of various forms of financial instruments (such as loans, guarantees or risk capital) pointed out on their slightly better efficiency to direct subsidies. The other policy recommendation based on this particular macroevaluation was to emphasize the creation or support of permanent research jobs in private sector or industrial doctorates to support the applied research or positive business development.

The Latvian Ministry of finance used in 2007 the HERMIN model to analyse what was the macroeconomic impact of the EU funds for the period of 2004-2006 (ex-post analysis) on the Latvia economy and what will be the prediction of the future situation for the period 2007-2013 (ex-ante analysis)[4]. The outcomes showed the positive impact of EU funds on the economy, pred prediction of the increasing tendency for the future. Also, it was found the funds have an effect on stimulating aggregate demand and supply. In the macroeconomic evaluation the overall positive impact was proved. For the period 2007-2013 the crowding-out effect on GDP was detected, related to drawing of EU grants. Therefore, the recommendation was suggested towards further public spending. It was also found that each country requires the specific evaluation process considering the local specifics.

The Slovak Government office in cooperation with the Slovak Academy of science used in 2016[5] the HERMIN model to conduct the ex-post evaluation of the effects of the structural funds and cohesion policy on the Slovak economy for the period 2007-2013. Three different scenarios were analyzed using various absorption level and with the focus on several territorial levels (except of the NUTS3 level). According to the analysis the cohesion policy performed in the studied period caused the positive effect on the Slovak economy. The analysis estimated that the Slovak GDP would have been by 5% in 2013 lower without drawing EU grants, in the following year by 6% and in 2015 by 8.4%. The analysis confirmed that the convergence process of Slovakia reached 77% of the average for EU-28 (based on the GDP per capita in PPP). Besides the positive effects of the EU grants, the cohesion policy had a significant impact on the employment (on the national as well as on the regional level) and on the creation of the added value in all of the fields of economy and all region. Further effect mapped by the analysis was the increase of the household consumption (by 7.6% in 2015) in comparison to the alternative scenario without the EU funds and the impact on the competitiveness of the Slovak regions.

3 Lithuanian Ministry of finance (2016)
4 Latvian Ministry of finance (2007)
5 Radvanský et al. (2016)

The analysis points out that distribution of the EU grants more equally during the whole period would have had stronger positive effect on the economy. Based on the findings it was recommended to focus more on the quality of the national policy and related legislative framework and also to link the EU funds with the systematical reforms and the national policies.

The case of Denmark could be seen as the example of the best practice. The country implements these methods for evaluating the impact of partial public policies. The particular examples from the recent years shows they use the econometric models (logit or probit models) to simulate the development and the effect of the selected decisions that were realized by the Danish government. The Danish administration use these methods to assess the effect of their particular strategies, for example in science, support of innovation towards business[6] or in education.[7] Some public institutions use the methods systematically and conceptually. For instance, Danish of Higher Education and Science and the Danish Agency for Science, Technology and Innovation prepared in 2011 the Central Innovation Manual on Excellent Econometric Impact Analyses of Innovation Policy (CIM) for strengthening the principles and the elements of the evidence-based policies in the public policy preparation[8]. The document sets the basic framework for minimal requirements and standards for the implementation and realization of these tools and describes the related procedures. It also formulates the requirements for quality and the data specifics necessary for performing the evaluations. It is necessary the data to be harmonized and therefore, it is essential the close cooperation and communication with the intuitions that process the data. A few years later, the Danish Ministry, in collaboration with the relevant agency, came up with an improved CIM 2.0 manual based on new knowledge, experience and information from research, evaluation practice or data collection.[9] The document shift further the standards for program and policy evaluation in the field of research and innovation. It helps the public policy decision makers the evaluate the planned or realized investments in public and private research and in education by identifying and measuring their effect.

5. Discussion

According to Blanchard (2018) current DSGE models are flawed, but they contain the right foundations and must be improved rather than discarded and we need different types of macroeconomic models for different purposes. The experience with using the macroevaluations for the policy evaluation show that both evidence-based evaluation approaches, microevaluations and macroevaluations, have their advantages, added value but also the disadvantages or limits. For the ideal policy evaluation the proper choice shows to be the combination

6 Centre for Economic and Business Research (2010)
7 Centre for Economic and Business Research (2011)
8 Danish Ministry of Science, Innovation and Higher Education (2012)
9 Danish Ministry of Science, Innovation and Higher Education (2014)

of both approaches. Bradley et al. (2006) used in their paper integrated approach for assessing the general economic effectiveness, efficiency and impact of public policy actions for large investment programs. *When setting up an integrated micro-macro (IMM) model the authors are trying to overcome two major shortcomings in actual policy design and analysis: Firstly, to bridge the gap between the scientific requirements of model-based decision making and evaluation and the practical requirement for flexible and easy to use decision support tools that are well suited for day-to-day application. Secondly, to address the observed discrepancy in policy analysis between programme monitoring and evaluation realized at a highly aggregate level using quantitative macromodels (the so called "top down" approach) and the highly disaggregated approach to project evaluation, marked as micro- or "bottom up"-approaches.*

6. Conclusions

There is growing complexity in global economies and therefore the demand on good governance and evidence-based policy-making is continually growing. To be able to understand to the complex space of flows and processes and to respond appropriately within various ways of policy-making, growing usage of macroeconomic evaluation and methods are recognized both in academics and public administration practice. This paper based on primary and secondary data analysis is gathering and completing the picture about macroevolutions use by public administration bodies across Europe for evidence-based policy-making based on available knowledge and information (secondary data) and from own experience (primary data). The paper also tries to answer what lessons public administration are and can possibly be learned when using such evaluation techniques based on individual cases and examples within EU member countries and their official public administration bodies. Therefore current practice shows that different evaluation tools provide different outcomes so each tool enriches policy-makers with different point of view when assessing particular public policy or programme. Based on the primary and secondary data analysis we found out that the main fields in which the macroevaluations are used by public administration institutions are structural reforms, policy evaluations, macroeconomic predictions or eventually also ESIFs. The empirical findings also show there is all the variety of how the macroevaluations are proceeded ranging from completely in-house to completely outsourcing with the prevailing option of partly in-house (own employees, not own model) followed by complete out-sourcing and last but not least completely in-house probably because of higher demands generally. The frequency of using macroevaluations or its outcomes in public administration is often determined also by the level of its obligation within the complex process scheme (administrative, legislative or regulatory processes or frameworks) or the administrative culture. Based on the analysis we can distinguish two main groups. First group contain those cases where the use of macroevaluations is non-binding or for the purpose of ad-hoc analysis. The latter group is represented by those administrations where

the use of macroevaluations is demanded by other processes or administrative or management aspects as mentioned previously. We also identified the benefits and disadvantages or limits perceived by the users of the model or its outcomes which influence frequently the motivation to works with such techniques and methods. There were also identified the cases of collaboration between public administration practice and university research. The experience with using the macroevaluations for the policy evaluation show that both evidence-based evaluation approaches, microevaluations and macroevaluations, have their advantages, added value but also the disadvantages or limits.

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CHAPTER 5

Obstacles in Implementation of the Smart City Strategies in the Czech Republic

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ABSTRACT

The aim of the paper is to identify obstacles that public administration representatives must face during and after implementing the Smart City strategies in the Czech Republic. The goal will be achieved through structured interviews with those who are responsible for the implementations. The interviews will take place in three Czech cities, namely Prague – the capital, Brno – the winner of the ITAPA 2018 AWARD in category V4 region, and Zlín – an example of the city "on the way" that has no Smart City Strategy implemented at the moment, but is running many smart projects within the city ecosystem. Obstacles will be classified and divided into two categories – external and internal. Based on examples of good practices from abroad, measures will be proposed that should prevent the emergence of these obstacles right at the very beginning or, at least, mitigate them at their origin. The main identified problems were shortage of experts in the Smart City area, political unrest, poor interconnection with existing legislation and excessive bureaucracy. The proposed measures then focus mainly on the exchange of the best practices among municipalities, the legislative changes and a greater public awareness.

Key words: Czech Republic, Smart City, Strategy

JEL classification: JEL_O38, JEL_P25

1. Introduction

In 2018, the United Nations Population Fund stated that the world is undergoing the largest wave of urban growth in history. More than half of the population today lives in cities and it is expected that the total of urban inhabitants will exceed 5 billion by 2030 (United Nations Population Fund, 2018). This situation is not only unsustainable in the long run but brings about a great deal of problems that the urban agglomerations need to address already today – from the lack of accommodation and air pollution to inability to deal with an excessive waste production.

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Precisely, the improvement of the living conditions and, in general, the quality of life in cities has been a big political topic in the last two decades. The representatives of public administration attempt to resolve these problems by implementing the tools of sustainable development. The concept of smart cities is currently regarded as a very effective tool. Its objective is to improve the quality of life in cities in view of accommodation, transport, environment, competitiveness and particularly public administration. New and innovative public administration is key to a balanced and sustainable development of the city, or rather – the urban area.

Establishing the concept of a Smart City within the urban ecosystem happens by means of strategic plans or visions, often referred to as "smart strategies". Implementation of these strategies then depends on the initiative of the respective authority. However, it is necessary that the whole ecosystem of the region participates in the process of fulfilling the visions and objectives of the strategy, including the science and research community, the private sector and, most importantly, the citizens. The implementation of the strategies itself seems to go rarely smoothly. On the contrary, a variety of problems can occur. The examples of three Czech cities below show the obstacles that the representatives of public administration had to face when implementing the smart strategies.

2. Literature Review

The sustainable urban development was originally associated only with the protection of environment as is seen in the development strategies of the UK in the 1980s (Healey, 1995). Over time, new areas such as environmental sustainability (Satterhwaite, 1997) and industrialization in developing countries (Stephens a Satterhwaite, 2008) were gradually brought into play. A breakthrough in the perception of sustainable urban development from other points of view besides environmental was made by the introduction of four dimensions, which should be taken into account by any sustainable city, by the United Nations Commission on Sustainable Development. The four dimensions are following (Littig a Griessler, 2005):

- Political-institutional
- Environmental (ecological)
- Economical
- Social

Since problems such as climate change, population growth, increasing urbanization, demographic changes and related population ageing, rapid digital transformation and growing social differences have been deepening, they need to be approached in a more intense and creative way than before (Didsbury, 2004). The fast progress of (not only) urban technologies is considered to be

one of the important elements of the search for the needed solution of the current unsustainable situation of cities (Marsal-Llacuna et al., 2015) and it is these changes that, in fact, resulted in the establishment of a new way of technology-led management of urban sustainability. The concept of the "Smart City" emerged from the belief that a city must be smart in order to achieve sustainability (Caragliu and Nijkamp, 2011).

Giffinger (2017) unified the following interconnected areas through which the concept of the Smart City is shaped: competitiveness, social capital, participation, transport and ICT, natural resources and quality of life. The concept of the Smart City is seen as a visionary approach to urban sustainability. In other words, Smart City is a city that is effective, technologically advanced, green and socially inclusive (Vanolo, 2014).

The representatives of public administration face a number of difficulties during the implementation of both strategies and individual projects. One of the principal issues could be the large number of players whose competencies do not always contribute to each other, but rather collide (Bachtler and McMaster, 2008). Poorly defined powers and multilevel governance are the result of insufficiently specified competencies on the level of regions and the fact that some public bodies are extensively centralized which causes delays in implementation and acquisition of expected results (EC, 2016). More problems can be caused by poor communication among municipalities and higher administrative units, insufficient or absent infrastructure, which is an issue in East European countries in particular (including the Czech Republic) (Kollar et al., 2018), and further by the lack of high-quality educated personnel in municipalities competent enough to supervise the strategies from their initial design, through securing the funding (from e.g. European funding programmes), to the final evaluation (Kollar et al., 2018).

In the Czech Republic, the problems are most frequently related to the lack of financial resources, legislative obstacles, insufficient communication with relevant ministries, lack of political will, overloading amount of exercise of delegated public powers and administrative burden (Úřad Vlády, 2018).

3. Methodology

The implementation of Smart City strategies usually takes place within the level of city administration via the city's development strategy or vision and, for that reason, the objective of this contribution is to point out the problems that it poses for the cities. The responsible persons of three cities that participate in the proposal and implementation of such strategies were approached. The three respondents are expert members of the cities' municipal authorities. Their identities remain anonymous herein.

The cities were chosen on the grounds of a stratified selection with the aim to include three city types:

- a capital;
- a city which is, within the Czech Republic, an expert in the field;
- a city which is "on the way" – it is only at the beginning of its journey towards a Smart City Strategy

The selected cities, then, are: Prague – the capital, Brno – the winner of ITA-PA 2018 AWARD in the category of V4 states, and Zlín which does not have a Smart City Strategy at the moment but has already implemented a scale of smart projects into the city's ecosystem and is developing a Smart City Strategy as well.

During the interviews, the representatives of public administration were asked specific questions; each interview was about 60 minutes long and resulted in a synthesis of findings presented below.

The representatives of public administration were asked the following questions:

- Can you introduce a strategy that your city currently follows and the circumstances of its origin?
- What is the attitude of the political representation to the smart project, or the smart concept in general?
- What difficulties did you encounter during the implementation of the strategy and the individual projects? Can you give specific examples?
- Did you try to solve these difficulties? And how?
- Is the city limited by the political representation or the government – does it face problems concerning the legislation?

Depending on the answers, more complementary questions were asked.

4. Analysis of Acquired Data

The text below introduces the obtained information. Firstly, each city and its strategy are briefly introduced followed by the transcripts of interviews made for the purpose of the research.

4.1. Prague City

Prague is the capital of the Czech Republic. It has 1.3 million inhabitants and, according to the Czech Statistical Office, its GDP per capita is approximately EUR 40,000 (ČSÚ, 2019). The city has prepared a strategy, whose name itself – "Smart Prague 2030" – refers to the concept of smart cities. The strategy is based on the trends in the area – mobile technology, digital platform, big data, open data, internet of things, sustainable energy, robotic automation,

zero waste, artificial intelligence and autonomous vehicles. The vision of the strategy is formulated as follows: “In 2030, Prague uses time-proven innovative technologies for transforming the capital to a sustainable city and a better living space” (IPR Praha, 2017). The strategy defines the following 4 steps required for a successful progress towards its goals (Smart Prague, 2017):

- Mapping and Prioritizing – review of all innovation options and processing a plan that will be used for their implementation – completed;
- Draft Measures – particular proposals that will help to set milestones for the implementation of individual projects – 50% fulfilled;
- Pilot Projects – individual projects are launched and start to appear in the public space – 10% fulfilled;
- Routine Operations – existing modern technologies help citizens and have become a part of their everyday lives; they can fully utilize their potential – expected to be fulfilled by 2025.

4.1.1. Interview Outcomes – Prague

Within the Czech Republic, Smart Prague 2030 is exceptional for several reasons. Prague deals with smart topics and projects in a “majestic and ambitious” way, it is also considered to be best at Data Integrating Platform and would like to offer its know-how to other, not only Czech, cities. Prague is the only city in the Czech Republic where the city’s development strategy is not directed by the municipal authority. It is the Prague Institute of Planning and Development (IPR Praha) – a subsidized organization, that manages and coordinates the area of strategic and urban planning. This distribution allows Smart Prague to work on more complex projects as it is not bound by the political representation which is a subject to frequent change in time.

However, an advantage can turn into a disadvantage and restriction. In its powers, IPR Praha has a certain degree of freedom, but due to its separation from Prague’s authorities, it is susceptible to a bureaucratically simple dissolution. For the future, the whole existence of IPR is, thus, theoretically threatened, particularly in case Smart Prague fails to meet the set objectives and requirements. Another disadvantage of this strategy is limited funding. Owing to its higher GDP, Prague belongs among the richer regions of the EU and its options to receive funding from the European funds are, therefore, limited. At present, the only funding available is through the Operational Programme Prague – Growth Pole of the Czech Republic, and in the next budget period, i.e. after 2021, the available funding may become even more restricted.

Another disadvantage of the strategy is the lengthy tenders for the smart solutions that have to be organized pursuant to the Act on Public Procurement. Besides, the emphasis on fast absorption of funding which can affect the added value of individual projects, is seen as a threat to the future.

4.2. Brno City

Brno is the second largest city in the Czech Republic with almost 380,000 inhabitants at the beginning of this year according to the CZSO (2018a). The methodology of the Czech Statistical Office and Eurostat only allow to measure the GDP on the level of the whole region. In the South Moravia Region, with Brno as its capital, the GDP per capita amounted for EUR 20,500 (ČSÚ, 2018b) and it can be assumed that in Brno itself it is slightly higher. The name of Brno's current vision #brno2050 refers to Brno as it will be in 2050. The aim of this vision is to overarch short-term strategies and projects, where drafting and implementation of these projects follows the same methodology. Brno's objective is to be an attractive, improving, lively, harmonious, sustainable and well-managed city by 2050. The vision focuses on the following three points of reference (Vize a Strategie #brno2050, 2017):

Quality of life – healthy people, coherent city and city of respect, cosmopolitan city, cultural city, city of sports, healthy living environment, nature in the city, compact and balanced city, architectural face of the city, city with affordable housing, prosperous city, Central European RDI centre, educated university city.

Resources – globally accessible city, city with efficient and sustainable mobility, city with effective water management, energy-saving, independent and resilient city, self-sufficient, circular, clean and safe city.

Governance –shared vision and good names of the city, functioning Brno metropolitan area, efficiently functioning electronic administration, city open in the area of data.

4.2.1. Interview Outcomes – Brno

A substantial problem was encountered already during the drafting of the vision. There was no political committee that could formally supervise its implementation. All political clubs were consulted, and their observations incorporated in the vision, however, it later turned out that the parties' perception of this approach was rather negative. The change of political spectrum brought about the change in opinions and attitudes to the strategy, which then affected the creation of subsequent strategic projects. Political representation is reluctant to undertake long-run projects as they may not be able to influence the outcomes due to the change in representation every four years. Unwillingness and carelessness to participate in the design of the vision was an unexpected and troublesome problem that emerged from certain departments of the Brno City Municipality whose employees in charge do not attend the regular meetings with the working groups and generally neglect their participation in the management of the strategy.

In the long term, the strategy struggles with the Brno City Municipality's (lack of) respect, even though it attempts to instruct the departments methodologically so that the individual projects have the same structure, but often

face disapproval. As to the strategy planning in general, the bitterness toward long-term planning remains from the period of communist regime associated with its central planning, the so-called five-year plans. There is a stronger tendency to pursue rather short-term projects.

Legislation is also a persistent problem. Let us take as an example the legal obligation to have a certain number of parking spaces for a given number of houses and flats. If the capacity is not fulfilled, the building cannot be approved by the final inspection, although the number of parking spaces required by law may not be necessary, for example due to the location and availability of public transport. Another issue is the city's limited authority in certain areas. For example, the Brno's intention is to build a city ring to facilitate traffic in the city, but such construction is under the responsibility of Road and Motorway Directorate. The city can only influence this indirectly through communication with the relevant ministry or the Union of Towns and Municipalities. That, however, may not always be an effective solution and requires a lot of time. Lastly, the city states that it should have cooperated more closely with the municipalities of the Brno Metropolitan Area that are also affected by the strategy. Currently, the players (mainly mayors of the surrounding municipalities) are not too involved in further planning.

4.3. Zlín City

Last of the studied cities is Zlín – a city with nearly 80,000 inhabitants located in the Zlín Region whose GDP per capita is EUR 15,800; again, it is expected that the city's own GDP is slightly higher than the region's average (ČSÚ, 2018c). The city's current strategy is called "The City Development Strategy Zlín 2020" and was created already in 2012. Although, the strategy does not include the concept of smart cities in its name, its global vision declares the following: "Zlín 2020 – entrepreneur, smart, creative and sustainable city". The strategy as such is not in line with smart strategies in general but carries partial elements of these strategies (e-governance, sustainable transport systems, use of rainwater, etc.). These elements are then a part of individual projects and make clear that the city of Zlín is already half-way "smart" (Zlín 2020, 2012).

4.3.1. Interview Outcomes – Zlín

Zlín is presently preparing a new strategy which would put more emphasis on being "smart". Several obstacles have been met in the implementation of the smart projects. European funding for a telematics systems project was the core of one of them. The obstacle lies in the sustainability of projects, which is set by the European funds to be 10 years, but the development of these systems is on the move and their sustainability is objectively much shorter. If the city wanted to later exchange these systems for new, more efficient and modern ones, it would have to return the entire subsidized amount and finance the payment purely from its own resources.

Another problem, which is partly related to the lack of a smart strategy, is the absence of a working group that would focus on smart projects. This group should include city leaders, experts, and companies. The reason for this is, in particular, the political displeasure and disapproval of the Smart City concept. This is now changing with the new political representation that has been in office for about 7 months.

Other problems encountered by the city in implementing smart projects concern land ownership, as buying land from the owners is not always uncomplicated, and conflicts of interest with local ecologists also arise. Legal proceedings that are supposed to resolve and eliminate these problems and shortcomings are very lengthy and costly and oftentimes unsuccessful.

5. Synthesis of Findings

In identifying the obstacles that cities must face in implementing either whole strategies or individual projects, two sorts of the problems' origin were recognized. The problems can be defined as either **internal** or **external**. The internal ones are those for which the authority or the city bear responsibility and can, at least partially, influence. The external ones lie outside of the authority's influence, their impact is often vast and seldom removable. The table below presents the most frequent obstacles categorized according to the above.

Table 1: Problems the cities face in the implementation of Smart City strategies

Problem	Type	City where the problem arose
Limiting legislation (by national government or the EU)	external	Brno, Zlín, Prague
Limited and limiting funding (by national government or the EU)	external	Zlín, Prague
Limited authority of the city	external	Brno
Reluctance of officials to involve in the planning process	internal	Brno, Zlín
Dependence on political representation	internal	Brno, Zlín, Praha (in Prague, since IPR Praha could be dissolved, the political representation as such is not limiting)

Source: Authors' own compilation

Table 1 shows that most problems appear in more than one city regardless of whether the city is an expert in the field or implements individual smart projects without an overall strategy. What may be surprising is the fact that the problems in the implementation of project are never caused by citizens. All interviews confirm that the citizens either do not notice new projects, adapt to them automatically or welcome them. As for the prevention of the problems, the city of Zlín,

for example, has decided to set up a working group for the purposes of the newly formed strategy, which will act as a unifying authority across relevant departments. Brno considers implementing a similar measure. The cities are unlikely to be able to influence the elements of limited and limiting funding by national government and the European Union. However, they may be able to put pressure on relevant ministries and competent authorities. Similarly, in the case of dependence on the political representation, which can change every 4 years, the only conceivable solution in this case seems to be to meet regularly with responsible politicians and emphasize the positive impact of smart strategies.

6. Conclusion

The aim of this paper was to identify the most frequent challenges that the representatives of public administration face in the implementation of Smart City strategies in the Czech Republic. Three cities were chosen for the study on the grounds of stratified selection – the capital city of Prague and cities Brno and Zlín. Each city has its own specifics, they vary in population size, GDP per capita as well as their approaches to the strategy designs. Prague, the capital, founded a subsidized organization Prague Institute of Planning and Development, while in Brno and Zlín, the strategies were created under the authority of local municipalities. It should be noted that the city of Zlín has an older strategy and is currently preparing a strategy that will follow the Smart City concept. On the basis of structured interviews with the representatives of public authorities and authors of the strategies, two categories of the most common problems have been identified : internal and external, where internal problems can be, to some extent, influenced and possibly resolved by the cities, while external problems are very difficult for the cities to deal with on their own. The external problems are limiting legislation created by the bodies of both the Czech Republic and the European Union, limiting and limited funding, also from the side of both Czech authorities and the EU, and the cities' limited authority. The internal problems that cities frequently face is dependence on political representation which changes each electoral term as well as the reluctance of the officials to cooperate on the creation and implementation of the concept of the Smart City.

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CHAPTER 6

IT technology application to accounting in Montenegrin companies – decision tree classification method

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ABSTRACT

The new wave of digital revolution "industry 4.0" has led to radical digital transformation into the sphere of accounting. Today, more than 90% of companies have digitized their processes in the field of accounting and in this way have made that the accountant "craftsman" become a "digital accountant ". The focus of this research is to look at the company's profile in Montenegro through the prism of IT application, types of accounting software, the format of compiling accounting statements, and the degree of their publication on the company's website. The research was carried out by analyzing the survey data using the Decision tree classification method, by usage of RapidMiner tool. The results have shown that most companies use IT solutions for more than 10 years, except small privately owned enterprises. In practice, the application of local software is dominant, while large foreign-owned companies from the central region, as well as foreign-owned companies from the southern region use SAP and other well-known products. Also, most companies compile financial statements in EXCEL format, while large privately owned companies from the central and southern regions use PDF, WORD or XML formats. Micro-companies and small-sized private companies from the northern region generally do not have their own website, so large state-owned companies from the central region and large foreign-owned enterprises published their financial statements on the web site. Methodologically, this work has shown that the decision tree method can be used for analyzing the survey data, especially when it comes to categorical data.

Key words: IT technology, accounting, classification, decision tree

JEL classification: L86, M41, M49 I C44

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1. Introduction

The new industrial revolution, recognized as the “fourth” or “industry 4.0”, has resulted in a radical redesign of business models and their redefinition. It relies on the third industrial revolution and is much more radical than the previous ones. Its priority is on the integration of technology and their comprehensiveness, eliminating the boundaries between physical, digital and biological spheres. In relation to the previous three industrial revolutions, which are considered linear, the last industrial revolution is exponential. All this leads to the conclusion that it is necessary to have strong business foundations in order to adequately respond to inevitable and expected challenges. This is especially because the new industrial revolution is specific, and the researchers estimate that more than 47% of business activities will be automated.

In such a very challenging business environment, one of the professions that is affected by the new wave of “digital Darwinism” is also accounting. Accounting is a profession that has always been labeled as a profession of “crafts” and that has not been the subject of great interest until the beginning of the last century. However, previous events, as well as numerous malversations that led to the creation of creative accounting, conditioned the greater importance of qualitative determinants contained in financial statements. Traditional data processing and reporting models for external and internal users have been replaced by new models of business information exchange. In that sense, according to available research, over 90% of companies in the field of accounting redefined their business models, making a radical step forward: an accountant “craftsman” becomes a digital accountant.

Accountant “craftsman” or “quasi” accountant adopts new ways of thinking, behavior and organization under the influence of new technological revolutions. Like every novelty, the fourth industrial revolution, which focuses on the overall automation of production, has certain advantages and disadvantages. The fact is that companies have to change the existing way of perceiving the business environment and adapt to new circumstances. This is confirmed by the results of a survey in which 75% of companies in the USA implement or plan to implement some of the contemporary IT solutions into their business system, which makes a significant improvement over the results of the research announced in 2016[5] when 62% of companies had this status[6].

If we “look into” the “domestic” reality, we could say that we already have some kind of digitization of financial statements[7], but the question of their usability by the management is open. As a result, some authors talk about of intellectual insecurity, which requires the upgrade of knowledge in continuity.

5 https://www.accountingtoday.com/opinion/what-digital-transformation-looks-like-for-todays-cpa-and-accounting-firms (accessed 18.09.2018)

6 https://www.roberthalf.com/sites/default/files/documents/RHI-Benchmarking-2018-FINAL.pdf (accessed 21.09.2018.).

7 See the broader results of practical research in this paper.

Since the implementation of the IAS / IFRS in the statutory accounting framework in 2002 in Montenegro, certain progress has been made to align with the "acquis communautaire". The changes were initiated by the request and the desire to improve the discipline of financial reporting. However, in a professional environment, comments can be heard that the legislative accounting and auditing framework offers adequate solutions, but for certain reasons there are problems in implementing the same solutions. At the same time, the problem of transparency of financial reports has been existed for a long time, as one of the main preconditions for accessing and publishing financial information.

A survey carried out by Lalević A. et all (2017) indicates that there has been no significant progress in the area of transparency in financial reporting and the availability of reports on the company's website, which leads to the conclusion that the level of consciousness development has not changed significantly. Results indicate low level of information literacy of the company, which is a devastating result, since transparency and public disclosure of financial statements are a prerequisite for improving the quality of financial reporting, but also the most effective way to enable stakeholders to have easy access to the financial operations of the company. At the same time, the results that only 23 Ltd have their own web site, which is 46% of the total sample, while only 9% publish their financial statements on the website (13,9). On the other hand, there is no uniformity in the delivery of financial reports in Montenegro, which is not adequate in terms of comparability and processing. Generally, financial statements are submitted in PDF or EXCEL format, which means that data is "locked" within these formats. This further leads to a number of problems that arise in the collection and processing of data, as well as in reporting.

In the context of the above, the aim of this paper is to examine the extent to which the new wave of digital revolution has affected a segment of business that is of crucial importance from the aspect of creating and distributing information that are important for business decision making. The specific objective of this paper is to analyze the survey data using the decision tree method (DT analysis) and to indicate how the company's headquarters, size and business activity influence on the usage of information technologies (IT) in accounting in Montenegro, i.e. to define the profile of the companies that apply, or do not apply IT in an adequate manner in the accounting.

The hypothesis of this paper is: "Awareness of the importance of IT technology is insufficiently developed in the accounting profession of Montenegro". Apart from the introductory part and literature review, the paper is structured in two segments, methodology and data and empirical results and discussion. At the end of the paper, the authors give concluding observations regarding certain identified problems. This paper could be useful to accounting policy makers, but also to participants of the accounting process to make benchmark analysis with the aim to innovate their business model and offer better quality solutions for interested parties.

2. Literature review

In recent years, experts and researchers have published papers that point out the benefits of presenting financial information over the Internet compared to traditional print reports. (Lymer et al., 1997, Ashbaugh et al., 1999, Oyelere et al., Fisher et al., 2004; Hodge et al., 2006; Wagenhofer, 2003). When it comes to the countries in the region, or in EU, we conclude that there are surveys that deal with the information technologies in accounting at the country level, but not at the level of the region of a particular country. Cvijetić, M. at all, compared Serbia and the countries of the EU in 2014, and reached the following conclusion: in Serbia, only 26% of the analyzed companies have a web site, while the search on the site is possible in 15% of cases. Financial reports were available in HTML format (29%), or PDF (47%), while were not available in XBRL format. Unlike Serbia, the survey shows that 46% of EU companies have a location map, while 44% of companies have the option of searching information, while financial statements of most companies are presented in PDF and HTML format, and XBRL is recognized in only 6% of sampled companies. Analysing the usage of accounting information published on the web site, an inter-agency survey was conducted in Slovenia. It was stated that 52.6% of companies publish their accounting information on their websites and that 40.2% of users actually use this information (Dolinšek, at all,. 2014).

Frey and Osborne's (2013) predicted that the accounting profession will face extinction, believing that the usage of technological processes automates routine accounting activities that result in a reduction in the number of jobs around the world. However, other studies show that, in spite of the technology revolutionary boom, technology is not able to substitute emotional intelligence and the ability of critical thinking of a human being. As technology expands the scope of the profession, the knowledge and mastering of technological novelties are more than the necessary "skills" by which the accounting profession will respond to the challenges of the future.

By reviewing the available literature dealing with accounting and digital transformation, we conclude that the authors identify three phases of digital transformation in accounting (Schäffer, U. and Weber, J., 2016; Quattrone, P., and Hopper, T., 2005; Newman, M., & Westrup, C., 2005).

According to their opinion, the first phase of digital transformation in accounting began in the 1970s and ended in the mid-1990s. It is known as "accounting and functional IT". The mentioned stage was directed towards the development of specific IT programs for tracking accounting transactions or for improving the calculation of results. At this stage, digital transformation has contributed to the development of certain IT programs that have made it easier to record and process accounting data as well as more efficient internal calculations, giving much greater autonomy to accountants, as well as shifting their original craft focus. More precisely, the accountants had a fair degree of autonomy in relation to the IT sector, since the systems were developed and used within the accounting and financial function.

The second phase, which lasted during the entire first decade of the new millennium, began in the mid-1990s. It is an era of ERP (Enterprise Resource Planning) where the digital transformation focused on the integration (Hyvönen et al., 2008) of various functions within the enterprise and the promotion of process-oriented and inter-functional culture (Quattrone and Hopper, 2005). Financial-accounting function had the great importance at this stage since the business financial orientation was directed towards creating value for shareholders. It is noted that at this stage in many companies, especially in large, IT sector becomes one of the subsectors of the company's financial sector, creating a very strong connection between accounting and IT.

The third phase of digital transformation begins in 2010 and continues to date. At this stage terminology is changed, so instead of accounting and IT terms, the term accounting and digitization is used with the intent to highlight the breadth of the focus of digital transformation in accounting. In addition to the role given to the financial function in the previous phases, at this stage, the focus on the control and risk function is expanding. The processes become completely automated and robotized, and many directors are thinking about introducing artificial intelligence, creating a potential threat to decrease the existing role and importance of the financial function.

In the context of the above, it can be undoubtedly concluded that the digital revolution has largely redefined the accounting business model. Most authors point out in their papers that the future belongs to multidimensional accounting in real time. Todosijević, R. and Todosijević Lazović, S. (2018) also point to the advantages that accounting in the time of the fourth industrial revolution carries with itself: a) digital invoices; b) accounting in progress; c) accounting with archiving; d) real-time updating. This approach allows the accountant to have less and less direct contact with clients, as well as to focus on the interpretation of the received data, and less on their processing that becomes automated. This is supported by the results of the survey, which are obtained from a sample of 2,500 accountants from Belgium, France, The Netherlands, Spain, The United Kingdom and USA. According to these results, the number of one-to-one contacts with clients decreased from 97% to 56% in 2017 compared to 2016.[8]. In general, the geographic spatial dimension is no longer a limitation in communication, since direct communication is achieved using modern telecommunication applications (SMS, Whatsapp, Facebook, etc.).

3. Methodology and data

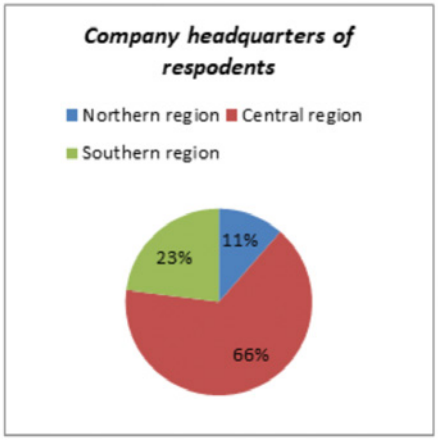
In this paper, we tried to determine whether and to what extent the accounting community is under the influence of digital transformation. Accordingly, we collected data through a structured web survey, distributed to 320 electronic addresses to members of the accounting community who belong to a professional association of accountants in Montenegro - Institute of Certified Accountants of Montenegro.

8 https://www.exact.com/uk/exact-online/accountants/advise/ (accessed: 11.04.2019.)

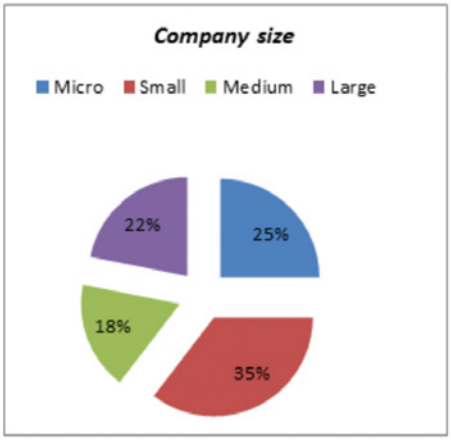
The survey was conducted in the period from March 1 to April 15, 2018, after very dynamic events in the accounting profession, so accountants and auditors were able to feel the advantages and disadvantages of applying existing accounting IT solutions. The questionnaire was answered by 96 respondents, 30% of total number of electronic addresses, so we thought that the size of the sample was sufficient for conducting the survey. Data entry was done automatically via Google Forms, while the data processing with the necessary logical controls was done in IBM SPSS Software.

Observed by the headquarters of the respondent company, we noticed that the largest number of companies is located in the central part (66%), then in the south (23%) and in the north (11%) (Graph no. 1). As the largest number of companies in Montenegro is located in the central part of Montenegro, this structure was expected. According to the ownership criterion, the largest number of companies (53.3%) comes from the private sector, while 26% are state-owned and 18.8% are foreign owned. Most respondents come from micro (25%) and small enterprises (35.4%), while a slightly smaller number comes from large (21.9%) and medium-sized enterprises (17.7%) (Graph no. 2). This structure of the company according to the size criterion is expected, since that small, micro and medium enterprises have a dominant share in Montenegrin economy, as well as in the economies of most other countries (Monstat, 2012).

Graph 1: Company headquarters



Graph 2: The company size



The dominant number of respondents comes from the sector of services (32.3%), 20.8% from sector of trade and 14.6% of enterprises are the budget institutions.

In this paper the Decision tree (DT) analysis was used to identify the interactive effect of the observed factors (headquarters, size and business activities) on the application of IT technology in the accounting of Montenegrin companies. DT method requires the connection between dependent and independent variables through the so-called tree structure, i.e. nodes, branches and leaves. Each node is linked to one of the independent variables in the tree, and each

tree branch with a subset of the values of the corresponding independent variable. If the target variable is discrete (it has a limited number of values), then the tree is considered a classification tree, and each leaf represents one value of the target variable (one class). DT algorithm also generates relative frequencies for each leaf, i.e. the probability of belonging to the class represented by this leaf. The process of tree induction recursively divides the initial set of data into subgroups. The aim of each iteration is to get the best possible division. The separation method defines the variable to be assigned to the node in the tree. Each branch of the tree that comes out of that node corresponds to one of the obtained subgroups.[9]

4. Empirical results and discussion

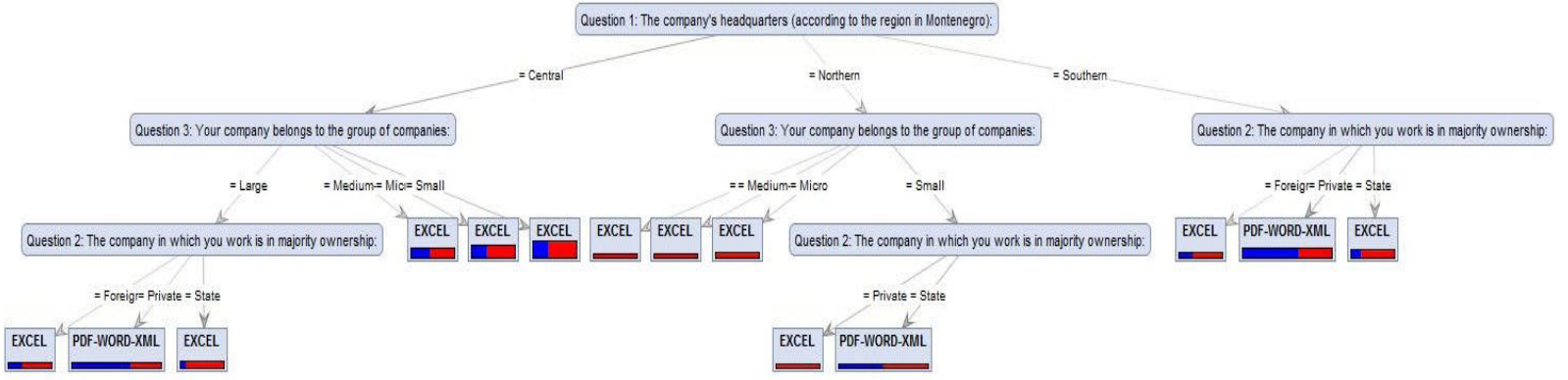
In order to analyze the results and make conclusions, five DT models are generated. Each leaf corresponds to one "if-then" rule. The leaves represent the values of the dependent variable: a) the format in which the accounting statements are compiled (the first DT model, Chart no. 3); b) owning a website (second model, Chart no.4); c) IT solution - the type of accounting software (third model, Chart no. 5); d) the period of IT usage for the processing of accounting data (fourth model, Chart no.6); e) publishing data on a web site (fifth model, Chart no.7).

The most important are those leaves that have a thicker rectangle in the bottom, which means that the rules that correspond to them are related to a larger number of data. But also, "margin of victory" is very important. The "margin of victory" of a rule is greater if in the rectangle at the bottom of the leaf, the color corresponding to the leaf is prevalent, whereby each leaf (dependent variable) is assigned the appropriate color. It is impossible to expect an ideal classification where each of the leaf would have one and the corresponding color. Accordingly, each accuracy greater than 50% in the leaves is acceptable, but more important are the rules that correspond to the leaves with greater accuracy. It means that attention should be focused on them during the analysis of the DT model (a thicker rectangle and greater representation of the corresponding color in the leaf).

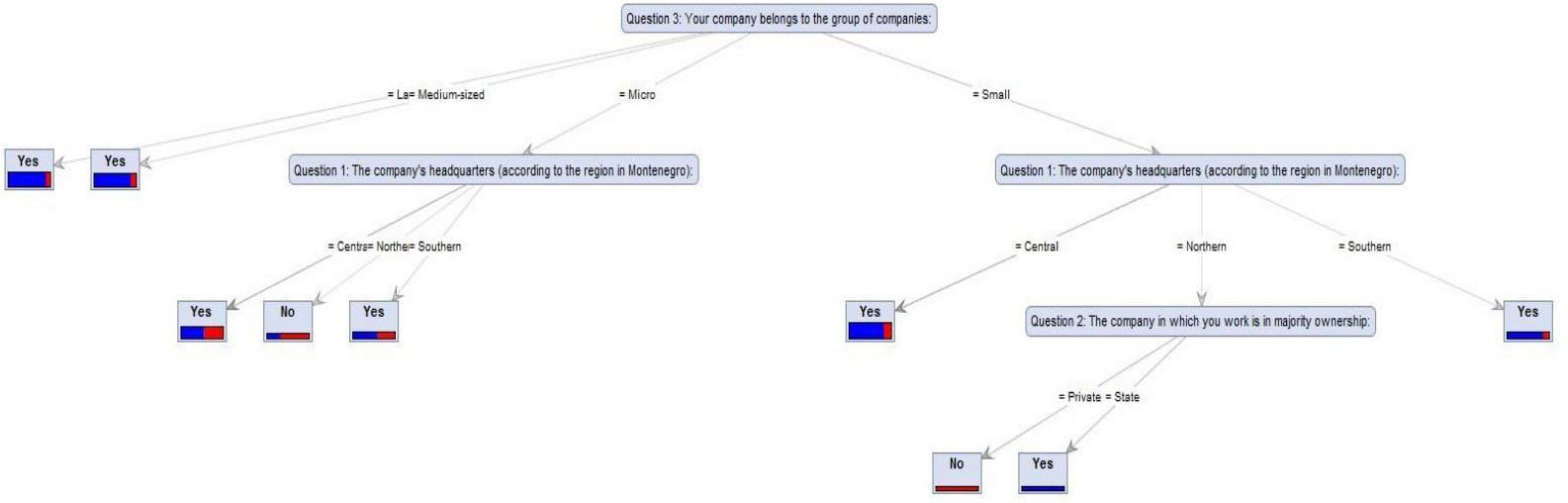
Below the text is a graph showing the DT model for the format in which the accounting statements are compiled.

9 Novovic Buric M.,Kašćelan Lj, Kascelan V.: "Limiting factors of real estate insurance development in Montenegro - decision tree analysis", XLV Symposium on Operational Research, Zlatibor, 2018, pp:125-134

Graph 3: DT model - format of accounting statements



Graph 4: DT model - web site



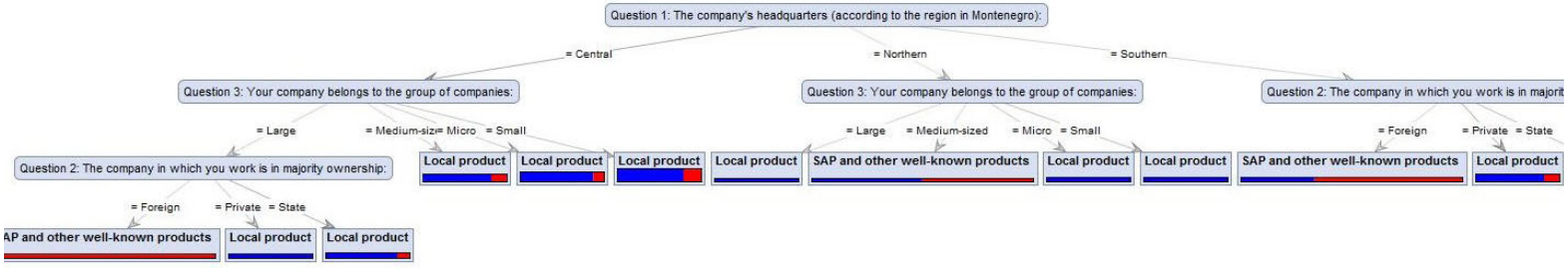
Graph 3 shows that leaf thicknesses are most pronounced in leaf[10] numbered 4, 5, 6 and 13, which means that the rule that corresponds to them is related to a larger number of data, i.e. that a large number of data from the sample was applied. In this model, EXCEL is highlighted in red, while the dependent variable PDF-WORD-HML is marked in blue. In accordance with the accuracy of the application of the rules with a probability of more than 50%, all the leaves can be analyzed, especially leaf number 7, 8, 9 and 10 with the highest accuracy.

Therefore, the chart refers to the following conclusions which are derived from the interpretation of the rules relating to the leaves. Excel format is used by companies from the central part of Montenegro that belong to the group of micro, small and medium enterprises (leaf 4, 5 and 6), while PDF-WORD-XML formats for the preparation of accounting reports are used by companies in privately owned, based in the southern region (leaf 13). Companies based in the north of Montenegro, both micro and small, as well as large companies, use an excel format for presentation of accounting reports. Excel format is also used by small privately owned companies (leaf 7,8,9 and 10).

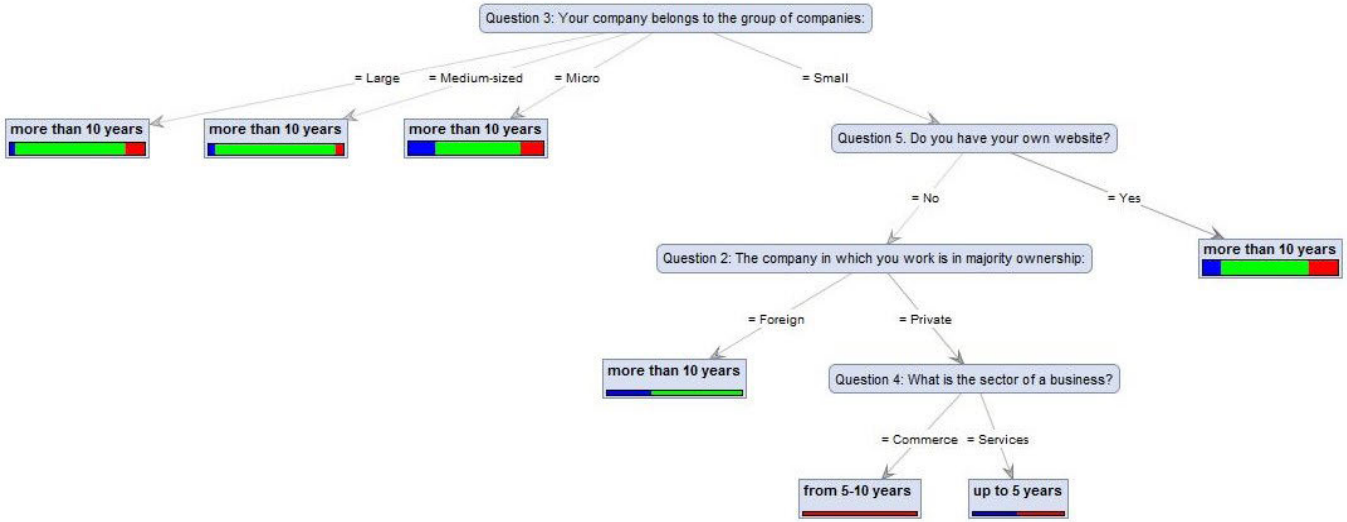
Leaf thickness is most evident in leaf no. 1, 2 and 6. The existence of the website is marked in blue, and the opposite (non-existence) in red, and accordingly, the highest accuracy of the application of the rules are evident in leaf 4 and 7, as well as no. 1,2, 6, 8 and 9. By referring to the indicated leaves, we notice that companies belonging to the group of medium and large enterprises have a web site (leaf 1 and leaf 2), as well as small companies based in the southern and central part of Montenegro (leaf 6 and leaf 9). Small enterprises based in the north of Montenegro, which are state-owned, have a website, while private ones do not have (leaf 8 and leaf 7). The website also does not have micro companies located in the north of Montenegro (leaf 4).

10 Leaves are read from left to right

Graph 5: DT model- software type



Graph 6: DT model - period of IT usage for the compilation of financial reports

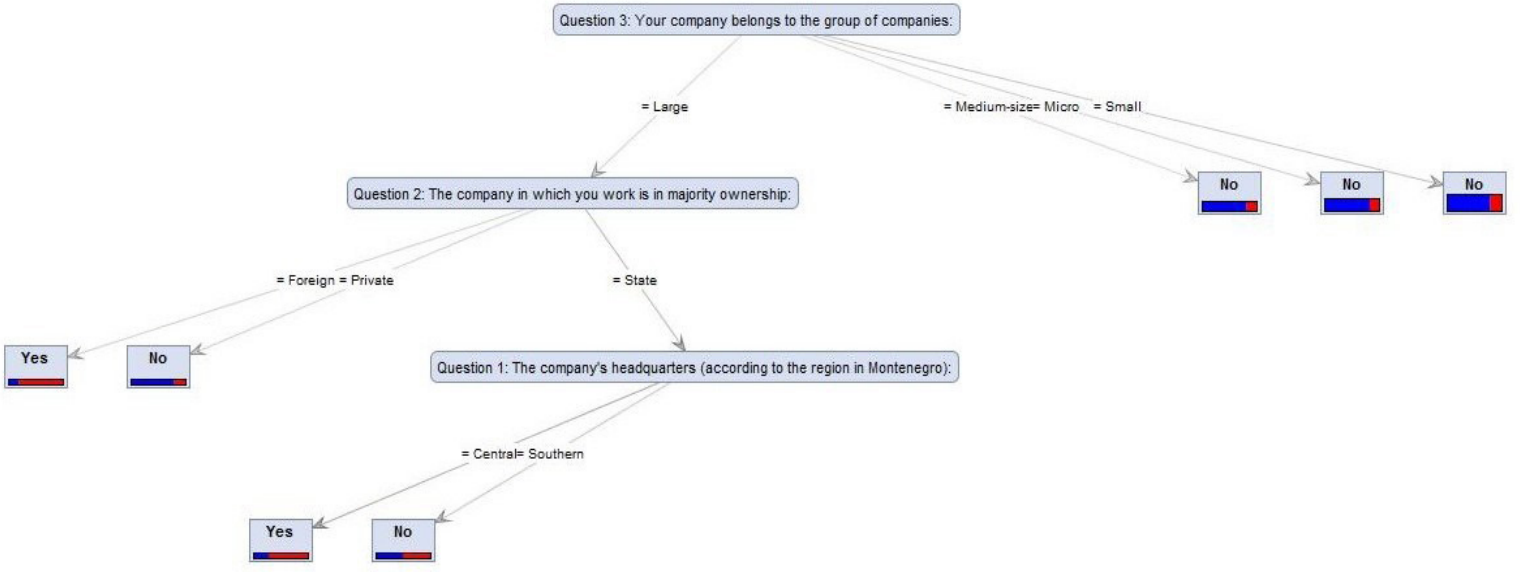


In accordance with the thickness of the rectangle and the accuracy of rules application over 50%, in the model shown in Graph no. 5, the most significant are leaves 4, 5, 6, and 12 (from the aspect of the number of data from the sample to which the rule applies), as well as all other leaves, especially leaf 1, 2, 7, 9 and 10 (from the aspect of the accuracy of the data application). Accordingly, small, micro and medium-sized enterprises from the central region use a local product (leaf 4, 5 and 6), as well as privately owned companies from the south (leaf 12). Large companies from the central region that are privately owned also use a local product, while those that are foreign owned use SAP and other well-known products (leaf 2 and leaf 1). Small, micro companies, as well as large companies from the north of Montenegro use local products (leaf 7, 9 and 10).

For the analysis of the IT period, it is desirable to observe all the leaves because they meet both criteria (the criterion for the rectangle thickness and / or the representation of the appropriate color). Namely, micro, medium and large companies use IT to compile financial reports for more than 10 years, as well as small companies that have their own website. Small companies that do not have their own web site, which are foreign owned, use IT for more than 10 years, while those that are privately owned, from 5 to 10 years (commercial companies) or less than 5 years (services companies).

The last model shows the presentation of data on the website. The tree shows that all leaves are valid for analysis, except leaf no. 4 in which the precision of the rule application is less than 50%. Graph no. 7 shows that small, micro and medium enterprises do not publish data from the financial reports on the website, while the publication in large companies depends on the ownership and headquarters of the company. Such large foreign-owned companies publish data on the website, as well as those from the central region that are state-owned. However, privately-owned companies do not publish financial reports on the website, as well as state-owned enterprises from the south of Montenegro. Such results are generally expected, as large companies in Montenegro predominantly have foreign capital and operate in a business culture that is immanent to the countries from which the capital comes.

Graph 7: DT model-publication of data on the web site



5. Conclusion

In this paper, the Decision tree analysis was used to identify the interactive influence of the observed factors (headquarters, size and activities of the company) on the application of IT technologies in the accounting of Montenegrin companies.

The results of a survey conducted in Montenegro with the use of DT analysis, showed that private-owned companies in the southern region use PDF, Word or HML format, while all other companies predominantly present financial reports in Excel format. The use of these non-unified formats is not adequate, because it creates a problem when processing, or creating statements with all the relevant qualitative attributes. Also, small privately owned companies from the north of Montenegro, as well as micro companies located in the north of Montenegro, do not have a website, while the accounting reports on the site are mainly published by large state-owned companies from the central region and large foreign-owned enterprises. Local software products are generally used, while SAP and other well-known products use large foreign-owned companies from the central region, as well as companies from the southern foreign-owned region. Most companies use IT solutions for more than 10 years, except small privately owned companies in the field of services and trade that use them for a shorter period of time.

From the methodological point of view, the research has shown that the DT method is effective in analyzing the survey data. DT method can also work with categorical variables (with a limited number of values), which is often the case with the survey. By revealing the interactive effect of several factors, this method can provide more information than standard regression methods that mainly reveal the effects of individual factors. Thus, this method can automatically detect the dependencies that exist between target and multiple independent variables (without the need to pre-specify the assumptions about this dependency). Also, this method has no problems with the multicollinearity of the input variables and does not require the specification of a functional form as a regression.

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CHAPTER 7

With social enterprises towards smart governance in social policy – myth or reality?

Lucia Makýšová [1]

ABSTRACT

Recently, there has been an increasing amount of hybrid organisations that are unique for combining the aspects typical of different sectors. Some of them are also known as social enterprises, which mix the elements of the nonprofit and for-profit world. The organisations aim to fulfil their social or environmental mission while doing business activities and generate their revenues to achieve their mission. The business practices help them to obtain new financial resources and sustain their goal in the long-term or even increase their impact in solving specific social issues thanks to the additional finances (e.g. employing those who could not easily find a job). Certain researches also describe social enterprises as those creating new social innovations. Though the phenomenon becomes popular worldwide, the development of social entrepreneurship in eastern Europe is still in its infancy. In the Czech Republic, there is no legal framework regulating social enterprises, nor efficient incentives for their support. In the unknown space, it is, therefore, possible that social enterprises could evolve differently than in the countries of long tradition and support for social entrepreneurship. The paper aims to shed light on what is the theoretical concept and current practice in eastern Europe, more specifically in the Czech Republic. The description of the current state supplemented by the data of Czech social enterprises will be put in the context to the findings of the relevant foreign literature and compared. Based on this research, the policy recommendation for public authorities in the field of social policy will be suggested.

Key words: Social enterprises, Czech Republic,

JEL classification: JEL_L31, JEL_L38

1. Introduction

In the last decades, there has been an increasing number of organisations, also known as hybrid organisations, that are unique for combining the aspects typical of different sectors. The growing amount of these organisations in almost all industries causes the previous sectoral determination to vanish. In fact, hybrid organisations and hybrid arrangement may be easier to find than those considered as ideal-typical notions (Brandsen et al. 2005). From the sectoral point of view, hybrids are considered as those organisations, that have a characteristic

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feature of different sectors, from the public, private and non-profit sectors (Billis, 2010). The hybridisation can be seen in the mixed ownership (share of the ownership according to the sectors), multidimensional goal structure, the multiplicity of funding arrangements and public/private forms of financial and social control (Johanson & Vakkuri, 2017). Social enterprises are one of the various examples of hybrid organisations. And, although, the concept of social enterprises varies among the researches, the main characteristics of social enterprises remain the same – they are built on explicit social objective to create social value by applying business strategies to generate income used for fulfilling their social mission (Defourny and Nyssens, 2010, Powell and Osborne, 2018). The objective of these organisations is to fulfil their social, community or environmental mission while doing business activities and generate their own revenues. The business practices help them to obtain new financial resources and sustain their goal in the long-term (Smith et al., 2013).

The aspect of making own revenues make social enterprises differ from non-profit organisations. Nonprofit organisations can be engaged in income-generating activities that result in additional resources (e.g. fundraising); these are rather small (Saebi et al., 2019). On the other hand, while generating profit makes social enterprises similar to for-profit organisations, they use it to further social impact rather than maximise profit for their stakeholders (Powell and Osborne, 2018).

The phenomena of social enterprise appeared in the late 20th century as a reaction to the persistent social issue with the potential to better address social needs, either as social service providers or as employing people who were excluded from the labour market (Defourny and Nyssens, 2010). Since then, their number, as well as their role in the ecosystem, has been increasing worldwide. Currently, the sector of social economy provides paid employment for 6.3% of the working population in the EU-28 (Monzon & Chaves, 2017). The current data, however, shows that the development of social entrepreneurship in the Czech Republic is still at the beginning since the main boost was detected only in the last ten years. Moreover, compared to pure non-profit organizations, their amount is still marginal. Their relatively short history is also linked with low public recognition. Therefore, little is known about what role they play in Czech society and what is the justification of their existence. Do they also emerge as the reaction to the inadequate welfare system?

The aim of the paper is, therefore, to shed light on what is the current state of social enterprises in eastern Europe, more specifically in the Czech Republic. The description of the current state of Czech social entrepreneurship will be put in the context to the findings of the relevant foreign literature and compared.

The paper is organized as follows. First, the concept and the role of social enterprises will be described by using foreign literature and concepts. Second, the methodology of the paper will be introduced and applied to analyse the current state and the role of social enterprises in the Czech Republic.

2. Literature review

Social enterprises have been arising within the welfare state as a reaction to remedy the failures occurring within the public sphere, more specifically to address the issues of society that have proved to be "beyond bureaucratic, ineffective and wasteful" government (Dees 2007, p. 25). However, the first wave of social enterprises arose in the late 20th century, when many European countries were dealing with the pressure on reducing public costs due to the state budget deficits. The inadequate public policy was not able to deal with the issue of increasing social exclusion of certain groups from the labour market and the society as well (Testi et al., 2017). Those people were low qualified, unemployed in the long term or dealt with other social problems that made them difficult to employ in the time when the countries suffer from persistent structural unemployment (Defourny and Nyssens, 2010). The question arose, whether non-profit organisations could address these issues more effectively. Therefore, social enterprises focusing on employing disadvantage people started to emerge.

Due to the transformation from the non-profit organisation to the more business-like organisations, they were able to secure the places for those who were not attractive for the labour market. The emergence and sustainability of the work integration social enterprises were linked with the public policy support (Testi et al., 2017). Their role in employing the vulnerable groups remain one of the key activities of the social enterprises also in nowadays, since the market economy lacks the capacity to secure employment for these people (Baglioni, 2017, Chabenet, 2017) or simply the social needs are not considered to be attractive enough for the market to serve (Saebi et al., 2019).

But, besides employing the vulnerable group of people, social enterprises often operate in the niches of the service provision, that was not appropriately addressed by the other social service providers. To do so, they often use new technologies or come up with an innovative way of service provision (Zimmer and Obuch, 2017). Prazskier et al. (2017) point out that in a particular field, they may even replace the state services with the cooperation of the third sector organisations. One of the reasons is that they address the social needs through personalised approached shifting from the standardised form provided by the public authorities (Testi et al. 2017).

From the perspective of organisations situated inside the third sector, their transformation to social enterprises was also driven by other additional aspects. As non-profit organisations, they often cannot address the social issues directly due to their lack of capacity (Teasdale, 2012). Moreover, they may face diminishing charity donations because the rising number of nonprofit organisations leads to resource competitions. Moving from the dependency on donors' contributions the organisations could secure financial sustainability through resource diversification (Seelos and Mair, 2005), They adopted earned income approaches to deliver commercial revenues (Teasdale, 2012).

Opportunities to gain them came with the emergence of alternative service delivery. New Public Management reforms attempted to implement the instruments associated initially with the private sector to the public sector to improve performance in the public sector (Christensen and Lægreid, 2011; Powell et al., 2019). It was assumed that those private and nonprofit organisations would be able to provide social services with higher quality and lower expenses. Therefore, contracting services out would lead to a decrease in public expenditures (Testi et al., 2017) and would create an innovative, multi aspect idea that would be well embedded in the local environment (Praszkier et al., 2017).

3. Methodology

For the analysis purpose, the data of Czech social enterprises were collected. The number of social enterprises is still unknown since the official database where the enterprises would be registered does not exist. There is a directory of social enterprises to map the field, that is operated under the Ministry of Labour Market and Social Affair. Till now, it is the biggest database covering social enterprises operating in the Czech Republic. The list was created based on the telephone survey in 2012 and is regularly updated. Currently, there are 238 social enterprises registered. However, the registration is optional and, therefore, it does not include all of the existing social enterprises in the Czech Republic. Subsequently, the list was further extended by the social enterprises that were approved to receive a subsidy from the EU funds, that were determined for the development or support of social enterprises. The list was also enlarged by social enterprises found through google. The final list contains 488 social enterprises. The data about social enterprises were found through the Business Register and from the websites of social enterprises.

To analyse the current state, first, the description method was used for explaining the roots, historical contexts and current state. The statistical methods were used to extent the descriptive part. The findings from the primary research were supplemented by the findings of previous analyses of Czech social entrepreneurship. Afterwards, the method of synthesis was applied.

4. The concept of social enterprises in the Czech context

Social enterprises in the Czech Republic are a relatively new phenomenon, growing in the last decades. But their background stands on a long tradition of solidarity within the community. At the end of the 19th century, the first co-operative was grounded and was based on mutual support among members. Afterwards, many co-operatives were developed in various business fields, also in the period between the First and Second World War when they reached their peak. However, after 1948, when the Communist Party took over, the civil society, as well as co-operatives, were mostly suppressed by the regime.

Some of them remained operating, but they lost their autonomy and had to confirm the role of the communist regime. The situation was reversed after the collapse of the system in 1989 when the country returned to the market economy and democracy. The change provided an opportunity to rebuild the Czech civil society, which formed the basis for the social economy and thus for the emergence of social enterprises (Dohnalová et al. 2016). But their growth has appeared only recently.

Dohnalová et al. (2018) and Vaceková et al. (2015) point out important moments affecting the emergence of social enterprises in the Czech Republic. In 2002, the International Conference on Problems of Propagation of Social Economy was held in the Czech Republic. One of the outputs at the conference was the acceptance of the "Prague declaration", which contained the summary of social economy features. Afterwards, the interest in the foreign conception of social enterprises began to raise. The excitement was also reflected in the emergence of social enterprises in Czech. International experience linked to social enterprises was spreading further as well as the thoughts of corporate social responsibility after the accession to the EU. One of the leading accelerators of their emergence came with the opportunity to access the financial support from the EU funds that were crucial for collecting enough sources to set up the social enterprise (Fraňková, 2019).

In 2006 the EQUAL programme, partially financed by the European Social Fund, was established. The programme provided support for social enterprises and created a space for discussions in the National Thematic Network for Social Economy, where all the stakeholders (officials, experts, social entrepreneurs) would meet to discuss the Czech approach of social economy and social entrepreneurship. After the end of the programme, the activities were taken on by the Thematic Network for the Development of Social Economy (TESSEA) emerged in 2009. It consists of people interested in the social economy in the Czech Republic – social entrepreneurs. TESSEA aimed to formulate principles and standards for the Czech social enterprises since the concept had not been defined, nor any legislation covered the social enterprises existed. In 2011, TESSEA formulated the definition of the term social economy and social entrepreneurship and the principles of how social enterprise should be approached in the national context and proposed indicators for social enterprises and work integration enterprises (WISE) The features correspond to European commission's standards (Dohnalová and Průša, 2011). This classification was used by the Ministry of Labour and Social Affairs for the processing of calls for social economy and subsequently used by the bank in a pilot program of microloans for social enterprises (Dohnalová et al. 2018).

Table 1: Features of social enterprises and work integration social enterprises

1.Social benefit	2.Economic benefit	3.Environmental and local benefit
a) Performance of an activity benefiting society or a specific group of (disadvantaged) people. **b)** Employees and members participate in the enterprise's strategic decision-making.	**a)** Any profits used preferentially to develop the social enterprise and/or to achieve publicly beneficial goals. **b)** Independence (autonomy) from external founders in decision-making and management. **c)** At least a minimum proportion of total revenues and growth thereof accounted for by revenues from sales of goods and services. **d)** Ability to manage economic risks. e) Asset lock. f) Performance of systematic economic activity. g) Trend towards paid work.	a) Preferential satisfaction of the local community's needs and local demand. b) Preferential use of local resources. **c)** Consideration for environmental aspects of both production and consumption. **d)** Social enterprise co-operates

Source: OECD (2016)

*Characteristics that are highlighted are required.

** In case of WISE, social benefit principle (emphasis on the development of work competences of disadvantaged people) is added, while 2f and 2g principles are omitted.

Comparing the definition of European Commission on social enterprises, certain specifics of Czech social enterprises can be found. Firstly, the European Commission, as well as another international perspective, emphasise that while both business and social logics are present in the functioning of social enterprises, the social goal is superior to the financial goal. However, Dohnalová et al. (2018) point out that this may not hold in the Czech environment because the economic goal is considered by social entrepreneurs equally important. The authors also point out the dissimilarities in the perception of the employees' position in the organisation. While the international perspective emphasises the position of employees in the decision-making process, in the Czech practice, their role is less important, or they do not participate in the process at all.

Most social enterprises in the Czech Republic are integrative, employing disadvantaged people. Therefore, the term WISE and social enterprise often overlap in the Czech context (Boukal, 2013). In the case of WISE, the organisation is expected to employ at least 30% of its target group employees. But, part of the WISEs also accentuate the support of local community producers as their suppliers, or they point out that either the products their use or the products their create are harmless to the environment (Fraňková, 2019).

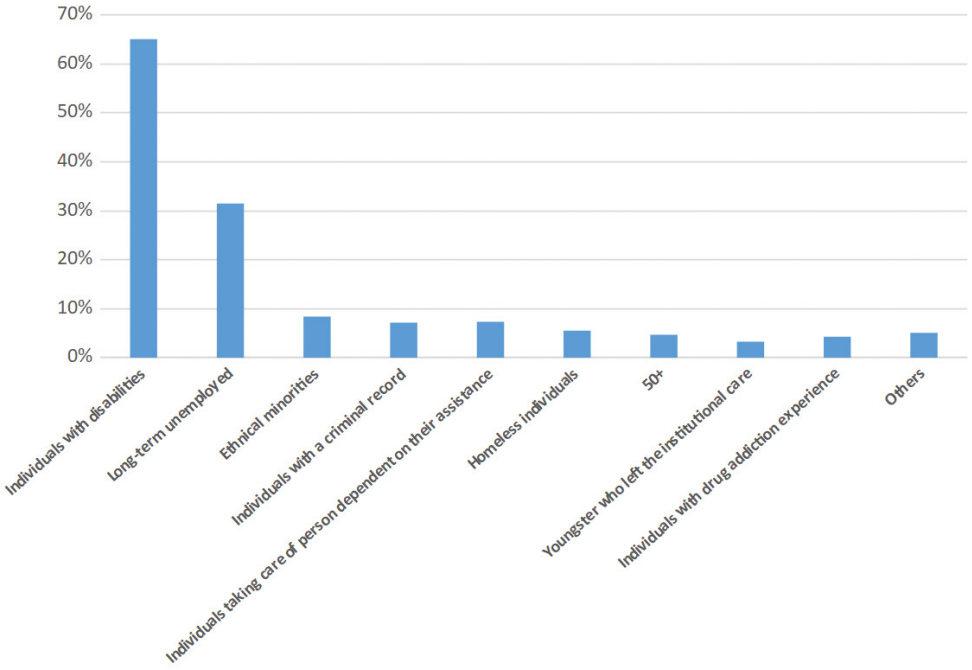
The legislation regulating the social economy is yet to be approved. Therefore, currently, the legal framework of social enterprises does not exist, nor there is a norm legally defining the concept of social enterprises. They currently operate either as a business company or a nongovernmental organisation. Since 2014, new legal form arose. A social cooperative is described as a subject that systematically performs publicly beneficial activities to support working and social integration of disadvantaged people into society, prioritising the local needs and the use of local resources based on the location and scope of the social cooperative. Up to the present time, this legal form is the only legally acknowledged form of social entrepreneurship.

4.1. The current state of social enterprises in numbers

The field of social enterprises is very differentiated in the Czech context. The organisations operate in various legal forms. Overall, the number of social enterprises arising as a commercial organisation prevails (63%) over the number of social enterprises operating under the nonprofit status (29%). The majority of social enterprises operate as a limited liability company, from which the non-profit organisation establishes 5%. Nonprofit organization increases their chances for getting loan by banks when running a business company. Furthermore, they are not limited to generate profit as it is when the organisation operates as a nonprofit. The profit can be made only through the secondary (supplementary) activities. The data indicate that the pattern of extending the capacity of the third sector organisations is happening, but it is a marginal issue.

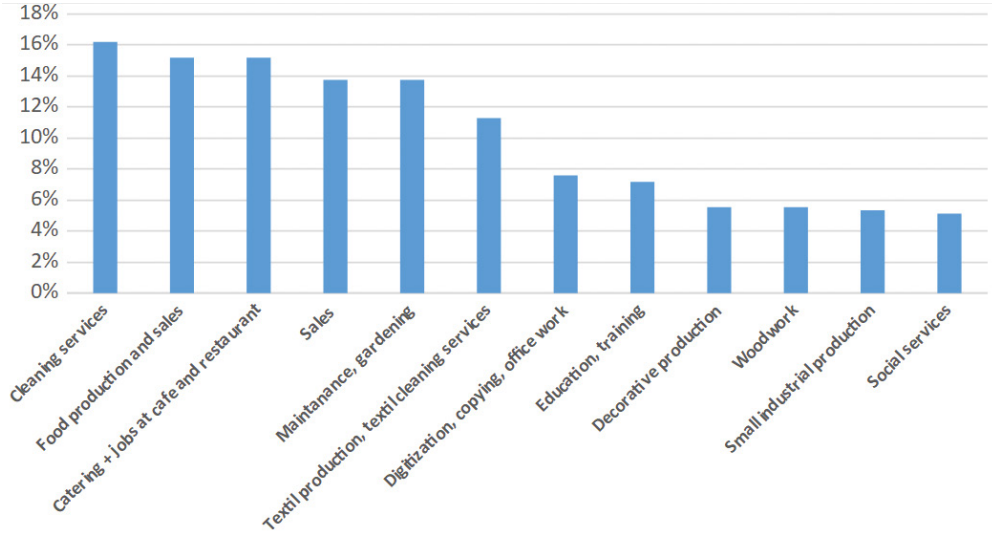
The data confirm that the preponderance of social enterprises is linked with employing people that are somehow disadvantaged, as it corresponds to the international practice. Almost 30% of all social enterprises employ more than one targeted group. Fraňková (2019) explains that targeting various disadvantaged groups may increase chances for social enterprises to be applicable for multiple grant programme or subsidies form the state. Most WISEs (Figure 1) employ people with disabilities (65%). A relatively high share of WISE also employs long-term unemployed. It is not surprising, since proving workplace either for disabled people or for people who are long-term unemployed is systematically supported through public funding. Other specific groups of people who either suffer from social exclusion or are threatened by social exclusion are hired by less than 10% of the social enterprises.

Figure 1: The share of social enterprises employing the specific disadvantaged group



Source: Own elaboration

Figure 2: Share of the social enterprises based on their activities



Source: Own elaboration

From the perspective of the social enterprise occupation, it is evident that the spectrum is rather diverse (Figure 2). Most of them provide cleaning and maintenance services (16%), employ the disadvantaged also in the food industry, as, for example in bakeries or confectionery (15%), provide them with a workplace in café or a restaurant (15%). But, in comparison to the business companies, a high proportion of social enterprise (34%), perform various type of economic activities, from diverse industries (e.g. provide gardening services, but also employ people in a laundry). One of the possible explanations could lie in trying to find the best suitable workplace for each individual with specific needs. Or they try to diversify the activities to be more sustainable. But in contrast to international practice, only 6% of social enterprises provide social services.

5. Discussion

The description of the Czech practice towards social enterprises as well as the data shows several similarities and differences to the international practice. Firstly, one of the key priorities of social enterprises is to employ disadvantaged people from diverse, vulnerable social groups. It holds also for the Czech social enterprises. However, in the majority of social enterprises only two selected groups are employed because their employment is also the focus of the public policy. Hiring them is linked with receiving subsidy from the government. It is the only systematic support from the state that social enterprises could rely. The lack of support is reflected in the non-existent systematic grant system or in the absence of contracting services out provided by the social enterprises (Wildmannová, 2018). In the process of selecting the candidates for service provision through the responsible public procurement process, social enterprises could be given advantage and be selected even if their service delivery would not be performed with the lowest costs. There is quite a share of social enterprises providing cleaning services, catering, gardening and maintenance services. These services are already contracted out. Though there are some examples of public institutions that support social enterprises through responsible public procurement, it is still more than an exception.

It is also evident that social enterprises are often not capable of surviving on the market without public support. In 2018, the Ministry of Labour and Social Affairs surveyed to map the state of social enterprises that received subsidies in one of the grant programmes. They found that the proportion of the enterprises showed low sustainability and were strongly dependent on subsidies. After the grant programme was closed, some of them left the market. As a reason, they point out they were not able to compete with other enterprises (MLSA, 2018). Though 41% of the respondents continue in their activities, they were forced to reduce the volume of provided services or to reduce the number of employees from the targeted group of people. A further problem lies in the difficulties to meet all requirement for receiving a grant. As Fraňková (2019) points out, the project preparation and the process of meeting all of the criteria is administratively demanding.

Similarly, credit and loans options are missing, and if there are some, they are not easily accessible for social enterprises, especially in the initial business start-up phase (Pelucha et al., 2017; Fraňková, 2019). Though some banks provide loans for social enterprises, it is rather a rare case.

The lack of financial grant or loan possibilities could be the reason why, contrary to the practice of foreign countries, the Czech social enterprises do not provide social services. As the data shows, social enterprises mostly create workplaces for the vulnerable groups in the industries with relatively low production costs and with the relative certainty of stable revenues. Since a large share of the existing social enterprises has been operating on the market for a few years already, it could suggest that it is a way for social enterprises to sustain their operations. However, the situation does not create a space for introducing social innovations.

The findings indicate that the significant difference could be linked with the attitude of the public authorities towards social enterprises. The international practice shows that the emergence of social enterprises was accompanied with the public support (Defourny and Nyssens, 2010; Testi et al., 2017), But that is not evident in the Czech case. The situation indicates that the issue of social entrepreneurship is not a relevant topic for the authorities. The lack of political interest could be the reason why the preparation of the legal framework is already a long-term process. But its absence causes the barriers of their development (Wildmannová, 2018) because it is expected that the framework will be used as a base for suggesting the plan for the systematic support for social enterprises.

6. Conclusions

As in other countries, Czech social enterprises are primarily associated with the work integration of socially excluded groups. Similarly, part of the social enterprise was created by third-sector organisations, which created social enterprises to expand their capacity to meet their social goals. However, contrary to international experience, the assumption that social enterprises are replacing the state in the provision of social services has not been confirmed in the Czech context, as these enterprises only provide a small number of social services. But their importance is justified by fulfilling a vital social function, as they employ people who are excluded in the labour market, due to the reduced productivity or due to requiring a particular working environment or adapting working hours and job content. By integrating these groups, there is not only a significant social impact on the targeted individuals and their families, but it is also beneficial for the state. These persons are not dependent on welfare, and at the same time, they pay taxes and social security contribution. However, the problem is that in the Czech Republic the potential of these companies is not very appreciated and therefore their systematic support is absent.

The lack of a legal framework and public support is the barrier to the development of social entrepreneurship. Its creation could expand the portfolio of financial opportunities that social enterprises could use for their growth. A diverse portfolio of financial support could create a space for social innovations that are not characteristic for Czech social enterprises at the moment.

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CHAPTER 8

Intangible capital in Croatia: Literature review[1]

Daria Maravić[2]

ABSTRACT

The purpose of this paper is to systematically review the literature on Croatian intangible capital, focusing on identifying key authors and topics and examining the linkages between the studies of global and Croatian intangible capital. Methodologically, the research will rely on a combination of standard review methods and bibliometric methods. Analysis of 55 documents from Scopus and Web of Science databases, processed in R, shows that high interest in this field was recorded after university professors Sundać D. and Pulić A. emphasized the importance of defining and measuring intangible capital through the development of VAIC measurement models. (2001-9). Besides Sundać and Pulić more notable authors are Boban, Susak (2017); Černe, Etinger (2016); Jerman, Janković (2018); Jerman, Kavčić, Kavčić (2010); Omerzela, Jurdanab (2016). There are two types of intangible capital that are most commonly studied in the literature, human capital and structural capital. The study of Croatian intangible capital focuses primarily on two sectors, tourism and the area of information communication technology. An international comparison shows that intangibles are less important for post-transition and transition economies (economies operate with a significantly lower share of intangibles) in comparison with traditional market economies. This paper makes several contributions to the literature. The analysis of existing literature of Croatian intangible capital provides a comprehensive insight into development of the Croatian intangible capital field and its basic features. In addition, it shows further research opportunities of such a significant category.

Key words: Intangible capital, Croatia, Bibliometric analysis

JEL classification: JEL_O30, JEL_O40

1. Introduction

The problem of establishing long-term economic growth and development and increasing productivity has always been at the center of the debate of economic theories. Today's situation is no different. The economy of the 21st century requires redefining of the baseline determinants of the success of all participants in the social community. The traditional concept of valuation of basic production

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factors as the most important holders of competitive advantage is reasonably abandoned under the influence of technological changes. Their place is occupied by a knowledge-based economy that creates high-quality outputs through the interaction of knowledge and technological changes. The aforementioned resources, which undoubtedly contribute to competitiveness at all social levels, are given special attention by the academic and business community. Their intensity is increased by numerous challenges of globalization and transition that can be successfully mastered only with the help of a flexible and adaptive society, ready to change. Due to active production and implementation of knowledge and the "products" based on it, individuals' performance, businesses and national economies grow. Therefore, economic theories, as well as practices, are extensively engaged in the problem of defining knowledge and all its "products" and its quantification. In other words, experts offer different definitions of intangible assets as relevant success factors recorded by the modern subjects of the wide community. The dynamics of the literature development, both theoretical and empirical, is certainly associated with the increasing heterogeneity of definitions and measuring instruments of intangible assets.

The ranking of the world's economies based on the measurement of investment in resource of the 21st century, requires excellent knowledge of all its elements and the results of their interactions as well as their interactions with tangible resources. The growth of interest in identifying intangible assets as holders of economic growth and development has been recorded in almost all countries seeking to achieve the best prosperity at international level. Identification and measurement of the components that affect the creation of added value in companies but also at the level of the national economy, allow for adequate management as well. The future of the less developed catch up economies such as Croatia lies in their knowledge of the importance, the possibilities and the abilities of applying the existing components of intangible assets in order to increase prosperity. This work aims to explore the development of awareness of Croatian researchers or, better yet, the international group of researchers and institutions, of the importance of intangible assets in Croatia and for Croatia.

The starting point and the main idea of this work is to analyze the existing literature that defines and deals with the problem of measuring the intangible assets in Croatia. The introductory remarks are followed by the second part of the work which gives a brief overview of the existing definitions and methods of measuring intangible capital, applicable both in the world and in Croatia, using the scientific records databases such as Web of Science, Scopus, Google Scholar and Hrčak. The next section of the paper identifies the main research areas, key authors and links between studies on intangible capital at a global level and in Croatia methodologically, with the help of the bibliometric analysis program. The results and discussion based on the analyzed literature are presented in the fifth section. The concluding sixth section outlines the underlying problems and limitations of the conducted analysis and presents proposals and recommendations for future research activities.

2. Literature review

Historically, there are two periods preceding modern economy based on the production of intangible. The first period was characterized by the dominance of natural resources in the production process. Companies at the time of Smith and Keynes aimed to increase production in volume, emphasizing the role of land as the most important production factor, the contribution of which could explain the surplus (given the cost of labor and capital) in agriculture. With the increase of population, land is becoming a scarce production factor because every worker operates on a smaller surface. Due to the resulting demographic changes and the rule of the laws of the economics, the use of natural resources becomes restrictive for economics and production, and the natural factors become affected by the law of diminishing returns (Jakovac, 2012)at best, evidenced in the endogenous growth theory which emphasizes the importance of education, research, innovation, technological progress and human capital in the economic growth. This can be also confirmed by the fact that nowadays we are talking about the so-called new economy in which traditional resources (land, labor and capital. However, the effect of the law of diminishing returns is only applicable for the constant state of technology.

Knowledge is finally theoretically recognized as a fundamental economic resource, and the paradigm of intellectual capital values man as a bearer of intelligence and high potential. It is very important to make a conceptual distinction between knowledge and intellectual capital in order to understand the concept. Indeed, individuals can possess an impressive collection of knowledge, but if they do not transform it into actions that create added value its existence is negligible, because knowledge remains unused (Pulić, 2008). The added value created by business entities in the new economy is primarily derived from the synergy of knowledge, capabilities and skills which human resources possess, the technological achievements and the sustainable interrelation of all business process actors (Sundać and Švast, 2009). Only one definition of intangible capital is mentioned above, which is in Croatian literature often interchangeable with intellectual capital.

2.1. Defining intangible capital

Throughout history, numerous attempts have been made to define and measure the impact of intangible assets on the growth and development of organizations and national economies, but the consensus in the world literature has not been reached. The term itself can be understood and interpreted in many ways, sometimes very broadly, due to its abstract, dynamic and inhomogeneous nature. Economically, this term can be observed from the point of view of input and from the point of view of output. Furthermore, in the accounting world it can be observed both on the property side and on the capital side. This is precisely why a wide range of synonyms for intangible sources has evolved. Most often, the term “intangible capital” is used globally. In addition, the most used

synonyms are as follows: “intangible assets”, “active knowledge”, “intangible resources”, “intellectual capital”, “invisible assets”(Kaufmann and Schneider, 2004). Termed “intellectual assets”, “intangible assets” have also been referred to as knowledge assets or intellectual capital. Although most researchers believe there is no difference between the terms, the OECD (1999) describes the difference between the concepts of intellectual capital and intangible assets. It defines intangible assets as non-monetary assets without physical performance that is held to be used in the production or supply of goods or services, for rent to others or for administrative purposes. Intellectual capital is defined as the imputed economic value of the company’s intangible assets (divided into two categories: organizational or structural capital and human capital). Lev (2001) considers that the use of concepts depends on the scope of their application. Thus, the notion of intangible assets is used in accounting; the notion of intellectual capital is used in human capital studies and for economists and the notion of knowledge assets is common. According to Lev, all these concepts refer to the same thing, which is a non-physical requirement for future benefits.

The first step in measuring human capital and the accounting monitoring of intangible assets was made by Sveibly. In his 1989 book “The Invisible Balance Sheet” he proposes a theory for measuring the capital of knowledge and categorizes it to individual, structural and consumer capital. His idea of measuring the capital was accepted in 1993 by a large number of Swedish companies as a standard for producing annual financial statements. He was also one of the key people in linking the previous surveys on measuring human capital with the newly created concept. He created one of the first standards for tracking intangible assets in the area (according to Kolaković, 2003).

Stewart (1991) uses the term intellectual capital and static definition (the source of the concept is intellect = knowledge that can be explicit and implicit). He claims that it is the cumulative of everything that people in the company know and what gives it a competitive advantage on the market. This includes knowledge, information, intellectual property and experience. Sullivan (2000) defines “intangible means” as a knowledge that can be converted into profit. Edvinsson (1999) gives a dynamic definition of intellectual capital describing it as a knowledge that can be converted into value. Many authors (according to Kaufmann and Schneider, 2004) have tried to define intangible means, but these definitions are more like illustrations because more was spoken about what constitutes it than what it actually is.

Most theorists have adhered to the definition of intangible capital that divides it into the following components:

- Human capital,
- Structural (organizational) capital,
- Relational (consumer) capital.

Structural and relational capitals are subject to the existence of human capital as the main driver for the creation of a new value. The interpretation of the concept of intellectual capital in scientific literature is often associated with an incomplete understanding of the nature of intangible capital and its role in the organization because it often focuses on only one aspect, e.g. human capital (Lentjushenkova and Lapina, 2014).

The relevant model for evaluating the science of intangibles to economic growth is the CHS model. The creators of the model provide the most comprehensive classification of intangible assets. They extend the basic concept of business investment into national accounts through the treatment of many business expenses as "intangible assets"-computerized databases, research and development, design, market value of brands, company-specific training and organizational efficiency - as an investment. They define intangible capital as any use of resources that reduce current consumption in order to increase it in the future. In their first study, researchers reported that total investments in intangible assets were one trillion dollars in 1999, and that amount was roughly the same as the investment in tangible capital. The studies conducted in the more developed economies of the world (Corrado, Hulten, and Sichel, 2005; Corrado, Jona-lasinio, and Corrado, 2014; Jona-lasinio, Iommi, and Manzocchi, 2011; Fukao et al, 2009; Piekkola Hannu, 2011; Roth and Thum, 2010; van Ark, Hao, Corrado and Hulten, 2009) confirmed that economic growth and productivity growth of the 21st century are explained by intangible means and many studies have confirmed it. The World Bank (2006) estimates that for countries, the preponderant form of worldwide wealth is intangible capital and 78% of total world wealth is due to intangible capital. One fifth to a one third of labor productivity growth in the US and the EU in a non-market sector can be explained by intangible assets. Bacchini (2016) states that intangible capital accounts for one third of labor productivity growth in the non-market sector of the EU economy. Roth and Thum (2010) record that productivity growth of 39% in developed EU countries explains the impact of intangible capital. All of these are excellent predispositions for registering such an important category and for measuring its influence on organizations and economics in all, all countries, developed and underdeveloped, because today's growth is not determined by time and space, but is equally possible for all countries.

2.2. Measuring intangible capital

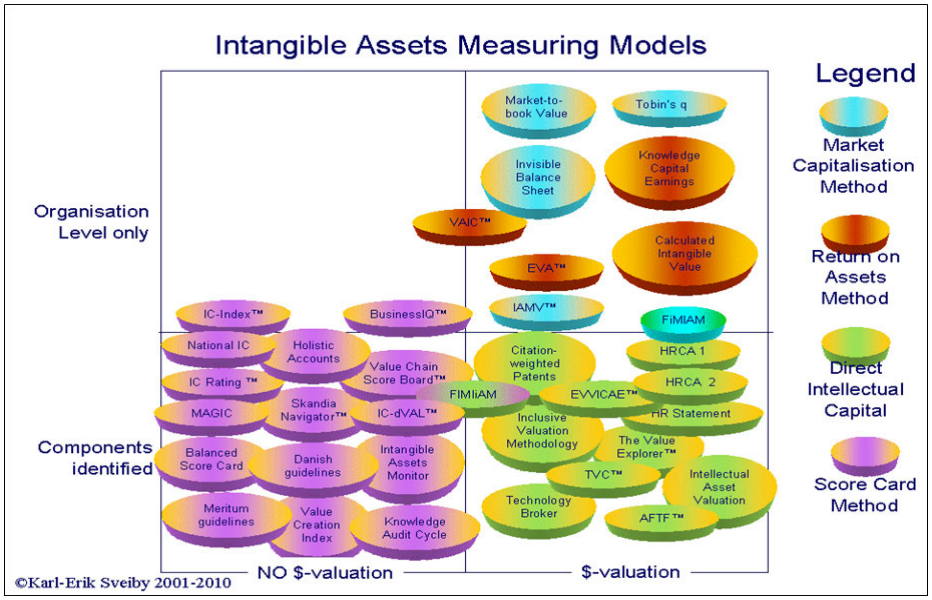
When valuing intangible capital in economics there are several models and methodologies, depending on whether it refers to a profit-making or a non-profit organization. The gap between the market and the carrying amount of the company's assets increased over time. The ratio of market to book value is between five to one to six to one (Petrovic, 2018 according to Edvinsson 1997). The aforementioned difference was explained as goodwill, but the recognition of intangibles as part of goodwill has been subject criticism on the basis that "goodwill is like soup; we do not necessarily know what is inside"

(OECD, 2012 to Zambon, 2011). IAS 38 Intangible Assets made the difference between goodwill that has been gotten through a business merger (calculated in accordance with IFRS 3) and internally generated goodwill (falls within the scope of IAS 38-not recognized as a means). In other words, as goodwill is recognized only by what is created by the business merger, separable assets can be sold, transferred, licensed etc. Stemming therefrom, most intangible assets are not recognized in the financial statements. Lev (2002) concludes from a survey conducted on S&P 500 companies that 80% of the value of the company was not included in the financial statements. In order to improve the company's internal performance and to increase the interest of potential investors and other beneficiaries of financial statements, it is important to report transparently on the historical and present results, but also on future plans. It is therefore important to implement measuring systems to monitor the performance of intangible capital.

The intangible assets valuation is challenging, but important for strategic analysis, analysis of financial statements and projection of future development. The pioneer of intellectual capital measurement is Edvinsson, who has developed an intellectual capital monitoring model in the Swedish insurance company Skandia. The Model is called Skandia Navigator. The model displaces intellectual capital on the constituent elements: human and structural, consumer and organizational, innovative and procedural, and intellectual property and intangible assets.

Methods of measuring undetectable capital at company level are shown in the following scheme.

Scheme 1: Methods of measuring intangible capital



Source: (Sundac and Krmpotic, 2009)

Sveiby (2010) divided methods of valuation of intangible capital into four main groups:

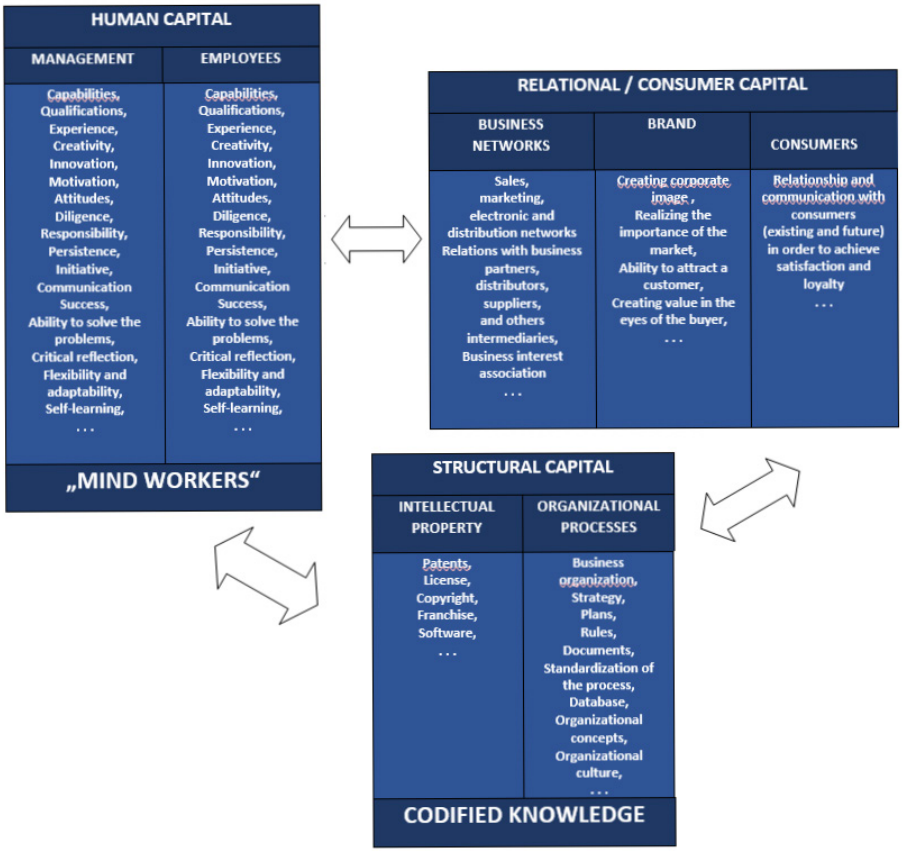
- Direct Intellectual Capital Methods (DIC
- Market Capitalization Model (MCM),
- Return on Assets Methods (ROA),
- Scorecard Methods.

The disadvantage of DIC method is a large number of components that must be measured, which makes the valuation process more complex. The indicators must be adapted to each organization, which makes the comparison of companies based on these data extremely difficult, almost impossible. The sole purpose of this method is to demonstrate the complete health of the organization. The MCM method is extremely useful for company merging and mergers, and during the stock valuation. It tracks the difference between the market capitalization and the value of shares. It is applied to the companies operating in the same field, undertaking the same activities, thereby facilitating the comparison of the financial value of intangible assets. ROA method measures intangible capital as a ratio of total investment and average value of assets. This group of methods has proven to be sensitive to interest rate assumptions and discount rates. Their limitation on the measurement of values only at the level of the organization does not give them the possibility of application at lower levels. The SC method is similar to the DIC method. Estimates are not based on the monetary value of intangible assets and can be applied at any level in the organization. For this reason, both methods are suitable for use in non-profit organizations (Mrša, 2018).

Among the first in Croatia, Sundać and Pulić write about intangible capital in 1997 and use the term intellectual capital. Sundać implies under the notion of intellectual capital the creative application of knowledge in production and any other activity based on the creative process that will convert knowledge into products and services that bring value. The author emphasizes that Croatia has not yet realized the importance of intangible capital and that it is best reflected in the development of a national economy that is socially and economically lagging behind. Moreover, the author certainly uses the opportunity to emphasize the importance of knowledge, ability, motivation, creativity or human capital as a factor of socio-economic development. The same importance in achieving prosperity adds to other factors, structural and relational capital. A similar definition is given by Vujic (2008, 51), who states that "intellectual capital represents the knowledge of employees as a source of development which they "carry" in themselves – experts, researchers and other potential drivers of innovations that create innovative ideas, which are further converted into a company's long-term value." He is the creator of the first book on intellectual capital in Croatia and the fifth in the world.

The following illustration shows the structure of intellectual capital represented by Sundać in his book “Intellectual capital – the fundamental factor of competitiveness”.

Scheme 2: The structure of intangible/intellectual capital



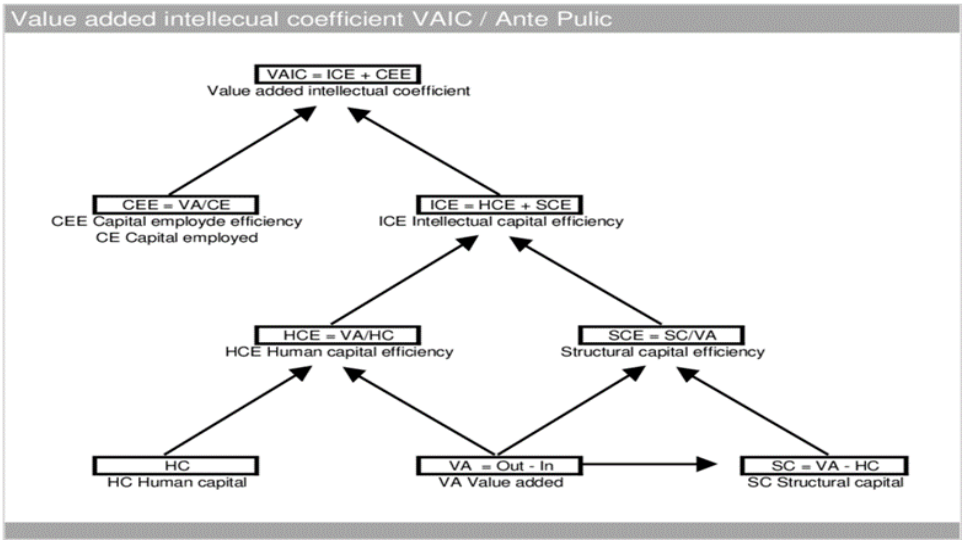
Source: (Sundać and Švast, 2009)

Human capital consists of management and employees who are seen as mind-workers. All the abilities listed in the table are in reality intertwined and contribute jointly to the success of the organization. It shows that motivation and attitude are the most important factors on the way to success. Human capital is the only category that is capable of accepting new insights and which implements new insights into everyday practice and thus creates new concepts. It is helped by structural and relational capital. Although it is difficult to quantify each of these components, the structural capital is the easiest of all to quantify and evaluate (Sundać and Švast, 2009).

Ante Pulić (2000, 2003 and 2005) defines intellectual capital as an interaction of the knowledge and the abilities of employees, together with company’s infrastructure – organization, IT technology, patents – create added value.

The author developed an internationally recognized model – Value Added Intellectual Coefficient (VAIC) to measure added value and efficiency in the use of intellectual capital.

Scheme 3: Construction of the Value Added Intellectual US VAIC



Source: (Ståhle, Ståhle and Aho, 2011)

The previous scheme shows how the concept is conceived. Namely, the author uses human capital and structural capital as two basic components. Human capital is not treated as a cost but as an investment, and the structural capital is described as a result of the engagement of human work in the past. The VAIC method does not provide guidance to the management structure to reduce costs, but it addresses the problem of value creation. The efficiency indicator shows the success of the use of all resources (physical and intellectual), and expresses the intellectual capacity of the company, the economy. What makes the analysis original is that it can be applied at all levels of business: micro, meso and at the macroeconomic level, as well as within the company itself. The advantages of using one of the most famous methods are: the comparability of business units, the indicator of corporate efficiency, by locating a segment in the company where “value is lost” it helps management with guidelines for situation improvement, by applying it at lower levels in the organization it allows for targeted management activities and the raise in efficiency (Pulić & Kolaković, 2005).

Despite numerous advantages, (Ståhle et al., 2011) the models are often criticized. The most important critique is related to the use of added value as a central element in a formula which can produce contradictory results that are related to the variability of added value. The criticism also signals that the IC elements are confusing, and the analysis can only be carried out based on the use of work and capital and the actual productivity of the work. However, Pulić

remains an important scientist who did not just make a first step and recognized the importance of intellectual capital, but also valorized it.

The challenges of the Croatian scientific community in defining a new environment through the prism of knowledge and its products followed the first steps of Sundać and Pulić. “Hidden assets”, although intangible, consist primarily of the abilities and the knowledge of employees, their innovativeness, the narrative, the initiative and the positive attitude, the connectivity of the company with customers and suppliers, and then brand, image, organizational culture, etc. (Handkerchief, 2002). Croatian companies and the overall economy in the performance related to GDP and exports are lagging behind mid-developed European Union countries. Therefore, an adequate solution must be sought through increasing the knowledge of an individual who will be incorporated into the enterprise and thus contribute to competitiveness. The analysis conducted a year earlier by Lovrić (2001) confirms the lag of the Croatian economy through low levels of GDP.

The global approach to internationalization, small and medium-sized enterprises, suggests that the estimation of intangible assets is important because through intangible assets the company’s ability is assessed. The establishment of an export process with those markets that represent a profitable venture for small and medium-sized enterprises is the result of opportunities to recognize the effectiveness of global thinking (Miočević and Crnjak-Karanović, 2010) born global approach indicated that firms can internationalize instantly on a full scale by avoiding incremental steps. However the born global approach to internationalization confirmed that, besides informational and resource based perspective, intangible assets (capabilities Public investments, especially in transport and human capital, have a positive and significant effect on corporate productivity in Croatia (Borković and Tabak, 2018).

The most dominant research category is human capital (education). Many authors (Lažnjak and Švarc, 2002; Sundać, Škalamera-Alilović and Ahmetović, 2013; Teodorović and Buturac, 2006) note Croatia’s need for imitation or adaptation of foreign technologies and the need for increasing the share of highly educated workforce as the only possibility of development. The role of the managing elite, which must provide a healthy business environment in which the highly educated workforce will be satisfied and participate in creating added value and create a competitive advantage, is also important. Croatian highly educated workforce often seeks its future abroad after completing the educational process and thus influences the decline of the competitiveness of the domestic economy. Statistical analysis identified a significant correlation between increasing competitiveness and reducing brain drain. The high rate of youth unemployment increases the likelihood of brain drain. Therefore, the task of Croatia, in the context of creating a knowledge-based economy, is to increase investment in human capital that will encourage professionals to remain in their home country (Fabritz and Falck, 2016; Stumpf and Sundać, 2016)a key factor to maintain and increase the competitiveness is the human capital.

Long-term development of the economy of the Republic of Croatia depended largely on the quality and expertise of human resources, which entailed the fact that the investment in human resources, their professional development and encouragement of the implementation of measures for their stay in home country should have been highly positioned on the priority list of the Republic of Croatia. This scientific paper conducted an analysis and determined the relationship between competitiveness and brain drain, as well as stated measures and proposals for reducing the brain drain, which should consequently affect the increasing competitiveness of the Republic of Croatia. The research results suggested that the brain drain caused by dissatisfaction in the home country greatly affected the competitiveness of the Republic of Croatia diminishing its importance on global competitiveness ranking. These findings were confirmed by international experiences which indicated that it was necessary to continuously work to prevent emigration of highly educated professionals by giving them satisfactorily working conditions, opportunities for constant development and life in general in their home country (Fabritz & Falck, 2016; Stumpf & Sundać, 2016). The recognition of knowledge as an important production force was also discussed in another study. The results indicate that human capital in Croatia is not educated enough to help develop the modern economy. In solving the problem Croatia has also been assisted by international institutions which require meeting certain standards (Sundać and Fatur Krmpotić, 2009a). Using the development index, research capacity, technology and innovation efficiency, and the ability to absorb knowledge and technology on a sample of 100 selected countries, Croatia is globally ranked the 34th, as a country with a high human resources development index. Regardless of that, it is necessary to stimulate the investment in faster absorption of knowledge and technologies in order to reach the level of competitiveness of the European Union countries (Aksentijević and Ježić, 2009).

The scientific community is also active in considering accounting records of intangible capital. So Jerman, Kavčić, Kavčić (2011) analyze the relationship of intangible assets in total assets and its influence on the economies of Croatia, Slovenia, Germany, America and the Czech Republic (listed countries are divided into transitional, market and post-transitional economies). In addition, they prove that the proportion of goodwill in intangible assets (only recorded in the case of mergers and acquisitions) in Croatian companies is insignificant in comparison to the shares in companies of market economies because businesses have not participated in the mergers and acquisitions. The problem of registering in the Croatian accounting system is the systematic rewriting of other intangible assets that are not included in the goodwill. Jerman and Janković (2018) deal with the analysis of the importance of intangible assets in Croatian hotel companies. The hotel companies have been selected due to the reason that the results in tourism generate 18.9% of GDP. On a sample of 1134 companies, the authors confirmed that those companies that have a higher proportion of intangible assets are necessarily more profitable in their burial assets. This is due to the fact that the majority of intangible assets are not recognized in the

financial statements. However, economic growth in Croatia has been intensively generated by working and technological advances that had little impact on the growth rate of real GDP (Škare & Sinković, 2012)we look into the correlation between investment in technical structure and growth in Croatia for two periods - socialist (1960-1989.

3. Methodology

The purpose of this study is to present an overview of all the research conducted in Croatia on the topic of impact of intangible assets on economic growth and productivity. The aim is to identify relevant documents, the most productive authors and links with studies conducted on a regional and global level. For the purpose of this study, Rstudio software was used for bibliometric and descriptive analysis. The R-package used in the analysis has proven useful for quantitative research of authors, keywords, citation network and historiography.

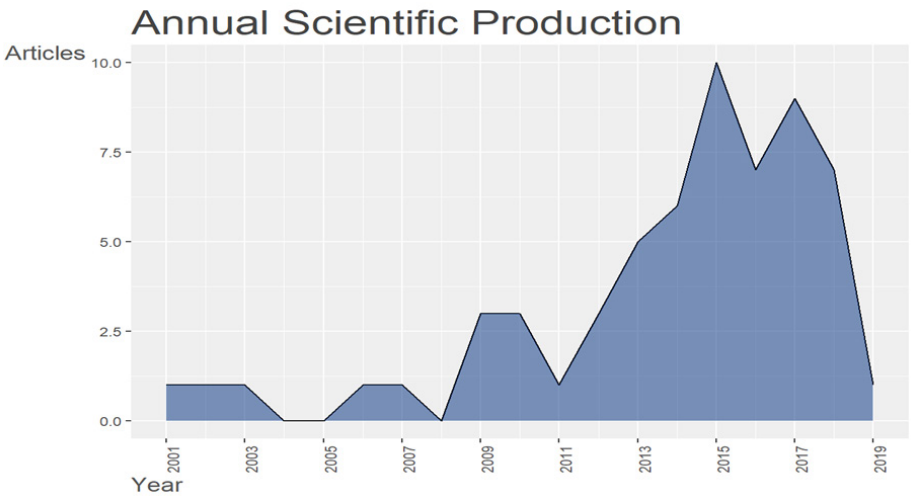
The collection of data was made by extracting relevant articles from the Clarivate Analytics' WoS (http://www.webofknowledge.com) and Elsevier Scopus (https://www.scopus.com) online database systems. These two listed databases were selected because they contain topics indexed by SSCI (Social Science Citation Index). In order to collect reference information from the search databases, notions and terms such as intellectual capital, economic growth, labor productivity and Croatia have been used. Firstly, the intention of this study was to provide an overview of the literature on intangible capital in Croatia as a descriptive analysis, including annual production of articles, total quotations annually, the most productive authors, the most relevant sources and top manuscripts according to the descriptive analysis and certain sources and articles available for this research. A standard review of the literature of the most productive authors is given at the end of the descriptive analysis. At the end of the study, different types of network mapping related to the key words, authorship and quoting and the identification of the most quoted and relevant articles from the past to date are visualized.

4. Empirical data and analysis

The elimination method also excluded irrelevant and double documents. The first relevant article was published in 2001 and after that the number rose to 60. The documents considered are written both in English and in Croatian. The types of documents are articles, unpublished articles, and articles still in process, books, conference announcements and reviews of a total of 43 sources. The total number of authors is 122, out of which 111 multi-authored documents, and only 11 single-authored documents. In other words, the average number of authors per document is 2.03, and documents by author 0.49. The number of co-authors per document is 2.18. The documents are mostly published in the Economic Survey, the Economic Research and the Proceedings of Rijeka

Faculty of Economics: Journal of Economics and Business. Chart 1 shows the annual scientific production of publications.

Chart 1:



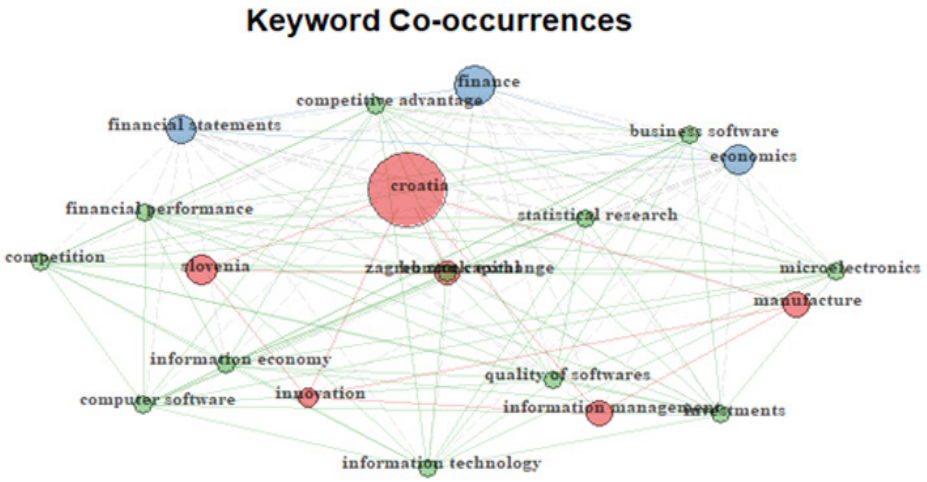
The most productive period is after the entry of Croatia into the European Union when due to accounting regulations an interest increased in questioning the accounting profession about the height of those parts of intangible assets that are not displayed as goodwill. The reason for the increased number of documents is the later awakening of awareness of scientists, empirical and broader public about the transition to a new knowledge-based economy. According to the analysis performed, the most productive authors and the most quoted articles are presented in the following table.

Table 1: Most productive authors and top manuscripts per citations

Rank	Authors	Articles	Authors	TC
1	Jerman M.	2	Šebalj D.	21
2	Ježić Z.	2	Djukec D.	15
3	Mikulić D.	2	Mikulić D.	11
4	Nagyszombaty AG	2	Bubić J.	9
5	Rep A.	2	Šarlija N.	9
6	Rupčić N.	2	Odobasa R.	7
7	Sinković D.	2	Perić I.	7
8	Susak T.	2	Teodorović I.	7
9	Škare M.	2	Vuletić G.	6
10	Aksentijević NK	1	Stipčević D.	6

Table 1 shows that the list of the most quoted articles does not match the results of the list of the most productive authors. Only Mikulić is on both lists, while other authors appear on one but not the other and vise versa. The most cited work is the one of Šebalj, even 21 times, followed by Djukec. Šebalj (2017) investigates the current situation of the IT sector in eastern Croatia. He finds that the IT sector in relation to other sectors captures the smallest decline in the number of business entities and employees in recent years. The 21 most frequently occurring words are shown in Figure 1.

Figure 1:



Since this research has been done at a national level, the most commonly used word is *Croatia*. In the matrix of coincidences, three circles are formed. The first connects the terms *Croatia, Slovenia, production, information management* and *innovation*. The remaining two comprise words in the financial, information and economic context. Croatia's scientific collaboration is the strongest with Slovenia which is also justified due to the fact that both countries have similar characteristics, from geographic, demographic and social to economic. In addition to the focus of researchers on the comparison between the two countries, it is important to note that small and medium-sized enterprises, whose intellectual capital is most often the subject of analysis, should be added to this cluster. The problem of financial valuation of this phenomenon can be observed as a roof cluster that is more extensively represented in the literature.

5. Results and discussion

The aim of this study was to identify the main authors and document titles and to link the existing literature in Croatia with the literature on a global scale. The Croatian scientific community is polarized around the study of the specifics of the definition and the structure of intangible capital. There is a group of authors

without empirical evidence claiming there is a positive correlation between intellectual capital and the success factors of individuals, businesses and national economies. Theoretically they justify their position, but empirically they do not confirm it. The second group empirically confirms what the first group elaborates in theory.

However, several areas of interest may be identified in the study literature. The starting point is macro-economic studies in comparison with studies of other similar countries or more developed economies. Human capital interacting with technological achievements is the subject of the interest of most studies at the macro level. Since Croatia, now long ago, has become an independent, sovereign and independent state, it has not yet met the complex demands of the modern environment. It still feels the consequences of previous economic and political disputes in an environment that creates a problem in convergence with market economies. The authors often refer to a crisis period in history but emphasize that the open market offers a handful of opportunities to exploit and increase prosperity. Furthermore, a small number of authors focused on examining investments in human and structural capital, which, according to Corrade, are the most important components, because their synergy implies the emergence of a third element. Tourism is a branch that contributes most to the generation of domestic products, therefore the interest in the development of studies in the measurement of intangible capital in this activity is justified, as well as in traffic and logistics. The impressive part in this small sample belongs to research papers on intangible capital in the financial accounting's sphere of action.

6. Conclusions

The results obtained in the analysis of the existing literature on intangible capital in Croatia confirm the initial hypothesis about the insufficient realization of the importance of the phenomenon that drives the world. As determined by the analysis, very little research which is relevant is conducted. The primary restriction indicator in the analysis is a small sample of documents. However, there arises a problem of multidimensional concept of intangible capital. The study of literature shows the dispersion of existing literature in printed form and electronic form. This can be interpreted by bibliometric analysis of results that do not show the right state of affairs as they are not covered by all existing sources. The existing literature serves as an adequate benchmark to confirm this deficiency. Data processing shows Professor Pulić's under-representation in the databases and his contribution to the development of intellectual capital theory from the aspect of valorization is neglected. Studies continuously alert the Croatian public about the drastic brain drain that harms the creation of added value and the achievement of competitive advantages of the national economy. On the other hand, by missing the opportunity to improve its image through better publicity of scientists, who are internationally recognized, it directly creates negative implications for the competitive advantage of the national economy.

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CHAPTER 9

The impact of digital technologies on quality performance and process advancement in dental medicine

Hrvoje Pezo, Luka Samaržija

ABSTRACT

Introduction of digital technologies dramatically changes processes in dental medicine. With the introduction of digital technology, the time of patients' treatment is shortened, the number of steps in the treatment of the teeth and the replacement decreases, and the quality of performance is increased. In order to achieve and remain competitive in the long run, introduction of digital technologies in dental medicine became an absolute imperative and not just a fading trend. The aim of this paper is to provide overview on the importance of digital technology and especially 3D technology for dental medicine, and also to present results of an empirical research on the effects that introduction of digital technologies in dental medicine has compared to traditional teeth repair methods. Research was done on a sample of both dentists and laboratory experts, and clearly indicates benefits in quality performance and process advancement brought by introduction of 3D digital technologies in dental medicine.

Key words: Digital technologies, 3D technology, Quality, Performance, Dental medicine

JEL classification: O14, O33

1. Introduction

As opposed to traditional industry processes and activities, development of modern technologies has brought significant changes in today's business. These changes are seen primarily in automation of simple and repetitive tasks, high degree of automation, smart technologies, real-time nature of inputs and outputs or automated disposition (Sackey, Bester, 2016) to name just a few. Research also show that technology processes, for example in production, will be and are highly affected by digital modelling, simulation and visualization, advances in industrial robotics, additive and green manufacturing (McKinsey Global Institute, 2012). Still, these changes are not just present in smart or manufacturing companies. These technology changes are happening very quickly and are presented widely, so every industry is affected by these processes (Fitzegarld et al., 2013).

Emerging development of digital technologies has changed working procedures, operations, processes and products and services design in most industries, including dental medicine. This change is not just evident in the process of teeth health and healing but also in design of organizations in this sector.

Lately, digitization of processes in dentistry has a significant impact on reducing time spent on maintaining and improving health of the teeth and advancements in performance quality. As Dawood et al. (2015) emphasize digital technology has a special resonance with dentistry and it will have an even increasing importance, especially with advances happening in 3D imaging and modelling, together with CAD CAM technologies already in use.

In the field of dental medicine, the quality of products and services is crucial for the patients to feel they have received what they have paid for. Poor quality of products and services in dental medicine presents an irreversible damage to the patient. Unfortunately, patients find out this when it's too late. The fundamental difference between the experience of quality in other industrial branches and dental medicine is that patients cannot be satisfied when they get poor quality of products and services at a lower price. The consequences of poor quality in dental medicine are much more pronounced than when people, for example, buy a poorer quality product for a small price. Consequences of a poor quality in dental medicine are a non-refundable loss to the patient.

The aim of this paper is to present overview on the importance of digital technology, especially 3D digital technology for dental medicine, and also to present results of an empirical research on the effects that introduction of 3D digital technologies in dental medicine has compared to traditional teeth repair methods.

2. Literature review

Dental medicine encompasses all general activities pertaining to the field of oral health and is a common literature name from the field of dentistry. The main characteristic of this field is a rapid development of respective techniques and technologies. Rapid development of materials used in dental medicine and digitalization of the entire process demands an accelerated acquisition of digital know-how, knowledge of materials and development of laboratories which are capable of stepping up to these needs and developing advanced technologies in this field. Beside these, Achermann (2012) emphasizes that general trends in dental medicine encompass following:

- tooth health will improve,
- there will be no replacement for dental implants in the next 10 years,
- the number of dental patients will increase,
- patients will be better informed about tooth health and treatment options,
- different forms of alliances and consolidation of dental health organizations will increase compared to small private practices,
- productivity will increase and working time in the dental seat will decrease,
- investing in new technologies will increase the restrictions on entry into the industry,

- dental implants will become more attractive to dentists,
- there will be reductions in independent laboratories and they will be integrated into companies that offer a complete service,
- different dental services will be centralized,
- dental techniques will be completely computerized,
- full digitization of the process and value chain will be completed,
- digital scan will be performed using 3D display,
- competition for talent will increase,
- demand for dental implants will grow in line with the macroeconomic environment,
- dental implants will become a standard for tooth restoration,
- new patient requirements will completely replace standard requirements and
- increased efficiency of the work process will reduce costs.

When it comes to digital technology and 3D technology in dental medicine Mahamood et al. (2016) in their paper on application of 3D technology emphasize that this is a revolution in this industry. Describing history of 3D technology development authors also state that the beginning of 3D technology is from 1984. when Charles Hull was first to develop first usable 3D printer. Lateron, 1986. he was the one to develop first commercial 3D printer. Massachusetts Institute of Technology (MIT) in 1993. patent 3D technology. Biotechnology in regenerative medicine was developed in 2010 (Mahamood et al., 2016, p. 267).

Application of 3D technology in dental medicine refers to:

- 3D scans of the teeth health,
- tooth restoration, especially for dental prostheses including crowns and bridges,
- dental implants,
- complete artificial dentures,
- tooth accessories and
- creation of temporary replacement before final installation.

This technology removed hand modelling, helped implement 3D printer and revolutionized the industry (Mahamood et al., 2016). Scarfe (2011) also states advancements of application for patients, dentists as well as producers in digitization of prosthetic value chain. All procedures are more comfortable and are done more quickly, number of patient visits will decrease as well as costs of activities.

CEO of Germany's Merz Dental GmbH, Friedhelm Klingenburg has published an interesting article about how dental procedures and value chains are being transformed by new digital dental technologies (Klingenburg, 2016). In the article, the author describes changes brought about by introduction of digital technologies in dentistry as well as changes to the manner in which activities in value chain are organized and performed.

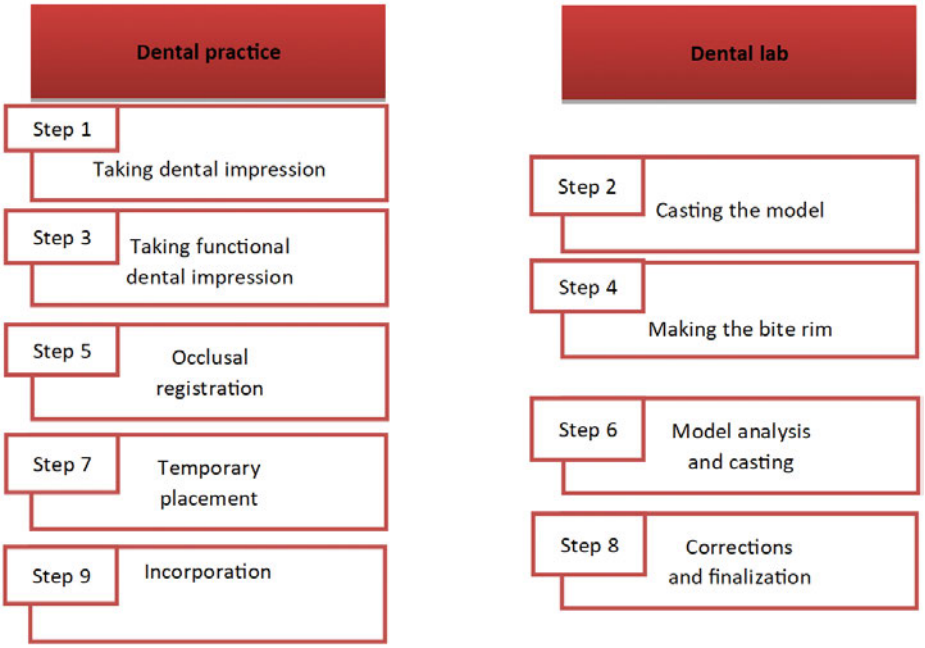
Klingenburg (2016) points out that the value chain is represented by the sum of all values added of each individual market participant. In dentistry, however, the specific situation of the market participants - dental lab, dental practice and patient, which together make up the value chain system of the industry - must be considered. In the past, the industry generated its value added by manufacturing dental equipment and consumables, the dental technician generated his or her value added by making traditional dental restorations and the dentist generated his or her value added by rendering services to patients. The traditional value chain, however, has changed significantly over the years mainly due to the introduction of digital technologies, given the integration of total prosthetics into digital technology. Klingenburg also describes how digital technology is transforming dental care:

- The profile of a dental technician's occupation, which is no longer a plaster room job but rather a computer workstation position. As a result, the requirements change for candidates because the modern-day skilled trade calls for future applicants to be interested in computer aided design (CAD) for crowns, bridges, telescopes, abutments, etc;
- The rendering of dentistry services is calling for increasing use of state-of-the-art digital instruments and methods. In the future, a dentist will not only make a diagnosis but especially focus on treatment preparation, surgery and the insertion of a dental restoration (conservative or prosthetic). The other activities will be replaced by digital work processes.

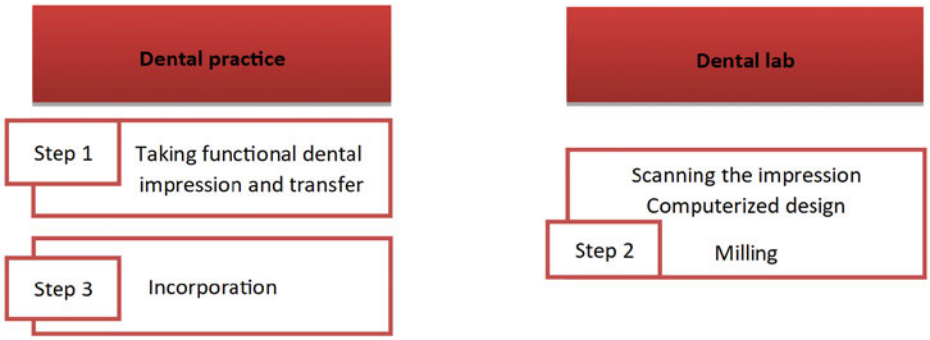
Furthermore, in his work on digitisation in dentistry, Klingenburg demonstrates the advantages of a reduced process flow by eliminating a great deal of activities typically involved in the conventional production process as shown in Figure 1.

Figure 1: Comparison of activities in traditional performance and in digital process performance that eliminates large number of activities

A) Activities in traditional performance



B) Activities in digital process performance

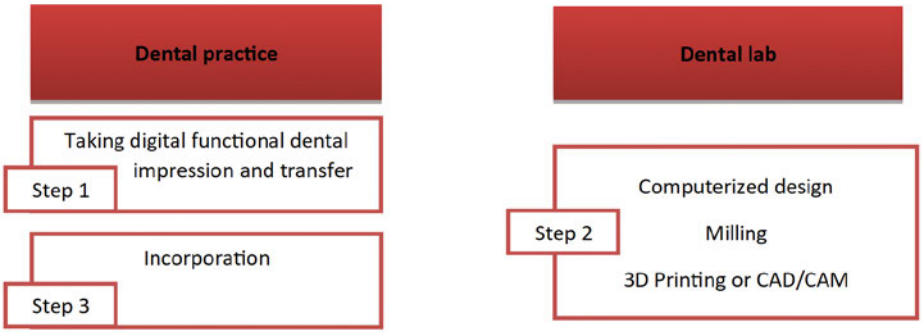


Source: Klingenburg, F. (2016) "Value chains being transformed by new digital dental technologies", Available at: https://www.dental-tribune.com/clinical/value-chains-being-transformed-by-new-digital-dental-technologies/, [Accessed: February 13, 2019].

Introduction of intraoral scanners since 2016 has generated opportunities to speed up the production process, improve productivity and quality.

The digital process flow looks like in Figure 2.

Figure 2: Activities in digital process with improved performance



Source: Klingenburg, F. (2016) "Value chains being transformed by new digital dental technologies", Available at: https://www.dental-tribune.com/clinical/value-chains-being-transformed-by-new-digital-dental-technologies/, [Accessed: February 13, 2019]

Digital technologies are indispensable tools used in dental practices and dental labs even though it means increased investment in equipment and employee education.

Klingenburg (2016), when describing changes in the value chain, explains that at the beginning of digital dentistry there were stand-alone solutions and single work steps, but nowadays there is more and more consideration of complex dental lab processes that can be implemented on a totally digital basis throughout the entire value chain that is providing a full range of service.

Introducing 3D printing technology fuelled a revolution in the dental industry.

Heutger and Kückelhaus (2016) argue that 3D printing is going to transform supply chains in the future. The authors claim that 3D technology will bring a revolutionary shift in production as revealed in Figure 3.

The special revolution in dentistry brings 3D technology for dental replacements.

Heutger and Kückelhaus (2016, p.4) highlight some of the advantages of using 3D technology:

- reduced process flow involving designing, making a prototype and manufacturing of a highly sophisticated product tailored to the customer (patient),
- shorter delivery time,
- lower logistics and production costs, including lower ordering and shipping costs and storage costs, reducing possible import-export costs by manufacturing localization and eliminating expenses related to new production tools in case of product modification and
- improved efficiency and sustainability of production due to reduced quantity of consumables and energy consumption in production.

Figure 3: Simplified layout of 3D printing process

Source: Heutger, M., Kückelhaus, M. (2016): 3D Printing and the Future of Supply Chains, Troisdorf: DHL Customer Solutions & Innovation

In the light of the foregoing considerations, it can be concluded that an intensified consideration of application and impact of 3D technology and digitization of the entire process is one of the most important steps in creating an effective value chain inside dentistry.

3. Methodology of empirical research and hypotheses of research

In order to assess importance of 3D digital technologies introduction in dental medicine an empirical research was designed and conducted. Based on previous considerations, the following hypotheses of the research can be set:

H_1: Introduction of computerization and digitalization of the process with a 3D printer significantly accelerates the processes in dental medicine, decreases the number of steps and shortens the time of service delivery

H_2: Introduction of computerization and digitization of the process with the 3D printer significantly enhances the quality of service

Precise calculation of delivery time of dental medicine services and measurement of the quality of services prior to digitization and after introduction of 3D technologies exceeded the scope allowed by this paper, so hypotheses testing is done through an empirical research done on sample of dentist and laboratory experts. We asked for experts' opinions and perception about the subject matter. We choose those experts that used to be in the technology-based process prior to digitization and are now working in highly digitized processes. In total our sample included 23 dentist and 28 laboratory experts. Through our survey we asked them to provide their perception on the percentage of change and advancement that is a results of 3D technology introduction in different aspects of their activities and services they provide. Dentists were asked to assess in percentage how introduction of 3D technology helped to improve assessment of teeth health, implantation process, quality of performance and facilitation of their work, and in which percentage it helped to decrease number of steps and time of patient treatment. Laboratory experts were asked to assess percentage how much 3D technology and 3D printing shortened time and decreased cost of teeth implantations design and development, as well as how much it helped in facilitating their work and quality performance.

4. Research results and discussion

When looking at dentist experts sample results reveal that in their opinion 3D technology has a significant effect on different aspects of their activities and services they provide. Results are presented in Table 1.

Table 1: Introduction of 3D technology effects according to dentists' opinion

Introduction of 3D technology effects	Percentage of advancement	Range	
		Min	Max
Better assessment of teeth health	86,65	30	100
Decrease in number of steps needed for healing teeth	73,22	30	100
Improvements in implantation	92,43	50	100
Decrease of time a patient spend in dental seat chair	53,61	10	100
Quality of performance in improving health and tooth mechanics	75,83	20	100
Facilitation of dentist work by performing service in one place and using "on-line" information enabled by digitization	98,78	90	100

Source: Author

According do dentist's opinion 3D technology has brought significant changes and advancement in facilitation of dentist work by performing service in one place and using "on-line" information enabled by digitization. On average dentists consider that advancement was almost 100% (98,78%). This is followed by highest percentage of advancement in improvements in implantation (92,43%) and better assessment of teeth health (86,65%). The least advancement is seen in decrease of time a patient spends in dental seat (53,61%). This is somehow expected, as time spend on dental seat and under treatment significantly depends on the type of problem a patient has and specifics of treatment. Undoubtedly 3D technology shortened this time, but time in this case is dependent among many other factors dentists cannot always directly influence.

Results of laboratory experts' perception of advancement are presented in Table 2. As opposed to dentists, laboratory experts have a slightly less positive view of the benefits and percentage of advancement brought by 3D technology.

Table 2: Introduction of 3D technology effects according to dentists' opinion

Introduction of 3D technology and 3D printer effects	Percentage of advancement	Range	
		Min	Max
Shortened time of tooth substitutes/implants development	28,75	0	100
Decreased cost of tooth substitutes/implants development	29,13	5	90
Facilitation of laboratory experts work	52,57	2	100
Quality of tooth substitutes/implants development	62,86	20	100

Source: Author

As regard to quality of tooth substitutes/implants development laboratory experts consider this is the area where advancement is mostly present as a result of 3D technology and 3D printing introduction. They consider that quality has increased by 62,86%. On the other hand, they see only small percentage of advancement in shortening time (28,75%) and decreasing cost (29,13%) of tooth substitutes/implants development. Interestingly, 7% of sampled laboratory experts consider that introduction of 3D technology and 3D printing did not shortened, but on the contrary it has extended time of tooth substitutes/implants development.

In general, according to our results we can accept both our hypotheses and confirm that introduction of computerization and digitalization of the process with a 3D printer significantly accelerates the processes in dental medicine, decreases the number of steps and shortens the time of service delivery, as well as that it significantly enhances the quality of service provided in dental medicine.

5. Conclusions

Dental medicine and its processes, as all other industries, are not isolated from modern technological changes and digital technology trends. In order to ensure long term sustainability and competitiveness, managers and dental medicine workers have to acknowledge that digitization and 3D digital technology present essence for development and it can help them advance their process as well as to advance and increase quality of their performance and services they provide. In order to assess level of advancement that introduction of 3D technology introduction brought to dental medicine processes and quality performance, an empirical research was conducted among selected sample of experts from dental medicine. In both samples, those of dentist and laboratory experts, results indicate that highest percentage of advancement is in facilitation of their work, but also in quality of their work. Still, dentist perceive higher percentage of advancement is present in activities and aspects of their job, as opposed to laboratory experts. Laboratory experts have a slightly less positive view on percentage of advancement, and some of them even consider 3D technology and 3D printing to have a negative effect on activities related to time of tooth substitutes/implants development. In general, however, results undoubtedly showed digital technology introduction has brought positive changes and advancements in processes and quality performance in dental medicine. Future will probably bring additional changes and advancements so its benefits will probably be even higher.

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CHAPTER 10

City Management Support and Smart City Strategy as Success Factors in Adopting Big Data Technologies for Smart Cities

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ABSTRACT

Smart city is a city seeking to address public issues using recent information and communication technologies supported by city management and other stakeholders. Big data technologies allow city management to monitor city infrastructure and to interact with the community. They also prove vital for increased efficiency, cost effectiveness, and increased citizens' satisfaction with city's services. In context of adopting big data technologies for smart cities, city management support and existence of smart city strategy as city's organizational factors play important roles. The research is based on current literature overview regarding city management and smart city strategy. The main goal of this research is to detect which aspects of city management support and smart city strategy are crucial for big data technology adoption in cities. Furthermore, a case study of an adopter city of big data technologies will be described to investigate some of the good practices regarding smart city projects. The Importance-Performance Map Analysis is applied to fulfil the goals of the research. Based on the Importance-Performance Map Analysis, the existence of smart city strategy that targets efficiency and technological advancements of the city's soft infrastructure is recognized as most important for technology adoption initiatives. In addition, the readiness of municipalities, city council and city administration to accept the financial and organizational risks relating to the adoption of technology is important. However, their readiness is perceived very low. Therefore, this paper provides recommendations for city management regarding activities related to organizational factors for successful adoption of smart city initiatives.

Key words: Smart city, Big data technologies, City management support, Smart city strategy, Importance-performance map analysis

JEL classification: R10, R50, R58, R59

1. Introduction

Academics and practitioners attempt to describe and define smart city, which results in numerous discussions without prevailing definition. Smart city is described by various stakeholders who often have conflicted interests and promote different but yet complementary smart city aspects.

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A smart city uses information and communication infrastructure as a foundational platform to improve quality of life of its citizens, optimise physical and services infrastructure, and establish effective governance of a city (Kondepudi, S. and Kondepudi, R., 2019). For this paper, a smart city is a city that solves public issues by using innovative information and communication technologies (ICT) supported by city management and other stakeholders.

Innovative information and communication technology, including big data technology, contributed to smart cities development by transforming the infrastructure and services of cities. It also changes the way of how citizens use a city's infrastructure. For example, cities collect data from parking spaces, security cameras are used to detect abnormal behaviour of pedestrians, and GPS systems are used to detected traffic congestion. Usage of such solutions enables access to information in real time for city management and citizens. Based on that information, citizens can get insights into the city's environment and bring valuable conclusions and decisions. Big data technology enables the collection, storage and analysis of large amounts of various types of data generated by a city's infrastructure and citizens.

Various stakeholders, including a city's management, should support the process of technology adoption in cities. Focus of this research is city management support and the existence of smart city strategy as a city's organisational factors for big data technology adoption in smart cities. The research is based on current literature overview regarding city management and smart city strategy. To our best knowledge, no previous research has tested whether city management support and smart city strategy are essential for big data technology adoption in cities. In order to fill out the research gap, the main goal of this research is to detect which aspects of city management support and smart city strategy are crucial for big data technology adoption in cities. Sub-goals of this research are i) to develop general recommendations for cities regard city management support and smart city strategy, and ii) to describe a case of an adopter city of big data technologies to investigate good practices regarding smart city projects.

The paper consists of five sections. After the Introduction, the Literature review section provides the rationale behind using the City management support and the Existence of smart city strategy as factors in the research model. The Methodology section describes hypotheses and data preparation for the Importance-Performance Map Analysis (IPMA). The fourth section provides Results and Discussion of the IPMA. The fifth section is the Conclusion.

2. Literature Review

From the organisational and innovative technology perspective, top management support refers to the level of management support for the adoption of innovative information and communication technology in an organisation (Abdollahzadehg et al., 2013). It consists of activities that help to create benefits for

an organisation (Salwani et al., 2019). Moreover, management support refers to the level of management's commitment to the adoption of information systems, and its readiness to allocate resources needed for the adoption of technologies. Top management is likely to provide needed resources when they are informed about the benefits that technology brings to an organisation, including benefits related to the process of decision making. Opinion and behaviour of top management influence directly to how the organisation perceives opportunities, problems and technologies (Lee et al., 2009). If top management show positive opinion or behaviour towards technology, an organisation is likely to bring decision about adopting technology, allocate resources and modify organisational procedures. Opinion and behaviour of management towards technology influence whether employees use technology and implement it in their work. They also influence a way of how an organisation presents and promotes technologies to clients.

Management support is vital for optimal management and usage of information and communication technologies. Therefore, management should recognise strategic opportunities and have a vision in order to assure technology adoption.

City management, as well as members of management in private sector, should have long term vision, take responsibilities and be devoted for creation of an organisational climate in which innovative information-communication technologies are considered desirable. Role of city management is to ensure optimal management of financial, technical and human resources to adopt innovative information-communication technologies. From the organisational perspective, management should help to overcome obstacles related to technology adoption, such as resistance to changes. City management that is aware of the benefits of innovation information-communication technologies such as big data technology is likely to allocate resources needed for its adoption. Such city management influence members of the organisation in a way they are likely to accept changes.

Big data technology present radical changes for cities' process management that demand different managerial capabilities. Technologies that enable radical improvements also demand significant complementary changes in organisational structure, routines and politics (Fischman, 2004). Therefore, adopting big data technologies in cities demands organisational and process adjustments. City management needs change management skills for leading the adoption of new technologies efficiently (Roberts et al., 2003). City management should be able to harmonise technology and city strategy. It also should be able to find human resources with appropriate knowledge of using big data technologies. An adequate level of city management support influence the adoption of technological initiatives in cities.

Top management support is proved to be the predecessor of adoption of various information-communication technologies, such as big data analytics (Lai et al., 2018), business intelligence systems (Lautenbach et al., 2017), RFID technology (Shi and Yan, 2016; Thiesse et al., 2011), Internet of Things

(Ching-Wen and Ching-Chiang, 2017), mobile technologies (Lin, 2016), e-business (Mohtaramzadeh et al., 2018; Ifinedo, 2012), social media (Zhang and Xiao, 2017), audit analytics (Li et al., 2018), and open source systems (Jaafar and Yayha, 2014). For this research, city management support is defined as the level of management's involvement and support to big data technology adoption in a city. City management is responsible for the governance of a city. Therefore, it is the leading promoter of technology initiatives that aim to improve the city's infrastructure and services.

Previous researches do not include the strategy of organisation or city in research models. However, smart cities should be planned strategically to achieve tangible economic and societal urban development. City strategy reflects urban development policies that involve high investments and high influence on cities. From the perspective of design and implementation of policy, the development of smart city strategy should be done methodologically and cohesively (Angelidou, 2015). Therefore, for the research, the existence of smart city strategy was included in the research model and tested as a factor of big data technology adoption in cities.

Angelidou (2014) described hard and soft infrastructure-oriented smart city strategies. Hard infrastructure oriented strategy targets the development and efficiency of the city's systems such as transportation, waste management or energy. Soft infrastructure oriented strategy focuses at the development of human aspects such as participation, inclusion or social capital. The advantages of soft infrastructure and people-oriented strategy surpass those of hard infrastructure-oriented strategies. Some advantages of soft infrastructure-oriented strategies are the empowerment of citizens, development of social capital and technological responsiveness to the needs of citizens. Disadvantages of hard infrastructure oriented strategies are issues related to citizens, such as the problem of privacy, transparency, surveillance and control, as well as unequal access to services which leads to the digital divide among citizens. Additional disadvantages of hard infrastructure-oriented strategy are that the costs of information and communication technology can be high. Furthermore, technology can be incompatible with the existing infrastructure. Disadvantages of soft infrastructure oriented strategy are that not all citizens have equal access to cyberspace, as well as accessibility does not automatically mean that citizens will participate.

For this research, smart city strategy is a strategy that promotes smart city initiatives, encourages efficient management of a city's resources and development of a city. City management needs to actively develop smart city strategy based on the challenges related to the city's infrastructure and the city's needs. Articulation and communication of smart city strategy stimulate changes in cities and help to adopt big data technologies in cities.

3. Methodology, Empirical Data and Analysis

3.1. City Management Support and Existence of Smart City Strategy in Adopting Big Data Technologies for Smart Cities

This research is part of broader research that evaluates the adoption model of Big data technologies in cities. The targeting construct of the research is Big data adoption in cities – BDA. The focus of this research is the City Management Support - CMS and the Smart city strategy - SMS, as predecessors constructs in the initial structural model. Additional predecessor constructs of the model are Absorptive Capacity – AC, Technology Readiness – TR, Compatibility – COM and Stakeholders' Support - SS. All predecessor constructs are used as necessary for carrying out the valid Importance-Performance Map Analysis procedure, including the comparison of their importance and performance.

The hypotheses of the adoption model related to the City Management Support and the Existence of Smart City Strategy are stated as follows:

- City Management Support (CMS) has a positive influence for big data technology adoption in cities (BDA).
- Existence of Smart City Strategy (SMS) has a positive influence for big data technology adoption in cities (BDA).

City management support in the context of big data technology adoption for cities refers to municipalities, city council, and city administration that are responsible for city governance, and therefore they are the main promoters of technological initiatives in each city. Smart city strategy refers to a strategy that promotes smart city initiatives and encourages efficient resource management and development of the city. Constructs City Management Support (CMS) and Smart City Strategy (SMS) contain four indicators each. The indicators refer to aspects of both constructs as described in Table 1.

Table 1: Aspects of the City Management Support and the Existence of Smart City Strategy

Construct	***Indicator***	***Aspects***
City Management Support	CMS-1	leadership and dedication to technology adoption in the city
	CMS-2	promotion, determination and selection of technological solutions
	CMS-3	acceptance of the financial and organisational risks of technology adoption
	CMS-4	efforts to engage and communicate with citizens

Construct	*Indicator*	*Aspects*
Existence of Smart City Strategy	SCS-1	active development of the strategy
	SCS-2	orientation to the city's hard infrastructure
	SCS-3	orientation to the city's soft infrastructure
	SCS-4	city strategy's alignment with the country's/ European Union's goals

Source: Author

Confirmation of the above-stated hypotheses is the main prerequisite of the Importance-Performance Map Analysis (IPMA), which is performed for this research. The hypothesis are confirmed (CMS BDA: p-value: 0.085, path coefficient 0.184; SCS BDA: p-value: 0,012, path-coefficient 0.279). Therefore, the main prerequisite for IPMA is fulfilled. Next subsection describes the methods used for the evaluation of the initial adoption model.

3.2. Data Preparation for the Importance-Performance Map Analysis

In order to evaluate the adoption model, a survey is carried out with the following definition of the target population and sample. The target population of this research are cities of the European Union - EU28 countries with more than 40 thousand inhabitants. According to data published by central national statistical services of EU28 countries, 1481 cities met the size criterion. The highest number of cities included in the target population were from Germany, Spain, France and Italy. All cities from the Republic of Malta have less than 40 thousand inhabitants, so they were not included in the research. The sampling frame was a list of the cities containing data on potential respondents with contact data from all of the 1481 cities. Target respondents of the research were persons involved in city management such as city mayors, managers of the city's IT department and Chief Information Officers. Additionally, in case that members of city management are not able to answer to survey questions, they are asked to proceed the survey to a person who participates in processes of the adoption of information and communication technologies, and smart city initiatives of a city.

The questionnaire was sent by e-mail. All of the questions were in the form of a statement. Respondents were asked to state their level of agreement with the statements by using a 7-point Likert scale. After data collection, questionnaires with inconsistent responses or less than 5% of missing values per question were excluded from further analysis. Missing values were treated by using the mean replacement method. Finally, responses from 94 cities were used to evaluate the research model.

Partial Least Squares – Structural Equation Modelling (PLS-SEM) is used to evaluate measurement and structural model. Finite Mixture Partial Least Squares (FIMIX-PLS) and Partial Least Squares – Prediction Oriented Seg-

mentation (PLS-POS) procedures are used for modelling unobserved heterogeneity in the model. Results of FIMIX-PLS procedure were used as the input for PLS-POS procedure. Finally, PLS-POS procedure was used to uncover unobserved heterogeneity in the research PLS path model, and to detect specific segments of the cities. Two segments of the cities are detected. Segment 1 consist of 67 cities and Segment 2 consist of 27 cities. PLS-SEM procedure is used to evaluate the model based on Segment 1 data since Segment 2 data were insufficient for valid estimation of the research model.

Valid results of all of the mentioned procedures are the basis for the Importance-Performance Map Analysis (IPMA). COM construct is excluded from IPMA because it is shown as insignificant in the adoption of big data technology adoption for cities. All of the procedures are conducted using SmartPL3 software.

The IPMA is the extension of the standard PLS-SEM analysis. It allows comparison of the predecessor constructs' and indicators' importance, represented by total effects, in predicting a specific target construct, with their performance indicated by average latent variable scores (Hair et al., 2018).

Purpose of IPMA is to identify predecessor constructs and indicators that have relatively high importance for predicting the target construct, but also have a relatively low performance. Such constructs and indicators represent the most significant opportunity to achieve improvements. Therefore, researchers can provide guide in the form of recommendations for improvements regarding aspects of such constructs based on the interpretation of the importance-performance map (Hair et al., 2018). For this research, IPMA is used to detect which aspects of the City management support and the Existence of smart city strategy are crucial for big data technology adoption in cities. Furthermore, IPMA results served as the basis for the development of general recommendations for cities regarding city management support and smart city strategy, which is the first sub-goal of this research. IPMA procedure was performed by using SmartPLS 3 and Microsoft Excel software.

4. Results and Discussion

Table 2 contains standardised and unstandardised importance and performance values for predecessor constructs CMS, SCS, AC, TR and SS. These values are used for the creation of Importance-Performance Maps of constructs (Fig.1 and Fig. 2).

In Importance-Performance maps, x-axis represents the importance, and y-axis represents the performance values of a construct or an indicator. Additionally, a vertical line represents the average importance value and a horizontal line represents the average performance value. When it comes to the interpretation of Importance-Performance Maps, constructs and indicators in the lower right area of the map have above average importance and below average performance.

Such constructs and indicators have the highest potential to achieve improvement, followed by those in the upper right, lower left and the upper left area of the map (Hair et al., 2018).

Table 2: Standardized and unstandardized Importance and Performance values of predecessor constructs (*EU cities segment, N=64*)

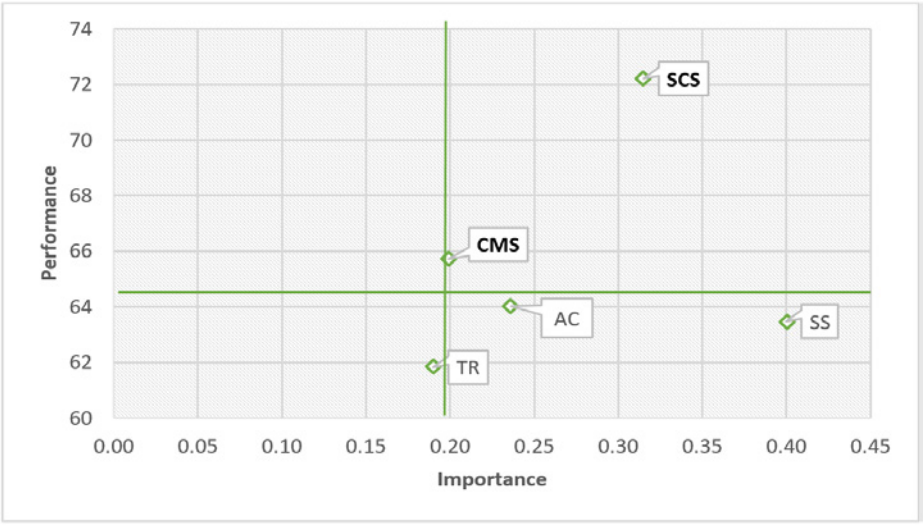
	Importance		**Performance**	
Construct	***Standardised***	***Unstandardised***	***Standardised***	***Unstandardised***
SCS	0.32	0.28	72.20	72.20
CMS	0.20	0.18	65.73	65.73
AC	0.24	0.22	64.03	64.03
SS	0.40	0.27	63.47	63.47
TR	0.19	0.19	61.83	61.83
Average	0.20	0.17	64.16	64.16

Source: Author, using SmartPLS 3 software and Microsoft Excel

Figure 1. and Figure 2. shows the effects of predecessor constructs on target construct Big Data Technology adoption in cities - BDA. They both indicate that the Existence of Smart City Strategy (SCS) has the highest performance in regards to Big Data Technology adoption in cities as well as the highest importance according to unstandardized values. The City Management Support follows the Existence of Smart City Strategy with its above-average performance. However, its importance is lower in comparison to other predecessor constructs. According to the maps, construct Stakeholders' Support (SS) is of the relatively same importance for Big data technology adoption as the Existence of Smart City Strategy. Moreover, the Absorptive Capacity (AC) have relatively low performance, but high importance as well. Therefore, maps suggest that predecessors Stakeholders' Support and Absorptive Capacity have the highest potential for improvements and considerable positive influence for Big Data Technology adoption in cities.

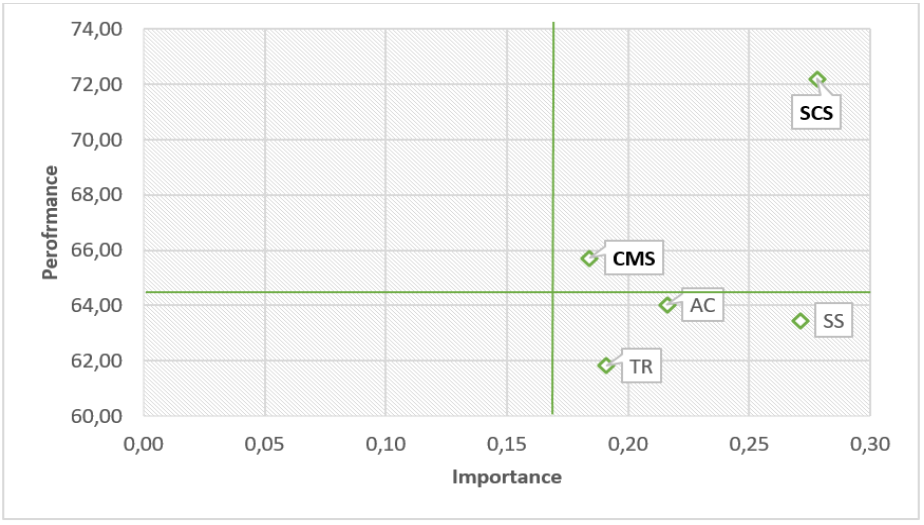
Maps indicate that some aspects of the Existence of a smart city strategy significantly support the adoption of big data technology in cities. Additionally, some aspects of the City Management Support can perform better. However, at the construct level of analysis, it is not evident which aspects of the City Management support and the Existence of the Smart City Strategy are especially important and perform better or worse in comparison to other indicators. IPMA at the indicator level is performed to investigate and answer the question on the importance and performance of the aspects.

Figure 1: Importance-Performance Map of predecessor constructs, standardised values (*EU cities segment, N=64*)



Source: Author, using SmartPLS 3 software and Microsoft Excel

Figure 2: Importance – Performance Map of predecessor constructs, unstandardised values (EU cities segment, N=64)



Source: Author, using SmartPLS 3 software and Microsoft Excel

Standardised and unstandardized importance and performance values are calculated for indicators of the predecessor construct SS, AC, CMS, TR and SCS based on data collected from 67 EU28 cities (Table 3). Figure 3 and Figure 4 show the effects of all of the indicators on Big data technology adoption in cities.

Table 3: Standardized and unstandardized Importance and Performance values of indicators (*EU cities segment, N=64*)

Indicator	Importance		Performance	
	Unstandardised	*Standardised*	*Unstandardised*	*Standardised*
SCS1	0.074	0.075	74.88	74.88
SCS2	0.077	0.075	72.14	72.14
SCS3	0.084	0.082	71.89	71.89
SCS4	0.081	0.082	70.15	70.15
CMS1	0.050	0.050	72.89	72.89
CMS2	0.054	0.052	68.66	68.66
CMS3	0.052	0.054	58.96	58.96
CMS4	0.043	0.051	61.94	61.94
AC1	0.001	0.001	66.92	66.92
AC4	0.137	0.139	61.19	61.19
AC5	0.103	0.104	67.91	67.91
SS1	0.124	0.100	66.42	66.42
SS2	0.075	0.069	65.17	65.17
SS3	0.107	0.097	60.20	60.20
SS4	0.094	0.077	61.94	61.94
TR1	0.059	0.079	55.97	55.97
TR2	0.061	0.073	61.44	61.44
TR4_5	0.070	0.072	67.16	67.16
Average	0.052	0.051	64.56	64.56

Source: Author, using SmartPLS 3 software and Microsoft Excel

Leadership and dedication to technology adoption of city management (CMS1) have the highest performance of all of the city management's support aspects. This means that municipalities, city council and city administration provide strong leadership and are dedicated to the processes of technology adoption in the city. However, this aspect has the lowest importance when it comes to big data technology adoption in cities. This means that leadership of the process of technology adoption in cities, especially larger cities, is usually assigned to a city's departments or special smart city groups.

According to the maps, promotion of technology initiatives, determination of implementations steps and selection of specific technological solutions (CMS2) by municipalities, city council and city administration are the most crucial aspect of city management's support. Results show that, in general, cities' management fulfil those roles well. However, the performance of this aspect is lower than some less important aspects such as leadership and dedication to technology adoption of city management. Therefore, there is a space for improvement.

For example, Spanish public administrations, administrations try to involve citizens in urban planning through participation programmes by using the information and communication technology (Santos, 2019).

Acceptance of financial and organisational risks (CMS3) relating to the adoption of technology was shown as important aspect of the city's management support. At the same time, this aspect has the lowest performance. This means that city management should perform practical and managerial activities in order to increase this aspect to support big data technology adoption.

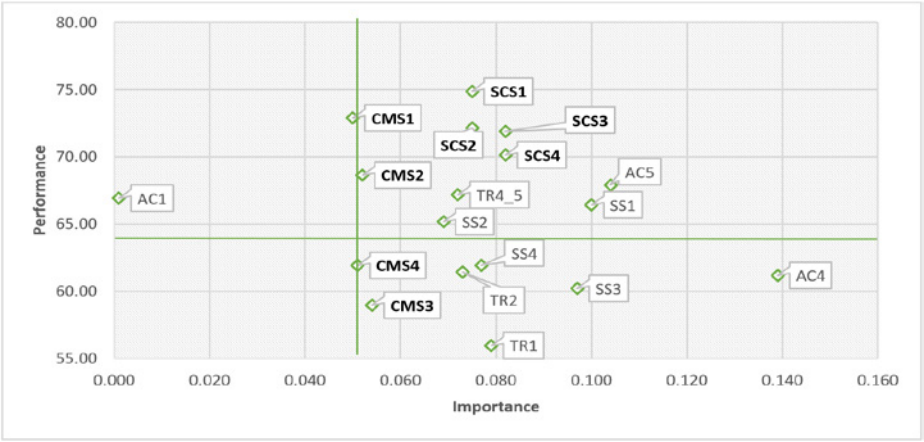
City management's effort regard engagement of citizens (CMS4) in technological innovations incentives and communication of benefits of technology was shown of average importance and relatively low performance. In order to increase performance, regard this aspect, smart cities need new forms of governance towards more collaborative and participative models. City management should understand technology itself will not develop smart city. It is human dynamics, consisting of various stakeholders, that greatly influences on the success of the smart city initiatives. Citizens, as testers and users of technology, should be informed and engaged in smart city initiatives.

IMPA analysis on aspects of the existence of smart city strategy showed their high importance as well as relatively good performance. Based on the challenges regarding city infrastructure and city needs, city management performs well in active development of strategy (SCS1) aimed at improvement of more efficient city resources management. This importance is high; however, it is the least important in comparison to other aspects of smart city strategy when it comes to the adoption of big data technology in cities.

Both maps indicate that the orientation of smart city strategy has high importance. The city strategy that targets efficiency and technological advancements of the city's soft infrastructure (SCS3) seems of the highest importance. However, its performance is lower in comparison to other less important aspects. The city strategy that targets the efficiency and technological advancements of the city's hard infrastructure (SCS2) is less important than orientation to soft infrastructure importance but has better performance. For the successful accomplishment of the smart city vision, the strategy should prioritise domains to upgrade and then clearly define the action plan for its realisation.

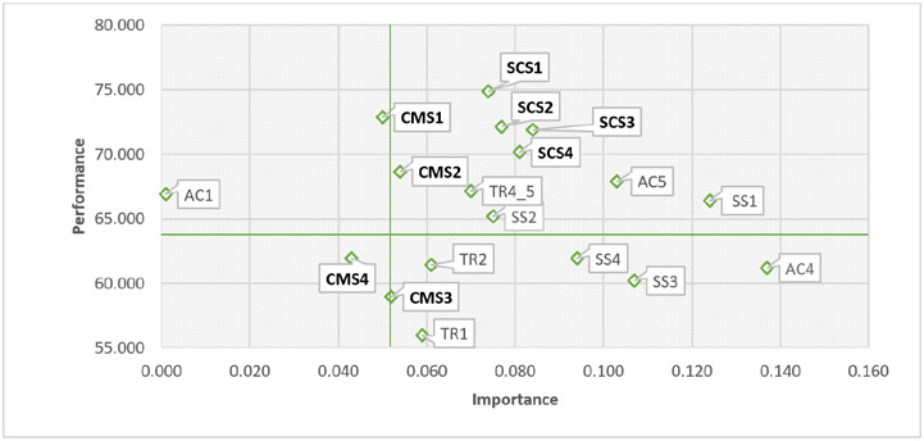
Second highest important aspect of smart city strategy is whether the city strategy is aligned with the country's/European Union's goals and the strategy (SCS4) related to city technology development. However, its' performance is lower than of other SCS indicators. Therefore, city management and other stakeholders included in defining smart city strategy should ensure smart city strategy's alignment to strategy and goals at national and European Union level. Furthermore, a smart city strategy should be aligned with the existing frameworks and funding schemes.

Figure 3: Importance – Performance Map of indicators, standardised values (*EU cities segment, N=64*)



Source: Author, using SmartPLS 3 software and Microsoft Excel

Figure 4: Importance – Performance Map of indicators, unstandardised values (*EU cities segment, N=64)*



Source: Author, using SmartPLS 3 software and Microsoft Excel

Good practices regarding smart city initiatives are described based on the Frankfurt am Main in Germany to fulfil the second sub-goal of this paper. Frankfurt is an appropriate example of how city management should support the development of a smart city and how the strategy should be anchored into smart city initiatives. Frankfurt's City Council set a Smart City strategy. The strategy and action plan for the transformation of the city are defined by using holistic and cross-section approach to ensure connection and support from stakeholders, including citizens. With "Frankfurt 2030", the city has formulated goals and strategies for an inter-sectoral approach with the interaction between many different aspects of urban development.

Frankfurt's Smart City Strategy promotes the development of the city based on the use of innovative technology, radical protection of the resources, holistic perspectives, and socially fair quality of life. Frankfurt's strategy follows the needs of the citizens and prioritises solving issues the city is facing. Frankfurt aims to use intelligent and systematic approaches to remain and achieve an energy-efficient, growing, open, social and sustainable economy. In order to achieve that, the departments of the city formulated five subject clusters in which Frankfurt has recognised both strengths and most prominent challenges: Economy and Consumption, Planning and Construction, Education, Climate and Open Spaces and Mobility. Frankfurt's smart city strategy is oriented both on hard and soft city infrastructure. Although there is no dedicated transport strategy for the city of Frankfurt, transportation policy makes up a significant part of the overall city's development.

Moreover, Frankfurt's smart city strategy is aligned with the goals of the European Union's strategy stated by the Horizon 2020 framework programme. It also follows the Digital Strategy Hessen, which is the strategy for modernising and digitalising the region of Frankfurt. It was set in 2016 with the detailed action plan that covers areas of industry, energy, culture, mobility, health, living and commerce. Its objectives are to overcome societal challenges, secure sustainable economic development and labour conditions, and strengthen the innovation power of the region. The strategy is supported by broadband networks, data centres, IT security and privacy, and geodata. Frankfurt's city management informs its citizens about smart city initiatives. Frankfurt Green City web page (https://www.frankfurt-greencity.de/en/status-and-trends/) covers news and topics on the Subjects Clusters. Anyone interested can contact city departments. For example, citizens can reach Mobility and Traffic Management Office for further information on initiatives related to Mobility Subject Cluster.

5. Conclusion

The main goal of this research is to determine which aspects of city management support and smart city strategy are essential for big data technology adoption in cities. Additionally, the research aims to develop general recommendations for cities regarding city management support and smart city strategy. The existence of smart city strategy was shown as the most important predecessor of big data technology adoption in cities. IPMA helped to discover which of the aspects of predecessors, the City Management Support and the Existence of Smart City Strategy, are most important for big data technology adoption. Acceptance of financial and organisational risks of technology adoption by a city's management and orientation of smart city strategy were shown as aspects of the highest importance. City management' acceptance of financial and organisational risks of technology adoption has the lowest performance. In order to overcome this, cities can use recommendations and good practices of cities that are successful in adopting smart city initiatives. For this paper, good practices regard city management support, and smart city strategy were described

based on the experience of Frankfurt that has implemented various smart city initiatives. Limitation of the research is that Segment 2 that contains 27 cities is not included in the Importance-Performance Map analysis. The reason is insufficient data for valid evaluation of the model for Segment 2, which is the prerequisite for the IPMA. Future research should include the following. First, to detect which aspects of other predecessor constructs, Absorptive Capacity, Technology Readiness and Stakeholder's Support are crucial for big data technology adoption in cities. Second, to develop general recommendations for cities based on results of IPMA for these constructs.

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CHAPTER 11

Creative class and entrepreneurial potential of rural areas in Serbia: Concept and measurement

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ABSTRACT

The role of the creative class, in the growth of rural economy is a relatively recent topic, which has been gaining more and more attention lately. For many years, empirical research has been focused on the relevance of the concept of the creative class only for urban economic growth. The contribution of the empirical researches conducted at the beginning of the 21st century is reflected in the expansion of the concept of the creative class to the rural setting. This paper focuses on the analysis of the relevance of the concept of the creative class in a rural setting in Serbia. Improving the "quality" of human capital in the models of rural economic growth can be seen as one of the key preconditions for stimulating rural restructuring. The basic research objectives are connected with the classification of creative class occupations in Serbia and measuring the level of "creative" human capital of rural areas in Serbia. The empirical research, based on panel data analysis during a five-year period, confirmed the positive link between the share of the individuals employed in creative occupations and a growth rate of entrepreneurial activity in rural areas in Serbia. The results show that highly educated individuals engaged in creative occupations are strongly associated with the growth rate of the number of entrepreneurs in the total number of employees. Also, the results indicate that the link between "creative"/"highly educated and creative" human capital and the growth rate of the number of entrepreneurs in the total employment is weaker in rural areas with higher level of entrepreneurial activity.

Key words: creativity, human capital, occupations, entrepreneurship, rural economy.

JEL classification: J24, O18, P25

1. Introduction

In addition to new technologies, research and development activities and innovations, an important precondition for economic growth and development is

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the *"quality"* of available human capital, i.e. individuals who are highly educated and/or who are capable to create new knowledge and ideas in different sectors of the economy.

In the literature, the concept of the "creative" human capital is recognized as a key factor that can foster urban and rural economic growth and development. Various empirical research conducted in the developed economies confirmed the relevance of the concept of the creative class for urban and rural development (Florida, 2002; Marlet and Woerkens, 2004; McGranahan and Wojan 2007a, 2007b; Florida et al. 2008; Boschma and Fritsch, 2009; McGranahan et al. 2010; Mellander and Florida, 2011). A higher level of highly educated and/or individuals engaged in creative occupations can foster local economic growth in different ways: by improving the ability of local businesses to adopt new technologies and innovations, by attracting new forms of business based on local amenities and by an increase in the number of entrepreneurs.

The following factors are recognized as those that attract the members of the creative class at the regional level: *regional culture* (the climate of tolerance and openness), *regional facilities* (the share of workforce in public health care, public education and in cultural and recreational activities) and *economic condition* (employment growth rate, wage level, land prices). Human capital, measured through the people engaged in creative occupations, can have an important role for the process of improving economic performance at the local level. According to the results of empirical studies, rural areas which offer high quality of life are attractive to highly educated and/or creative individuals with high ambitions of becoming entrepreneurs.

The subject of this paper is to analyse and test the relevance of the concept of the creative class for rural economic growth and development in Serbia. Two main research questions are the following: (1) *How can the concept of the creative class be applied to the rural setting of developing countries, like Serbia?* and (2) *Does entrepreneurial potential of rural areas in Serbia depend on individuals employed in creative occupations, i.e. can we confirm the positive link between creative class and economic growth, which is reflected in the growth of entrepreneurial activities?*

There are three main hypotheses in the empirical research conducted in this paper:

(1) *H1: The creative class has a significant positive effect on the entrepreneurial potential of rural areas in Serbia*; (2) *H2: The highly educated individuals engaged in creative occupations, as a part of the creative class, have a significant positive effect on the entrepreneurial potential of rural areas in Serbia* and (3) *H3: Differences in the entrepreneurial potential between rural areas with high outdoor amenities and rural areas with low outdoor amenities in Serbia are significant.*

After the introduction, the remainder of the paper is divided into five sections. Section two provides a brief background of the role of the creative class concept

in urban and rural economic growth and development. Section three describes the empirical econometric model, based on panel data analyses, developed for testing the starting hypotheses of the empirical research. In section four all variables of the developed econometric model are explained. Also, this section provides the classification of the creative class in Serbia. Section five presents the results of the empirical research and the discussion. The last section provides the conclusions.

2. Literature review

In the new economy, based on knowledge, innovations and skills, the concept of "creative" human capital is relevant for urban and rural economic growth and development. For many years, empirical research has been focused on the relevance of the concept of the creative class only for urban economic growth. Florida (2002) introduced the theory of the creative class in his book "The Rise of the Creative Class". He connected the special type of human capital, the creative class, with economic growth of urban areas with attractive amenities (with different outdoor recreation opportunities and with cultural diversity). Also, these urban areas are characterized by three factors called the Three T's. They value *new technology*, *talent* and *tolerance* (openness to new ideas and new people). Smart, talented people, whether in the form of educated human capital or creative class, are attracted to open and tolerant places where ideas will be accepted and can float freely between individuals (Mellander and Florida, 2012: 17). According to the creative class theory, creative class is an urban phenomenon and economic growth must be based on novel combinations of knowledge and ideas. Urban areas with a high share of creative class will have better economic performance due to innovations, higher level of entrepreneurial activity and due to attracting new forms of businesses.

The creative class is comprised of the individuals who are engaged in the jobs that can be described as highly creative and innovative. Two main subgroups of the original classification of the creative class based on professions created by Florida (2002) are: *Super creative core* (the individuals who are engaged in highly creative occupations and who create new creative content: new ideas, technologies or products) and *Creative professionals* (the individuals engaged in occupations that are based on problem solving, who are usually highly educated and who work in knowledge-intensive industries).

The original classification of the creative class occupations was aimed at providing an approximation for the level of the creative class in the metropolitan areas of the USA. The contribution of the empirical research conducted at the beginning of the 21st century is reflected in the expansion of the concept of creative class to the rural setting. Rural areas with a significant endowment of human capital (high proportion of employment in highly skilled occupations and/or high proportion of employment in creative occupations) have a potential for higher economic growth and development. The new, redefined classifications

of the creative class occupations are introduced in order to better reflect the available creative class in the rural areas of the USA and EU countries and in order to identify its true contribution to rural economic growth and development.

In order to test the link between the creative class and economic growth of rural areas, McGranahan and Wojan (2007a) developed a classification of the creative class occupations adapted to the rural setting of the USA. They introduced a new, redefined classification of the creative class by excluding, from the original Florida's classification, occupations with low creativity requirements and occupations that are not "footloose" and that provide services which are important to economic reproduction.

McGranahan and Wojan (2007a) created a model of rural economic growth by using the system of simultaneous equations (a three-stage least-squares model of change in creative class, employment change and net migration). On the sample of 2,145 non-metropolitan counties in the USA they confirmed the hypothesis that the size of the employment in the recast creative class occupations and its growth over one decade (1990-2000) had a strong, positive influence on the employment growth. Also, the results of the empirical analysis indicate that recast creative class measure is more highly associated with the regional development than the original measure presented by Florida.

The results of the second empirical research carried by McGranahan and Wojan (2007b) on the same sample of 2,145 non-metropolitan counties in the USA showed that rural counties with a high proportion of the level and growth of creative class residents not only had higher rates of job growth, but also more creative activities (higher rates of patent formation and the adoption of new manufacturing technology) during the period 1990-2004. The high level of creative class (e.g. engineers, managers, architects, artists) is characteristic of rural areas with a pleasant climate, mountain landscapes, lakes and other rural outdoor amenities.

In order to develop the classification of the creative class which is comparable across the EU countries, Boschma and Fritsch (2009) used the International Standard Classification of Occupations (ISCO 88) to identify creative professions. They developed the classification of the creative class based on professions, which consists of three main subgroups:

- *Creative Core*, consisting of individuals who are able to create new ideas and/or new technology (Physicists, chemists and related professionals; Mathematicians, statisticians and related professionals; Computer professionals; Architects, engineers and related professionals; Life science professionals; Health professionals; College, university and higher education teaching professionals; Secondary education teaching professionals; Primary and preprimary education teaching professionals; Special-education and other teaching professionals; Archivists, librarians and related information professionals; Social sciences and related professionals; Public service administrative professionals);

- *Creative Professionals*, consisting of individuals engaged in solving problems, who are usually highly educated (Legislators, senior officials and managers; Nursing and midwifery professionals; Business and legal professionals; Physical and engineering science associate professionals; Life science and health associate professionals; Finance and sales associate professionals; Business services agents and trade brokers; Administrative associate professionals; Police inspectors and detectives; Social work associate professionals), and
- *Bohemians*, as part of the creative class in cultural and artistic occupations, which represents regional culture of climate (Writers and creative or performing artists; Photographers and image and sound recording equipment operators; Artistic, entertainment and sports associate professionals; Fashion and other models). The role of bohemians is to attract the first two subgroups of the creative class.

Boschma and Fritsch (2009) analysed the regional distribution and economic effect of the creative class in seven EU countries. According to the empirical results, in every country, creative class is unevenly distributed across regions and is not inherent only to certain industries. The largest group of the creative class is the group of creative professionals and the second group is the creative core. The share of bohemians is less than one per cent of the population. The results of the regression analyses, based on the data for 503 regions in seven EU countries, have pointed out to the factors that have a significant influence on the uneven geographical distribution of the creative class. Region's economic conditions (e.g. employment opportunities) and factors that shape appealing "people's climate" (e.g. the regional climate of tolerance and openness to new ideas and newcomers and the level of cultural and recreational activities) are the factors that determine the share of the creative class at regional level. Additionally, the results confirmed the hypothesis about a positive relationship among the creative class, employment growth and entrepreneurship (start-up rates, particularly in high-technology industries). These results are consistent with the results of the empirical research carried out by Lee et al. (2004).

There are two groups of empirical studies: studies that are focused on the measure of human capital in terms of the educational level of the workforce and studies that are focused on the measure of human capital in terms of creative professions as a better proxy for skills. The presented classifications of the creative class are based on the professions which indicate what people are actually doing. Various empirical studies confirmed the role of educational human capital at the national and regional level (Ullman, 1958; Rauch, 1993; Glaeser, 2000; Glaeser and Saiz, 2003; Glaeser, 2004). According to Mellander and Florida (2012), the educational-based human capital is a proxy for the amount of knowledge offered at the labour market. Unlike the educational-based human capital, human capital based on creative professions shows how talent and skills of individuals are used within the economy. To become part of the creative class, it is not enough simply to have certain skills, knowledge and cre-

ativity that an individual can offer on the market, it is also necessary that there is a demand for these qualifications on the market.

Many empirical studies confirmed the validity of the model of rural economic growth based on the human capital measured traditionally through highly educated individuals or through creative occupations. They confirmed the positive link between the human capital and rural economic growth. Hence, we can ask the question: *Does human capital measured by creative occupations outperform human capital measured by formal education, or vice versa?* The main research question of a growing body of research is how best to measure human capital for the purpose of conducting empirical research on its role in and effects on economic growth and development. The subject of various empirical research studies, conducted on the territory of the USA and the EU countries, is the comparative analysis of the two measurements of human capital, the "highly educated" human capital and the "creative" human capital. The aim of these studies was to provide an answer to the question which of the two measures of the human capital was more effective in looking at the real contribution of human capital for economic growth. Depending on the findings, these research studies can be classified into three groups:

- The first group is comprised of research according to which human capital measured in terms of education is a better predictor of economic growth (Glaeser et al. 2001; Glaeser, 2004);
- The second group is comprised of research according to which human capital measured by the people in creative occupations is a better predictor of economic growth (Marlet and Van Woerken 2004; McGranahan and Wojan, 2007a), and
- The third group is comprised of research according to which both measures of human capital are good predictors of economic growth. According to the results, only the mechanisms through which human capital and the creative class explain the economic growth are different (Florida et al. 2008; Boschma and Fritsch, 2009).

Various empirical studies have focused on the role of rural outdoor amenities as factor that attracts talent and creativity (Wojan and McGranahan, 2007; Chi and Marcouiller, 2011, McGranahan et al., 2010; Rikalović and Josipović, 2018). Many authors have pointed to the migration movements of creative individuals (young families, mid-life career changers and active retirees) to rural areas with high natural, recreational and cultural amenities. They recognized rural outdoor amenities as an instrument for initiating the migration flow of the population into rural areas. According to empirical studies, rural areas which provide a high quality of life (mild climate, appealing landscapes and opportunity for different recreational activities) are attractive to highly educated and creative workforce. In the developed countries, human capital grows most rapidly in the rural areas with high outdoor amenities. These rural areas have a greater growth of human capital than the rural areas with low outdoor amenities.

A higher level of human capital can foster local economic growth in three different ways: by improving the ability of local businesses to adopt new technologies and innovations, by attracting the new form of business based on local amenities and by a growing number of entrepreneurs. According to the endogenous growth theory, knowledge capital and investments in knowledge and human capital generate economic growth through the spillover of knowledge (Acs et al., 2004). The shortcoming of the first two generations of the endogenous growth model (Romer, 1986, 1990; Lucas, 1988; Schmitz, 1989; Rebelo, 1991; Segerstrom, 1991) is reflected in not providing an explanation how spillovers occur. The third generation of the endogenous growth model (Audretsch and Feldman, 2003; Acs et al., 2004; Audretsch and Keilback, 2005; Audretsch et al., 2008) identified entrepreneurship as one type of the mechanism which enables the process of converting knowledge into economically relevant knowledge by starting a new firm. Various empirical studies tested and confirmed the positive relationship between entrepreneurial activity and economic growth (Audretsch and Fritsch, 1994, 2002; Wennekers and Thurik, 1999; Audretsch and Thurik, 2001; Armington and Acs, 2002; Lee et al. 2004; Acs et al., 2005). The people engaged in creative professions are very important for the increase of entrepreneurial and innovation potential at regional level, and thus economic growth (Fritch and Sorgner, 2014).

A small number of empirical studies analysed the role of the creative class concept in rural economic growth and tested the link between the creative class and entrepreneurial potential of rural areas (McGranahan and Wojan, 2007a, 2007b; McGranahan et al. 2010; Mikić, 2018). An important precondition for rural economic growth is the use of the rural outdoor amenities to attract and retain highly educated and/or creative individuals. On the sample of 3043 rural counties, McGranahan et al. 2010 confirmed the hypothesis that the creative class is strongly associated with the growth in the number of new establishments and employment during the period 1990-2000, particularly in the rural counties ranked in the top quarter according to the developed index of outdoor amenities. The creative class dynamics and entrepreneurial context (small firm size or self-employment rate) are two local factors that shaped the relationship of the creative class with local economic growth.

3. Empirical model: creative class and entrepreneurial potential of rural areas of Serbia

The overview of empirical researches, presented in the second part of this paper, confirms the relevance of the concept of “creative” human capital for economic growth and development. There is a gap in the empirical studies which analyse the link between creative class and entrepreneurial potential by using rural areas as a geographic unit of observations. In order to test the link between the “creative” human capital (the creative class) and the growth rate of entrepreneurial potential of rural areas of Serbia, we developed an econometric model based on panel data analyses. The developed model takes into account

the skills, knowledge and creativity of people who live and work in rural areas. The initial specification of the panel data model for identifying the predictors of the growth of the entrepreneurial potential of rural areas in Serbia is a *pooled model with two dummy variables* which can be written in the following form:

$$EG_{it} = \beta_1 + \beta_{12}DV_2 + \beta_{13}DV_3 + \beta_2 CC_{it} + \beta_3 E_{it} + \beta_4 CCE_{it} + \beta_5 PS_{it} + \beta_6 SS_{it} + \beta_7 TS_{it} + \beta_8 QS_{it} + \beta_9 WP_{it} + \beta_{10} YP_{it} + u_{it}$$

where the dependent variable is:

EG_{it}	–	the growth rate of the number of entrepreneurs in the total employment (the number of entrepreneurs in the total employment in the current year/the number of entrepreneurs in the total employment in the previous year);

and independent variables are:

DV_2	–	dummy variable (1 if rural area is characterized by high outdoor amenities, 0 otherwise);
DV_3	–	dummy variable (1 if rural area is characterized by medium outdoor amenities, 0 otherwise);
CC_{it}	–	% of creative class in the total employment;
E_{it}	–	% of entrepreneurs in the total number of enterprises;
CCE_{it}	–	interaction of the creative class and the number of entrepreneurs (CC_{it}xE_{it});
PS_{it}	–	% of the employed in the primary sector;
SS_{it}	–	% of the employed in the secondary sector;
TS_{it}	–	% of the employed in the tertiary sector;
QS_{it}	–	% of the employed in the quaternary sector;
WP_{it}	–	% of working age population 15-65;
YP_{it}	–	% of young population age 0-14;
u_{it}	–	standard error of the model.

The developed econometric model will be tested on the sample of 24 rural areas[4] in Serbia. Since the number of units of observations (rural areas) is relatively small and there is no possibility of their increase, we can increase the number of observations in the sample from 24 (N units of observations) to 120 (NT number of observations, 24 rural areas and five year time periods) by using panel data. Also, the heterogeneity between the rural areas with different outdoor amenities in Serbia can be covered by the model. To achieve this, we include in the model dummy variables for the three groups of rural areas: the areas with high, medium and low outdoor amenities. These rural areas have been identified according to the empirical results of Josipović (2018). The selected pooled model with dummy variables is a model with a constant,

4 Due to the lack of data, the empirical research will only not cover the rural areas in the territory of Kosovo and Metohija.

because the number of dummy variables must be smaller by one than the number of the formed group of rural areas with different outdoor amenities. The model includes two dummy variables. One dummy variable refers to rural areas with high outdoor amenities and the other refers to rural areas with medium outdoor amenities in Serbia.

The main assumption of the model is that the creative class affects rural economic growth through the growth of entrepreneurial activity, the growth rate of the number of entrepreneurs in the total employment. On the basis of the presented econometric model, we will test three hypotheses on the sample consisting of 24 rural areas in Serbia as the key unit of the analysis:

- H1: The "creative" human capital, the creative class, has significant positive effect on the entrepreneurial potential of rural areas in Serbia, measured by the growth rate of the number of entrepreneurs in the total employment.
- H2: The highly educated individuals engaged in creative occupations, as a part of the creative class, have a significant positive effect on the entrepreneurial potential of rural areas in Serbia, measured by the growth rate of the number of entrepreneurs in the total employment.
- H3: Differences in the entrepreneurial potential between rural areas with high outdoor amenities and rural areas with low outdoor amenities in Serbia are significant.

We selected 2009-2013 as the period of observation for two reasons:

Official data of the Statistical Office of the Republic of Serbia on the available human capital across rural areas in Serbia are comparable only for the period 2009-2013. The Statistical Office of the Republic of Serbia (the Department of Labour Force Survey) conducted the Labour Force Survey once a year from 2000 to 2008, twice a year from 2008 to 2013 and on a quarterly basis since 2014.

We selected the year 2009 as the first year of observation because the publication "The Report on Small and Medium Enterprises and Entrepreneurship" was first issued in 2008 and no data are available on the number of entrepreneurs in 2007, which are necessary for calculating the growth rate of the number of entrepreneurs in the total employment for 2008.

4. Empirical data and analysis

We quantified all variables of the econometric model presented in section three by using the data of the Statistical Office of the Republic of Serbia (the Department of Labour Force Survey), the Ministry of Economy of the Republic of Serbia and the National Agency for Regional Development of the Republic of Serbia ("The Report on Small and Medium Enterprises and Entrepreneurship", 2009, 2010, 2011, 2012, 2013, 2014).

As a proxy for the endowment of the special type of human capital, called the creative class or "creative" human capital in the literature, we used the data about employment in creative occupations from the Statistical Office of the Republic of Serbia (the Department of Labour Force Survey)[5]. Creative occupations have been identified according to the classification of the creative class developed for the EU countries by Boschma and Fritsh (2009). The "creative" human capital is measured by the share of people engaged in creative occupations in the total employment, i.e. human capital is measured through the occupational structure of employees.

Because observed rural areas are not homogeneous in terms of the size of their territory, in order to ensure comparison, we had to standardize the number of entrepreneurs with the total number of enterprises or with the total number of employees. We standardized the number of entrepreneurs with the total number of enterprises (entrepreneurs, micro, small, medium and large enterprises).

Creative class talent and innovation is more engaged in the local economy in an entrepreneurial context and entrepreneurial context is more apt to lead to growth with the advantage of the creative class talent and innovation (McGranahan, 2010: 533). In order to test the synergistic effect of the creative class and entrepreneurship on the entrepreneurial potential of rural areas we included in the model the variable which measures their interaction. The assumption is that rural areas endowed with creative class and with a high share of entrepreneurs in the total number of enterprises enjoy higher growth rates of the number of entrepreneurs in the total employment. We expect that creative class and entrepreneurship have a strong, positive, individual and synergistic effect on rural economic growth measured through the growth rate of the number of entrepreneurs in the total employment.

4.1. Classification of creative class in rural areas in Serbia

To select the professions that belong to the creative class, we used the Classification of occupations in Serbia developed by the Statistical Office of the Republic of Serbia. This classification is based on the International Standard Classification on Occupations – ISCO 88. Ten major groups of occupations, according to the developed classification, are: Legislators, senior officials and managers; Professionals; Technicians and associate professionals; Clerks; Service workers and market sales workers; Workers in agriculture, fisheries and forestry; Craft and related workers; Plant and machine operators and assemblers; Elementary occupations and Armed forces. We identified creative professions according to the classification of the creative class developed for the EU countries by Boschma and Fritsh (2009). We established that three of ten major groups of occupations as creative: Legislators, senior officials and managers; Professionals and Technicians and associate professionals (Table 1).

5 The data are especially prepared for this empirical research by the Department of Labour Force Survey.

Table 1: Creative Occupations of rural areas of Serbia

Major Groups of Creative Class	Level of qualification	Sub-major Groups of Creative Class
Legislators, senior officials and managers	The 4th qualification level*	Chief Executives, Senior Officials and Legislators Administrative and Commercial Managers Production and Specialized Services Managers Hospitality, Retail and Other Services Managers
Professionals	The 4th qualification level*	Science and Engineering Professionals Health Professionals Teaching Professionals Business and Administration Professionals Information and Communications Technology Professionals Legal, Social and Cultural Professionals
Technicians and Associate Professionals	The 3rd qualification level**	Science and Engineering Associate Professionals Health Associate Professionals Business and Administration Associate Professionals Legal, Social, Cultural and Related Associate Professionals Information and Communications Technicians

* The 4th level of qualification (ISCO-88) is defined in accordance with five and six categories of the International Standard Classification of Education (ISCED) and includes education beginning at age 17 or 18, which lasts about three, four or more years (university degree, master's degree and PhD).

** The 3rd level of qualification (ISCO-88) is defined in accordance with the 3rd and 5th category of the ISCED (completed four-year secondary education or college education).
Source: Author's presentation

4.2. Additional independent variables of the model

In addition to the variables of the creative class, entrepreneurship and their interaction, we included in the model additional independent variables which, according to similar studies (McGranahan, 2010; Josipović and Molnar, 2018),

can have a significant effect on the growth rate of the number of entrepreneurs in the total employment:

- *Economic base*, which is measured through four categories of employment by the share of employment in primary, secondary, tertiary and quaternary sector;
- *Working age population* is measured through the share of population 15-65 years old in the total population;
- *Young population* is measured through the share of population 0-14 years old in the total population, and
- *Dummy variables*, in order to include the effect of rural amenities.

Dummy variables are used to present three groups of rural areas classified by the level of outdoor amenities (high, medium or low) according to the outdoor amenity index of rural areas in Serbia developed by Josipovic, 2018. *Climate* (temperature gap between July and January temperature), *landscape* (topography, water area and land in forest) and *recreation* (employees in restaurants and hotels, the development of modern road infrastructure) are aspects of the outdoor amenities that shape the total amenity value of each rural area in Serbia (Josipović, 2018; Rikalović and Josipović, 2018).

5. Results and discussion

In order to test three hypothesis of the empirical research, the pooled model with two dummy variables, will be estimated two times. First time, we will use the creative class measure as the proxy for endowment of human capital in rural areas in Serbia. Second time, instead of the variable of the creative class measure in the model will be included the variable that measures the share of highly educated individuals engaged in creative occupations in the total employment.

5.1. The link between “creative” human capital and entrepreneurial potential

In order to test the hypothesis that “creative” human capital has a significant positive effect on the entrepreneurial potential of rural areas in Serbia, we estimated the pooled model with two dummy variables, which has been presented in section three. The model is estimated by the Generalised Least Squares method (GLS method) due to the identified presence of the autocorrelation and heteroscedasticity (Table 2). Table 3 presents the results of the estimated starting and final pooled model with two dummy variables by the GLS method. The final model is a starting pooled model with two dummy variables, without a variable which, according to the results, does not have a significant effect on the growth rate of entrepreneurial activity in rural areas in Serbia (without the variable which refers to the share of employees in the quaternary sector).

Table 2: Results of testing the starting assumptions of the econometric model with "creative" human capital

Measure	Test statistic (p-value)
Autocorrelation / Wooldridge Test	8.95 (0.0065)
Heteroscedasticity / Breusch Pagan/Cook Weisberg Test	10.65 (0.0014)
Regression specification error / RESET test	1.24 (0.30)

Source: Authors' calculation

Table 3: Results of the estimated pooled model with two dummy variables – an econometric model with "creative" human capital

Variables	Regression model with all variables		Final model	
	Coefficient	p - value	Coefficient	p - value
Creative class	3.827	0.052	3.862	0.051
Entrepreneurs	1.717	0.014	1.735	0.014
Creative class x Entrepreneurs	-0.048	0.062	-0.048	0.061
Primary sector	1.573	0.000	1.143	0.000
Secondary sector	1.073	0.001	0.659	0.000
Tertiary sector	1.628	0.000	1.233	0.000
Quaternary sector	0.419	0.176		
Working age population (15-65)	-1.355	0.001	-1.439	0.001
Young population (0-14)	2.034	0.000	2.023	0.000
Rural areas with high outdoor amenities	-3.772	0.007	-3.876	0.006
Rural areas with medium outdoor amenities	-1.074	0.507	-1.332	0.415
Constant	-687.766	0.016	-123.114	0.043
R^2 (R^2 adj.)	0.40 (0.34)		0.39 (0.34)	
F statistic	6.46 (0.00)		7.05 (0.00)	

Source: Authors' calculation

Based on the results of the estimated pooled model with two dummy variables, we can conclude that the whole regression is statistically significant at 1% level. We can confirm hypothesis H1 that the "creative" human capital has a significant positive effect on the entrepreneurial potential of rural areas in Serbia. Also, the variable which measures interaction of the creative class and entrepreneurship is significant at 10% level. All other independent variables in the model, except the variable that is measured through the share of employees in

the quaternary sector and dummy variable for rural areas with medium outdoor amenities, are statistically significant at 5% level. The presented independent variables of the model explain about 40% of the variation of the dependent variable, the growth rate of the number of entrepreneurs in the total employment. According to the results, we can also confirm hypothesis H3 that there are significant differences in the entrepreneurial potential between rural areas with high outdoor amenities and rural areas with low outdoor amenities in Serbia. The dummy variable which refers to the rural areas with high outdoor amenities is significant with the negative sign of the estimated coefficient. This result indicates that rural areas with high outdoor amenities in Serbia (Zlatibor, Raška, Moravica, Pčinja and Bor, see: Josipović, 2018) have a lower growth rate of the number of entrepreneurs in the total employment in regard to the rural areas with low outdoor amenities in Serbia (Srem, South Banat, Central Banat, North Bačka, Podunavlje, West Bačka and North Banat, see: Josipović 2018).

5.2. The link between "highly educated and creative" human capital and entrepreneurial potential

Given that, according to the results of the empirical research, the creative class has a significant positive effect on the entrepreneurial potential of rural areas in Serbia, we will test one more hypothesis H2: *The highly educated individuals engaged in creative occupations* (*"highly educated and creative" human capital*)*, as a part of the creative class, have a significant positive effect on the entrepreneurial potential of rural areas in Serbia, measured as the growth rate of the number of entrepreneurs in the total employment.* We estimated again the pooled model with two dummy variables which has been presented in section three, but instead of the variable of the "creative" human capital we included the variable that measures the share of highly educated individuals engaged in creative occupations in the total employment. These individuals are engaged in two major groups of the creative class, Legislators, senior officials and managers and Professionals. The professions which belong to these two groups most often require the fourth qualification level (university degree, master's degree and PhD). The model is estimated by the GLS method due to the identified presence of autocorrelation and heteroscedasticity (Table 4). Table 5 presents the results of the estimated starting and final pooled model with two dummy variables by the GLS method.

Table 4: Results of testing the starting assumptions of the econometric model with highly educated individuals engaged in creative occupations

Measure	**Test statistic (p-value)**
Autocorrelation / Wooldridge Test	10.69 (0.0034)
Heteroscedasticity / Breusch Pagan/Cook Weisberg Test	6.88 (0.0098)
Regression specification error / RESET test	0.46 (0.7085)

Source: Authors' calculation

Table 5: Results of the estimated pooled model with two dummy variables – an econometric model with "highly educated and creative" human capital

Variables	Regression model with all variables		Final model	
	Coefficient	p - value	Coefficient	p - value
Creative class - highly educated	6.881	0.010	6.866	0.011
Entrepreneurs	1.660	0.001	1.665	0.001
Creative class - highly educated x Entrepreneurs	-0.091	0.009	-0.091	0.010
Primary sector	1.663	0.000	1.181	0.000
Secondary sector	1.087	0.002	0.619	0.000
Tertiary sector	1.693	0.000	1.240	0.000
Quaternary sector	0.478	0.143		
Working age population (15-65)	-1.174	0.008	-1.242	0.005
Young population (0-14)	1.946	0.000	1.933	0.000
Rural areas with high outdoor amenities	-3.195	0.029	-3.308	0.026
Rural areas with medium outdoor amenities	-0.613	0.706	-0.830	0.618
Constant	-175.252	0.004	-123.987	0.010
R^2 (R^2 adj.)	0.38 (0.32)		0.37 (0.32)	
F statistic	5.98 (0.00)		6.52 (0.00)	

Source: Authors' calculation

Based on the results of the estimated pooled model with two dummy variables, we can conclude that the whole regression is statistically significant at 1% level. All independent variables in the model, except the variable that is measured through the share of employees in the quaternary sector and the dummy variable for rural areas with medium outdoor amenities, are statistically significant at 5% level. The presented independent variables of the model explain about 37% of the variation of the dependent variable, the growth rate of the number of entrepreneurs in the total employment. We can confirm hypothesis H2 that the "highly educated and creative" human capital has a significant positive effect on the entrepreneurial potential of rural areas in Serbia at the level of significance of 5%. According to the results, we can again confirm hypothesis H3 that there are significant differences in the entrepreneurial potential between rural areas with high outdoor amenities and rural areas with low outdoor amenities in Serbia. Again, the dummy variable which refers to the rural areas with high outdoor amenities is significant, but with the negative sign of the estimated coefficient. This indicate that, unlike the rural areas with high outdoor amenities in developed economies, rural areas with high outdoor amenities in Serbia don't use their amenities as a key instrument for attracting individuals who are highly

educated, talented and creative and for the improvement of their entrepreneurial potential.

The sign of the estimated coefficient of the variable of the interaction of "creative" human capital and the share of entrepreneurs in the total number of enterprises (Table 3) and the sign of the estimated coefficient of the variable of the interaction of "highly educated and creative" human capital and the share of entrepreneurs in the total number of enterprises (Table 5) are negative. This result is not consistent with the results of empirical research conducted in developed economies (McGranahan, 2010). The effects of "creative" human capital/ "highly educated and creative" human capital on the growth rate of the number of entrepreneurs in the total employment are interdependent. A negative sign may indicate that, at higher levels of entrepreneurship, the link between "creative"/"highly educated and creative" human capital and the growth rate of the number of entrepreneurs in the total employment is weaker, i.e. that it decreases as the values of the first predictor increase (the number of entrepreneurs in the total number of enterprises). In particular, the effect of "creative"/"highly educated and creative" human capital on the growth rate of the number of entrepreneurs in the total employment is lower in rural areas with a larger share of the number of entrepreneurs in the total number of enterprises (Table 6) and vice versa, this relationship is more intensive in rural areas with a smaller participation of the number of entrepreneurs in the total number of enterprises (Table 7).

Table 6: Relationship between "Creative" human capital/"Highly educated and creative" human capital and the growth rate of the number of entrepreneurs in the total employment – rural areas with a high share of the number of entrepreneurs in the total number of enterprises

Rural areas with a high share of the number of entrepreneurs in the total number of enterprises	"Creative" human capital ("Highly educated and creative" human capital), (%)	The growth rate of the number of entrepreneurs in the total employment (%)	Correlation coefficient between "Creative" human capital ("Highly educated and creative" human capital) and the growth measure
Toplica	18.41 (10.90)	-2.71	0.06 (-0.17)
Jablanica	19.71 (12.42)	1.37	
Zlatibor	21.62 (11.06)	3.28	
Zaječar	23.87 (13.71)	1.52	
Šumadija	27.38 (15.63)	-1.11	
Rasina	22.54 (12.34)	2.74	

Source: Authors' calculation

Table 7: Relationship between "Creative" human capital/"Highly educated and creative" human capital and the growth rate of the number of entrepreneurs in the total employment – rural areas with a low share of the number of entrepreneurs in the total number of enterprises

Rural areas with low share of the number of entrepreneurs in the total number of enterprises	"Creative" human capital ("Highly educated and creative" human capital), (%)	The growth rate of the number of entrepreneurs in the total employment (%)	Correlation coefficient between "Creative" human capital ("Highly educated and creative" human capital) and the growth measure
Moravica	24.66 (13.36)	2.29	0.71 (0.65)
West Bačka	30.56 (19.22)	4.62	
Nišava	34.30 (17.50)	4.18	
North Banat	28.27 (15.68)	1.66	
South Bačka	34.97 (19.82)	8.54	
North Banat	25.65 (12.29)	4.08	

Source: Authors' calculation

The correlation coefficient between "creative" human capital and the growth rate of the number of entrepreneurs in the total employment for rural areas with a low share of the number of entrepreneurs in the total number of enterprises is 0.71, while the coefficient of correlation between "creative" human capital and the growth rate of the number of entrepreneurs in the total employment for rural areas with a high share of the number of entrepreneurs in the total number of enterprises is 0.06. The correlation coefficient between "highly educated and creative" human capital and the growth rate of the number of entrepreneurs in the total employment for rural areas with a low share of the number of entrepreneurs in the total number of enterprises is 0.65, while the coefficient of correlation between "highly educated and creative" human capital and the growth rate of the number of entrepreneurs in the total employment for rural areas with a high share of the number of entrepreneurs in the total number of enterprises is -0.17.

In order to support sustainable rural development it is necessary to focus on endogenous development and entrepreneurship. The endogenous development, especially of rural areas with high outdoor amenities in Serbia, should be based on the improvement of the quality of human capital and development of entrepreneurship and entrepreneurial spirit among the rural population, especially in areas such as: organic production and production of the traditional rural products, rural tourism and cultural activities and art. Improvements in the educational level of local workforce can contribute to economic growth through increased schooling in specific skill areas, such as: entrepreneurship,

management, engineering, computer science etc. In addition to a favorable environment for living and recreational activities, it is necessary to provide appropriate *economic condition* (employment growth through the diversification of rural activities, income growth, etc.), *regional facilities* (development of rural infrastructure, the establishment of the necessary institutions at the local level, the employment growth in public health care, public education and in cultural and regional activities etc.) and the preservation of local identity, social capital, outdoor amenities and cultural heritage. Also, it is necessary to adopt adequate regional development policies specifically focused on reducing intraregional inequalities.

6. Conclusions

The main intention of this paper is reflected in the analysis of complex problems of rural economic growth and development, with a special emphasis on the link between the creative class and entrepreneurship in the rural setting. Investigating the factors that can foster the improvement of the entrepreneurial potential at the regional level, various studies concluded that the factors that play an important role in this process include the following: highly educated individuals, people engaged in creative professions, social capital, industry structure, the level of income, unemployment rate and various types of support for the development of entrepreneurial initiatives etc. Empirical studies conducted in the EU countries confirmed the hypothesis that individuals that belong to the creative class are more likely to become entrepreneurs than the employees who are engaged in non-creative occupations. The empirical contribution of this paper is reflected in the presentation of the classification of the creative class occupations in Serbia and in the development of an econometric model for testing the effect of the creative class on the entrepreneurial potential of rural areas of Serbia during a five-year period (2009-2013). The results of the empirical analyses conducted on the sample of 24 rural areas in Serbia have confirmed the hypothesis that “creative” human capital, especially the part consisting of highly educated and creative individuals, is relevant for improving the entrepreneurial potential at the local level. Also, the hypothesis that the differences in the entrepreneurial potential between the rural areas with high outdoor amenities and the rural areas with low outdoor amenities in Serbia are significant is confirmed. Rural areas with high outdoor amenities in Serbia have a lower growth rate of the number of entrepreneurs in the total employment in regard to the rural areas with low outdoor amenities. Unlike the rural areas with high outdoor amenities in the developed economies, rural areas with high outdoor amenities in Serbia do not use their amenities as a key instrument for attracting individuals who are highly educated, talented and creative and for the improvement of their entrepreneurial potential. Basic limitation of the empirical research presented in this paper is related to the availability and comparability of statistical data on available human capital in rural areas in Serbia. For this reason it was not possible to prolong the observed period. Future directions of empirical

research could be focused on the improvement of the developed econometric model, primarily through the inclusion of new variables (factors) that can have a significant impact on the improvement of the entrepreneurial potential of rural areas of Serbia. Bearing in mind all the obtained results, it is concluded that the creative class, especially highly educated people engaged in creative professions, may foster the entrepreneurial potential at the local level and can serve as a crucial factor for rural economic growth and development in Serbia. The results of our empirical analysis represent the necessary basis for the improvement of the rural development policy in Serbia and its instruments in practice. In the new economy, the ability to create new knowledge, ideas and new forms of businesses is a key factor for sustainable rural development. Rural areas in Serbia should use their outdoor amenities as an instrument for the growth and retention of the highly educated and/or creative individuals. Outdoor amenities, human capital and entrepreneurship should have a complementary role in the development of rural areas with high outdoor amenities in Serbia. Rural development policies should be transformed from *exogenous* (focused on the attraction of new businesses) to *endogenous* (focused on the improvement of local assets, promotion of rural tourism and marketing of local natural, recreation and cultural amenities). The measures, instruments and activities of rural development should be focused on: the improvement of the knowledge and skills of the rural population, education of young population, wider application of information and communication technologies, the development of entrepreneurial culture, the improvement of competitiveness and innovation of rural entrepreneurship, providing favourable conditions for loans by banks and other financial institutions, providing support for young farmers who run their own businesses, a stronger co-operation between the public, private and civil sector etc.

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CHAPTER 12

The digitalisation of public administration and born-digital functions: a modern "Janus Bifrons"?

Stefano Rossa[1]

ABSTRACT

The digitalisation of public administration is a phenomenon that is generally described as an "organisational moment" of the administrative action. Its purpose is to exert, through the ICT, administrative functions, and to provide public services, that previously were used to exerting (or providing) in the analogical and traditional way.

However, digitalisation is also something else. If we consider the openness data policies, which realized the principle of transparency through ICT and which are directed to enhance the data asset of public administrations, we also can see another side of the digitalization.

Like "Janus Bifrons", the Roman god with two faces, the digitalisation is both "organization" to exert current functions (and to provide public services) in a better way, and exerting (and providing) of not pre-existing administrative functions (and public services). This is the case of born-digital functions and born-digital public services. An example of a born-digital function is the data analysis: with data analysis, public administrations do something new that up to a few years ago no one could just think about.

If we examine the classic side of the digitalization of the public administration, the organisational one, each national legal order establishes its own legislation, which generally states that is the central power (Government or Parliament) the actor appointed to discipline a general regulation. However, the local governments have to actualize "boots on the ground" the general and central regulation.

Nevertheless, the other side of the digitalization is different from the others. The question is if these born-digital functions (and born-digital public services) have to follow the regulation of the not born-digital ones. If the answer is negative, we have to think if local governments could be an autonomous actor in data analysis policies which do not depend at all from the Central power.

Key words: Digitalisation; Public Administration; ICT; Digital Public Administration.

JEL Classification: K23, K29, K30, O38.

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1. Introduction.
The actual usefulness of ancient myths and legends

Sometimes it is possible to be surprised about the fact that some words, that apparently are apart, reveal a common origin. An example of this are the words "January" and "door".

It is clear that "January" is the first month of the year and "door" is a barrier to close or open a passage between two different spaces. "January" derives from the Latin, instead "door" has a Proto-Germanic origin. To understand how these words are connected, it is necessary to use the Latin root of "door": the Latin word for "door" is "iānŭa-ae". At this point, it is clearly their closeness. Both these words derive from the name of the Ancient Roman god Janus (in Latin "Ianus-i")[2].

Janus is the oldest Roman god which is considered the primordial deity. Its name already appears in the third fragment of *Carmen Saliare*, an archaic Latin text for ancient religious rituals made by Salian priests[3]. Janus is one of the few Roman Gods that has no correspondence with another one in the Ancient Greek Pantheon. However, it had a fundamental importance for Romans, because Janus was primarily the God of the movement, the passage, and the change; the God of the beginning and the end. In fact, the first month of the year, January, is dedicated to Janus[4]. Traditionally, in the figurative arts, it is represented with two-faces: one that looks to the future, and the other one to the past. For this reason, one of its epithets is "Janus Bifrons" (from Latin "frons-tis", face).

The Janus's artistical representation testifies (at least) two important aspects of the human life: on the one hand that everything is subject of the inevitable process of change (after all πάντα ῥεῖ); on the other one that the duality is a common trait of nature, indeed everything has a beginning and an end. However, the wisdom which the current generation may see, for instance, in old myths and legends is still pertinent today. In fact, those features that the Ancients were used to describing in their culture, in order to try to understand their world, may show also actual problems. An evident example of it is the duality that derives from the two-faced Janus: duality which is still common nowadays, in particular in social phenomena. If we consider the important social nature of the law[5], it is possible to use these mythological representations as a starting point to analyse and to extricate complicated juridical issues.

2 About it *ex multis* see Linde (1891), and Cerinotti (2016), p. 391.

3 The third fragment, that with the first one is reported by Marcus Terentius Varro in De lingua latina, says: «cozeulodorieso. Omnia vero adpatula coemisse. Ian cusianes duonus ceruses dunus Ianusve vet pom melios eum recum» (cf. Goetz and Schoell (1964), Liber VII, vv. 26, p. 100). The fragments of Carmen Saliare are written in a pre-archaic Latin at the point which that language was partially unknown also for Roman rhetors and orators of Classical Period. Indeed Marcus Fabius Quintilianus wrote: «Saliorum carmina, vix sacerdotibus suis satis intellecta» (see Pennacini (2001), v. 40, p. 167).

4 Cf. Riganti (1978), v. 34, p. 40.

5 About the relationship between law and society see *inter alia* Kastner (2004).

The purpose of this paper is to propose an interpretative key, alternative to the one generally used, to the concept of the digitalising process of public administration. The Janus Bifrons's figure will be a precious instrument to draw this second point of view about the meaning of the digitalisation. However, at this point it is useful a clarification: the (few) legislative and doctrinal references in the following paragraphs will be referred to Italian laws and scholars. Fortunately, the nature of the heart of the digitalising process of public administration, a phenomenon that intrinsically may not be enclosable into national borders, allow this *modus procedendi* – at least about the part of our interest.

2. The concept of the digitalising process of the public administration

2.1. The first Janus's face: the digitalisation as an organisational moment (of pre-existing things)

The starting point is evident: what does digitalisation mean? In 2010 entered into force the Communication from the European Commission of 19 May 2010, better known as "Digital Agenda for Europe"[6]. It was one of the seven pillars of the Strategy "Europe 2020" that set some objectives for the growth of the European Union by 2020, in particular about the use of ICT to create a digital single market. Each EU member State adopted new domestic legislation in this field or amended pre-existing rules.

In Italy, the hardcore of the legislation in this area is the Legislative Decree No. 82/2005, the Digital Administration Code (IDAC)[7]. This law, which has been modified in several times also to comply with EU rules (like, for instance, the European Digital Agenda), does not define explicitly what digitalisation is. Indeed, even though Art. No. 1 IDAC has the heading "Definitions", nothing is written about the digitalisation. However, according to Art. No. 2.1 IDAC, which affirms the purposes of this law, it is established that the State (*recte*: State, Regions and Local Autonomies), on the one hand shall digitally guarantee the availability, the management, the access, the exchange, the storage, and the usability of the information; on the other hand that the State, to do that, has to organise itself and to operate through the ICT. Here it is possible to see the heart of the digitalisation. By interpreting the above-cited rule, it appears that the digitalisation of the Public Administration is a phenomenon that may be described as an "organisational moment". Public Administrations have to organise their internal procedures and their internal structure in order to exert better administrative functions and to provide better public services. Indeed, ICT allows the increasing of some important features of administrative action: efficiency,

6 Communication from the Commission of 19 May 2010 to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A Digital Agenda for Europe [COM(2010) 245 final – Not published in the Official Journal].

7 About the Digital Administration Code see *ex multis* Carloni (2005); Cardarelli (2015); Trojani (2017); and Boccia, Contessa, De Giovanni (2018).

efficacy, and affordability. At the same time, ICT represents a way to actuate important principles that shall guide the public administration, like the principle of good administration or those of impartiality, which are expressed in important International treaties[8] and, of course, in national juridical orders[9].

In accordance with this interpretation of the concept of "digitalisation of Public administration"[10], the ICT-oriented organisation is the key to exert pre-existing administrative functions and to provide pre-existing public services. The purpose is to do in a better way, through new technology, something that previously was done with traditional technology. But with the new technology – *i.e.* ICT – it is possible to obtain different and improved results. The centrality of the re-organisation is crucial because in this way public administration may play an active role in digital improvements.

At this point, it is necessary to highlight some tangible examples that make clear this aspect, through some digital projects developed in Italy.

2.1.1. The SPID project

The first example is represented by the SPID[11] project. SPID, acronym of Public Digital Identity System (in Italian *Sistema Pubblico d'Identità Digitale*), is a digital project developed in 2014 by AGID, the Agency for Digital Italy (in Italian Ag*enzia per l'Italia Digitale*), the technical agency of the Italian Government (*recte: Presidenza del Consiglio dei Ministri*) appointed to the realisation of the Italian Digital Agenda. With SPID citizens and legal persons are able to access to digital services provided by public administrations. Usually, the users have to insert their usernames and passwords every time they log in on private websites. The main problem is that each private website requests a specific username and password: in this way the user must generate a lot of different references. Actually, the reason of it is simple: (basically) the owner of the various different websites is not the same person; and for that, by giving usernames and passwords to users, owners have to identify every new consumer. The same things generally happen if users utilise the websites of public administrations. But these aspects are illogical in case the owner of the websites is the public administration. Indeed, it is illogical to require different usernames and passwords for each website of the public administration because owner is the same. Likewise, it is nonsense to generate more than one username and

8 See for instance Art. N. 41 EU Charter of Fundamental Rights. About this argument see, *ex multis,* Mihaescu-Evans (2015).

9 About the Italian legal framework see, in particular, Art. No. 97 Italian Constitution and Art. No. 1 Law No. 241/1990.

10 About the relationship between digitalising process and organisation of public administrations see, *ex multis*, Pesce (2018), pp. 138 ss.; Carullo, G. (2017), pp. 37 ss.

11 On this field see https://www.spid.gov.it/ and in English https://www.agid.gov.it/en/platforms/spid. In the IDAC there is the Art. No. 64-bis that represents the legal basis of SPID, because its heading is "Telematic Access to Services of Public Administration". Nevertheless SPID is regulated also by D.P.C.M. of October 24th, 2014. About SPID see also Titomanlio (2015); Amenta, Lazzaroni, Abba (2015); Contaldo (2016).

password to login into public administration's websites. SPID prevents these issues. In fact, this project permits citizens to log in to public administrations websites, in order to access to digital public services, with a unique username and a unique password for all the websites of public administration. In this way, the login procedure is easier both for users and public administration. Moreover, the subject appointed to generate references to the users is not the public administration, but other specific subjects which are accredited Identity Providers. In this way, if a citizen wants to access to digital public services, at first he must request the personal username/user-Id and password to one of the Identity Providers. To grant these references to the citizen, the Identity Provider has to identify the applicant. The citizen, received user-Id and password, and after having obtained via smartphone an OTP code, may log in to the website of the public administration. SPID's advantages are consistent: on the one hand the user can apply the same user-Id and password for all the websites of the public administration (instead the Identity Provider sent a different OTP code at every access); on the other one, the public administration does not have to identify users at every access because there are other subjects appointed to do that pursuant to statutory provisions.

SPID represents an evident case in which the technology improves an aspect of the administrative action that previously was differently managed. Indeed, in this case, SPID is related to citizens' fundamental identification for the access to public services. This identification is not an innovation. This is the reason why SPID an excellent and concrete example of how ICT may be useful to do in a better way something that earlier was done differently. But in order to do that public administration has to organise itself with the help of the technology.

SPID is not the only digital project that testifies this "organisational power" of the digitalising process of the public administration: another example could be findable in those developed by the Agency of Customs and Trader.

2.1.2. Agency of Customs and Trader's digital projects

If we add the two well-known proverbs "time flies" and "time is money", we can understand how important the time is for the entrepreneurs, in particular for those who work in the international shipping field. Indeed, a few years ago it was quite ordinary to spend a lot of time for custom practices: time that, if saved, could consist in a relevant economic earning. That is the reason why in the European Union important specific rules have been introduced to optimise custom procedures, like the Union Customs Code (UCC) that was entered into force in 2016[12]. Also European Union member states have adopted domestic legal frameworks to improve this field. Italy in this area has taken giant steps, especially for the use of ICT. In fact, the Final Relation of the "Italian Parliamentary Committee for the Inquiry on the Level of the Digitalisation and Innovation

12 Cf. Regulation (EU) No 952/2013 of 9 October 2013 laying down the Union Customs Code (recast).

of Public Administrations and ICT Investments" has underlined that the digital projects developed by the Italian Agency of Customs and Trader (IACT)[13] represent an important case study related to the digitalising process of the Italian public administration best practices[14].

The IACT worked on the methods to make the exchanges faster and cheaper, with the consequence of increasing their number. To do this, the IACT has elaborated a digital strategy that allows a real-time control on import-export shipping. In particular, with the digital platform AIDA[15], the Unique Custom Office[16] and the Electronic Custom Recorder (ECR)[17], the IACT has deeply improved the procedures, because with ICT it is now possible to track goods in transit actuating the principle of transparency; it is possible to pre-clear products through customs even before they arrive in custom (*e.g.* into the see if products are shipped via boat, or in air if these arrived by plan): in this way all the practices are on time and there is no waste of time and money; it is possible to present digital copy of supporting documents and only in suspected cases the declarant shall provide the originals to the customs authority, considering that according to the UCC «supporting documents shall be provided to the customs authorities where Union legislation so requires or where necessary for customs controls»[18]. All these digital projects allow obtaining significant economical advantages and important optimisations of internal procedures of IACT.

These aspects are evident from the following table (Tab. No. 1) in which are represented the percentage of clearing procedures concluded within five minutes in all the Italian customs, before and after the entrance into force of the ECR: in the first column on the left there are the typologies of the clearing procedure; in the second one the percentage in the period between January 1st and April 30th – *id est* before the introduction of the ERC; in the third one the percentage in the period between May 1st and December 31st – namely after the entrance into force of the ECR; in the last one there is the percentage of the use of ECR by Italian customs. From the analysis of the table, it appears that with ICT there has been an increase of more than 8% of the clearing procedures concluded within five minutes – in just six months.

13 See https://www.adm.gov.it/portale/en/web/guest/home-english.

14 See Final Relation (in Italian: *Relazione sull'attività svolta. La digitalizzazione della pubblica amministrazione italiana: analisi degli errori e valutazione delle priorità, dall'efficacia degli strumenti all'importanza del capitale umano) of the Italian Parliamentary Committee for the Inquiry on the Level of the Digitalisation and Innovation of Public Administrations and ICT Investments, in Parlamento Italiano, Atti Parlamentari – Camera dei Deputati, XVII Legislatura, Doc. XXII-bis No. 14,* October 26th, 2017, in particular pp. 135 ss.

15 Cf. https://www.adm.gov.it/portale/-/aida.

16 About it see Art. No. 4.57-58 Law No. 350/2003 and Art. No. 20 Legislative Decree No. 169/2016. *Ex multis* see Amoroso (2013).

17 See Art. No. 158-187 Regualtion (EU) No 952/2013, and IACT Nota No. 27517/RU/2017, in particular Art. No. 1.2, 3.4, 4.2, 5, 6, 8 and All. 1. *Ex multis* see Ferroni, Trabucco (2014).

18 See Art. No. 163.2.

TEMPO DI SDOGANAMENTO: % DI DICHIARAZIONI SDOGANATE ENTRO 5 MINUTI

TUTTE LE DOGANE MEDIA ITALIA	1 gen- 30 apr 2016	1 mag- 31 dic 2016	% utilizzo Fascicolo Elettronico
IMPORT	77,3%	88,7%	36,9%
EXPORT	88,9%	94,8%	37,3%
TRANSITO PARTENZA	70,9%	88,2%	37,8%
TOTALE	84,3%	92,6%	37,2%

Tab. No. 1: Table that originally appears in the Final Relation (in Italian Relazione sull'attività svolta. La digitalizzazione della pubblica amministrazione italiana: analisi degli errori e valutazione delle priorità, dall'efficacia degli strumenti all'importanza del capitale umano) of the Italian Parliamentary Committee for the Inquiry on the Level of the Digitalisation and Innovation of Public Administrations and ICT Investments, in Parlamento Italiano, Atti Parlamentari – Camera dei Deputati, XVII Legislatura, Doc. XXII-bis No. 14, October 26th, 2017, p. 137.

The experience of the IACT, that represents a model of Italian digitalised public administration[19], underlines that with the ICT it is possible to improve and do better what previously was done with lower results, in this case the custom procedures.

2.2. The second Janus's face: the digitalisation as a creative moment (of not-pre-existing things)

The concept of the digitalisation of public administration as described in the previous paragraphs represents only one of the two fundamental aspects of it. The digitalising process of public administration does not consist only in an organisational moment to do something that pre-exists in a better way than before the use of technologies, increasing the results. The digitalisation of public administration not only is the application of ICT at the internal procedures and organisation in order to improve and make more efficient the exertion of pre-existing administrative functions and the providing of pre-existing public services. This is just one of the two faces of Janus.

The other one, which is pointed to the future, is related to a "creative moment". If the public administrations, through the ICT, are able to improve something that pre-exists, they are able also to use ICT to create something that previously did not exist. More precisely, if digital technologies may be used by the public administration to organise itself with the purpose to exert pre-existing administration and to provide pre-existing public services, at the same time ICT

19 It is not surprising that the current General Director of the AGID, the Agency for Digital Italy, Dott.ssa Teresa Alvaro, previously was the Innovation Chief of IACT.

represents the instrument to exert *new* administrative functions and to provide *new* public services – and consequentially the tool through which public administration may organise itself to exert and to provide these *new* administrative functions and public services. If ICT permits public administrations to make the reality better, it allows creating something original. ICT allows the creation of those that it is possible to call "born-digital administrative functions" and "born digital public services".

At this point, some clarification on the character of creativity could be useful: an example may prevent interpretative issues. Let's think about the trolley case, the wheeled luggage. It is a quite recent invention (the 1970s-1980s)[20] if we compare this object with its component: the wheel and the suitcase. However, by putting together these two old tools, the trolley case's inventor has created a new object. If it is clear that the trolley case is a type of suitcase, at the same time it is not questionable that the trolley case has represented a new creation because before it did not exist. Until 1970-1980 no one thought about it, although the idea at the base is extremely simple. And exactly in this way, the creative aspect of the digitalisation of the public administration can be interpreted. Furthermore, it is possible to distinguish the digitalisation as a creative moment from the digitalisation as an organisational moment for another important aspect: the purpose. Indeed, as written above, the *ratio* of the first Janus's face is to improve and make more efficient the exertion of pre-existing administrative functions and the proving of pre-existing public services: the accent is added to economic detail. On the contrary, the other face of the Roman god, the creative one, is focused on the realisation of the goal of Open Government.

As is well known, the Open Government[21] is a strategy of the exercise of public power. Its main goal is to bring the government closer to citizenship. The Open Government establishes three fundamental principles that have to be realised to achieve this goal: transparency, participation, and collaboration. These principles must guide public powers, as underlined by the USA President Barak Obama's "Transparency and Open Government Memorandum for the Heads of Executive Departments and Agencies"[22], which is one of the first act in this field, Government should be transparent, participatory, and collaborative.

Data (in particular open data) has a central role In the Open Government strategy, considering, by one side, its features of openness and availability; and on the other side its relationship with the right to information and with the right to access. Indeed it is not fortuitous that some examples of born-digital administrative functions and born-digital public services are based on data and on data analysis. Data has useful features that may be used by governments to realise the Open Government principles: data has enormous amount; every subject

20 Cf. Hunter (2010).

21 *Ex multis* see Wirtz and Birkmeyer (2015); Hilgers (2012); Meijer, Curtin, Hillebrandt, (2012); Lathrop and Ruma (2010); McDermott (2010).

22 Cf. https://obamawhitehouse.archives.gov/the-press-office/transparency-and-open-government.About Open Government see also https://www.opengovpartnership.org/.

and object may produce data; data represents a precise instrument to describe the reality. For these reasons, data has a high economic value. With all these characteristics, data can be used to create those new born-digital administrative functions and born-digital public services. Two examples can explain these concepts.

2.2.1. Data and Analytics Framework project

The Data and Analytic Framework (DAF)[23] is a project elaborated by the Digital Transformation Team (in Italian *Team per la trasformazione digitale*)[24], the Governmental Commissioner structure for the Digital Agenda. The purpose of the DAF is to create a national platform for data held by public administrations, in order to make this data more available among citizens and enterprises. The starting point of this project is Art. No. 50-*ter* IDAC, that contains the legislative prevision of the creation of the National Digital Data Platform (NDDP) (in Italian *Piattaforma Digitale Nazionale Dati*). Even if it has not been released in the final version yet, the DAF project concretises the NDDP. However it goes beyond that as drawn by the legislator. Indeed its main aim is to improve the promotion of data of public administrations among physical people and juridical persons. Considering the data descriptive feature of reality and its economic value, public administrations realised to have the opportunity to deeply know those social behaviours relevant for making public choices; consequentially, with this knowledge, public administration can take better citizens-oriented choices.

Moreover, if this expertise is useful for the public administration *a fortiori* is useful for private persons (enterprises, corporations, etc.) and for citizens too. Indeed, public administration may make data available to private persons, for instance, to encourage the private economic initiatives in fields related to data held by public administrations. The latter may also to promote the knowledge generation among citizenship – in general or in particular areas (like Mèmora project – see the next subparagraph).

The DAF project is focused on two relevant areas: the first one is the improvement of the data interoperability between all public administrations, and of the data exchange among all the player; the second one is the promotion of open data among public administrations, and of digital instruments to visualise and to facilitate the understanding the data analysis results (*e.g.* thematic dashboards).

Therefore, the purpose of the DAF project is to enhance public data and information assets. To do this, it provides innovative digital instruments for the data analysis and the data management that can be used autonomously by each public administration; in particular, with this project, public administrations can employ a precious system for data governance, for data standardisation, and for data visualisation. When the DAF will be released in the final version, all these things will be available to public administrations on a public data portal.

23 About the DAF see Bodino, Ercolani, Piunno, Ruggiero (2018).
24 See https://teamdigitale.governo.it/en/.

As written above, the goal of the DAF is the generic enhancement of public data and information assets. However, there are other digital projects that are focused on specific types of data object of enhancement. An example could be represented by the Mèmora project.

2.2.2. Mèmora project

Mèmora[25] is a digital project elaborated in 2018 by the Italian Region of Piedmont[26] and CSI Piemonte, one of the most important Italian consortium of public administrations and Universities in the ICT sector. Mèmora is a platform through which it is possible to catalogue and to collect the cultural and heritage information assets. In particular, this project allows describing cultural assets held by Piedmontese regional public administrations, using international standards. This description is made in a digital and integrated way, namely through the establishment of links and relationships between the various elements into the platform (*e.g.* through the use of metadata). In this way it is possible to precisely know the elements the cultural heritage of the Piedmont region is composed of.

Each element in Mèmora is a digital object, which is integrated with interactive multimedia content like images, video, audio, hypertext, and georeferencing system. Each individual may access to the platform, both citizen and public administration: the access to Mèmora is free and without costs also because it has been created with open-source technology. As described *supra*, it is clear that Mèmora allows in practice to safeguard and to enhance the cultural and heritage information assets of the Region of Piedmont. On the one side, the elements in the platform are available in a unique portal – and this aspect simplifies the relationship with citizens and third subjects. On the other side, these elements are catalogued and collected with digital technology, through which it is possible both to add further information to the single element in order to improve the experience of those who accede to the elements in the platform; and to ensure the conservation of these element over the years, even if the same element can be digitally acceded by a lot of subjects at the same moment (point that is not possible in the "classical" museum access). In any case, through the georeferencing system, it is possible to know the precise real museum or collection in which the elements are stored, in order to go there and to consult them "traditionally".

Moreover, Mèmora is inspired by open-access and open-source philosophy. Indeed each citizen may reuse data of the elements in the platform in compliance with the reuse licenses established by Mèmora's rules. Additionally, the platform is created with open-source software which permits that the international community of developers, for free, can resolve technical problems through updates and through the software security control. In this way, it is avoided

25 About Mèmora see http://www.memora.piemonte.it/ (in Italian). About it see also Brunetti (2018).

26 Piedmont is an Italian region located in northwest Italy. Its main city is Turin.

the so-called "lock-in effect" that *de facto* obliges public administrations to purchase the use-licenses of the software from the technology companies, with relevant phenomena of competition distortion.

In conclusion, Mèmora represents an important example of an instrument that can be used by public administrations to enhance their public data and information assets, in particular in the field of cultural heritage.

3. Final (and partial) considerations

In conclusion, it is possible to see the digitalisation of the public administration as a complex phenomenon that consists of two fundamental aspects. On the one hand, the digitalisation represents an organisational moment: public administrations organised their internal procedures and their internal structure to exert pre-existing administrative functions in a better way, and to provide pre-existing public services in a better way. Public administration uses ICT to improve the efficiency, the efficacy, and the affordability of their action: in this way, they realise fundamental principles that have to guide and to inspire the public administration, in particular, the principle of good administration and the principle of impartiality. The projects, briefly described above in the subparagraphs No. 2.1.1. and 2.1.2, represent clear examples of the realisation of this aspect of the digitalisation: in these cases, ICT is a technical tool to digitally shift analogical functions and services.

Analysing the digitalisation, it is possible to realise that this phenomenon does not consist only in an organisational moment to improve pre-existing administrative functions and public services. Digitalisation is also something more. Considering that it has a relevant transformer feature, at the same time it can be the key to create something innovative. Through the ICT public administrations are able to create administrative functions and public services that previously did not exist. In this case, the digitalisation reveals its other side: a creational moment of "born-digital administrative functions" and "born-digital public services"; and, consequentially, public administrations have also to organise themselves to the exertion of these born-digital administrative functions and to the providing of these born-digital public services. While the digitalisation as organisational moment has the purpose to realise those that may be called "traditional" principles of the administration (*e.g.* good administration, etc.), this second meaning of the creational moment is focused on the actualisation of the Open Government principles: transparency, participation, and collaboration. As written *supra* (v. subparagraphs 2.2.1. and 2.2.2.) digital projects that represent some examples of this conception as the digitalisation are related to the data analysis process and the enhancement of data and information assets of the public administration. These projects underline that their purpose is not the simple data exchange between public administrations (and citizens): this exchange has always been "classical" administrative function exerted by public administration also before the diffusion of ICT (with lower results).

Here the goal is to analyse data and information in a deep innovative way; a way not comparable with the previous one. For this reason, it is possible to talk about “creation” instead of “improvement”, also in consideration that through the descriptive feature of data and information, data analysis is a precious instrument to describe the reality and to predict some future situation (in particular the big data analysis[27]). The exertion of born-digital administrative function – an example of which can be the data analysis[28] – represent a fertile soil for the setting up of born-digital public services (in relation to the previous example, a born digital public service data-oriented). Furthermore, in these cases, the public administration could be the subject that makes data available to citizens and entrepreneurs, realising the principles of participation and collaboration.

In the end, the digitalisation of public administration, that can be considered composed of the “organisational” and “creative” moments, may be described like Janus, the Roman god with two faces: one that is pointed to the past, and the other one to the future. The temporal question past-future is useful because it allows making a reflection. Do the exertion of born-digital administrative functions and the providing of born-digital public services have to be regulated with the same rules of not born digital administrative functions and public services, in particular, those about the relationship between State and local Governments in the digitalising process of public administration? If the answer is negative, local autonomies could play a different (and maybe more important) role in the digitalising process of public administration. But this question and the connected answer need much more space to be solved and can not be completed just in this paper.

27 About big data see, *ex multis*, Multiple Authors (2013); Ambrose (2015); Gandomi and Haider (2015); De Mauro, Greco, Grimaldi (2015).

28 Carullo, G. (2017), 35-36 uses the expression of «funzione amministrativa dei dati» (data administrative function) to refer to that administrative function finalised to the organisation, management and availability of data («*funzione amministrativa volta alla organizzazione, gestione e fruizione dei dati*»).

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CHAPTER 13

Health Technology Assessment[1]

Jana Rozmarinová

ABSTRACT

The proliferation of Health Technology Assessment (HTA) and its expanding can contribute to slow down burgeoning of health care costs. HTA is considered to be one of the tools how to improve health systems imbalances and problems through systematic evaluation of properties, effects, and impacts of health technology. The role of HTA is discussed in the context of increasing expenditures on health care caused especially by improving and using new technologies in the health care sector. The paper analyzes reasons for the growth of costs of health care and describes one of the methods for regulation of this growth - use of HTA. The Analysis deals with the development and use of HTA in the Czech Republic. The conflict of available resources and innovative technologies in healthcare is performed and methods of HTA are discussed in general introduction. In the paper we reflect the Czech situation in HTA and especially the legal frame of it., furthermore the main issues of HTA assessment in relation to health policy are introduced. The progress of HTA in the Czech Republic is evaluated separately as a process towards to applied Pharmacoeconomics and as a process towards HTA. Both the comparative analyses are performed to show the gap in implementing HTA in the Czech Republic. The Pharmacoeconomics was implemented in the Czech Republic even that CR does not have a formal HTA body in the sense of an independent agency. This selective use of HTA principles so far has not resulted in the implementation of HTA.

Key words: Health Technology Assessment, Health care cost

JEL classification: I 10

1. Introduction

The reality that society has infinite desires and wants, and an only limited amount of resources is available is the main problem of the economy. Calls for better resource efficiency, consequently, is not new. The awareness of the limitations of scarce resources accompanies the company since its inception, the health sector is not an exception. Contemporary health systems show different degrees of complexity, integration, and coordination, which reflects a diversity of socio-political conditions and a varying amount of available economic resources.

Health Technology Assessment is one of the tools on how to choose proper medical technologies so that it brings the highest possible value for the society and to increase the efficiency of resource use in health care.

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This study summarizes the cooperation in Health technology assessment (HTA) at the European level. Further, the paper discusses in detail the role of HTA by assessing its formalization and institutionalization, and standardization of methodology in the Czech Republic. The aim of this article is to reflect the Czech situation in the area of HTA and the main issues of HTA are discussed with emphasis on institutionalization and formalization of it.

There are only a few papers dealing with the topic of HTA in the Czech Republic (e.g. Gulácsi, 21014) but none of them is focused on the legal aspects of HTA. Through our research, we would like to fill this research gap in knowledge.

1.1. Background

No matter which system the health sector is built on, the most important fact about health care expenditures worldwide is their rapid rate of growth (the rate of increase in spending in the rest of the economy (GDP minus health) is lower, e.g. From 2000 to 2015 increased the health care cost in the Czech Republic from its 5,7 % proportion on GDP to 7,5 % proportion on GDP in 2015 (OECD statistics, 2018).

The answer that the aging of the population is the main factor of it is popular but not so important (Fuchs, 2011). The reason is that the last half-century, the technology base of healthcare has continued to grow in both equipment, device and drug investment and brought us to the limit of available resources (the resources from obligatory health insurance in case of the Czech Republic).

The rate of increase in spending in the rest of the economy is lower. In data on health care expenditures as a percent of GDP compiled by the OECD countries, the rate of change in health care spending grows rapidly everywhere.

New drugs, new devices have proliferated, some of them have proven to be extremely valuable (decreased mortality at a reasonable cost), but other innovations have favourable effects on health but greatly increase the cost of care. Long time a no effective mechanism for sorting out the innovations that enhance value from those that provide little value existed.

The field of health technology assessment (HTA) has shown remarkable growth over the last decade, having spread first from the United States, where the early history of HTA, beginning around 1975, to Europe. HTA activities in the Member States of the European Union (EU) are increasingly visible, In the majority of the European countries, specialized HTA-agencies have been established that provide information for decision and policy making at regional or national levels. Central and Eastern European countries are also developing HTA activities (Gulacsi, 2014). Currently, more and more health (care) decisions on all advised by HTAs.

By the “technology” in the phrase “Health Technology Assessment” we do not think only huge machine as one can imagine but a broad scale of interventions used in health cares (the drugs, devices, and surgical procedures,

or a public health care program), according to definition HTAi and INAHTA "the health technology is an intervention, which can be used for the support of health, prevention, diagnostic and cure acute or chronic illnesses or rehabilitation. It is obvious from this broad definition that decisions on health technologies are an important part of the decision-making when the health sector is publicly financed.

In studying HTA development in various states, one can identify a broad set of processes to reach a valid methodology for HTA and find the widely shared opinion that the need for HTA is due to increased expenditures in Health Care desirable.

2. Literature review

In general, the issue of using research to inform practice has been the subject of debate since the 1950's and has been of particular concern within the healthcare field.

The health care costs constantly increase for decades and the focus of the period from 1985 was on seeking more effective links with policymakers, particularly in Europe. From the Year 1976 when it was first conceptualized (Banta,2003), the field HTA has grown remarkably and it gains importance in Health care financing.

One of the oldest definitions of Health Technology Assessment (HTA) was given in 1985 by the Institute of Medicine in the USA: "Any process of examining and reporting properties of a medical technology used in health care, such as safety, efficacy, feasibility, and indications for use, cost, and cost-effectiveness, as well as social, economic, and ethical consequences whether intended or unintended (National Academy Press, 2001).

Currently, the most often used definition states that Technology Assessment (HTA) is one of the tools how to measure cost-efficiency of healthcare services and improve health systems imbalances and problems through a systematic evaluation of properties, effects, and impacts of health technology (Goodman, 2004). Battista reminds that intention of HTA is to enable the consideration of research knowledge by those involved in the decision-making and policy-making processes (1996). The role of HTA has been often described as a bridge between research and decision making (Battista & Hodge, 1995), while it is a systematic knowledge synthesis that "bridges" the gap between scientific knowledge and decision-making (Garrido, 2010; Kristensen,2012). HTA is the process, usually applied to the field of policy analysis studied the medical, social, ethical and economic implications of the development, diffusion, and use of healthcare technology. Mueller defines the objective of HTA as providing a synthesis of the best available evidence to support policy decisions (2017).

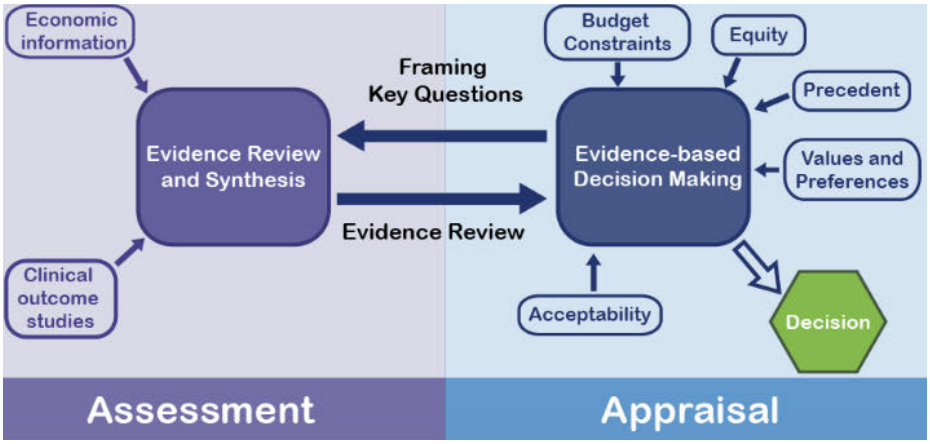
Concerning different strategies to reach methodology for HTA study point out, that although HTA implementation strategies from the region can be relevant

examples for other countries with similar cultural environment and economic status, the fully transferability without taking into account country-specific aspects is not possible. The country size, gross domestic product per capita, major social values, public health priorities, and fragmentation of healthcare financing should be taken in mind (Kaló et al 2016).

The process of HTA can be divided into three phases:

Assessment (phase) is a phase in the process of HTA when clinical (economic, etc.) evidence is reviewed and described. The second - **Appraisal** (phase) - is a phase in the process of HTA following the assessment phase when recommendations. The final phase – **the decision** (phase) – when the political decision based on recommendations (usually from the HTA agency is made. The economic appraisal should be made relevant to decision making, but it is a political process into which the research study enters as one source of the information.

Figure 1:



Source: Author Based on Teutsch, 2005

3. Methodology and data

First, we research the background behind HTA, therefore, the first part of the research was focused on HTA and its role in decision making.

The legal framework is the main topic of the article. It is impacted especially by the EU government and is consisted of several different elements. The research methods are mainly based on literature studies, overviews of regulations and reasoning. Analyze of legal action connected with Czech HTA are performed.

4. Results

4.1. HTA Collaboration in Europe

Europe includes approximately fifty countries. Concerning policy setting twenty – seven of these countries joined the European Union. Governments of the states are anticipating pressures on public spending, where health care is part of it. The health sector is in an unenviable situation and should ensure the solidarity between health insurance payers and health insurance consumers and to allow technology development on the other. “In order to balance biomedical advances with the resources available, the Governments of the European countries frequently turned to the scientific community to elucidate and explain what policy options there are to approach the challenges, and to provide some evidence as a basis for decisions of what ought to be publically funded” (R. Cranovsky , 1997).

The need for practical transnational collaboration to support timely, relevant, and high-quality HTA results has become evident with the increasing political support and impact that HTA has gained in Europe in recent years (Kristensen et. al., 2009)

In July 2008 the European Commission adopted a draft Directive to facilitate the application of European patients’ rights in relation to cross-border health care (European Commission, 2008a). This directive should “reduce overlap and duplication of efforts in the field of HTA and promote the effective and efficient use of resources”

INAHTA (the International Network of Agencies for Health Technology Assessment) is a “network of 50 HTA agencies that support health system decision. This nonprofit organization was founded in 1993 and works on the principle support for the sharing and exchange of knowledge and information of HTA agencies that meet every year.

An international collaboration of INAHTA organization, on HTA, the sharing the experience and methodology, is an efficient way to increase capacity to produce high-quality HTA information and to increase the number of timely national HTA reports. On the other hand, the independence of national decision making has to be respected (Mäkelä et al, 2012). As regards the legal aspect of the joint action the paragraph 15, Directive 2011/24/EU is mportant and especially the Article 7-of the Proposal for a Directive of the European Parliament and of the Council on the application of patients’ rights in cross-border health care include Cooperation on management of new health technologies.

Member States shall facilitate development and functioning of a network connecting the national authorities or bodies responsible for HTA.

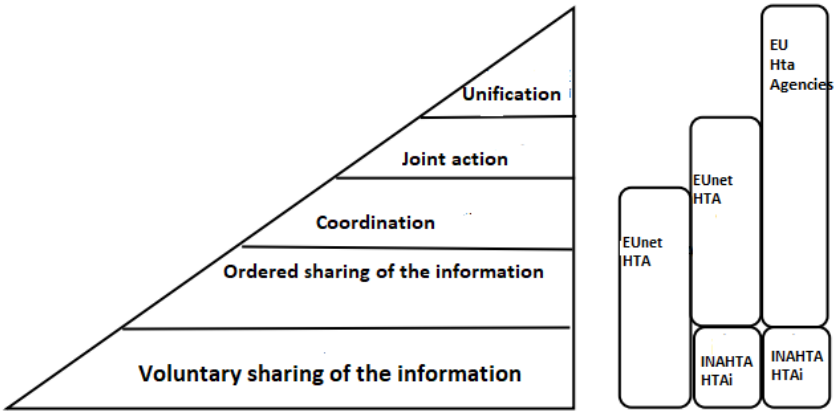
The objective of the HTA network shall be to support cooperation between national authorities’ bodies; to support provision of objective, reliable, timely, transparent and transferable information on the short- and long-term effectiveness

of HTA and enable an effective exchange of this information between additional authorities or bodies.

Member States shall designate the authorities or bodies participating in the network as referred to in paragraph 1 and communicate to the Commission names and contact details of those authorities or bodies.

The Commission shall, in accordance with the procedure referred to Article 19 adopt the necessary measures for the establishment and the management of this network and specify the nature and type of the information to be exchanged.

Figure 2: HTA cooperation in Europe



Source: Author based on Garrido et al. (2008)

EUnetHTA is an organization which was found to create a sustainable network for HTA across Europe with the aim to develop reliable, timely, transparent, and transferable information to contribute to HTA in European countries. To product and share the HTA information the Core Model® is used- a *methodological framework* for production and sharing of HTA information (EUnetHTA, 2018).

Besides INAHTA and EUnetHTA later the European HTA Network was established in 2003 (Directive 2011/24/EU) (Loblová, ….).

Concerning the HTA model, the studies based on Core Model® should include:

- Health problem and currently used technologies
- Examined technology description
- Safety
- Clinical effectivity
- Cost and economic assessment
- Ethical attitude
- Social attitude
- Legal attitude

From the above mentioned we point out that the economic analysis (cost and economic assessment) is only one part of HTA process, and the complex view on the all aspects related to technology assessed is important.

4.2. The Czech Republic

The Czech Republic so far has not been able to establish a national policy concerning HTA. The Czech Republic health care system is based on the obligatory public health insurance system. What is important to emphasize is that the state pay contributions for the retired and unemployed (and other disadvantaged groups of inhabitants as students, women on maternity leave, prisoners, soldiers). Currently, this fact means that the state is the insurance payer for the majority of the population of the Czech Republic and the pressure on the public sources is enormous so the HTA is a helpful tool in the decision-making process.

A reimbursement list, in which new medicines are added for reimbursement if they comply with predefined criteria, is the main instrument used. The Amendment to Act No. 48/1997 Coll. on public health insurance was the first legal action connected with HTA in the Czech Republic, a Cost-effectiveness became of the standard criterium of the dossier submitted for the health insurance coverage. Later Information required for HTA is usually taken from the reimbursement application dossier submitted.

The formal body for performing HTA for drugs in the Czech Republic is State Institute for Drug (SÚKL), which issued an obligatory document “The procedure for evaluating the cost-effectiveness” in February 2013. companies that aim at the coverage of their products from the health care insurance should follow this legal action. Concerning this directive, the preferred economic evaluations are cost-effectiveness analysis (CEA) or cost-utility analysis (CUA), where criterium for a positive recommendation is ICER = 3 x GDP per capita (ICER – incremental cost-effectiveness ration). The private companies are under the pressure to prove the cost- efficiency of the drug and should invest in HTA analyses, the analyses mostly rely on synthesizing existing information.

On the other hand, the initiative for such progress in HTA development for the medical device is lacking. SÚKL does not show significant interest in other aspects of HTA (Gulácsi, 2014), so far only one significant activity of the government was performed for implementing of HTA for medical devices (more detailed see below). The above-mentioned issue of HTA in the Czech Republic shows the research gap in the knowledge about HTA in the Czech Republic and lack of interest in the implementation of HTA for the medical device in the Czech Republic even if the medical device industry is one of the most dynamic fields of the health care in the Czech Republic. The SÚKL finally decide which medical technology will be covered from the health care insurance.

Besides the evaluation of the drugs, there is no more progress in HTA development in the Czech Republic, the HTA agency is still missing and its function not quite properly represents SÚKL (tab. 1).

Recently, there has been growing attention paid to the spreading the HTA to other than pharmaceutical technologies. The attention of the central government and Ministry of the Czech Republic is more concentrated on negotiation on the proliferation for HTA (press, 2019) but so far, no legal act testifies it. To summarize, the Czech Republic belongs to the countries, where the HTA was not fully implemented. As the analysis showed, a typical feature for HTA in the Czech Republic is a very discontent situation. On the one hand, we can see an active SÚKL which appraisals of cost-effectiveness analyses are translated into decisions; on the other hand, the situation is very different when considering medical devices. The HTA for medical devices lacks systematized approach and the methodology is in the stage of the creation, discussion and pilot studies.

Table 1: How technologies enter the Czech health care system

	Drugs	Medical devices	Interventions	Prevention
Transparency	Partly	NO	NO	NO
Rules	YES	minimally	NO	NO
Ration cost/outputs	YES	NO	NO	NO
HTA	Partly	NO	NO	NO

*Source:*Author based on Dolezal, 2016

Recently, there has been growing attention paid to the spreading the HTA to other than pharmaceutical technologies. The attention of the central government and Ministry of the Czech Republic is more concentrated on negotiation on the proliferation for HTA (press, 2019) but so far, no legal act testifies it. To summarize, the Czech Republic belongs to the countries, where the HTA was not fully implemented. As the analysis showed, a typical feature for HTA in the Czech Republic is a very discontent situation. On the one hand, we can see an active SÚKL which appraisals of cost-effectiveness analyses are translated into decisions; on the other hand, the situation is very different when considering medical devices. The HTA for medical devices lacks systematized approach and the methodology is in the stage of the creation, discussion and pilot studies.

The establishing and effective HTA is a challenging task and even the fact that it is recommended that an appropriate organizational structure should be identified, this does not necessarily mean the establishment of an HTA agency. But the appraisal of HTA evidence provided by HTA doers and researchers is crucial. In the Czech Republic has SÚKL the role. The problem is that it is highly recommended to separate two phases of HTA (the appraisal and the decision phase), this recommendation is not fulfilled in the Czech Republic, SÚKL has its role in the appraisal phase and further in the decision phase.

5. Conclusions and discussion

When we aim at HTA development in different states, we would find various way to reach a valid methodology for HTA. The specific features of the development of HTA in the Czech Republic in relation to a methodology for HTA are that the Czech Republic is active in HTA of the drugs.

Concerning the future development of the HTA for other, then drug technology (e. g. medical devices) in the Czech Republic, there are many questions to face. HTA even though it can finally save resources with cost-effectiveness use of them, to start the process of institutionalization it is reasonable to assume that it demands some additional resources no matter if we consider the financial or human. A public agency would need health economists and other experts, who should be remunerated and trained.

Another aspect is that there is a lack of political will to establish a special institution in the Czech Republic, probably due to the existing gap between researchers who conduct HTA reports and policymakers, who should decide based on it. One of the directions for the future development of HTA in the Czech Republic could be that SUKL takes the initiative as in the case of drugs and will build on the by previous experience with drugs.

This paper emphasized and discussed the development and use of health technology assessment in the Czech Republic. It was found that HTA for category of drugs is nearly solved.

HTA represents a link between the research health policymakers. HTA agencies may have an important role. For the Czech Republic and its HTA plan, it will be certainly necessary to collaborate across countries in order to set up systems HTA.

It appears that the independent effort in isolation has only limited potential to improve the situation in Czech´s HTA. Concerning international cooperation, HTA in general is no longer conducted in isolation. The collaboration could help overcome difficulties with establishing HTA in the Czech Republic with sharing HTA activities. The collaboration among HTA organizations could be relevant especially for the countries without institutionalized HTA, which Czech Republic belongs to.

In conclusion, we think it is vital for the development of HTA in the Czech Republic that public authorities indicate and support SÚKL to be responsible for HTA as a process toward assessing medical technologies in general not only separately for the drugs. But what is currently being missed is the political demand for such a step towards development HTA.

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The HTA Core Model®

CHAPTER 14

The Influence of Business Process Prioritization on Success of BPM adoption

Dragana Stojanović[1], Barbara Simeunović[2], Ivan Tomašević[3], Ivona Jovanović[4]

ABSTRACT

Business process management (BPM) has a central role for creating sustainable competitive advantage, but there is still large number of unsuccessful BPM projects. Business process improvement (BPI) is important phase of BPM lifecycle and for BPI a main decision-making task is to prioritizes processes that should be improved and managed. The purpose of this paper is to examine the way formalized approach to business process prioritization (BPP) impacts adoption of BPM in organization. BPM adoption was measured through Process performance index (PPI). A survey research was conducted on a sample of 91 manufacturing and service companies in Serbia and collected data were analyzed using statistical package SPSS. The results suggest that companies with larger extent of BPP formalization have higher PPI. This shows that BPP formalization is positively related to success of BPM adoption. By formalizing the procedure for BPP, it is possible to efficiently make decisions about processes that need to be improved and managed, which ensures more successful adoption of BPM in organizations.

Key words: Business process management, Business process prioritization, Process performance index, BPM adoption

JEL classification: L20, L23, L29, M11, O14

1. Introduction

Business Process Management (BPM) is recurring theme in literature and practice for few decades. Harmon (2005) defined BPM as “a management discipline focused on improving corporate performance by managing a company’s

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business processes". BPM has a central role in creating sustainable competitive advantage (Broadbent et al., 1999; Niehaves et al., 2014), and empirical research confirms a positive correlation between BPM and business success (McCormack et al., 2009). Madison (2005) states that 85% of companies' problems can be attributed to business processes, and that solving those problems can lead to quality improvements, customer satisfaction improvements, cost and time reductions, etc.

Successful adoption of BPM concept can enable efficient operations of company (Tomašević et al., 2011; Tomašević et al., 2009; Škrinjar and Trkman, 2013). Although BPM practice is important for improvement of organization competitiveness, research shows that as much as 80% of BPM initiatives were unsuccessful (Abdolvand et al., 2008; Bai and Sarkis, 2014; Karim et al., 2007; Macintosh and Maclean, 1999; Trkman, 2010). This data is a cause for caution when implementing BPM initiatives, since the implementation itself can be expensive and time consuming (Tomašević et al., 2014).

BPM adoption is difficult and risky operation, with failure rate far greater than success rate (Chiplunkar et al., 2003; Dennis et al., 2003; Tomašević et al., 2014). This fact might work against convincing company to implement BPM concepts (Tomašević et al., 2014). BPM might be considered successful if it continuously meets predetermined goals, both within a single project scope and over a longer period of time (Trkman, 2010). According to Hribar and Medling (2014), one of possible ways for measuring success of BPM adoption is through Process performance index (PPI), suggested by Rummler-Brache Group (2004), which represents a measure for evaluating process management environment.

Since BPM adoption is expensive and time consuming, and companies are eager to see results, they need to define business process improvement (BPI) projects which will achieve and show results quickly. These projects can be key drivers for successful BPM deployment (Stojanović et al., 2017). BPI is one of the important parts of BPM (Stojanović et al., 2017; Zellner, 2011) and it represents one of the sources of competitive advantage (Stojanović et al., 2012), so it is necessary to develop the system for successful BPI. Since organizations can be extremely complex with a number of processes that need to be improved, often with limited resources, it is necessary to select one or few processes that can be improved at the same time. Hence, BPI demands business process prioritization (BPP) for improving. Some companies select processes to be improved ad hoc, and the others use certain criteria for selection (in a more formalized way). Based on the approaches and process selection criteria that can be found in the literature (e.g. Balanced Scorecard Institute, 1996; Harrington, 1991; Jae et al., 2012; Jeston and Nelis, 2006; Keen, 1997; Page, 2010; Pande et al., 2000; Porter, 1985; Radović et al., 2012; Sarkar et al., 2011; Ulis, 1993), it can be concluded that there is no generally accepted set of criteria for business processes prioritization, nor established way for business process evaluation.

Based on facts stated above, the following questions arise: Does the way of business process prioritization for improvement affect the results of BPI initiatives, thus influencing the success of BPM adoption in the organization? Does selection of the "wrong process" cause failure in achieving the desired results of BPI initiatives, leading to unsuccessful BPM adoption?

In accordance, in this paper, we argue that the formalization of BPP influences the success of BPM adoption.

Formalization of BPP implies the procedure with precisely defined criteria for process selection, as well as the method of process evaluation according to the criteria.

The rest of paper is organized as follows. Section 2 provides literature review about BPM adoption and business process prioritization. Section 3 elaborates on the research methodology that was used for the purpose of this paper, and the survey findings are given in Section 4. Research results will be discussed in Section 5, and the conclusion and future implications are given afterwards.

2. Literature review

Business Process Management is defined as "a management discipline focused on improving corporate performance by managing a company's business processes" (Harmon, 2005:1). According to Jeston and Nelis (2006) BPM implies achieving organizational goals by improving, managing and controlling core business processes, and that it is extremely important to adopt a continuous business process improvement within the concept.

Companies that adopt BPM are in a better position to achieve a competitive edge compared to others (Wong, 2013). Several studies have shown that process-oriented companies have better results than companies that are not process-oriented *(Škrinjar et al., 2010).* It has also been confirmed that the technical and managerial capabilities of BPM affect organizational performance (Wong et al., 2014) and the innovative performance of the organization (Tang et al., 2013).

Although BPM is an important practice for improving the organization's operational competitiveness, research has shown many unsuccessful BPM projects in practice (Trkman, 2010), and almost 60-80% of BPM initiatives (Bai and Sarkis, 2014). It is therefore important to consider the key elements of BPM and whether those elements can be improved in order to increase the success of the BPM adoption.

2.1. Business process management adoption

Many organizations are unsuccessful in attempting to adopt BPM (Buh et al., 2015), and it is therefore important to determine which are critical success factors for successful BPM adoption. By searching Scopus and Science Direct

database with key words “business process management” and “critical success factors”, 28 articles, published in journals and conferences, were found. Three of them could not be opened because of limited access, and two articles were in Spanish. Regarding the remaining articles, it has been found that only three of them are related to critical success factors for the BPM implementation, while the rest are related to critical success factors for the application of BPM systems and the ERP and IT environment.

One of the problems highlighted in studied papers is how to measure the success of the BPM adoption/implementation in the organization. Trkman (2010:126) states that BPM adoption is successful if it “continuously meets predetermined goals, both within a single project scope and over a longer period of time.” Škrinjar and Trkman (2013) and Hribar and Medling (2014) analyzed the impact of culture on the success of BPM adoption and suggested following measures for success of BPM adoption: (1) Business Process Orientation (BPO) according to maturity model developed by McCormack and Johnson (2001), and (2) Process Performance Index (PPI), developed by Rummler-Brache Group (2004). Both measures are empirically validated, quantitative, and publicly available (Hribar and Medling, 2014).

BPO is measured over three basic elements: Process Management and Measurement; Process operations; and Process observation (McCormack and Johnson, 2001). PPI represents a measure for evaluating business process management environment (Rummler-Brache Group, 2004). Criteria and method of determining PPIs are shown in Table 1.

Table 1: Process Performance Index (Rummler-Brache Group, 2004)

Criteria	**Description**
Alignment with strategy	Business processes are directly linked to the organization’s strategy and critical success factors.
Holistic Approach	Enterprise business processes are defined before launching improvement initiatives
Process awareness by management and employees	Key players understand the role of process management in improving performance.
Portfolio of process management initiatives	Improvement efforts are prioritized according to process “health” and linkage to current issues.
Process improvement methodology	Process management teams use a standard approach to navigate process analysis and design.
Process metrics	Process performance is measured at the individual, process, and enterprise levels.
Customer focus	Process analysis and design efforts focus on delivering value to the customer.

Criteria	Description
Process management	Process owners monitor process metrics and continuous improvement efforts on a regular basis.
Information systems	Process is the “master” and information systems are the “servants”
Change management	People and cultural issues are effectively addressed when process changes are introduced.

Based on the criteria for determining the PPI, the importance of the structured approach to BPI and BPP is recognized. Considering the elements of both measures (BPO i PPI), PPI is more appropriate for this research.

2.2. Business process prioritization

One of the BPM focus is designing and improving business processes in order to meet customer expectations while achieving the goals of an organization (Skalle et al., 2009). BPI is based on the evaluation of the current state of the processes in the organization, and then on the selection of processes that need to be improved (Stojanović et al., 2014). Different authors suggest different criteria for the BPP.

Some authors (e.g. Darmani and Hanafizadeh, 2013; Hanafizadeh and Osouli, 2011; Partovi, 1994) propose the process selection or classification starting from the Porter’s value chain (Porter, 1985). They argue that processes that are in the value chain should be improvement priority, because they generate value for the end user, and by improving these processes users can quickly feel the effects of change.

Harrington (1991) distinguishes four approaches to BPP: (1) Total approach - a number of BPI projects are launched in all areas of the organization at the same time, which can only be effectively implemented in small organizations; (2) Management selection approach - a list of processes that are critical to business performance and a list of processes with the greatest problems are created; processes that appear on both lists are candidates for improvement; (3) Weighted selection approach – each of the major business processes is rated (from1 to 5) in the four categories, then the ratings of those categories are totaled for each business process, and the process with the highest rating is selected; and (4) Informed approach – processes are selected in a basis of the importance for external customers and the degree to which the process can be improved; processes that are high in importance as well as high in improvement opportunities should be selected for improvement.

According to Ulis (1993) managers need to select a process (processes) to improve, by choosing one of the existing approaches: (i) Customer-focused approach – process that customers are most dissatisfied should be selected

first; (ii) Hot button approach - process that senior managers are most dissatisfied should be selected first; and (iii) Analytical approach – process is selected according the weighted criteria. Balanced Scorecard Institute (1996) suggested Process Selection Worksheet for process selection, with following criteria: customers' satisfaction with the products or services; process scope; frequency of process occurring; visibility of problem in the process; importance of the process improvement for the management; importance of the process improvement for the stuff; etc. Keen (1997) suggests salience/worth matrix as analytical tool for selection of process for improvement. According to him, only processes that are in value chain should be improved.

Radović et al. (2012) classifies processes as priority processes (the processes that should be reviewed first, in order to accomplish certain target in a short period of time), critical processes (the processes that are problematic regarding quality, time or cost) and key processes (processes whose execution contributes to achievement of the organizational goals or stakeholders requirements). These three categories of processes should be considered first for improvement. Page (2010) suggests developing criteria in order to determine the relative importance of one business process over another. Criteria should be classified into four general categories: impact, implementation, current state and value. The next step involves deciding how to measure each of the categories of criteria. According to Page (2010) any criteria should be weighted, but the author does not explain how weight can be determined, except intuitively.

Sarkar et al. (2011) researched the selection of sub-process for improvement, within already selected process. As criteria for selection, they used cycle time, processing time, inventory, and manpower and rework quota of the sub-processes. They suggest application of variable selection through stepwise regression model approach for sub-process selection. However, although they verified usage of this approach for sub-process selection, its application for selection of critical process for improvement remains questionable.

Jae et al. (2012) proposed three dimensional decision framework for BPP and outlined ten common critical success factors for business processes grouped into three groups (Improvement Needs, Process Performance, and Improvement Readiness). The level of each factor in the decision framework is determined by the average of the contained sub-items.

By reviewing the literature related to the BPP, it can be noticed that different authors give different criteria for business process selection, but most of them do not include prioritization of the process. Furthermore, the authors mostly give recommendations for process classification and for process selection criteria, rather than defining the procedure for evaluating the process. Having this in mind, it can be concluded that in literature and practice there is no generally accepted set of criteria for business processes selection and their prioritization for improvement. In other words, there is a lack of formalization of BPP.

3. Methodology

In order to confirm the importance and the need for BPP formalization, the research of BPP influence on BPM adoption is conducted.

In order to confirm our assertion (that formalization of BPP influences the success of BPM adoption), survey research was conducted. Questionnaire included 28 questions divided into three groups: (i) general questions about company, respondents and understanding BPM (created by the authors), (ii) questions about process maturity and Process Performance Index (adapted from BPTrends survey (Wolf and Harmon, 2012)), and (iii) questions referring to business process improvement and business process prioritization practice (taken from Process Excellence Network survey (Process Excellence Network, 2012). The questions required single or multiple choices, while some of them included an open form in case when offered answers couldn't reflect the views of the respondents.

Empirical research was limited to managers, CEOs and process analysts in companies operating in Republic of Serbia. Population included companies which have implemented ISO standard, because one of the formal requirements of the ISO standard is process approach application. This should ensure that the companies that participate in the research have adopted the process approach at least to a certain extent. Initial list of potential respondents were defined with the help of Chambers of commerce. Initial sample size was 674 active companies, but this list was narrowed to 500 companies, due to availability of e-mail contacts. A cover letter and invitation to participate in the study and a link to the web survey was then sent via e-mail to chosen companies. A total of 91 usable responses were returned, resulting in a response rate of 18.2 percent, which is adequate on the level of confidence interval of 10 %. According to Wong et al. (2014), response rate from similar studies was between 6,7% and 20,0%, so it can be concluded that sample size is adequate.

The data were gathered in the three months period. The survey was anonymous and respondents decided to participate voluntarily. The web survey was active until we received a balanced sample according to the size of the companies.

In order to analyze the results, statistical package SPSS was used. Kolmogorov-Smirnov test (with significance set to 0.05) was used as a goodness of fit test. In order to determine differences between groups that have different ways of selecting business processes, ANOVA and t-test of variables were used. Then, in order to accurately determine which BPP groups differ in the success of BPM adoption, a post hoc Tukey HSD test was performed. In addition, through the use of the Spearman-Rho correlation test, the impact of the degree of BPP formalization on the success of BPM adoption in the organization was examined.

4. Empirical data (documentation background) and analysis

4.1. Descriptive statistic summary

Among 91 respondents in the research, 10% were general managers, 9% were executive officers, 22% were business function/department managers, 13% were business analysts, 14% were business process analysts, 12% were consultants, 9% were researchers, while 11% of respondents stated that their position was something else. By checking the completed questionnaires it was determined that those who stated something else as their position and wrote their position, were also department managers or project managers.

Information regarding size, orientation, ownership and industry sector of companies that participated in research are given in the Table 2.

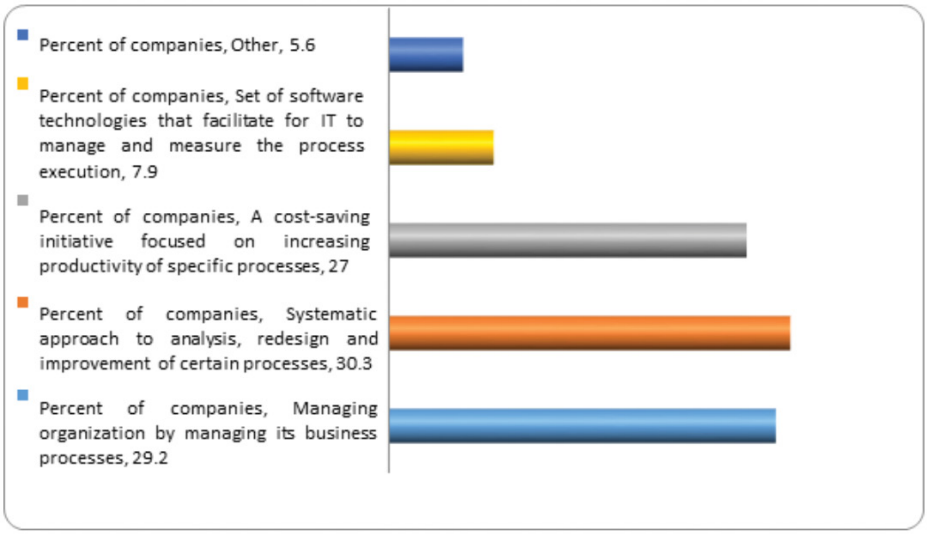
Table 2: General information about companies of respondents (adapted from Wong et al., 2014)

Elements	Values	Number of companies	
		[1]	[%]
Companies size	Large (more than 250 employees)	43	47,25
	Middle (50 to 250 employees)	17	18,68
	Small (less than 50 employees)	31	34,07
Companies orientation	Manufacturing	18	19,78
	Service	54	59,34
	Manufacturing and service	19	20,87
Ownership	Domestic ownership	60	65,93
	Foreign ownership	22	24,17
	Shared ownership	9	9,89
Companies industry	Heavy manufacturing	3	3,30
	Light manufacturing	11	12,09
	Financial Services/Insurance	10	10,99
	Chemicals/Energy/Refineries	6	6,59
	Computers/Consumer, Electronics/ Software	8	8,79
	Education	5	5,49
	Government/Military	7	7,69
	Healthcare/Medical Equipment	5	5,49
	Leisure/Entertainment/Travel	2	2,20
	Professional/Business Services/ Consulting	15	16,48
	Retail and Wholesale	9	9,89
	Telecommunications	6	6,59
	Something else	4	4,40

Majority of companies included in the research were large companies (47%) with more than 250 employees, but there was also significant number of small enterprises (34%). When it comes to company orientation, majority of them (59%) were service oriented, 20% were manufacturing companies, while 21% were operating both in service and manufacturing industry. Most companies were domestically owned (65,93%), about a quarter of them have foreign owners (24,17%), and with the rest (9,89%) the ownership was shared between domestic and foreign owners. Regarding the industry, majority of companies provides professional/business services/consulting, but there was significant number of companies operating in light manufacturing (food industry, textile industry, and wood industry), financial or insurance services, as well as retail and wholesale.

To better understand how companies understand the term Business process management, respondents were asked to choose among four options, or to suggest an alternative to the four options, and the Figure 1 presents the results.

Figure 1: Companies' understanding of Business Process Management concept



Source: Authors

Figure 1 shows that respondents mostly stated that their organizations understand BPM as systematic approach to analysis, redesign and improvement of certain processes (30,3%), or managing organization by managing its business processes (29,2%). Initiative for cost saving focused on increasing productivity of specific processes is also represented in 27%.

When it comes to experience in BPM and BPI implementation (Table 3), majority of companies (70,33%) have been working for more than 2 years on BPM and BPI projects, among which 34,07% even more than 5 years.

Table 3: Experience in the BPM and BPI implementation projects

Duration	Number of companies	
	[1]	[%]
At the beginning	10	10,99
Less than 2 years	17	18,68
Between 2 and 5 years	33	36,26
Longer than 5 years	31	34,07
Total	**91**	**100**

Table 4. shows the main drivers that led companies to focus on BPM and BPI implementation.

Table 4: The major business drivers causing companies to focus on BPM and BPI initiatives

Drivers	Number of companies	
	[1]	[%]
Need to improve productivity/ efficiency	66	72,5
Need to save money by reducing costs/defects	46	50,5
Need to improve market share and revenue	40	44,0
Need to improve customer satisfaction to remain competitive	34	37,4
Certification according to some of the standard requirements	29	31,9
Need to improve existing/create new products/ services to remain competitive	28	30,8
Adaptation to new regulations	17	18,7
Need to reduce business risk	12	13,2
Need to improve management of IT resources (ERP/ CRM applications)	9	9,9
One time event (merger or acquisition)	6	6,6
Business partners requirements	6	6,6

Based on Table 4, most companies were driven by the need to improve productivity/ efficiency or to reduce costs/defects, as well as by the need to improve market share and customer satisfaction.

The respondents were asked to indicate which approach they use for BPP in order to improve processes, and the results are given in Table 5.

Table 5: Business process prioritization approach

BPP approach	Number of companies	
	[1]	[%]
Processes that management is not satisfied with are mostly selected for improvement	26	28,6
Processes that customers are not satisfied with are mostly selected for improvement	10	11,0
An analytical approach to the process evaluation according to the criteria defined by the company	12	13,2
An analytical approach based on process performance measurement	19	20,9
An analytical approach based on the ROI/Cost-benefit analysis	5	5,5
Processes that enable achievement of quickly results with minimal efforts are mostly selected for improvement	10	11,0
There is no formal BPP approach for improvement	27	29,7
Other	0	0,0

Table 5 shows that almost a third of the respondents stated that there is no formal approach to BPP (29,7%). In 28,6% of companies processes that management is not satisfied with are mostly selected and in 20,9% of companies an analytical approach based on process performance measurement is used for BPP. Of the total number of respondents, 13.2% said that the organization uses its own BPP approach. A small number of companies (5.0%) use return on investment or cost benefit analysis, which are more complex and require more detailed data collection and processing.

Success of BPM adoption is measured through Process performance index, described in previously in the paper. For each PPI criterion, respondents evaluated one of the answers offered, with following ratings: 1 - never, 2 - in some cases, 3 - always. The results are shown in Table 6.

Table 6: Process performance index evaluation

Criteria	Description	1	2	3
Alignment with strategy	Business processes are directly linked to the organization's strategy and critical success factors.	23	53	15
Holistic Approach	Enterprise business processes are defined before launching improvement initiatives	6	49	36
Process awareness by management and employees	Key players understand the role of process management in improving performance.	16	52	23
Portfolio of process management initiatives	Improvement efforts are prioritized according to process "health" and linkage to current issues.	27	34	30
Process improvement methodology	Process management teams use a standard approach to navigate process analysis and design.	53	11	27
Process metrics	Process performance is measured at the individual, process, and enterprise levels.	10	44	37
Customer focus	Process analysis and design efforts focus on delivering value to the customer.	47	33	11
Process management	Process owners monitor process metrics and continuous improvement efforts on a regular basis.	15	55	21
Information systems	Process is the "master" and information systems are the "servants"	8	53	30
Change management	People and cultural issues are effectively addressed when process changes are introduced.	61	25	5

Next, for each company, the PPI value is calculated, as a sum of ratings by criteria. The PPI values ranges from 10 to 30 for each company. Table 7 provides descriptive statistics for the PPI.

Table 7: Process performance index – descriptive statistics

	N	Minimum	Maximum	Mean	Std. deviation
PPI	91	10	29	19,57	4,300
Valid N	91				

The frequency and percentage of companies with specified PPI values are given in Table 8.

Table 8: Value of process performance index – descriptive statistics

PPI value	Frequency	**Percentage**	**Cumulative percentage**
10	1	1,1	1,1
11	2	2,2	3,3
12	1	1,1	4,4
13	2	2,2	6,6
14	2	2,2	8,8
15	6	6,6	15,4
16	7	7,7	23,1
17	8	8,8	31,9
18	11	12,1	44,0
19	10	11,0	54,9
20	10	11,0	65,9
21	5	5,5	71,4
22	6	6,6	78,0
23	1	1,1	79,1
24	4	4,4	83,5
25	2	2,2	85,7
26	3	3,3	89,0
27	8	8,8	97,8
28	1	1,1	98,9
29	1	1,1	100,0
Total	**91**	**100,0**	

Table 8 shows that PPI value for the largest number of companies, is between 18 and 20, which indicates moderate value of the PPI, i.e. that the success of BPM adoption in organizations is moderate.

4.2. Analysis of the correlation between Business process prioritization approach and Success of BPM adoption

In this case, the independent variable is the BPP approach (categorical variable), and the dependent variable is the PPI (continuous variable). Normal distribution of dependent variable was tested using the Kolmogorov-Smirnov test (Table 9).

Table 9: Kolmogorov-Smirnov test for PPI variable

		PPI
Sample size	N	91
Parameters of the normal distribution model	Mean	19,57
	Standard deviation	4,3
	Significance	0,148

The Kolmogorov-Smirnov test assesses the normality of the distribution of scores. Due to existence of one independent categorical variable and one dependent continuous variable with normal distribution, it was decided to use the ANOVA (one way of between group ANOVA) (Pallant, 2011; Tabachnick and Fidell, 2006).

In order to examine whether companies that are using formal BPP criteria differ in PPI in relation to enterprises that are not using them, the t - test for an independent sample is used. Table 10. shows descriptive statistics of the BPP and PPI variables.

Table 10: Descriptive statistics of the BPP and PPI variables

	Business Process Prioritization	**N**	**Mean**	**Std. Deviation**	**Std. error Mean**
PPI	Some formal approach	64	21,19	3,750	,469
	No formal approach	27	15,74	2,877	,554

Table 11. shows results of t-test of the BPP and PPI variables.

Table 11: T-test of the BPP and PPI variables

			Total PPI	
			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		3,664	
	Sig.		,059	
T-test for Equality of Means	t		7,509	6,748
	df		63,220	89
	Sig. (2-tailed)		,000	,000
	Mean Difference		5,447	5,447
	Std. Error Difference		,725	,807
	95% Confidence Interval of the Difference	Lower	3,997	3,843
		Upper	6,896	7,050

T- test showed that there is significant difference in scores for companies that have some form of criteria for BPP (M=21,19, SD=3,750) and companies that do not have formal approach to BPP [M=15,74, SD=2,877; t(91)= 7,509, p=0,000]. The magnitude of the differences in the means is 5,447 (eta squared=0,387).

The **guidelines** (proposed by Cohen, 1988) for interpreting this value are: 0,01=small effect, 0,06=moderate effect, 0,14=large effect. Considering the value of the eta squared, it can be concluded that there is a large effect, i.e. that the difference between the groups is high.

The analysis with grouping respondents' answers was conducted to explore the impact of BPP approach on BPM adoption, measured by the PPI. Companies were divided into three groups according to prioritization criteria (in other words, degree of BPP formalization): Group 1 (value 1): There is no prioritization criteria (respondents' answer: there is no formal BPP approach for improvement); Group 2 (value 2): companies use one or two prioritization criteria (respondents' answer: Processes that management is not satisfied with are mostly selected for improvement, Processes that customers are not satisfied with are mostly selected for improvement and Processes that enable achievement of quickly results with minimal efforts are mostly selected for improvement); and Group 3 (value 3): companies use more than two criteria or analyze processes in detail (respondents' answer: An analytical approach to process evaluation according to the criteria defined by the company, An analytical approach based on process performance measurement and An analytical approach based on the ROI/Cost-benefit analysis). There were no respondents with answers was in different groups, which was important condition for grouping variables. In order to determine if there is a difference in PPI between those three groups, the ANOVA was conducted. Table 12. shows descriptive statistics of PPI per group for BPP.

Table 12: Descriptive Statistics of PPI per group for BPP

Groups	N	Mean	Std. Deviation	95% Conf. Interval for Mean		Min	Max
				Lower Bound	Upper Bound		
Group 1	27	15,74	2,877	,554	14,60	16,88	10
Group 2	34	19,15	3,056	,524	18,08	20,21	15
Group 3	30	23,50	3,082	,563	22,35	24,65	18
Total	91	19,57	4,300	,451	18,68	20,47	10

Levene's test for homogeneity of variances (Table 13) shows that variances are equal (p=0,388), which is assumption needed for ANOVA.

Table 13: Test of Homogeneity of Variances of PPI

Process Performance Index			
Levene Statistic	**df1**	**df2**	**Sig.**
0,958	2	88	0,388

An analysis of variance (Table 14) confirmed that there is significant difference between the groups regarding PPI [F(2,91) = 18,506, p=0,000].

Table 14: Summary of analysis of variance of the PPI groups' for BPP

Process performance index					
	Sum of Squares	**df**	**Mean square**	**F**	**Sig.**
Between Groups	20,347	2	10,174	18,506	,000
Within Groups	48,378	88	,550		
Total	68,725	90			

ANOVA test showed that there was a statistically significant difference in PPI scores for the three BPP groups (Group 1: N=27; Group 2: N=34; Group 3: N=30; F(2, N=91) = 47,656, p=0,000). When it comes to means, Group 1 have the highest result (M=23,50), followed by Group 2 (M=19,15), and Group 1 (M=15,74).

In order to control Type I errors, post-hoc comparisons were conducted using Tukey HSD test (Table 15).

Table 15: Tukey's HSD post hoc test for dependent variable PPI per group for BPP

(I) Prioritization criteria	**(J) Prioritization criteria**	**Mean difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Group 1	Group 2	-3,406*	,777	,000	-5,26	-1,55
	Group 3	-7,759*	,799	,000	-9,66	-5,85
Group 2	Group 1	3,406*	,777	,000	1,55	5,26
	Group 3	-4,353*	,755	,000	-6,15	-2,55
Group 3	Group 1	7,759*	,799	,000	5,85	9,66
	Group 2	4,353*	,755	,000	2,55	6,15
* Difference between means is significant if the value of test is less than 0,05.						

Tukey HSD test indicated that there is significant difference between groups, regarding PPI. Based on the comparison of the means, it can be concluded that:

- PPI of Group 1 is less than PPI of Group 2 and Group 3
- PPI of Group 2 is higher than PPI for Group 1, and less than PPI of Group 3
- Group 3 has the highest value of PPI.

The effect size, calculated using eta squared, was 0,0296, which means that the difference have practical significance, i.e. the difference in mean scores between the groups is large.

The relationship between degree of BPP formalization and success of BPM adoption (measured through PPI) was investigated using the Spearman's Rho non-parametric test (Table 16), which is appropriate for ordinal variable (Pallant, 2011).

Table 16: Spearman's Rho correlation between Degree of BPP formalization and PPI

			Success of BPM adoption	BPP formalization
Spearman-rho	PPI	Correlation Coefficient	1,000	0,744**
		Sig. (2-tailed)	.	0,000
		N	91	91
	Degree of BPP formalization	Correlation Coefficient	0,744**	1,000
		Sig. (2-tailed)	0,000	.
		N	91	91
** Correlation is significant at the 0,01 level (2-tailed).				

According to (Cohen, 1988) r > 0,5 represents a high degree of correlation, so there is a strong, positive correlation between the two variables [r = 0,744, n = 91, P = 0,000].

In order to determine how much variance two variables share, the determination coefficient can be calculated, by squaring the value of the correlation coefficient (Pallant, 2011). The correlation coefficient is 0,744, which when squared indicates 55,4% shared variance, which is quite impressive amount of variance. Thus, the degree of BPP formalization can explain 55,4% of the variance of the PPI.

5. Results and discussion

Majority of the respondents are functional/department managers. This can be attributed to the fact that majority of companies assign functional/department managers to deal with process management issues. There is significant number of process analyst which indicates that surveyed companies have business process awareness. Respondents were mainly from the large companies and this result is in line with the results of similar research (Wolf and Harmon, 2014). Most of the companies are service oriented with domestic ownership. Majority of the companies were mainly from consulting, retail and wholesale, light manufacturing and financial sector. BPM is very popular in retail and wholesale and financial sector where a large number of early BPM adopters come from this sector (Wolf and Harmon, 2014). Experience in BPM and BPI shows that companies from this survey have more than 2 years of experience in this field which is in accordance with results that implicated process awareness in companies operating in Serbia and also confirms that sample was adequate for this study.

Success of BPM adoption was measured through Process performance index, which has been calculated for each company in a basis of ten criteria, according to recommendations of Rummler-Brache Group (2004).

The largest number of companies has PPI values between 18 and 20, which indicates the moderate value of the PPI, i.e. moderate success of BPM adoption in companies. This outlines necessity of creating a more suitable environment for BPM in companies in Serbia. Creating a more suitable environment for BPM would contribute to a better BPM adoption in companies.

By conducting t-test for an independent sample, it has been shown that companies that have certain BPP criteria significantly differ in the PPI in relation to enterprises that do not have them. Then, in order to determine degree of formalization of BPP approach, three groups of companies are defined:

- Group 1 - companies that do not have formal BPP approach
- Group 2 - companies that use one or two prioritization criteria based on subjectivity
- Group 3 - companies that use more than two (analytical) prioritization criteria.

Difference in PPI between those three groups was analyzed using ANOVA, and obtained results showed statistically significant differences. Furthermore, post hoc Tukey HSD test was performed in order to accurately determine which BPP groups differ in the success of BPM adoption. These statistical tests have confirmed that companies that do not have a formalized BPP approach have less success in adopting BPM relative to companies that have some degree of formalization of BPP approach. It has also been confirmed that organizations that have precise criteria for BPP are the most successful in adopting BPM. In addition, through the use of the Spearman-Rho correlation test, it was found

that there is a positive correlation between the degree of formalization of the BPP approach and the success of BPM adoption.

According to previous, companies that had one or two defined criteria for BPP, accomplished better results in BPM adoption. So, as a starting point, companies should define one or two criteria for BPP (for example, process efficiency, process effectiveness, or impact of process outputs on organization goals) which requires a little effort, in order to be successful in BPM adoption. As the company progresses in adopting BPM, more criteria for BPP should be introduced to make the results even better.

It can be said that investing more effort into formalization is cost-effective, because a wrong process may consume those resources that would be invested in formalization, without any results.

6. Conclusions

The obtained results suggest that the companies with larger extent of BPP formalization have higher PPI. This shows that BPP formalization is positively related to success of BPM adoption. In that way, assertion that formalization of BPP influences the success of BPM adoption is confirmed. By formalizing the procedure for BPP, it is possible to efficiently make decisions about the processes that need to be improved and managed, which ensures more successful adoption of BPM in organizations. Since the literature review indicated lack of formalized BPP approach, and survey research indicated significant influence of BPP on success of BPM adoption, necessity for the procedure with clearly defined criteria, as well as their evaluation, is evident. However, there are few limitations regarding this research that need to be taken into account. Firstly, survey research was limited on the companies that operate in Serbia. However, there is no specific reason that nationality might affect the results. Secondly, this research does not address the problem that is related to the formalization of BPP, rather it imply on the necessity of it. Although the need for BPP formalization (or defining precise set of criteria for prioritization, and their evaluation) is recognized by the companies that participate in the research, the data collected in this research are not sufficient for making any conclusions about this topic. Given the limitation mentioned above, the future research would include (1) Systematization of criteria for BPP; (2) Development of integrated procedure for the BPP, based on relevant criteria and a defined system of criteria evaluation; (3) Expanding the application of research into other areas, starting with the region.

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CHAPTER 15

The relationship between the basic characteristics of the company and innovativeness

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ABSTRACT

The purpose of this research is to examine the relationship between the basic characteristics of the company and innovativeness in Croatian companies. The research involved 303 Croatian companies in the manufacturing and information and communication technology industries. The survey was conducted using the survey method during the last three months of 2016. The sampling method used for the purpose of this research was stratified random sampling and Spearman rank correlation and Kruskal-Wallis ANOVA was used for data analysis. A positive relationship between the basic characteristics of a company and innovativeness was not established. Similarly, the auxiliary hypotheses show that there is no positive relationship between the number of employees and innovativeness, company age and innovativeness, or level of education and innovativeness. In the context of this research, it is likely that the basic characteristics of a company, including the number of employees, company age and level of education, do not affect the innovativeness of its activities, which can be reflected in the long term through better market positioning and the realisation of a company's competitive capabilities.

Keywords: company age, innovativeness, employees' education level, Croatian companies

JEL classification: JEL_L2, JEL_ O3, JEL_O1

1. Introduction

This paper explores the relationship between the basic characteristics of companies and innovativeness in Croatia and possible explanations for such relationships. The primary research questions addressed were: 1. What is the relationship between the number of employees and the innovativeness of companies? 2. Is there a link between company age and innovativeness? 3. What is the relationship between the level of education and innovativeness in a company? In order to answer these questions, an empirical survey was conducted at the end of 2016 based on a sample of 303 Croatian companies. The research is

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organized in the following way. Firstly, the literature on the impact of a company's core characteristics (number of employees, company age and education level) on innovativeness is analysed. Then hypotheses are made, followed by a description of the methodology and the research results. Finally, a conclusion which leads to theoretical and practical implications is presented.

2. Literature review

2.1. Basic characteristics of a company (age, number of employees, level of education)

As a company grows in size, the nature of its innovation focus is likely to change. It seems that the scope and nature of innovative practices within a company are partially affected by demographic variables, such as the number of employees, the age of the company and the level of education of employees (Mazzarol et al., 2010). The effect of entrepreneurial orientation in the three dimensions of innovativeness, proactiveness and risk-taking could indicate that older companies that are not willing to take risks and act proactively are less successful in developing innovation (Calantone et al., 2002; Hult et al., 2004; Nybbak, 2012). Cefis and Marsili (2005) show that firms benefit from an innovation premium that extends their life expectancy, regardless of specific company characteristics such as age and size. Process innovation in particular seems to have a significant impact on company survival. Furthermore, survival chances increase with the age and growth rate of a company, the latter being more crucial than initial size. Finally, high intensity technology sectors are essential to a company›s survival. Older organizations possess the competencies to develop and commercialize innovations by themselves, while SMEs are more likely to seek sources of external financing and ways to engage in innovation by forming strategic alliances with customers, suppliers, knowledge institutions and other organizations in order to leverage the resources of others to compensate their own deficiencies (Mazzarol et al., 2010, p. 113). Findings from the study suggest that the company's size, its age and pace of growth are important determinants in influencing how firms behave when innovations are in their early stages (Mazzarol et al., 2010). Rosenbusch et al., (2011) conducted a meta-analysis which combines empirical discoveries with the purpose of determining under which circumstances smaller companies, poor in resources, benefit from innovation. Factors like the company's age greatly affect the innovation performance and success of the company. The findings show that: 1. The link between innovativeness and performance of small and medium-sized companies is positive; 2. A positive link between innovativeness and performance is stronger in "young" companies than in "adult" companies. Education is important for achieving high-quality human capital that contributes to supporting structural change and approaching the innovative framework of the company. Human capital is considered to be one of the main resources in the company and an indispensable source of potential innovation, so it is necessary to focus on increasing the quality of that resource.

Cohen and Levinthal (1990) argue that the ability of the company to recognize the value of new external knowledge and to adapt and apply this knowledge of business is of crucial importance to the company's innovative ability. The findings of one study have shown that demographic variables such as experience or the CEO's education (Sciascia et al., 2006; Altinay and Wang, 2011) have been found to have a positive effect on the level of entrepreneurial orientation. In addition, the relationship between learning orientation and firm innovativeness depends on the company's age. The older the organization, the stronger the relationship between learning orientation and the company's innovativeness (Calantone et al., 2002), i.e. organizations with a long history show a strong relationship between learning orientation and firm innovativeness, whereas organizations with a short history display a weak relationship. Also, when there is no shared vision and commitment to learning, as a rule, young companies are not successful in the development of innovation due to the lack of knowledge and unique resources (Calantone et al., 2002). Thus, the relationship between learning orientation and firm innovation, and between learning orientation and business performance grows stronger with the age of the company because older companies can use information more effectively. According to Verworn and Hipp (2009) a high share of highly skilled employees in the company had a positive effect on innovation input and output. Nybakk (2012) showed that the company's age has no effect on the link between learning orientation and innovativeness. The complexity of basic characteristics of a company due to its specificity requires further research.

2.2. Innovativeness

Innovativeness can be defined as the ability to introduce new processes, products and/or ideas into the organization (Hult et al., 2004). Company innovativeness is conceptualized from two perspectives. The first views it as a behavioural variable, that is, the rate of adoption of innovations by the firm. The second views it as an organization's willingness to change (Calantone et al., 2002). In this research, the company's innovativeness is defined as a company's propensity to create and/or adopt new products and business systems (Nybakk, 2012, p. 4). Product innovation includes the development of new products, improvements to existing products and the adoption of products and is widely recognised as an important factor for manufacturing firms (Nybakk, 2012, p. 5). Process innovativeness is defined as an action that leads to process innovation and as the process itself (i.e., the technologies and improvements used in production) that constitutes the innovation (Nybakk, 2012, p. 5). Business system innovativeness can apply to every aspect of the firm that is necessary to manage, structure, operate and administer the business and its internal and external environments (Nybakk, 2012, p. 5). The studies highlight that innovative activity increases the longer a company is in business. Younger firms, having fewer preconditions for innovation, have more difficulty developing innovation, and are less able to employ highly educated individuals with the necessary competences for the development of innovation (Frenkel et al. 2001; Fritsch

and Meschede, 2001; Huergo, 2006). The study by Mohnen and Röller (2005) suggests that the knowledge of employees significantly affects innovation. In accordance with this result, it was found that companies in various industries have a lack of highly educated employees, which becomes a key obstacle to the development of innovativeness. Equally, it is considered that highly educated employees are the main sources of ideas for innovative new products, processes and systems and the main drivers of innovation activities in all functions of the company (Østergaarad et al., 2008). According to a study by Verworn and Hypo (2009) to become innovative, companies should employ creative and highly educated people because they believe that a high proportion of highly educated employees has a significant positive impact on the development of innovation. Based on the above, it can be determined that the age of the company, the number of employees and their level of education are all important factors that affect a company's innovativeness.

3. Hypothesis

The main hypothesis will be determined by the existence of a relationship between the basic characteristics of companies and innovativeness where the independent variables are the base characteristics of the company (number of employees, age, companies and educational level of employees), and the dependent variable is innovativeness.

The hypothesis will check the following additional hypotheses:

H1a: There is a positive relationship between the number of employees and innovativeness.

H1b: There is a positive relationship between company age and innovativeness.

H1c: There is a positive relationship between the level of education and innovativeness.

4. Research methods

The research was conducted based on the survey method. The aim of the research is to determine whether there is a positive relationship between the basic features of a company and innovativeness. The main hypothesis shall assume the existence of a relationship between the basic characteristics of a company and innovativeness where independent variables are: the company's basic characteristics (number of employees, company's age and employee education level) and the dependent variable is innovativeness. To prove the hypothesis, the Spearman rank correlation test and Kruskal-Wallis ANOVA were conducted. Statistical testing is performed at a significance level of 95% (α = 0.05), (Šlogar, 2018). Statistical analysis and data analysis were carried out by STATISTICA 6.1 StatSoft inc. 1983-2003.

4.1. Sample

The basic set from which the sample was chosen consists of registered companies that actively carried out their activities in 2016 throughout the Republic of Croatia. It is a three-stage stratified random sample that consists of 900 companies (Šlogar, 2018). For the first stratification level, the differential criterion is the division of counties according to three regions: 1. Northwestern Croatia, 2. Central and Eastern (Panonian) Croatia, and 3. Adriatic Croatia. For the second level of stratification, the differential criterion is the size of the company. The provisions of the Accounting Act (Official Gazette No. 78/15), which prescribe the conditions to be met for categorisation of a company, are applied: the number of employees, the amount of revenue and the amount of total assets. For the third level of stratification, NKD 2007 (National Classification of Activities) categories are used, and target companies belong to the following areas: C - Processing industry, Section 10-33 and J - Information and Communication, Section 62 - Computer programming, consultancy and related activities (Šlogar, 2018). An originally developed questionnaire was piloted and sent to 10 randomly selected companies from the defined database. The aim was to check the user-friendliness of individual claims from previous studies and to identify potential uncertainties regarding some questions. Subsequently, the questionnaire was modified and revised. The company's general data relating to the total number of employees, the age of the company, and the level of employee education were collected. To measure the innovativeness, the scale adapted from Nybakk (2012) was used which consists of 15 items and assesses the subfactors of product innovation, process innovativeness, and business system innovativeness. Additionally, a 5-point Likert scale was used: 1 – 'the claim does not relate to my company at all' to 5 – 'the claim is completely related to my company'.

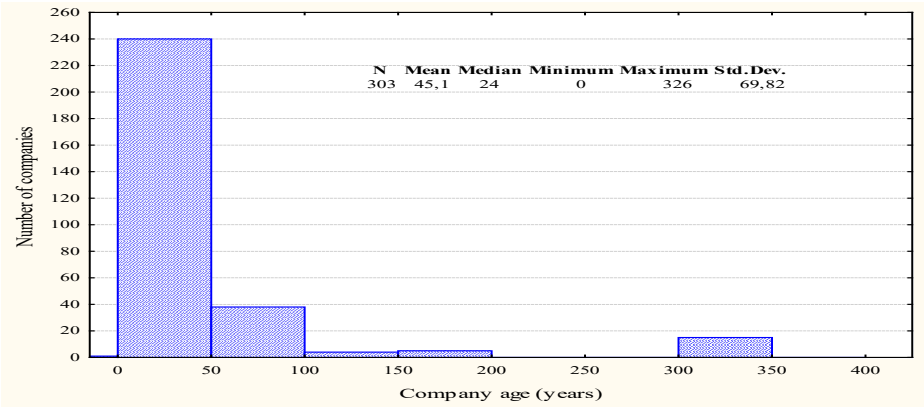
4.2. Data collection

The research was conducted over the last three months of 2016. In the process of data collection, an e-mail was sent to 900 Croatian companies that were actively doing business on the domestic or international market, selected from an online database, www.biznet.hr, i.e. from the Register of Business Entities of the Croatian Chamber of Commerce and the Croatian Exporters Register of the Croatian Chamber of Commerce. The questionnaires were sent in October 2016 to the e-mail addresses of CEOs and executive managers of companies included in the sample. In November, a reminder was sent and another questionnaire to those who had not yet responded. Within three months, 303 questionnaires were properly filled out and sent back (out of 900), resulting in a response rate of 35.31% (Šlogar, 2018). Of a total of 345 collected questionnaires, only 303 were used in the final analysis; the rest, those with significant amounts of data missing, were excluded. It should be noted that a large number of leading Croatian companies submitted completed questionnaires.

5. Research results

The results show that 65.68% of respondents have a university degree; 12.54% of respondents hold an MSc and/or PhD; 10.56% have an associate degree, and as many as 11.22% have only completed secondary education. 29.70% of respondents hold the position of director/head of other organizational sector followed by director/head of research and development/marketing 19.80%, director/production manager/logistics 18.81%, chairman/CEO 17.49% and the director/head of finance/accounting 14.19%. The biggest difference between the number of men and the number of women per function was observed in the function of chairman/CEO where there were 48 men and 5 women.

Figure 1: Distribution of companies according to age (N = 303)



Source: authors' research

Figure 1 shows the 303 companies in the survey, the average age is 45 years and the median was 24 years, 50% of companies surveyed are younger than 24 years, the other 50% are older than 24 years. The oldest company was founded 326 years ago.

The results show that under NKPJS, the largest number of companies, 52.1%, belongs to Northwestern Croatia HR01, 33% are located in Central and Eastern (Pannonian) Croatia HR02, while the smallest number of companies, 14.7%, are headquartered in Adriatic Croatia HR03. The distribution of companies throughout the industrial sector shows that the largest number of companies, 22%, is engaged in the production of metals and metal products, machinery and equipment; 18% in the production and processing of wood, pulp and paper; 17% in the production of chemical products, synthetic fibres, rubber, mineral products; 16% in the production of food, beverages and tobacco products; 11% in financial and other services; 9% in the production of textiles and textile products; and 7% in computer programming. The results show that in 2015, 44.6% of the surveyed companies generated revenue of less than HRK 60 million, 28% between HRK 60 million and HRK 300 million and 27.4% of the companies generated revenue of more than HRK 300 million. The results show that in

2015 the total assets of 44.6% of the surveyed companies were less than HRK 30 million, 27.7% from HRK 30 million to HRK 150 million and 27.7% more than HRK 150 million.

The hypothesis assumes that there is a positive relationship between the basic characteristics of companies and innovativeness and arises from the hypotheses H1a, H1b and H1c. Number of employees is categorised into three groups on the basis of which the company's size is determined (1-49, 50-250, more than 250 workers). With the aim of testing the hypothesis, the Spearman rank correlation and Kruskal-Wallis ANOVA test was conducted.

H1a: *There is a positive relationship between the number of employees and innovativeness.*

As part of the empirical research it was attempted to determine whether there is a positive relationship between the number of employees and innovativeness. To prove the H1a hypothesis, the Spearman rank correlation was applied which tested the relationship between the number of employees and innovativeness.

Table 1: Spearman rank correlation - relationship between the number of employees and innovativeness

	Spearman rank correlation coefficient
Innovativeness	-0.019
Product innovation	0.019
Process innovativeness	0.035
Business system innovativeness	-0.106

Table 1 shows the Spearman rank correlation coefficient between innovativeness and the number of employees. The values of the coefficients are not statistically significant, which shows that there is no statistically significant relationship between innovativeness and the number of employees. To prove the H1a hypothesis, Kruskal-Wallis ANOVA was used, which tested the relationship between the number of employees and innovativeness.

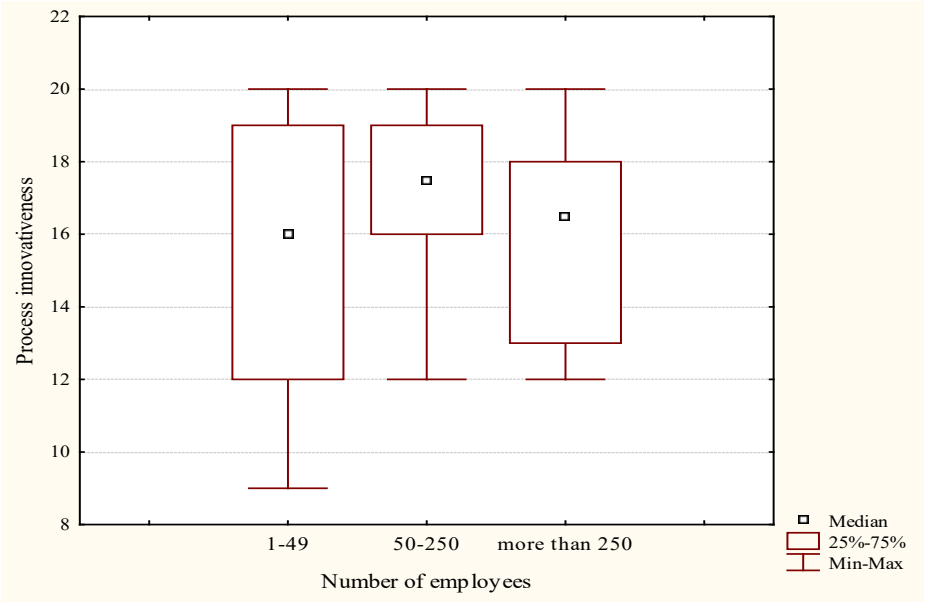
Table 2: Kruskal-Wallis ANOVA - testing the difference between the three groups of the number of employees in relation to innovativeness

Kruskal-Wallis ANOVA	H (2, N=303)	p-value
Innovativeness	2.546	0.280
Product innovation	1.372	0.504
Process innovativeness	8.416	0.015
Business system innovativeness	3.448	0.178

Table 2 the results show a statistically significant difference between the three groups of the number of employees in relation to process innovativeness ($p < 0.05$), whereas no significant difference between these groups with respect to

overall innovativeness, product innovation and business systems innovativeness was found (p> 0.05).

Figure 2: Process innovativeness in three groups of number of employees



Source: authors' research

Figure 2 shows that process innovativeness is slightly higher in companies with 50 to 250 employees, than in companies with 1 to 49 employees and companies with more than 250 employees. It does not confirm a positive relationship between the number of employees and innovativeness. It can be argued that this is the expected result because it relates to the size of the company, however, the claim that "quantity creates quality" does not apply in this case. Such a statement could refer to more innovative companies. Business practice has frequently shown the great innovativeness of small businesses. Such companies must position themselves on the market and provide "something new" in order to survive alongside big companies. Based on the presented data, it can be concluded that the respondents have poorly identified the extent of the desired attachment and the auxiliary H1a hypothesis has not been confirmed.

H1b: *There is a positive relationship between company age and innovativeness.*

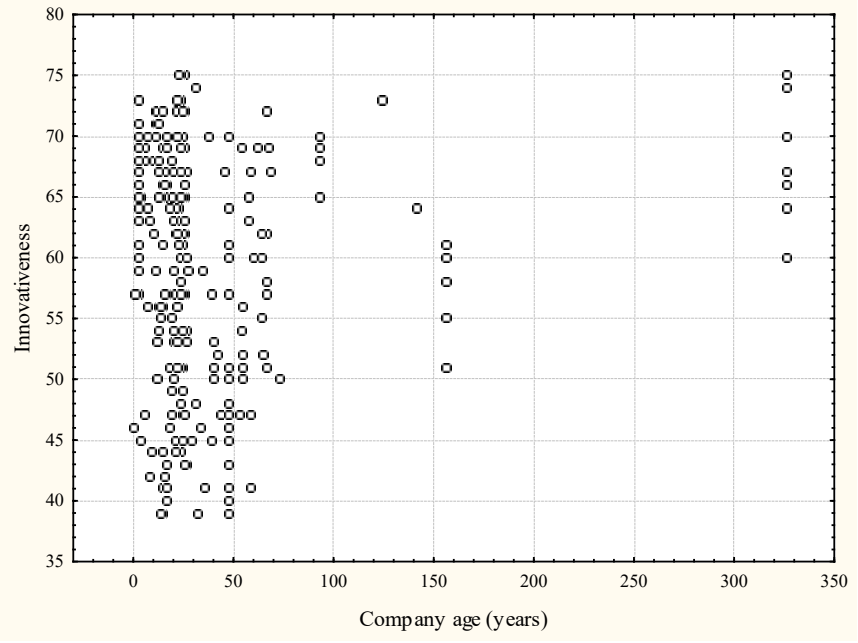
The research attempted to determine whether there is a positive relationship between company age and innovativeness. The Spearman rank correlation was applied to prove the hypothesis.

Table 3: Spearman rank correlation - relationship between company age and innovativeness

Innovativeness - Company age	Spearman rank correlation coefficient
Innovativeness	-0.052
Product innovation	-0.005
Process innovativeness	-0.018
Business system innovativeness	-0.105

Table 3 shows that the Spearman rank correlation coefficients between innovativeness and company age are not statistically significant and there is no statistically significant relationship between innovativeness and company age.

Figure 3: The relationship between company age and innovativeness



Source: authors' research

Figure 3 clearly shows the lack of a connection between company age and company innovativeness. Based on the presented data it can be concluded that the respondents have poorly identified the extent of the desired relationship and that these findings were not confirmed by the auxiliary H1b hypothesis.

H1c: *There is a positive relationship between the level of education and innovativeness.*

Part of the empirical research attempted to determine whether there is a positive relationship between the level of education and innovativeness.

Table 4: Level of education of employees

Level of education	Number	Percentage (%)
Predominantly secondary education	128	42.2
Predominantly degree (associate or university)	49	16.2
Approx. the same percentage of employees with secondary education and degree (associate or university)	126	41.6
Total	303	100.0

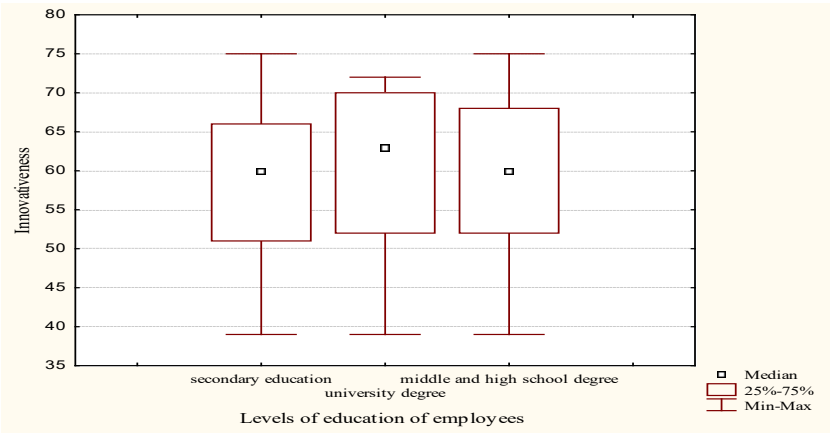
The results in Table 4 show that the largest number of companies in the sample, 42.2%, predominantly have employees who have completed secondary level education; 41.6 % of the companies have approximately the same number of employees with either secondary education or a degree (associate or university); and 16.2% of the companies from the sample predominantly have employees with a degree (associate or a university).

Table 5: Kruskal-Wallis ANOVA - testing the differences between the levels of education of employees in relation to innovativeness

Kruskal-Wallis ANOVA	H (2, N=303)	p-value
Innovativeness	1.736	0.420
Product innovativeness	2.719	0.257
Process innovativeness	3.364	0.186
Business system innovativeness	0.492	0.782

The results presented in Table 5 show that the total innovativeness, product innovation, process innovativeness and business systems innovativeness were not significantly different among the different levels of education of employees ($p > 0.05$). The level of education of employees in companies is also shown in Figure 4.

Figure 4: The levels of education of employees in relation to innovativeness



Source: authors' research

Practice shows that companies with simple production, such as family farms (OPGs), can be just as innovative as companies that use complex technologies and produce sophisticated products, so this is a somewhat expected result. Based on the presented data it can be concluded that the respondents have poorly identified the extent of the desired relationship and that these findings were not confirmed by the auxiliary H1c hypothesis.

6. Conclusions

Innovativeness is considered to be an essential determinant of business, which means that innovative activities are an important factor of success regardless of the basic characteristics of the company. The results of the statistical hypothesis testing obtained in this study showed that they did not have a significant positive relationship. Although the selection is based on the principle of impartiality in sample selection, the sample does not meet the principle of representativeness, so the results of this research may only be considered relevant for companies in the C and J NKD 2007 sectors which are included in the research and cannot be generalized for all companies. In addition, the reasons for the results of this research, which were contrary to expectations regarding the existence of a positive relationship between a company's basic characteristics and innovativeness, should be explored in more detail. In conceptual terms, the research has contributed to the development of scientific thinking about the existence of a positive relationship between the basic characteristics of a company and innovativeness. Even though some aspects of company characteristics have not been examined, it would seem that a fairly clear picture of the current situation in Croatian companies was attained. The question is whether these characteristics show that Croatian companies are ready for global competition and whether they have the resources and potential for a greater presence on the international market. Consequently, in future research more attention should be given to those issues that would burden Croatian companies at the micro level.

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CHAPTER 16

The Great Illusion: The Euro Area as an Optimum Currency Area

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ABSTRACT

The instability in the Economic and Monetary Union (EMU) worsened as news of the excessive public deficit and high public debt in Greece at the end of 2009 triggered the so-called sovereign debt crisis that quickly became a serious problem for the Euro Area as a whole. The sovereign debt crisis exposed its removal from the ideal of an Optimum Currency Area (OCA). The starting point of this work will be the analysis of the application of the criteria for the OCA to the case of the EMU. For this purpose, the study was carried out based on empirical methodologies for various indicators, namely the ratio of immigration of the 12 countries of the Euro Area by the working population ages 15-64, the Employment Protection Legislation (EPL) index, the Herfindahl-Hirschmann index, the ratio of imports and exports by GDP, the standard deviation of the cyclical component of the GDP deflator, the correlation coefficient between the cyclical components of GDP, the ratio of the sum of inflows and outflows by GDP and the transfers of structural funds from the European Union (EU) to the different Member states. We conclude that the EMU does not represent an OCA. Although a large part of the negative results presented in the various macroeconomic indicators derive from the sovereign debt crisis, in some cases the weak macroeconomic performance was already evident when the EMU was created, such as the absence of business cycle synchronisation.

Key words: Euro Crisis, Economic and Monetary Union, Optimum Currency Areas.

JEL classification: E31, E43, G01, H60.

1. Introduction

The sovereign debt crisis associated with the debt problems of some Member States of the Economic and Monetary Union (EMU) and the lack of credibility of financial investors questioned the continuity of the EMU, until then seen as a success case among the other monetary unions created throughout economic history.

The sovereign debt crisis has highlighted some of the shortcomings of the Maastricht Treaty, notably regarding the prevention and budgetary surveillance of Euro Area Member States, thus resulting in very sharp adverse effects on

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the most fragile economies with simultaneous deficits in their public accounts. There were also some problems related to rescue and financial recovery procedures to be taken when a Member State faces severe economic and financial difficulties and needs financial support. The Maastricht Treaty was devoid of rules and ways of circumventing economic and financial turmoil that might arise in the Euro Area. On the one hand, it was believed that "forcing the euro to follow the rules of the framework", the weaker countries would be forced to "align their efficiency and their operation by the German rules". On the other hand, it was also thought that "without a frame, German efficiency would have to converge to the average" (Bento, 2013: 73). It is in this perspective that the current crisis cannot be seen only from an economic and financial perspective. Some authors (Teixeira, 2014; Soares, 2016 and Stiglitz, 2016) argue that the fragile structure of the EMU is enough to drag countries into collapse. The desire of the Euro Area to represent an Optimum Currency Area (OCA) in this way has been increasingly difficult.

This work seeks to analyse a set of macroeconomic indicators within the framework of criteria defined in the economic literature for a monetary area would be considered an OCA. To this end, eight macroeconomic indicators are analysed to quantify the position of the EMU in the light of the OCA theory, with the main objective of identify if the claim of the EMU represents an OCA is only an illusion of its founders or if there is some evidence which allow to conclude that the Euro Area is in the path of optimality.

It is also our intention to see if discrepancy between the results achieved by the Euro Area Member States, particularly with regard to the business cycles synchronization, may indicate that the European peripheral countries present greater structural vulnerabilities compared to the so-called core countries, a situation which seems to have become evident with the triggering of the 2008 financial crisis and, above all, the sovereign debt crisis.

This study does not deal with a single criterion, thus making an analysis of the main criteria established for an OCA in the specific case of the countries that are part of the Euro Area. For some indications, a comparative analysis with the United States of America (USA) is still under way.

It is exactly in the attempt to find an answer to this and other questions that we believe that this work can be a good contribution to the economic literature.

Apart from the introduction, the paper is structured along four sections. Section 2 briefly reviews the economic literature around the OCA theory. Section 3 is dedicated to the empirical analysis of the eight criteria check that are normally referred to as constituting an OCA. Finally, section 4 presents the main conclusions of the paper.

2. Optimum Currency Area: a theoretical analysis

An Optimum Currency Area can be defined as a monetary union formed by an economic bloc of a set countries or regions, where circulates only one currency and whose primary objective is to maximize the economic efficiency of the same area.

In this theoretical approach we analyse some of the criteria that will serve as a basis for our empirical study, among them: i) mobility of the labour force; ii) labour market flexibility; iii) degree of openness of an economy to the exterior; iv) production diversification; v) similar inflation rates; vi) business cycles synchronization; vii) capital mobility (financial market integration, and fiscal integration), and viii) solidarity.

The first criterion concerns the mobility of the labour force initially advocated by Mundell (1961). Mundell (1961) analyses the factors of production mobility, namely labour and capital, arguing that it is fundamental that a particular monetary area is characterized by a high mobility of factors of production between its internal borders.

In light of mobility of factors of production of Mundell's theory (1961), an unemployed person must leave the country where he resides and works to look for new employment opportunities in a country that is part of the same monetary area. Thus, in practical terms, there will be no increase in unemployment in this currency area. Therefore, regarding labour market mobility we can conclude that in order to achieve full employment in the countries that constitute an OCA, a high level of internal mobility of the labour factor must be observed. A high mobile of the labour force in a given currency area allows a greater adjustment of the countries in the event of negative shocks or in the sequence of a financial crisis.

Mckinnon (1963) also refers to the mobility of factors of production, emphasizing that it is divided between geographical mobility between countries or regions and mobility between industries. Of course, the existence of a single or a common currency will facilitate the mobility of factors.

The second criterion for a monetary union to be an OCA concerns the labour market flexibility, a theory initially presented by Friedman (1953) for whom an OCA should be characterized by flexible wages. However, it is important not confuse labour mobility with flexibility in the labour market, which in turn has the nominal wage level. In fact, nominal wages are a financial instrument that balances demand and supply in the labour market.

The third criterion concerns the degree of openness of an economy to the exterior and was originally introduced by Mckinnon (1963). The author's basic principle is the analysis of international trade, based on the ratio of goods tradable to non-tradable goods. In other words, the degree of openness of an economy to the exterior is measured by the ratio of exports and imports by GDP. The higher the ratio, the greater the degree of openness of the market, and, therefore, the more efficient the position of a country or a monetary area in the international market.

Regarding the fourth criterion, it was Kenen (1969) who introduces the idea of diversified economies, according to which countries with diversified production levels may represent and OCA. A high and similar production diversification between the Member States of a monetary area reduces the asymmetric shocks that may arise as a result of the decrease in aggregate demand or technological change, and mitigate its possible negative effects, in particular, the decrease in prices and wage and rising unemployment.

The fifth criterion concerns the existence of similar inflation rates between the countries of a given monetary area. This idea was presented firstly by Fleming (1971), arguing that inflation rates should remain low.

Another criterion concerns the business cycles synchronization or, in other words, to the existence of similar business cycles. In this context, it is noteworthy the study of Burns and Mitchell (1946), known as one of the pioneers of the business cycle approach.

It is also worth mentioning the financial market integration criteria (Ingram, 1962) and the fiscal integration (Kenen, 1969). The financial market integration criterion is highly related to the mobility of capital. In this sense, a high level of integration in financial market will lead to an increase in capital flows and a decrease in "differences in long-term interest rates, easing the financing of external imbalances but also fostering an efficient allocation of resources" (Mongelli, 2008: 3).

Fiscal integration is a mechanism for financial transfers between Member States. Thus, when a Member State is hit by an asymmetric shock, notably at the level of labour mobility, the mechanism of financial transfers will be automatically triggered and the tax revenue of countries with sustainable financial conditions will be redistributed by that Member State.

Finally, and in the context of political integration (Mintz, 1970), it is also important to refer a criterion introduced in the literature of the OCA known as commonality of destiny or solidarity criterion, essentially related to the history between the Member States of a monetary union, for example with regard to the fight of political interests, where all Member States should not neglect the prosecution of common objectives. Contrarily to the fiscal integration criterion, the solidarity criterion can be assessed in the light of the European transfers of funds. It follows that countries with a higher (lower) level of wealth will receive less (more) funds.

3. Is the Economic and Monetary Union an Optimal Currency Area?

In this section we analyse the eight criteria mentioned above, which will allow to conclude if the EMU represents an OCA.

To this end, we used data from the databases of Organization for Economic Co-operation and Development (OECD) and UNCTAD (United Nations

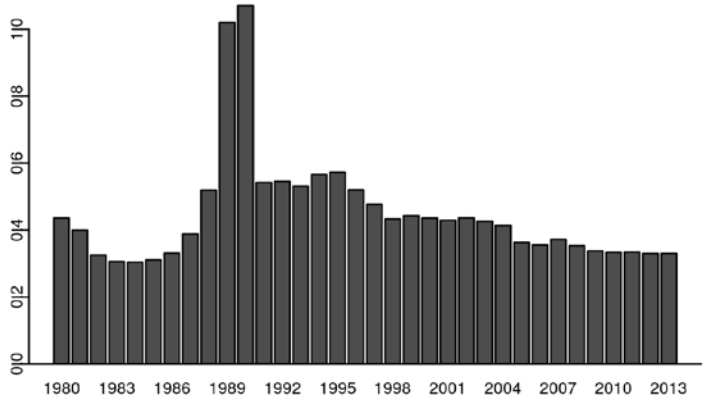
Conference on Trade and Development) for the period between 1980 and 2016, considering the Euro Area -12 countries. Luxembourg was sometimes excluded from the analysis because it was an outlier.

3.1. Mobility of the labour force

The mobility of the labour force is analysed according to the following ratio:

$$\frac{Imigration\ in\ the\ Euro\ Area\ to\ 12\ countries}{Population\ of\ working\ age\ from\ 15\ to\ 64\ years}$$

Figure 1: represents the mobility of labour force in the 12 countries of the Euro Area in the period between 1980 and 2013.



Source: Authors' calculations

The result presented in 1989 and 1990 stands out from the rest. The peak of labour mobility in 1989 and 1990 may be due to the fall of the Berlin Wall on the night of 9 November 1989, which coupled with the fact that Germany's data are used as a proxy for France can enhance this high degree of mobility in these two years.

For the period from 2008 to 2013, the results obtained are like those obtained by Pasimeni (2014), which shows a decrease in the labour mobility in the post-crisis period. In this sense, the results are not surprising. The increase in the unemployment rate in the European peripheral countries during the crisis period was expected to contribute to a significant increase in the migratory flows of part of the population to countries with high employment rates. However, this did not happen.

In this context, it is extremely important to seek to understand the reason for this situation. According to Eurostat data, the period from 2008 to 2013 was characterized by a generalized increase in unemployment rates in the European peripheral countries, with Greece and Spain standing out due to high unemployment rates. Greece moved from 4.6% in 2008 to 17.3% in 2013,

with Spain moving from an unemployment rate of 5.3% in 2007, the lowest since 1999, to 17.3%, in 2013. In turn, Portugal saw unemployment rates increase by 5.1 percentage points from 2008 to 2013, registering an unemployment rate of 10.8% this year.

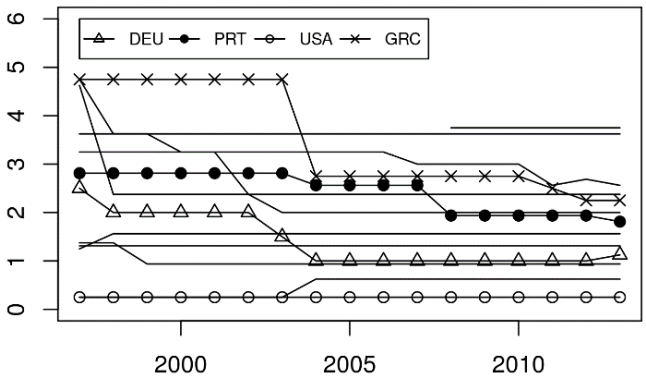
Based on the data presented, it can be said that the weak labour mobility observed during the period under review is largely supported by the structure and heterogeneity of the Euro Area Member States as suggested by the OECD (1999), for whom the cultural and language differences of the countries can justify that the population moves from their country only in extreme situations. In this context, the migratory flow recently observed in some Euro Area countries seems to have remained relatively small, in such a way that it ended up not being reflected in a very pronounced way in the labour factor mobility in the years in which it occurred.

3.2. Labour market flexibility

With regard to the flexibility of the labour market, we used the Employment Protection Legislation (EPL) index, namely the index of the protection of temporary jobs (see Figure 2) and the rate of protection against individual dismissal and collective workers permanent contracts (see Figure 3), in order to analyse in which countries the labour factor regulation is rigid and, therefore, the labour market presents itself less flexible. By definition, the EPL index ranges from 0 to 6, with values close to 6 indicating that the labour market is characterized by more rigid regulation of labour contracts.

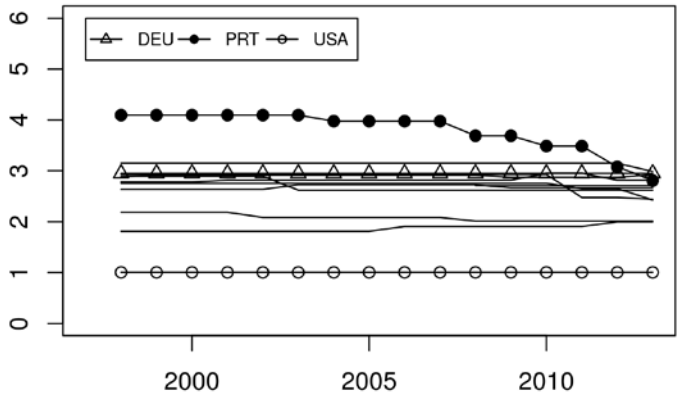
As can be seen from the analysis of Figures 2 and 3, the evolution of these indicators has evidenced a greater labour market flexibility in the Euro Area countries. However, most of these countries continue to regulate their labour market in a more rigid way compared to the USA, which stand out because the value of both indicators is constant and close to zero, showing that the USA is the country with the least rigidity in the labour market.

Figure 2: Temporary EPL



Source: Authors' calculations

Figure 3: Permanent EPL



Source: Authors' calculations

Over the years, some reforms have indeed been implemented with the aim of increasing flexibility in the labour market of the Euro Area countries. Even so, Greece stands out because of the high level of protection of temporary work and Portugal for protection in terms of permanent work.

In this context, it can be said that despite the greater flexibility observed in the labour market of some Euro Area countries as a whole, and compared to the US, the UEM is still a global labour market with a high degree of protection, so everything seems to suggest that in this respect the Euro Area cannot yet be considered an OCA.

3.3. Degree of openness of an economy to the exterior

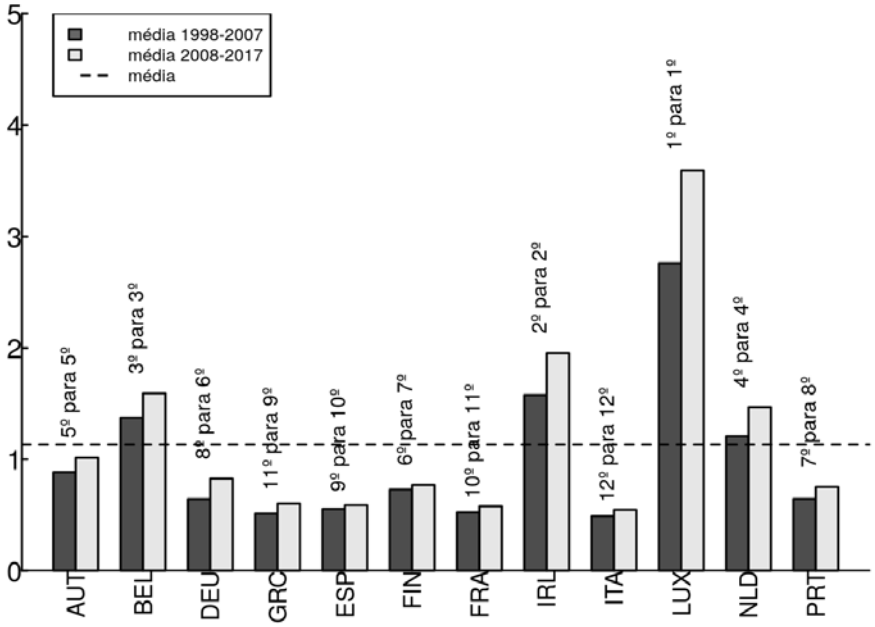
The degree of openness of an economy to the exterior (DOEE) is an indicator that allows to evaluate the position of a country in the international market, being defined as follow:

$$DOEE = \frac{Imports + Exports}{GDP}$$

Thus, an economy is more open to the exterior, the greater the value of this indicator. Moreover, the higher the value of this indicator, the greater the sensitivity of the domestic economy to fluctuations in the foreign economy (international market).

Figure 4 presents the evolution of the degree of openness of the economy to the exterior of the Euro Area - 12 countries in two different periods: from 1998 to 2007 and from 2008 to 2017, as well as the position (ranking) of each country in each of these periods.

Figure 4: Degree of openness of an economy to the outside



Source: Authors' calculations

In the countries under review, Luxembourg stands out from the others and is clearly the economy more open to the exterior in the two periods considered, followed by Ireland, Belgium and the Netherlands with a higher degree of openness than the average of the 12 countries of the Euro Area (average value presented by the horizontal dashed line). Of course, the results presented for Luxembourg may be due to the size and geographic location of the country. Inversely, Italy is the country with the lowest degree of openness, being closely followed by Greece, France and Spain, countries with a low degree of openness and below the average of the Euro Area. In the period from 1998 to 2007, Greece occupied the 11th position, with a low degree of openness. This situation was slightly circumvented in the period from 2008 to 2017, becoming the 9th position, by exchange with France, which then came to occupy the 11th position. Already Spain, fell one place in relative terms, going from the 9th to the 10th position, despite between the two periods have increased slightly the degree of opening.

A similar situation also occurred with Portugal and Germany. Between 1998 and 2007, Portugal had a lower degree of openness than the Euro Area average and Germany had a lower degree of openness than Portugal, although very close to it. However, when comparing the two periods, it is clear that, in the case of Germany, there has been a positive evolution, namely an increase in the degree of openness to the exterior, which has allowed it to rise two positions (from 8th to 6th position). Already the Portuguese economy, although in absolute terms has increased its degree of openness, compared to the other

countries in the sample, their relative position worsened from 7th to 8th, thus reversing their position in relation to the German economy.

In Camarero, Gómez and Tamarit (2013) study, among the 11 countries of the Euro Area, Belgium, France, Luxembourg and Italy are indicated as the countries whose the implementation of the single European currency brought more benefits in terms of cross-border trade, particularly in terms of intra-EMU exports, that are visible in Figure 4 for the specific case of Luxembourg and Belgium, which stand out from the various countries under analysis. As noted, the size and location of countries have positive effects in international trade. Thus, since Luxembourg has a small economy and borders on large countries, it gains great benefits from trade between EMU Member States.

Given these results, it can be said that with respect to the degree of openness of the economy to the exterior, the Euro Area fulfils the criterion to be considered an OCA.

3.4. Production diversification

The production diversification criteria is analysed based on the Herfindahl-Hirschmann index (H), which allows us to determine the degree of diversification of production, or in other words, the weight of each sector of activity in total production (gross value) of each country. The index varies between 0 and 1, indicating values close to 0 and a greater diversification of production.

The Herfindahl-Hirschmann index is given by:

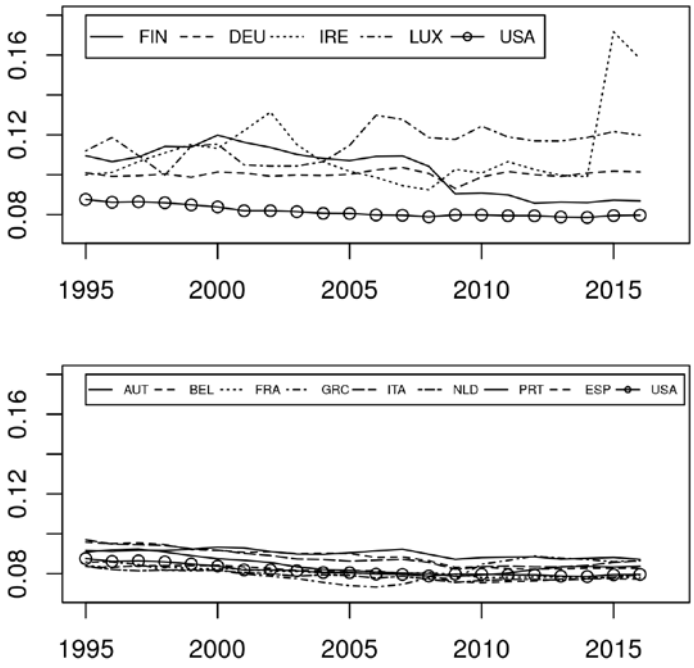
$$H = \sum_{i=1}^{N} q_i^2,$$

where q_i represents the degree of diversification of the country i in the production market and N the number of countries.

Figure 5 allows us to analyse the indicator for the diversification of production and to compare the results of some countries in the Euro Area, namely Germany, Finland, Ireland and Luxembourg, with the results obtained for the USA.

Starting with the analysis of the lower panel of Figure 4, generally, it is seen that the Euro Area countries have a production diversification index quite similar to that presented by the USA. The exception appears to be Germany, Finland, Ireland and Luxembourg which have a degree of production diversification considerably lower than in the USA. This reality is evidenced if we look at the upper panel of Figure 4. Therefore, there are relatively more specialized economies. This trend is related to the economic activity sector of countries. For example, Germany is more specialise in the automobile industry and Ireland in the banking and financial services. On the other hand, Finland has a greater specialization in the service provision and Luxembourg in financial and insurance services.

Figure 5: Degree of production diversification



Source: Authors' calculations

Based on the results, we can conclude that some countries tend to have more specialized economies that deviate from the position occupied by the countries that have a degree of production diversification nearest of the USA degree of diversification, which seems to indicate that the Euro Area still does not fulfil the criterion of production diversification.

3.5. Similar inflation rates

The criteria of similar inflation rates is assessed based on the calculation of the standard deviation of the cyclical component of the GDP deflator (ratio of nominal GDP by real GDP). In a first step, the cyclical component of the GDP deflator, calculated using the Hodrick and Prescott filter (HP filter), developed by Hodrick and Prescott (1980), is determined with two smoothing parameters for an annual analysis, a $\lambda = 100$, a parameter generally used in annual time series, and a $\lambda = 400$ that will allow us to smooth the trend of the time series. In a second phase, the standard deviation of this same cyclical component is determined to obtain a measure near the concept of price flexibility. The results of this analysis are presented in Table 1.

Table 1: Standard deviation of the cyclical component of the GDP deflator

Countries	λ=100	λ=400
Austria	0.57	0.72
Belgium	0.61	0.8
Finland	0.96	1.15
France	0.91	1.41
Germany	0.52	0.85
Greece	1.96	2.1
Ireland	3.8	5.03
Italy	0.67	0.77
Luxembourg	1.68	2.33
Netherlands	0.92	1.44
Portugal	1.22	1.39
Spain	1.73	2.38
USA	0.8	1.04

Source: Authors' calculations

As can be seen, price flexibility is quite different between the countries under analysis. In particular, Ireland stands out with the highest standard deviation of 3.8 to lambda = 100 and 5.03 to lambda = 400, followed by Greece, Spain and Luxembourg. In contrast, Germany is the country with the lowest standard deviation of 0.52 for lambda = 100, followed by Austria and Belgium. For its part, Belgium is the country with the lowest standard deviation of 0.72 for lambda = 400, followed by Italy and Belgium. In the specific Irish case, it is easily perceived that the results presented are related with the deflation observed by Ireland in 2009.

Table 1 shows that the USA presented a standard deviation below the Euro Area average, which is in accordance with the study developed by Fendel and Frenkel (2009).

By these results, it can then be said that the inflation rates of the Euro Area Member States do not converge, mainly because of the high inflation rate differentials and therefore the presence of high standard deviations, which allow us to conclude that, with regard to the criteria of similar inflation rates, the Euro Area does not fulfil this criteria to be considered as an OCA.

3.6. Business cycles synchronization

The business cycles synchronization is analyses based on the correlation coefficient between the cyclical component of real GDP of each country considered in relation to the aggregate of the 12 Euro Area countries for two different periods (1996Q1 to 2008Q2 and 2008Q3 to 2018Q2).

The results of this analysis are presented in Table 2, where the third column refers to the average of the two time periods analysed and the last column presents the correlation coefficients between the cyclical component of real GDP of each of the 12 Euro Area countries and the cyclical component of real GDP of the USA for the same time horizon (1996Q1-2018Q2).

Table 2: Correlation coefficient between the cyclical component of real GDP

Countries	1996Q1-2008Q2	2008Q3-2018Q2	1996Q1-2018Q2	1996Q1-2018Q2 (USA)
Austria	0.94	0.89	0.91	0.71
Belgium	0.82	0.94	0.88	0.77
Finland	0.86	0.9	0.89	0.69
France	0.91	0.9	0.91	0.77
Germany	0.91	0.93	0.92	0.66
Greece	0.57	-0.21	0.13	0.06
Ireland	0.74	0.31	0.42	0.41
Italy	0.9	0.95	0.93	0.67
Luxembourg	0.81	0.69	0.75	0.63
Netherlands	0.92	0.9	0.91	0.64
Portugal	0.73	0.68	0.7	0.47
Spain	0.94	0.73	0.83	0.55

Source: Authors' calculations

As expected, it can be seen that the 12 countries of the Euro Area in question are less synchronized with the USA than with each other, highlighting positively Italy, Germany, Austria, France and the Netherlands, with a correlation coefficient higher than 0.90, and, negatively, Greece, which has a negative correlation coefficient in the second period. This negative correlation may be strongly related to the sovereign debt crisis. Also highlight Ireland, Portugal, Luxembourg and to Spain by the low degree of synchronization. The countries whose economic cycles are less synchronized with the USA are Greece, Ireland, Portugal and Spain, while the most synchronized are Belgium and France, both with a correlation coefficient of 0.77.

On the basis of the results presented, on the one hand, it can be said that the business cycles synchronization is higher among the Euro Area countries in comparison with the USA, which is in line with the theory presented by Gächter and Riedl (2014). On the other hand, the European peripheral countries are the least synchronized as a result of the sovereign debt crisis, which suggests to us that the criterion on the business cycles synchronization is also not fulfilled.

3.7. Capital mobility

Capital mobility is analysed considering the indicator that quantifies the weight of Foreign Direct Investment (FDI) in GDP. FDI is a macroeconomic indicator that allows analysing the degree of investment in a country as a result of investing in innovation and technology or through investment in the real estate and financial sector, thus being a way of quantifying international capital mobility between countries.

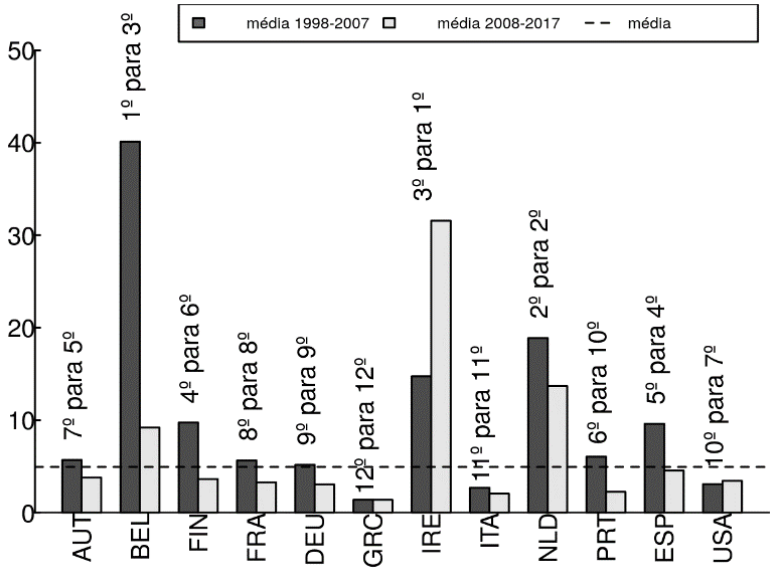
The FDI is calculated by the following equation:

$$FDI = \frac{Inflows + Outflows}{GDP},$$

at where the inflows represent the inflows of capital in a given economy via FDI and, in turn, the outflows, the reverse flow, that is, outflows of capital.

Figure 6 shows for the same two periods of analysis, from 1998 to 2007and from 2008 to 2017, the weight of the FDI in the GDP of the 12 countries of the Euro Area, excluding Luxembourg, compared to the USA. Luxembourg was excluded from our analysis for the reasons stated above, i.e., because its values are considered to function as outliers. The average value of FDI for the whole period (1998 to 2017) is represented by the dashed horizontal line.

Figure 6: Weight of foreign direct investment in GDP



Source: Authors' calculations

As can be seen, by comparing the weight of FDI in GDP in the two periods considered, Belgium stands out of other countries by the high disinvestment seen

in its economy. On the other hand, Ireland stands out positively by the evolution of this indicator, presenting as the most attractive country for FDI in terms of wealth created in the country. Faced with this performance, a question must be raised: how is it justified that FDI has increased in the Irish economy, given that the Irish crisis of 2008 resulted from a real estate bubble, strongly affected by the financial crisis of the USA and the global crisis in the banking sector?

The culmination of the banking crisis had negative financial impact in Ireland, with the public deficit to reach 32.10% of GDP, in 2010, and public debt going from 23.92% of GDP, in 2007, to 96.18% of GDP, in 2010. However, stands out in a surprising way of other countries with economic and financial difficulties due to the recovery in economic performance, registering a quite pronounced GDP growth of 25.56% in 2015. We believe that for this performance the capital inflows in the Irish economy as a result of FDI contributed a lot. Unlike in Greece, the austerity measures implemented in Ireland have led to improved macroeconomic conditions of the Irish economy. Public accounts showed signs of recovery, with the budget deficit falling from 32.1% in 2010 to 12.6% of GDP in 2011.

The Spanish economy was also shaken by a housing bubble. However, unlike the Irish economy, Spain did not have the same capacity to raise FDI. On the Contrary, Spain's position has deteriorated to the point where weight of FDI in GDP has gone below the average of the 11 countries of the Euro Area.

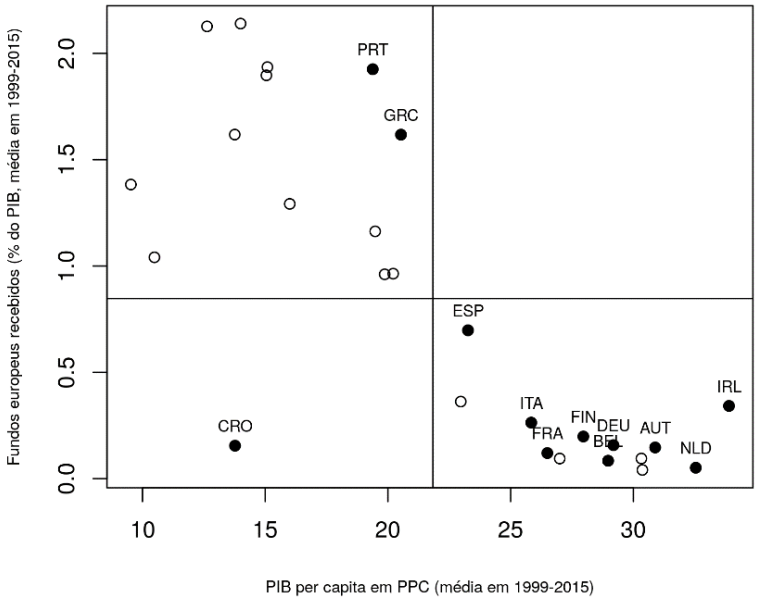
On the other hand, Portugal and Germany once again show very similar performances, although in both countries there was also a loss of importance of FDI in GDP between the two periods considered, although more pronounced in the Portuguese economy. It performed worse than Portugal and Germany, only Italy and Greece, with the latter holding the lowest FDI position among the countries under analysis.

In this context, it can then be said that the results seem to suggest that regarding capital mobility criterion, the Euro Area has conditions to be an OCA. Finally, it should be noted that the USA has a very low FDI weight in GDP, which is lower than the average of the 11 countries of the Euro Area, but with values close to those observed in France and Germany.

3.8. Solidarity

Solidarity is assessed based on the analysis of transfers of funds from the European Union to a given country. The 28 countries of the EU, excluding Luxembourg, were considered once again to be outlier. In Figure 7 on the transfer of EU funds to the various countries, countries were ranked according to their level of wealth. Thus, countries with a higher (lower) level of wealth - measured in the abscissa axis by GDP per capita in Purchasing Power Parity (average value in 1999-2015) - would be expected to receive less (more) European funds - measured in the percentage of GDP (average value in 1999-2015).

Figure 7: Transfers of funds from the European Union



Source: Authors' calculations

As can be seen, the data are very interesting and somehow confirm the expectations of EU funds transfer and, therefore, the existence of solidarity within this Union. This is evident if we analyse in a more particular way the cases of Portugal and of Greece. In fact, Portugal and Greece have two of the lowest levels of wealth among the various countries considered, but it is also these countries that have received the most transfers of EU funds. On the contrary, Croatia, which comes here as the country with the lowest level of wealth, is the country that has received the least amount of transfers from the EU. This may be explained by Croatia's recent accession to the EU. As would be expected, if there were solidarity, the countries with the highest levels of wealth are also those with the lowest transfers of funds received from the EU. We refer here, for example, to the cases of France, Belgium, Germany, Austria and the Netherlands.

Given these results, there is no doubt that, as far as the solidarity criterion is concerned, everything seems to indicate that the Euro Area can be considered as an OCA.

4. Conclusion

The present work sought to analyse whether the criteria that define an OCA apply to EMU. The analysis of the data allowed us to conclude that EMU does not constitute an OCA, not only due to factors arising from the sovereign debt crisis, in this specific case of non-compliance with the criteria of sustainability and soundness of the public finances also established in the PEC, but also by the EMU architecture itself.

From our analysis we can draw some particular inferences. First, labour mobility is weak and has tended to decline since the sovereign debt crisis. In this regard, it is essential that measures be implemented to encourage labour mobility and to remove the differentials in unemployment rates within the EMU. Second, although the evolution of the EPL index has been very favourable, there is still considerable heterogeneity with respect to labour market flexibility, and therefore most countries continue to regulate the functioning of the labour market more rigidly than in the USA. Third, like the USA, there is a high degree of production diversification in some countries, thus being a positive factor, allowing them to neutralize negative shocks that may hit other economies. On the other and, some other countries are very specialized in certain sectors of activity. Fourthly, the generalized increase in the degree of openness in the period from 2008 to 2017 suggests that economies are open to the exterior. Fifthly, price flexibility is quite different between Member States, with particular emphasis on Ireland given the high standard deviation shown. Sixthly, in general, the economic cycles of the Euro Area Member States are similar. However, Greece and Ireland still have weak synchronization. This criterion is a strong indicator that the Euro Area has been characterized since its creation by structural problems that need to be altered and reformulated. It is also verified that the weight of FDI in GDP is quite different between the various countries under analysis, with Belgium being negatively affected by the high level of divestment in its economy and Ireland by the positive. Finally, it is concluded that there is solidarity among the countries of the Euro Area, since countries with a lower (higher) level of wealth receive more (less) European funds.

The analysis carried out throughout the work allows us to say that the EMU does not represent an OCA. Although a large part of the negative results presented in the various macroeconomic indicators analysed derive from the sovereign debt crisis, it should be noted that in some respects the poor macroeconomic performance was already evident when the EMU was created, such as labour mobility and the business cycles synchronization. It is thus appropriate to try to understand in subsequent investigations whether this trend will remain or whether, on the contrary, it will be contradicted by the implementation of new economic integration policies.

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CHAPTER 17

Fiscal Performance of Local Government Units for Smart Regions and Smart Cities

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ABSTRACT

The complexity of the public administration system in Croatia is the result of current legislation and the different political goals of certain political parties. The final result is an uncompleted process of political, functional and fiscal decentralization. The consequence of that is slow local economic development of local government units in Croatia. Nowadays, the main characteristics of the administrative and territorial structure of Croatia are a centralized management system, low level of fiscal decentralization as well as the low fiscal capacity of local and regional government units. The objective of this paper is to analyze the fiscal performance of local government units in Croatia over the 2010-2018 period for the establishment of smart regions. The results of the analysis have shown that the fiscal capacity of cities is higher than in municipalities in the observed period, allowing them to finance expenditures for local development. Therefore, this provides evidence for fiscal performance and fiscal capacity for the establishment of smart regions and cities.

Key words: local development, fiscal decentralization, fiscal capacity, smart region

JEL classification: JEL_H71, JEL_H72, JEL_R51

1. Introduction

In every country, including Croatia, local government is one of the preconditions for creating a public policy that is in line with citizens' interests. To achieve all this, it is necessary to have a good-quality local finance system. Its significance and role are determined by the functions that are provided by local government units. In Croatia, there are three levels of government, i.e. the central state government, regional government consisting of counties and municipalities as well as cities as the units of local government. The challenge for the central state government is to achieve a decentralization which balances the benefits and expenditures impacting the level of fiscal autonomy of the local government units.

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Stigler (1957), Musgrave (1959) and Oates (1972) were the pioneers in the establishment of fiscal decentralization. They all examined the questions of efficiency of public services in local units and the optimal use of available resources in order to achieve sustainable fiscal capacity and autonomy. Therefore, every local and regional government, agency and organization is vital for creating the basis for a smart region within a country. This leads to the effective and efficient regional development of the public sector supported by high information-communication technology. The important role of smart cities as sub-units of smart regions is to measure the ability to attract and retain global capital, people and ideas and to maintain the sustainability of fiscal performance. Moreover, they are a motivator for growth, new jobs and productive investment in order to create an environmentally friendly economy, not only in Croatia, but also in other European Union member states. All of this can be achieved by using the appropriate information and communication technologies in a way to improve shared economic, social and environmental outcomes in smart regions.

The objective of this paper is to analyze the fiscal performance of local government units in Croatia over the 2010-2018 period for the establishment of smart regions. Moreover, the paper will present the concept of smart regions and cities. The paper is organized as follows. After a brief introduction, the literature review regarding fiscal decentralization is presented. In the third section, the system of local government units and smart regions is described. Section four presents the results of the analysis and a discussion. The last section includes conclusions and provides recommendations for future research.

2. Literature review

In every regional and local government, there is always the problem of insufficient financial resources for financing all the public functions and services. In order to examine the appropriate functions of the different levels of government and funding resources, it is important to explain the system of decentralization and the level of fiscal capacity as performance indicators of local government units. In the literature there are quite a number of researchers that have examined the concept of decentralization from different perspectives (Buchanan 1950; Tiebout, 1956; Prud'homme 1995; Tanzi, 1996; Rosen, 1999; Fornasari, et al. 2000; Dabla-Norris and Wade, 2002; Rodríguez-Pose and Bwire, 2004). They have all concluded that decentralization refers to the relationship between central and local state bodies of authority, where local bodies have a certain degree of autonomy in financing specific expenditures, determined by the constitution and law. According to Kratlić and Gasparini (2007), there are two main reasons why the process of decentralization is present. The first one is that it raises the awareness of citizens' role in decision making, and the second one is that it increases the need for effective and efficient public management. They also differentiate four types of decentralization: political, administrative, fiscal and market or economic. The aim of political decentralization is for citizens and other local government representatives to have more authority in the

decision-making process. Administrative decentralization includes the delegation of authority, responsibility and sources of funding to the lower level of government. Fiscal decentralization refers to the level of fiscal autonomy regarding the capability of collecting revenues and allocating expenditures. Market or economic decentralization switches the responsibility from the public to the private sector, allowing private entrepreneurs to provide economic activity in the area of the public sector. Based on the theory of Tiebout (1956), the two basic economic arguments in favor of fiscal decentralization are that decentralization will increase the economic efficiency, since local government is capable of providing better services for their citizens, and competition and population mobility across local governments for the delivery of public services will ensure the right matching of preferences between local communities and local governments. Based on a sample of new members of the European Union, Patonov (2013) estimated the efficiency of fiscal capacity of local government from 2000 to 2010. He found that, "the highest degree of efficiency is achieved when the property taxes are collected by local governments and that the fiscal capacity equalization via shared taxes is not sufficiently effective" (p. 68).

Rodríguez-Pose and Krøijer (2009) examined the relationship between the level of fiscal decentralization and economic growth rates at the national level for 16 Central and Eastern European (CEE) countries over the 1990-2004 period. They found that expenditures and transfers to the subnational level had a negative correlation with the national growth rates in CEE countries, while locally imposed taxation had positive economic benefits over time. In their research, Bajo and Primorac (2014) found that, when comparing the degree of fiscal decentralization with other member states in terms of total revenue and expenditures, Croatia lags behind the European Union average. Moreover, the vertical fiscal imbalance in Croatia is lower than in the other European Union member states. Once again, in a case of Croatia, Primorac (2014) proposed a model of fiscal equalization in Croatia. In his model, the fiscal inequalities of local government are determined by Gini coefficients and presented using Lorenz curves. Based on the results, he proposed that fiscal inequalities in Croatia needed to be improved in order to enhance the efficiency and fairness, but also the transparency and credibility of the equal system. Hodžić and Muharemović (2019) estimated efficiency scores for 20 Croatian counties over the 2009-2016 period and examined the relationship between the counties' efficiency scores and a group of exogenous determinants. The results showed that, among exogenous determinants, only the annual registered unemployed rate and annual average wage for full time jobs were statistically significant. Erjavec et al. (2017) investigated the relationship between Croatian local government fiscal success with a set of economic and non-economic determinants. Based on a sample of 428 municipalities, 128 cities and 20 counties in Croatia for the period 2012-2014, by applying a panel data analysis, they found differences among local government units in Croatia, which are of economic and political origin. Determinants that influence the economic success of Croatian cities, as units of local government, were analyzed by Rašić Bakarić et al. (2014).

Based on the research, they concluded that key determinants are the size of the cities, the grouping of cities into larger regional units and the dominant political party in city. The measurement of the performance of local government units in Croatia was also investigated by Jurlina Alibegović and Slijepčević (2012). They found that one of the main obstacles for regional development is a significant divergence of budgetary outcomes from the approved budget. Jurlina Alibegović et al. (2019) measured the level of fiscal autonomy of large cities as conductors of local development activities in three countries, i.e. Croatia, Serbia and Bosnia and Herzegovina, for 2015. The results of the analysis showed that, among the large cities in each country, the highest index of fiscal autonomy was recorded in Croatia (54.95), Bosnia and Herzegovina (25.00) and in Serbia (17.35). As these large cities do not have a sufficient level of fiscal autonomy to increase budget capacity, it is also very questionable whether or not they have fiscal and financial performance of local government units for establishment of smart regions.

3. The system of local government units and smart regions

Croatia, as a centralized country, is divided into three administrative levels of government. These are the central state, counties and cities and municipalities. Counties are units of regional governments, while municipalities and cities are units of local governments. The counties were established in 1993 as part of an institutional transformation from the previous communal system to a modern system of local self-government. After reforms and constitutional changes in 2000, the new local self-government legislation was established. According to the Act on Local and Regional Self-Government Financing, there are 20 counties and city of Zagreb, which has the dual status of a city and county, 127 cities and 428 municipalities. Local government is an indirect level of authorities and citizen participation to achieve a higher living standard and democracy in general. In line with the central budget approval, local government units decide on their primary goals, public functions and their own revenues. Every regional and local government unit based on their statute regulates its financial resources and way of working within an internal structure. According to Koprić et al. (2016), the main characteristics of local government in Croatia are “fragmented territorial organization; limited administrative and financial capacity of most municipalities; weak county level with counties of 175,000 inhabitants on average; slow adjustment to European Union standards; low capacity to apply for European Union structural funds; and problems with transparency and corruption” (p. 203). The distribution of responsibilities among the three levels of government is presented in Table 1.

Table 1: Distribution of responsibilities among levels of government in Croatia

Public functions	Municipalities	Counties	State
01 General public services			
01.1 Executive and legislative bodies, financial and fiscal affairs, external affairs	●	●	●
02 Defense			
02.1 Military defense			●
02.2 Civil defense	●		
03 Public order and safety			
03.1 Police services			●
03.2 Fire-fighting services	●		
04 Economic affairs			
04.1 General economic, commercial and labor affairs (consumer protection)	●		
04.5 Transport	●	●	●
05 Environmental protection			
05.1 Waste management		●	
05.2 Waste water management		●	
05.3 Pollution abatement	●		
06 Housing and community amenities			
06.1 Housing planning and development	●	●	
06.2 Community planning and development	●	●	
06.3 Water supply			
06.4 Street lighting	●		
07 Health			
07.1 Medical products, appliances and equipment			●
07.2 Outpatient services		●	
07.3 Hospital services		●	●
07.4 Public health services		●	
08 Recreation, culture and religion			
08.1 Recreational and sporting services	●		
08.2 Cultural services	●		●
09 Education			
09.1 Pre-school and primary education	●		
09.2 Secondary education		●	
09.3 Post-secondary non-tertiary education		●	●
09.4 Tertiary education			●
10 Social protection	●	●	●
10.6 Housing		●	●
10.7 Social exclusion n.e.c.		●	●

Source: Jurlina Alibegović et al. (2018a).

According to Table 1, the counties can carry out local and regional affairs which in particular deal with education, health, spatial and urban planning, economic development, traffic and transport infrastructure, maintenance of county roads, planning and development of a network of educational, health, social and cultural institutions, issuance of construction and location permits, other building-related acts and implementation of spatial planning documents for the county area outside the area of a large city, and other tasks in accordance with special laws. On the other hand, cities and municipalities can carry out activities related to housing planning and development, community planning and development, water supply, social protection, pre-school and primary education, recreational and sporting services, transport and others.

In Croatia, but also in other European Union member states, the effectiveness of decentralization is directly linked to the way responsibilities are assigned across levels of government. According to a study by the OECD (2018), there are guidelines for effective assignment of responsibilities to make decentralization work. These are:

- "Clarify the sector responsibilities assigned to different government levels;
- Clarify the functional responsibilities assigned to different government levels;
- Ensure a balance in the way different responsibilities and functions are decentralized;
- Align responsibilities and revenues;
- Actively support subnational capacity-building by the central government;
- Build adequate coordination mechanisms across the different levels of government;
- Support cross-jurisdictional cooperation through specific organizational arrangements or financial incentives;
- Allow for asymmetric arrangements and pilot experiences;
- Effective decentralization requires complementary reforms;
- Enhance data collection and strengthen performance monitoring" (p. 9)

Based on their responsibilities, every level of government maintains its public functions and collects certain revenues. To achieve its goals, every local government unit needs to have economic, financial, organizational and human capacities. The main obstacle is the financial capacity, because, without revenues, local government units are not able to experience local development. Moreover, a matter of willingness to enhance knowledge development and technology is a smart city and region. This is a tool to perform urban development innovations to accelerate urban competitiveness. The most-used components for smart cities in the literature are smart economy, smart people, smart governance, smart mobility, smart environment and smart living. The origin concept of smart cities can be traced back to at least the smart growth movement of the late 1990s.

Smart region as a term is broader. According to Sutriadi (2017), it can be defined as "innovation of sustainable planning approach at the regional level that promotes knowledge-based development through the continuous learning of human resources and an integrative part of regional resource development, especially in encouraging harmonization between conservation and developable areas in the context of national development planning system" (p. 7). Jurlina Alibegović et al. (2018b) compared the competitiveness of large Croatian cities by ranking the cities according to the smart urban development index. They found that only eleven large Croatian cities (Pazin, Dubrovnik, Varaždin, Pula, Rijeka, Zadar, Čakovec, Split, Koprivnica, Samobor and Karlovac) rank above average in the smart city model. The smart urban development index showed the heterogeneity of large Croatian cities not only in their smart development, but also in their financial capacity. To establish smart cities and smart regions, financial support not only from the central state budget, but also from other organizations is inevitable.

4. Results and discussion

In order to investigate fiscal performance, i.e. the fiscal capability of local government units in Croatia over the 2010-2018 period as a budget basis for the establishment of smart regions, all the data were collected from publicly available local budgets. The data from the local budgets are in line with the European system of National and Regional Accounts 2010. Besides this, to calculate the fiscal capacity, we followed the methodology from Bajo et al. (2015). They calculated the fiscal capacity as the difference between total revenues and expenditures of economic activity in certain local government units. For the purpose of this analysis, we only used aggregated data for each year from local government unit budgets.

In Table 2, the results of the fiscal capacity of municipalities are presented.

Table 2: Fiscal capacity of municipalities

	Fiscal position	**%**
2010	15664075.00	99.56
2011	-31780833.00	100.95
2012	-22486165.26	100.69
2013	-35146789.00	101.03
2014	87394935.00	97.55
2015	57346046.00	98.45
2016	163795401.00	95.81
2017	-1615429.00	100.04
2018	130269645.00	97.36

Source: Authors' calculation.

By only observing municipalities (N=428) for each year, the results showed that, in five years (2010, 2014, 2015, 2016 and 2018), the level of fiscal capacity was positive. This means that, in those years, municipalities had enough revenues to cover all their expenditures and to finance their own capital and current expenditures in order to stimulate the local economic development of the municipalities.

The results of the fiscal capacity of cities are presented in Table 3.

Table 3: Fiscal capacity of cities

	Fiscal position	**%**
2010	-142248785.00	100.95
2011	-213144577.00	101.49
2012	40627599.00	99.72
2013	789780308.00	95.02
2014	-683461513.00	104.41
2015	283731024.00	98.08
2016	5940392.00	99.96
2017	-226237513.00	101.43
2018	16018530.00	99.91

Source: Authors' calculation.

The results of the fiscal capacity of cities (N=127) are very similar to those of municipalities. For each observed year, we noticed a similar situation to the previous table. By calculating the level of fiscal capacity, the situation is similar for cities, because we also have five positive years (2012, 2013, 2015, 2016, and 2018). This can be reasoned that cities as units of local government are trying to collect more revenues in order to establish local economic development and investment within one city. Moreover, the results showed that cities have more financial capability and responsibility within local government to establish and invest in smart cities and to create smart regions. Based on the analysis, we can conclude that, after Croatia acceded to the European Union, the local budgets of municipalities and cities also received revenues from European Union grants, which stabilized their budgets in 2015, 2016 and 2018.

Similar research was done by Bajo et al. (2015), where they calculated the fiscal capacity of 21 Croatian counties (20 counties plus the city of Zagreb) over the 2011-2013 period. The results of the analysis showed that the best average annual position was recorded in the city of Zagreb, which has the status of a city and county, followed by Istria county, Primorje-Gorski Kotar county and Zagreb county. Research by Erjavec et al. (2017) showed that, besides different levels of administrative governance, there is a positive correlation at the county and municipality levels between the fiscal success and the share of grants as part of the total revenue as well as the political affiliation at the local and central government levels. Our analysis showed that, over the 2010-2018 period, the fiscal capacity of cities was much better than that of municipalities.

This means that cities, although they have more responsibilities in public functions, also have more and stronger fiscal capacity to establish smart regions. Moreover, this will lead to the effective and efficient local development of public functions within the local public sector, with the aim to increase the living standards of the population.

5. Conclusions

The financing system of local governments is a broad topic that consists of various dimensions. The establishment of fiscal relationships between the central and local government levels is a very complex problem which requires a high level of transparency and economic activity. In addition, local government units should take responsibility and authority for the business for which they have fiscal capacity. The good quality of local and regional government policies is a precondition for providing efficient public functions and services to citizens. Therefore, cities, especially large cities, have been identified as the bearers of local development activities. One of the solutions is to establish smart cities and smart regions. This can only be achieved if policy decision-makers provide a stable local financial management system. The financing system of local government units, as part of the integral national system, should be in direct function of specific local government unit goals.

The objective of this paper is to analyze the fiscal performance of local government units in Croatia over the 2010-2018 period for the establishment of smart regions and smart cities. Our analysis showed that, over the 2010-2018 period, the fiscal capacity of cities was much better than that of municipalities. This means that cities, due to having more responsibilities in public functions, also have more and stronger fiscal capacity to establish smart regions. To achieve a higher level of the fiscal performance of local government units in Croatia, it is necessary to increase the fiscal autonomy and decentralization of public authorities The main task of the central state is to ensure an adequate level of fiscal autonomy for the local government units. This level of fiscal autonomy should be utilized to the fullest extent.

The limitation of this research is that we only observed aggregated data for each year. Therefore, a recommendation for further research is to run an in-depth analysis of all the municipalities, cities and counties for each year to investigate which municipality, city or county had the best fiscal performance. In addition, this will serve as a basis not only in scientific literature, but also among local and policymakers to generate the further development of smart cities and smart regions.

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CHAPTER 18

Cryptocurrencies, bitcoin and market bubbles[1]

Denis Buterin, Sanja Janković, Silva Klaus

ABSTRACT

Bitcoin is emerging as the cryptocurrency for the first time in 2008., and introduces a completely new financial concept on the market. Bitcoin is digital, decentralized money that is not controlled by any official institution. Due to significant changes in value that are solely the result of changes in supply and demand, bitcoin resembles a textbook case of a market bubble. Media attention has contributed to the mass of bitcoin trading, and it is possible to perceive similarities with tulip mania, a phenomenon marking Dutch economy in 16th century. Authors analyze technical trading indicators in order to determine whether they are really a market bubble or it can be considered as a good investment opportunity. Authors find that bitcoin is an example of market bubble whose value will drop significantly, regardless of current fluctuation.

Key words: cryptocurrencies, bitcoin, market bubble

JEL classification: C80, G11, G17

1. Introduction

In recent months, bitcoin has attracted a massive media coverage and put forth an entirely new financial concept on the market. This cryptocurrency is digital and decentralized currency, which is not being subjected to any central authority. Due to its significant fluctuations in supply and demand, Bitcoin became a highly interesting financial topic not only in economic circles, but with media and investors alike. It was often recognized as a lucrative investment opportunity, while emitting signs of a market bubble. This created a dilemma – was it a real investment opportunity or a market bubble on the brink of bursting?

Cryptocurrencies have recently become a hot topic and this attracted many speculative investors. That is the reason why this paper is analyzing market indicators to find if bitcoin can be seen as a good investment opportunity. With this in mind, a technical analysis was conducted with emphasis on price fluctuation and trading volume combined with available signals and conclusions.

The introduction is followed by a technical analysis on bitcoin market movements and interpretation of the findings is given afterwards. Authors are giving their views on future trends, their strength and possible breaking points.

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On the basis of main and medium term technical analysis, the authors conclude that bitcoin value will keep dropping as the negative trends continue. Authors have determined that fluctuations constitute a market bubble and that bitcoin cannot be regarded as good investment.

2. Literature review and methodology

Growing popularity of cryptocurrencies and their technological advance attracts those who are looking for a quick and large profit (Sajter, 2018). According to Yemerack (2015), it is commonly accepted that most people do not want to hold on to a rapidly depreciating currency, instead trying to get rid of it quickly. First significant increase in bitcoin value happened in 2011 and 2013 Cyprus financial crisis marks the moment when bitcoin first hit $250, gained increase in users and transaction numbers, followed by creation of first online exchanges. (Buterin et al., 2015). Technical analysis, which authors used to answer questions about future trends, their strength and possible breaking points, is based on Murphy's (2007) view that technical approach is based on three main premises – market trends, prices and history. Furthermore, Murphy classifies trends in three categories according to time – major, intermediate and near term, which were used to analyze bitcoin price trend. The analysis of moving averages, as the most common technical indicator, was used to identify and signal the beginning of a new trend or reversal of an existing one (Edwards and Magee, 2007). Sample method was used to observe the object of research in specific moments, which are put into correlation with moments that immediately precede and follow. To determine if negative bitcoin price trends are to be expected, analysis uses oscillators: momentum, relative strength index and MACD.

3. Empirical data and analysis

3.1. Cryptocurrencies and bitcoin

Cryptocurrencies have lately become a popular topic. While the advanced technology and inventive design attracted many, some were more interested in its potential for a quick profit. On January 1st 2016, price of one bitcoin was around $400, on January 1st 2017 around $1000, and one year later, on January 1st 2018 it skyrocketed to $13,000. This jump during only one year (from 2017 to 2018) acted as a magnet for speculative investors, resulting in another increase in value – reaching $18,000. But quickly the price went down to half of that amount. This intense oscillation is damaging bitcoin's chances to survive and spread to a wide user base, because few people would make payments in currency with a strong appreciation (they would be more likely to store it for future use). Similarly, not many people would want to own currency that depreciates greatly, instead they would try to sell it quickly (Yemerack, 2015). Main role of the central banks is preserving the value of money, but since the ground principle

of cryptocurrencies is financial system without institutions, including central banking (Nakamoto, 2008), this strong volatility is not surprising (Saiter, 2018).

First significant increase in value of bitcoin was noticed in 2011, when bitcoin was traded at around $30. During the Cyprus financial crisis in 2013, bitcoin value passed $250, which is also the time of rise in user and transaction numbers, which led to opening of first online exchanges (Buterin et al., 2015).

Chart 1: Average daily bitcoin price in 2011

Source: https://99bitcoins.com/price-chart-history/_(3/19/2018)

3.2. Bitcoin technical analysis

Technical analysis is one of the most widely used types of financial market analyses. This analysis through the use of charts to study market action with a goal of forecasting future price trends. Therefore, when conducting a technical analysis, the focus should be on price and volume. Technical approach is based on three premises (Murphy, 2007):

1. Market action discounts everything
2. Prices move in trends
3. History repeats itself

Each trade, when analyzed by technical analysis, should include charts with as many indicators possible, including supply, demand and price. Since knowing why the market behaves in a certain way is mostly impossible, technical analysis does not aim to find cause for prices to rise or drop. Instead it tries to understand the market before the trends are reversed. It can be said that technical analysis provides larger and clearer picture of a certain market, although each analyst has individual understanding of the charts that depends on his education, experience and other factors – which led to term “the art of

chart analysis". Technical analysis is the essential tool for short term and long term financial market trend analysis and is often more widely applicable than fundamental analysis. All of the tools that are used in technical analysis are designed to measure the market trend with the aim of timely participation in trend direction. Simply put, trend represents market movement, and it can be either downtrend, also known as bearish, or uptrend, known as bullish, or horizontal, known as trendless.

3.2.1. Time trends

Trends can be classified in three categories according to time:

1. Major (longer than one year)
2. Intermediate (up to six months)
3. Near term (two to three months)

Chart 2: Major and intermediate bitcoin price trend

Source: authors' edit of https://www.coindesk.com/price/ (3/19/2018)

Each trend becomes a portion of next larger trend. Chart 2 shows major and intermediate trend for bitcoin price from January 1st 2017 until March 18th 2018 which is suited for long term analysis. The beginning of the observed time span also marks the lowest price - $997.69 on January 1st 2017. From thereon bitcoin price rises constantly, reaching an all-time high on December 17th 2017 - $19,086.64. After that day, the price is falling, but with periods of shorter price downtrends and uptrends. Lowest price point happened on February 5th 2018 - $6,914.26, which is almost the same as on November 14th 2017 ($6,598.77). Lowest price points, at which the price direction changes, are called support levels, and it is where the buying interest is strong enough to overcome selling pressure. Opposite situation is resistance level, which is a price level at which

the pressure of selling interest overcomes the buying pressure and that makes price stop rising.

Chart 2 shows that bitcoin price started to downtrend on December 18th 2017 and lasted until December 22nd, when it recovered shortly, with support level ultimately forming on December 30th 2017 at $12,629.81. Resistance level at $17,135.84 (January 6th 2018) hinted a new bitcoin fall, which soon followed. Bitcoin quickly smashed the support level and drops to $11,694.47 on January 28th 2018, which meant continuation of the downtrend. Former support level became the new resistance level, but even that did not last because of the increased strength of the selling pressure. So the price kept falling until it reached $6,914.26. A short recovery brought bitcoin price up to $8,196.02 on March 18th 2018.

3.2.2. Moving averages

Moving average is among the most widely used technical analysis tools. It represents an average of a certain body of data, and simply put, it is a tool used to timely identify trends. It aims to identify and signal the beginning of a new trend or the reversal of an existing one (Edwards i Magee, 2007).

Chart 3: Moving averages

Source: authors' edit of https://www.coindesk.com/price/ (3/19/2018)

A short moving average will give out a signal sooner, opposed to a long moving average, which will give out a signal later, but with more reliability. After the lines are intersected, trend reversal can be expected. Moving averages lines in Chart 3 do not look like they will intersect in near term, so it can be expected that the trend will remain negative or that, the very least, there will be no significant reversals of the price.

There is no consensus on which moving average is best used in a given moment, long term or near term. Moving average follows the market and points

that the trend exists, but explicitly post festum, i.e. after it happens. Chart 3 shows the double crossover method, in 45 and 90 day values.

3.2.3. Oscillators

Oscillators are used as an analysis technique in nontrending markets. Those are tools that enable a better trend evaluation and are considered as secondary indicators, most useful near the trend end. In order to determine whether bitcoin price downtrend could be expected to end, the following oscillators were used (Murphy, 2007):

1. Momentum
2. The relative strength index
3. MACD

Chart 4: Momentum, relative strength index and MACD

Source: http://www.stockcharts.com/ (3/20/2018)

3.2.3.1. Momentum

Momentum is the basic application of oscillator analysis and it measures the velocity of price changes by continually taking price differences for a fixed time interval. It shows the difference between prices in two points in time. If prices are rising and the momentum line is also rising and it is above the zero line, the

uptrend is accelerating. When momentum line goes below zero line the trend is going down. If the up-slanting momentum line begins to flatten out, means that the gains are equal to those in the given time interval. That means a longer momentum should be used to identify the trend reversal more easily.

The formula for momentum is:

M= V-Vx

V= the latest closing price

Vx= the closing price x days ago

Chart 4 shows momentum 35, 20 and 10. From November 1st 2017 until December 17th 2017 momentums 35 and 20 are accelerating and from December 18th 2017 downtrend gains momentum. Starting from February 5th 2018 the trend goes down. Momentum indicates that the trend will continue being negative, so the price can be expected to drop.

3.2.3.2. The relative strength index

To ensure clearer trading, relative strength index is used alongside momentum. When constructing momentum lines, there are two major problems (Murphy, 2007):

1. Sharp changes in the price values being dropped off
2. The need for a constant range in which the oscillator could move

Relative strength index provides smoothing of those distortions. Problem of sharp changes in the price being dropped off manifests itself when sharp increase 10 days earlier can cause sudden shift in momentum line, regardless of price staying more or less the same. Relative strength index also solves the need for constant range in which the oscillator could move, by fixing it between 0 and 100. This oscillator is considered to be more sensitive the shorter the time period.

Relative strength index is calculated as follows:

IRS= 100-100/(1+RS)

RS is the average gain of up periods during the specified time frame / Average loss of down periods during the specified time frame.

When interpreting the relative strength index, a term “failure swing” is used to describe situations when index is below 30 or above 70 points. It occurs when a peak of the relative strength index fails to exceed a previous peak in an uptrend, followed by a downside break of a previous trough. Downtrend displays an inverted situation. Chart 4 shows the relative strength index. The indicator shows that it is currently overbought, which should result in continuation of the downtrend and loss in value.

3.2.3.3. MACD (Moving average convergence/divergence)

MACD indicator is used to detect shifts in strength, direction, momentum and duration of a trend, and also shows relation between two moving averages of closing prices. MACD consists of two lines – faster and slower. The faster MACD line is the difference of two exponentially smoothed moving averages of closing prices. Slower line (known as the signal line) is usually a 9 period exponentially smoothed moving average of the MACD line. Most commonly used are 12, 26 and 9 periods, which are also shown on Chart 4. When the lines cross, the buying and selling signals appear. Bear signal occurs when MACD falls below the signal line and vice versa, MACD above that line is a signal to buy.

4. Results and discussion

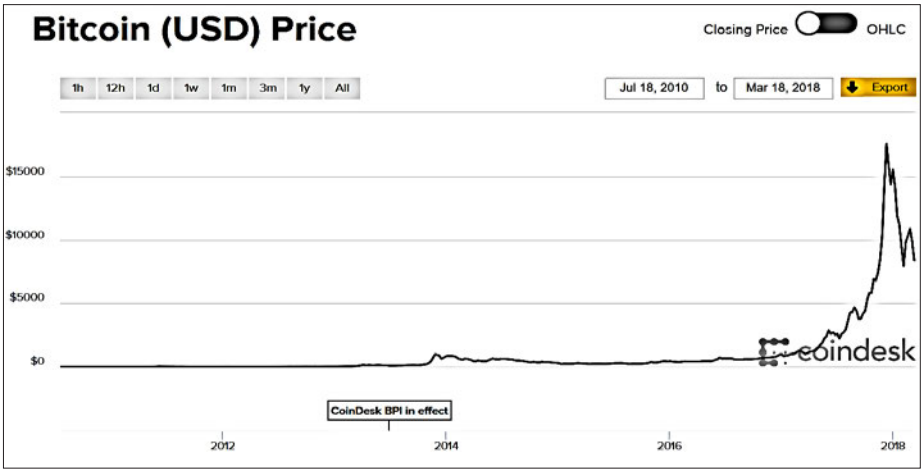
Conducted technical analysis suggests that bitcoin price went down rapidly from December 18th 2017 to February 5th 2018, when it reached a low point of $6,914.26 where a strong support line was formed. Lines cross three times within the observed interval, on December 19th 2017, February 13th 2018 and March 12th 2018. In the first case, MACD crossing meant bull signal. In the other two instances MACD crossed below the signal line, so it represented a bear signal, i.e. signal to sell.

Momentum suggests that bitcoin price will continue to downtrend. The relative strength index is momentarily overbought what should result in continued downtrend and loss in value. In the observed period, two out of three places where MACD lines are crossed are selling signals. Technical analysis shows that bitcoin price can be expected to fall significantly, and further moving average crossings below the signal line can be expected. Furthermore, in the following months negative trend can be expected to accelerate.

In order to use the technical analysis efficiently, trader psychology and its effect on market needs to be understood. Assets, like shares and bonds, always follow cycles that include unforeseeable market movements determined by supply and demand.

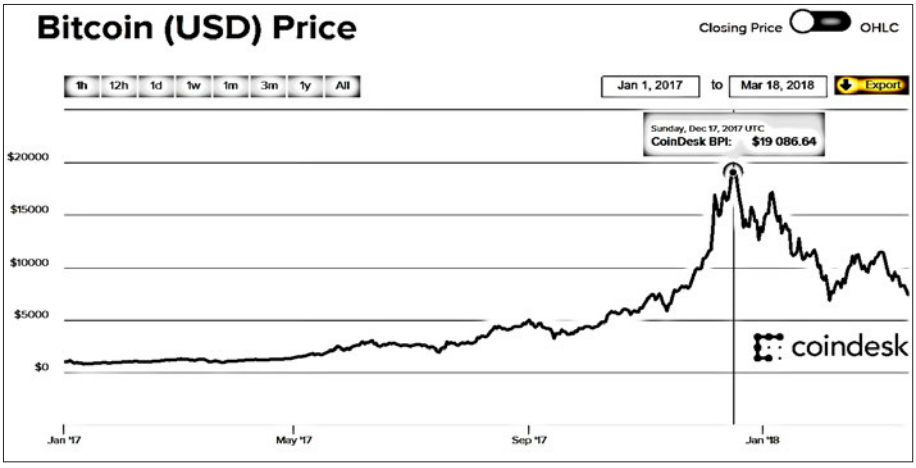
Precisely this unstable movement that is primarily fueled by “mass psychology” suggests that we are looking at a market bubble. Market bubble is characterized by steady buying until a first major increase in price sparks a mass buying frenzy. It is usually a novelty on the market coupled by unfounded rise in value and high demand. Those indicators create sudden price jumps beyond any rational level. Market is then bound to fall significantly, followed by what seems a recovery period, only to ultimately crash.

Chart 5: Bitcoin price movement from 7/18/2017 to 3/18/2018



Source: https://www.coindesk.com/price/_(3/19/2018)

Chart 6: Bitcoin price movement from 1/1/2017 to 3/18/2018



Source: https://www.coindesk.com/price/_(3/19/2018)

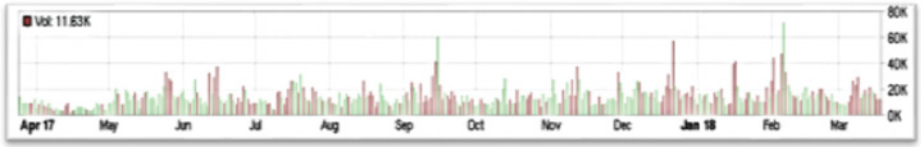
Chart 6 shows bitcoin price value from January 1st 2017 to March 18th 2018, which shows stages of possible market bubble. In this period larges changes in bitcoin value were recorded – including the all-time high of $19,086.64 on December 17th 2017. From that date onwards, price is going down with some temporary reversals, but it never gets back to that level. On March 18th 2018 bitcoin closed at $8,196.02, which is 42.94 % less than on December 17th 2018. Back in 2013, Paul Krugman warned that bitcoin is not suitable for storing value and he concluded that bitcoin investors surely must realize that (Krugman 2013).

Chart 7: Bitcoin closing price and trading volumes from 3/18 2017 to 3/18/2018.

Source: https://Bitcoincharts.com/_(3/19/2018)

Looking at Charts 5, 6 and 7, a similarity between bitcoin price movement and that of a market bubble can be noticed, which is a sign for great caution when trading in this cryptocurrency.

Chart 8: Bitcoin trading volume from 3/18 2017 to 3/18/2018.



Source: https://Bitcoincharts.com/ (3/19/2018)

Looking at the bitcoin trading volumes from March 2017 to March 2018 it can be concluded that high volume of around 60,000 was recorded in mid-September 2017, which was then repeated in December 2017. Around the second high selling volume, on December 18th 2017 downtrend gains momentum. By far the highest volume, of roughly 70,000, happened in early February 2018. After, trading volume is decreasing.

Parabolic upward price movement is common for market bubbles, and for bitcoin it started roughly a year ago, in spring of 2017. During this ascent, bitcoin doubled in price every 30 to 60 days (Soberman, 2018). Although the price was significantly corrected immediately after hitting the $19,000 peak, the usual bubble collapse has not happened yet.

Bitcoin price movement and trading volume analysis clearly show market bubble stages, which leads to conclusion bitcoin is a classic example of such bubble. Bitcoin's attributes classify it as a bubble, since it is a market phenomenon when demand is above every rational level. It can be connected to flawed belief that the market bubble will grow indefinitely, which makes almost everyone wanting to buy, despite the fact that the burst is only a matter of time, because the bubble has no real foundation. Bitcoin comes with no such foundation or any kind of guarantee. Price gains and rapid ascent cannot be justified with something real (Sinha, 2014).

Technical analysis made the basis of historical indicators, as this one, makes us conclude that bitcoin is not a good investment opportunity at this point. Although bitcoin still holds a high price point (March 2018), it is important to note that all of

its key indicators and stages coincide with those of a market bubble. Oscillators show that bitcoin price downtrend is highly probable and that the value will fall. Oscillators undoubtedly indicate strengthening of the negative trend.

Considering the fact that, throughout history, market bubbles caused huge losses for investors, it can be said that bitcoin is not a good investment opportunity. It is worth having in mind, that regardless of trends, short term and sudden gains are possible due to extreme volatility and mass effects, which in turn makes even short trading bitcoin highly risky.

5. Conclusion

Although bitcoin exists on the market for almost ten years, for most investors it has only recently become an opportunity for speculative investment. It was designed as a financial instrument for direct payments outside of any central authority, but it is now primarily interesting to the wider public due to its price volatility. Bitcoin price is solely determined by supply and demand. Bitcoin's practical value has not changed considerably since it entered the market, but the perception of its trading value has. Especially when it comes to its potential for financial speculation. In turn, this led to increased demand and generated further price increase. Parabolic bitcoin price movement that soon followed, confirmed that this might be a market bubble. Technical analysis suggests that bitcoin price and trading volume will fall. It has already changed the perception on bitcoin's potential which reflected negatively on demand – which was the main generator of price increase. Therefore, bitcoin is facing further selling pressure, and so the price downtrend is highly probable.

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CHAPTER 19

The significance of risk identification and quantification during the preparation, contracting and implementation of smart cities projects[1]

Davor Vašiček[2] Damir Juričić[3] Saša Marenjak[4]

ABSTRACT

Smart cities projects, as with any investment, carry a series of risks stemming from internal and external factors. Risk materialization throughout the lifecycle of a project determines the efficiency of a project, i.e., the degree to which goals are achieved as defined at the beginning of the project. Accordingly, procedures for identifying (defining individual risks) and quantifying (determining the financial value of the risk) are particularly important for proper preparation of a smart city project.

These projects, unlike other public projects in the area of social and economic infrastructure, where historical data exists and which can be used to determine the likelihood of risk distribution, are characterized by a lack of data and a relatively "wider" distribution of probability.

This article defines the role and significance in the process of risk quantification using practical examples, and proposes a method for deriving the cost (income) and risk from probability distribution risks when contracting smart city projects, and when the project is procured by a traditional or alternative procurement model such as public-private partnership.

Key words: smart cities, risks, contracting, financial modelling

JEL classification: G38, H80.

1. Introduction

Today, preparing any type of investment project, including public projects, without a particular analysis of projects risks is unacceptable. Every investment consists of an entire series of risks, the materialization of which may significantly change the values of expected outcomes. On account of this assertion, which does not require specific proof as it stems from indisputable personal experience

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in communicating the present and future, i.e., the relationship between today's investments and expected outcomes in the future, for any public administration orientated to the provision of public goods and services representing the greatest value for money, particular importance is given to processes in identifying, quantifying and mitigating risks. Whereas risk analysis in developed countries is an integral part of the preparation process for any (larger) public investment (British Columbia, 2018), in other countries there is almost no idea or need for systematic risk analysis, devising a catalogue of risk, quantitative and qualitative validation, defining risk management strategies, and the like. While in developed countries, the preparation process and assessing value for money focus on total existential costs of public projects (SCI-Network, 2011), the risks of which are an integral part, in other countries there is a prevalence of an orientation towards capital costs as the key criterion for assessing social acceptability and economic feasibility of public projects. What is in fact risk in public projects and why is risk management in public projects so important? There are numerous definitions of risk. Each of them originates from the experience of the risk assessor of the actual risk phenomenon. Hence, risk refers to any negative or harmful event which may occurring in the future and the occurrence of which distances the actual outcome (benefit) from the excepted outcome. On the other hand, risk is also understood as a possible outcome of a different likely event across an entire domain of possible events, hence this approach in defining risk also include positive and negative outcomes and effects, and is described as the total distribution of probability on the domain of possible events (Day, 2009; IBRD; WB; ADB; IADB, 2014). However, in wider professional and lay circles, risk refers to outcomes of an undesirable and harmful event (Vose, 2008).

The practice of creating feasibility studies is narrowed down to the process of calculating resulting values of investment outcomes based on numerical values of input parameters. These values are in most cases single values, and most often represent values with the greatest single probability (ML – most likely). In such analyses and for the purpose of risk analysis, sensitivity analysis is most often where the effect of changes in one parameter on another parameter are analysed. A change in one parameter takes place under circumstances of equal probability. This process fails to provide the best picture of project risks nor information on risk adjusted output values of a project.

The method proposed in this article includes tri-parameter values for each output parameter (financial indicators in business projections) which determines the probability distribution of a particular parameter. This leads to the inclusion of the ML parameter from the standard analysis of the feasibility study, and also minimum (Min) and maximum (Max) parameters as well as a certain probability distribution function (PDF). Based on these parameters, projects risks are extracted in a simple manner for project phases (construction, exploitation) and the risk adjusted output value of the project can be calculated.

This paper explores solely the method of extracting risks from the financial values of a public project business as described by certain distributions of values.

The subject of the paper involves not methods of assessing the best distribution of probability nor detailed methods for analyzing risks, separation of volatility from uncertainty, identification processes and risk allocation, the purpose and justification of applying the Monte Carlo method and the like.

2. Risks in smart city projects

In recent years (Angsana, Shuguang, 2010), cities are coming under increasing pressure to transform education, health care, transportation, civic engagement, public safety as well as other government services in order to maintain their competitiveness and improve quality of life for their inhabitants. Cities in the digital age are important actors in global economic and social development. With decreasing budgets and rising expectations of citizens,[5] an understanding and the utilization of modern technologies is critical for the efficiency of local governments. In addition, issues such as climate change and population growth are straining existing infrastructure, and also accelerating the evolution of smart cities. The basic risks faced by cities today are security, adoption and data. As local governments begin the evolution into smart cities, devices and systems utilized across governments will have greater interconnectivity than ever before, working together in real-time to improve various efficiencies. A more integrated government though, places greater concern on malicious attacks and system failures. Without effective cybersecurity, the potential for such vulnerabilities occurring in a smart city environment grows due to increased interdependencies brought about by the Internet of Things, artificial intelligence, automation as well as other emerging technologies. Effective user adoption is critical in smart city environments; without proper user adoption, the risk of human error can be extremely damaging.

At the project level, smart cities projects are organized as systems that have their own revenue, costs, investment value, and as projects fulfil certain requirements of inhabitants, the economy and other social spheres. However, as cited by the European Commission (2013), the implementation of such projects is encountering obstacles, such as: (i) perception of high risk when investing in innovative solutions and energy efficiency measures, (ii) uncertain energy price policies and uncertainty about fossil fuel prices, (iii) large volumes of investment required, (iv) long-term delays before reaching maturity/profitability and (v) limited capacity for public funding – high public deficits in municipalities and lacking capacity to raise funding from capital markets. Overcoming these obstacles or barriers in implementing the projects requires devising instruments and tools to facilitate decision making regarding project implementation during the preparation phase of smart cities projects and based on quantitative analysis of total living costs which are an integral part thereof, all in compliance with standard HRN ISO 15 686-5:2008 (HZN, 2009), and including identified and quantified risks. Considering the large gap between developing the discipline

5 https://efficientgov.com/blog/2018/11/27/why-smart-cities-need-risk-management/

of identifying and quantifying risks, and the very sparse practical application of these methods in processes involving preparation of smart cities projects, the nature of the procedure for financial modelling incorporating quantified risks, the deterministic method of risk quantification which we propose in this paper may present a manner of partially overcoming this gap.

3. Simple deterministic method to include risks in the preparation of smart city projects

Generally speaking, in the project preparation phase, which also includes public smart cities projects, a sensitivity analysis is often used. It is a financial modelling tool for verifying or determining the effect of changes in a single parameter or group of parameters on the final result of a public project.[6] Sensitivity analysis is used in cases when verifying the effect or risk materialization which may occur due to changes in particular project parameters. Sensitivity analysis, in addition other risk analysis models, is recommended by the European Commission in procedures for analysing and preparing public projects (European Commission, 2014). The purpose of sensitivity analysis is to identify the effect of critical parameters on the final desired outcome of a project, most often in the form of the Financial Net Present Value (FNPV) or Financial Internal Rate of Return (FRR). In line with the European Commission's recommendation, the ultimate goal of applying sensitivity analysis is to answer questions, such as "To what extent can the value of a certain parameter in a public project be increased or decreased (capital costs, revenue, operational costs, interest rates, and the like) in order for the indicator (e.g., FNPV or FRR) to have a zero value?"

However, though useful in practice, an important feature of the described manner of using the sensitivity analysis is that it facilitates measuring outcomes (e.g., FRR or FMPV) of changes in a parameter (e.g., capital costs of a public project or revenue) of equal likelihood. The range of tested changes in parameters is equally likely across the entire domain of a particular parameter. This is one of the more significant limitations on the presently applied sensitivity analysis. The final goal of such an analysis is the risk adjusted outcome of a public project (for example, risk adjusted financial rate of return – RAFRR or risk adjusted financial net present value – RAFNPV), where the parameter variation and the effect of its change is tests equal likelihood across the entire domain of change.

The Model

The model we use to present the procedure and prove the hypothesis is the classical model of investment discounting and the project exploitation effect in the utilization phase (revenue and expenditure). The investment refers to investing in the present, whereas exploitation of revenue and expenditure is the result of the investment in the future. The output value of the model is the

6 https://corporatefinanceinstitute.com/resources/knowledge/modeling/what-is-sensitivity-analysis/

Financial Net Present Value (FNPV) and the Financial Internal Rate of Return (FRR) for a public project (EC, 2014):

$$FNPV(P) = -PV(I) + PV(R) - PV(C) \quad (1)$$

where FNPV(P) project financial net present value, PV(I) present value of investment, PV(R) present value of revenue and PV(C) present value of the costs. Present values are discounted applying specific discount rate.

Importantly, it should be pointed out that most often, in deterministic single-parameter feasibility studies, the values of I, R and C are values with the highest individual probability, i.e., ML – most likely values.

Our proposal to advance the existing deterministic method applied in the investment feasibility study is to show present each parameter as three parameters, in terms of a parameter with a certain probability distribution. In this way, the analysis becomes transparent and providing a simple approach to extracting risks from costs:

$$RAFNPV = -PVI[D(Min; ML; Max)] + PVR[D(Min; ML; Max)] - \\ -PVC[D(Min; MI \quad (2)$$

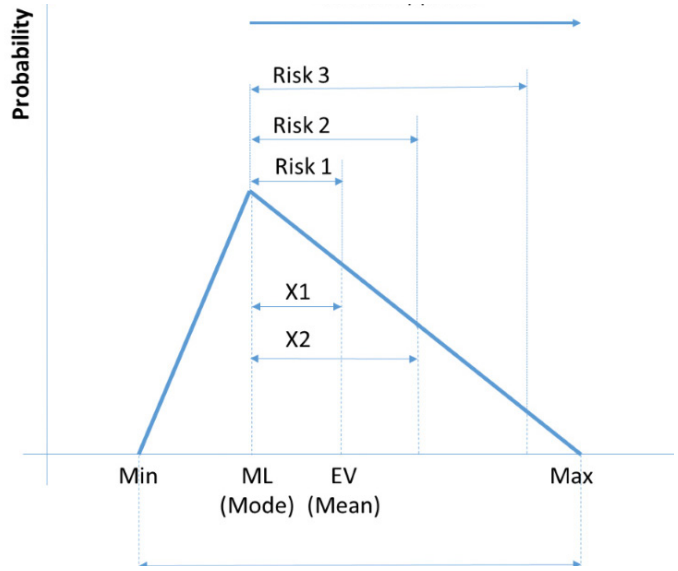
where RAFNPV – risk adjusted financial net present value, D – probability distribution function (PDF), Min – minimum value parameter of PDF, ML – most likely parameter of PDF, Max – maximum value parameter of PDF.

Extracting risks from the distributions

Using the system described in (2), it becomes possible to extract the risk value from the defined probability distributions. On account of a simpler presentation, in our case we used the measure of risk as the difference between EV and ML, even though the risk value depended mostly on the “risk appetite” (Nelkin, 1989; Quintel, 2012; HZN, 2018). This is shown pictorially in Graph 1. Once the selected procedure has determined the probability distribution which best reflects the volatility of a certain parameter, a comparison of EV and ML (in our case) enables us to also determine the risk value of the respective parameter.

The rationality in this approach to defining risk within a given probability distribution is as follows: if the probability distribution is described using three parameters (Min, ML, Max), then its expected value (EV) on the entire domain [Min, Max] or the median value of a single part of the domain can be calculated, for example, [ML + X; Max], where ML < x < Max. The larger X is than ML, i.e., the smaller it is than Max, the larger the risk value. Using the example from the Figure 1, X1 < X2, hence Risk 1 < Risk 2. The situation where the value of X is greater means s smaller “risk appetite”, i.e., a smaller inclination to assuming risk, in other words, it refers to a risk-averse person.

Figure 1: Relation between parameters of PDF and risk value



Source: Authors.

Due to simplicity of the presentation, in our example we took a situation where the subject doing the investing is inclined to assume risks, i.e., has a large "risk appetite". Accordingly, risk represents the difference between EV and ML. The expected value represents the median value of all generated parameter values (Vose, 2008). The greatest probability that the actual parameter value assumes a certain value actually lies in the EV point or its proximity. On the other hand, predicting business in the project is most often done using data which is considered most likely independent of the probability distribution form. This is the value of ML (Mode) in Figure 1. Depending on the other parameters and form of the probability distribution, the values of EV and ML will be distanced varyingly. If EV represents a parameter value which most likely will occur when taking into account all possible combinations of expenditure values and probabilities across the entire domain, and ML has the parameter value with the greatest probability regardless of expenditure values and probabilities across the entire domain, the deviation of ML from EV may represent the actual risk (Risk 1 shown in Figure 1). This has a magnitude expressed in units of the parameter measured (cost) and represents the distance of the most likely values of the parameter from its median value (EV-ML). In another instance where the inclination towards assuming risk is less, the value is the difference between, for example, the median value (EV) of the second half of the probability distribution for the domain [ML, Max] and the most likely value (ML). In that case, the extracted risk will be greater, whereas the risk adjusted output value will be smaller.

Illustration of a use

This method of extracting risks from the probability distributions can be applied in procedures for drafting feasibility studies. The manner of this use is shown as an example in Table 1.

Table 1: Structure and projection of the project's inputs described with PDF

Item	1	2	3	4	5	6	7	8	...	20
Capex	**1.767**									
Construction	1.200	T								
- Min	800									
- ML	1.300									
- Max	1.500									
Construction Risk	-100									
Risk in ML	-7,69%									
Furnishing	567	T								
- Min	300									
- ML	400									
- Max	1.000									
Furnishing Risk	167									
Risk in ML	41,67%									
		P	P	T	P	T	P	T	P	P
Revenues	**0**	**750**	**756**	**725**	**770**	**754**	**785**	**787**	**802**	**812**
- Min	0	400	392	384	376	369	362	354	347	340
- ML	0	800	800	800	800	800	800	800	800	800
- Max	0	900	945	992	1.042	1.094	1.149	1.206	1.266	1.330
Revenue Risk		-50	-44	-75	-30	-46	-15	-13	2	12
Risk in ML		-6,25%	-5,48%	-9,32%	-3,78%	-5,71%	-1,87%	-1,65%	0,28%	1,46%
Opex	**0**	**442**	**493**	**451**	**513**	**462**	**468**	**475**	**481**	**489**
- Min	0	350	343	336	329	323	316	310	304	298
- ML	0	400	400	400	400	400	400	400	400	400
- Max	0	700	735	772	810	851	893	938	985	1.034
Opex Risk		42	93	51	113	62	68	75	81	89
Risk in ML		10,42%	23,17%	12,83%	28,31%	15,57%	17,07%	18,67%	20,37%	22,17%
Difference ML	**-1.700**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**
Difference ML + Risk	**-1.767**	**308**	**264**	**274**	**256**	**292**	**317**	**312**	**321**	**323**

Source: Author's simulation.

The standard procedure for drafting a feasibility study requires a projection of business based on a single parameter from individual financial indicators along with a subsequent application of sensitivity analysis for the purpose of estimating the capacity of a project in assuming risk. This means that in standard feasibility studies, the projection is prepared most often using ML values as shown Table 1. In terms of the suggested method, projections are prepared so that each financial indicator in the business projection is expressed using three parameters which also describe a specific probability distribution. The projection in Table 1 was devised using two probability distributions: Pert and Triangle. Results of the projection from Table 1 are shown in Table 2.

Table 2: Values of the project's outputs

Name of the output parameter	**Value of the output parameter**
Project financial ret of return – ML (FRR (C) – ML)	23.07%
Project financial ret of return – MML+Risk (FRR (C) - ML + Risk)	15.72%

Source: Author's calculation

The standard procedure for drafting a feasibility study calculates the FRR for a project based on the ML value. This calculation procedure results in a value of 23.07% for the annual value of FRR(C). Howefer, when applying the proposed deterministic method, the calculation for FRR(C) also incorporates risks, hence the value of the risk adjusted FRR(C) is reduced to 15.72% annually, i.e., by 31.9%, which is a significant deviation of the risk adjusted value (RAFRR(C)) from the probability distribution (MLFRR(C)).

The possibility of extracting risks using the described deterministic method of estimation is especially useful in procedures for estimating value for money (VfM). The procedure for estimating value for money compares wo technological options within a single public project procurement model or two different procurement models. In such estimation procedures, risks often have a significant effect on the final value for money. Consequently, risks should be specifically highlighted, which is in fact this method does.

Limitations of the model

Though the deterministic method of estimation, as described in this article, is a practical approach for calculating risk adjusted output values of a project, it nonetheless has limitations in terms of results which can be obtained using the probabilistic method of estimation. Namely, this method cannot calculate the probability of the onset of a certain event on part of the domain [Min, Max], which is possible using the probabilistic method along with application of Monte Carlo simulation.

4. Conclusion

The aim of this paper is to advance standard procedures for drafting feasibility studies using a deterministic method of estimation incorporating risk adjusted output parameters for public smart cities projects. The improvement is apparent in the inclusion of probability distributions when determining values of particular financial categories. The reason for developing this estimation method is the need to extract risks from probability distributions and presenting two fundamental parameters: ML and Risk. This method better describes risk adjusted output parameters for public projects, but also enables estimation of value for money by comparing various technological investment options within the same procurement model or by comparing different procurement models for public projects. However, it has its limitations which can be overcome, for now, only by applying probabilistic methods of estimation using Monte Carlo simulation.

Future research

Given that in presenting this method and proving similarity of the results with the probabilistic Monte Carlo method, only a single measure of risk (EV-ML) was used, further research should focus on calculations in terms of which various measures of risk which can be presented in a simple manner as described

by ‘’risk appetite’’, i.e., different inclinations towards assuming risk. This research was orientated toward calculating expected values of different parts of the distribution domain on the area between ML and Max parameters for selected probability distributions.

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CHAPTER 20

Impact of Industry 4.0 technologies for Business Services in Hungary

Robert Marciniak[1]

ABSTRACT

The impact of new digital technologies is all around us. They change the way of what, how and why we do in our personal and professional lives. Many time these technologies are cited as Industry 4.0 but they are prevailing in other sectors as well. These technologies could be transformative in many segments of the economy and there are signals that the service sector is also changing due to digital technologies. This research aimed to understand the implementation of new, mostly service delivery automation technologies within business service segment that is one of the most developing service segments in the last 15 years. The research includes an online questionnaire and an interview series to answer how game-changer could the technology be in the business services and what kind of change could we expect. The research paper summarizes the main possibilities that Service 4.0 as a digital technological framework mean and how it differs from Industry 4.0. The technologies also drive the business model of organizations and in the business services segment, there are more evolutionary stages of service delivery. The research introduces the intelligent service delivery model as the next step for leading-edge business service centres built on new digital technologies.

Key words: Shared Services, Services 4.0, Digital Transformation, Digital and Automation Technologies, Intelligent Service Delivery

JEL classification: M16, F23, M19

1. Introduction

Just as the Internet revolutionized the business environment a few decades ago, technological advances now dictate the pace of development in the whole economy and society (Scholten, 2017):

- automatic information sharing amongst machines (machine-to-machine, M2M) and machine to product/parts;
- process flexibility and product customization, which seems to go against recent standardization, but is often used in combination with it;
- increasing the importance of relationships and networks between manufacturing plants, consumers and business partners.

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As a result of automatic information sharing and networking, a new business paradigm has emerged, known as servitization. In fact, this means a steady growth in the service sector, in contrast to the other two sectors: industry and agriculture. For example, by developing data-based services for sharing information between machines and products connected in production, and thus creating predictive maintenance, they become an integral part of production activities. And process flexibility and customization have enabled companies to meet the unique needs of their customers. (Scholten, 2017) (Govindarajan & Immelt, 2019)

The German government created a high-tech strategy in 2011 for its industry that is called as Industry 4.0. The strategy states that using of new digital technologies the society and the economy can reach the level of 4th industrial revolution, a new stage of technological evolution that could be explained as a virtual economy with a lot of connected technologies and devices. Industry 4.0 technologies combine the physical and digital world with a 3-stages loop. In the first stage, technologies capture information from the physical world and create a digital record from physical data, then in the second stage technologies share information with other devices and in the third stage technologies apply algorithms to translate decision from the digital world into movements in the physical world. This industry 4.0 strategy includes 9 different technologies: advanced robotics, additive manufacturing, augmented reality, simulation, horizontal/vertical integration, industrial internet of things, cybersecurity, cloud and

big data and analytics (Colotla, és mtsai., 2016). Most of them are not limited to the industry but available in other sectors as well. Industry 4.0 is a global concept, which has many forms and constituent parts. In US, the term is used more holistic and the focus is on the digital supply network, but in Europe, it is more factory-based. (Cotteleer & Sniderman, 2017)

One area that stands out from the continuous growth of the service sector is the business services segment, which covers the services that one organization provides to another organization or organizational unit on a business basis. These services can be very different (e.g. financial and accounting services, business analysis, marketing research, etc.) but they have in common that they always cover intellectual activities.

In the last ten years, business services have been the second most dynamically developing sector in Hungary, only the automotive industry is ahead of it, but in a few years FDI for business services has even overtaken the automotive industry as well. When not, it was steadily in second place. In terms of FDI, the business services sector is globally 3rd - 5th position, even ahead of the info-communications sector. And with that, the government's attention was drawn to the sector. There is now a targeted support policy to stimulate growth in the sector. This was, of course, due to the fact that the segment is difficult to define because of the diversified scope of activities, thus its development was less transparent, detectable, and for a long time, the focus was on the low value-added services. While the former has not changed much, the latter has seen a spectacular transformation over the years. Today, only half of the companies in the segment focus on low value-added or transactional operations, and more or more companies have already made quality changes to their service portfolio.

This transformation has been specially accelerated by the digitalisation wave of recent years, which has enabled companies to automate and robotize low-value-added activities using software solutions, even replacing significant human work. It is a characteristic of the sector that the freed up the workforce is not laid off but provides them with higher value-added activities.

2. Literature review

2.1. Service transformation

In the advanced economies, about 70% of the GDP comes from the service sector. Using new technologies in the service sector (called Service 4.0) holds great promise for enabling service providers to respond to the challenges of increasing cost pressure, evolving customer behaviours, and an unstable competitive environment. It represents a significant change in performance, affecting how companies both offer and deliver services. (Matt, Hess, & Benlian, Digital Transformation Strategies, 2015)

Service companies lag far behind industrial companies in applying technology to improve operational efficiency and enhance client satisfaction (Rehse & Raj, Lean Services - A Primer for Success, 2012). It is based on the differences between expectations and features of products and services. In the service delivery, the focus was on the client's demand and not on the efficiency. But as service sector expanded (servitization), there is more and more mass service delivery (e.g. utility, ICT, bank, etc.) where the efficiency also became a key point in the operation. After this recognition, the service sector began to adopt those methodologies and technologies like the industry. However this is not a new phenomenon, the service sector is still at the beginning of this road. According to BCG (2016) research, across service industries, the typical waste level is between 40% and 50%. The telecommunication is one of the most inefficient service industry with 50% of cost eaten up by waste, but there is not so much better situation in the energy, banking, insurance, health care and government segment as well (Rehse, Hoffmann, & Kosanke, Tapping into the Transformative Power of Service 4.0, 2016) (Vandermerwe & Rada, 1988).

The inefficiency of service industry is based on several sources which could be also analysed by lean waste categories. Many times there are overprocessing in service delivery because of unnecessary use of expensive systems and resources e.g. based on unneeded system complexity and functions. There are several "overproduction" as well with excessive service and output levels, which have an insufficient link to customer value. In multiple data entries there are typically too many unnecessary physical activities and processes or at data lookups or validation tasks, there are many manual works that can be automated or eliminated by technologies, which means transport and motion waste in service provision. The services also include defects and rework but the quality problems of services hinder the downstream processes and the necessitate rework. But large stockpiles of physical goods or a backlog of troubleshooting tickets or inefficiencies that result from waiting for resources or slow processing also result inventory or waiting wastes of service provision. But use of overqualified employees for simple tasks or underqualified labour for complex tasks also leads an improper utilization of skills. (Rehse, Hoffmann, & Kosanke, Tapping into the Transformative Power of Service 4.0, 2016) (Khan, Rahul, & Lunawat, 2017)

Another reason for service transformation is rooted in customer needs. Nowadays the companies are realizing huge expectations from the user side who could be customer or employee as well. Users expect service interaction to be simple, intuitive, proactive, and personalized. Customers want real-time access to service providers and seamless interactions across multiple channels independently from their presence at home or at work. They experience quick, flexible and convenient digital entertainment service provisions in their private lives and expect similar high-level services in their professional lives. Few leading services provisions could impact the whole economy and society through the digital transformation of client expectations. (Sebastian, et al., 2017)

Gaining a competitive edge, some companies use advanced digital technology to enhance offerings, meet and often exceed customer expectations. These companies integrate external data and internal data to build big data and create holistic customer profiles and make real-time, personalized offers for customers. They also respond swiftly to complaints and provide customers with simple, interactive tools that make advice visible and easy to access. (Matt, Hess, Benlian, & Wiesbock, Options for Formulating a Digital Transformation Strategy, 2016)

According to BCG research, we can recognize an evolutionary path of service providing and classify it into four stages. Service 1.0 means the basic level of service provision where manual, non-standardized services enabled by different tools. Adopting the results of scientific management, in some service segments like telecommunication, logistics or banking, the standardized, industrialized, remote and labor-intensive service provision emerged. Due to these changes, service 2.0 brought efficiency into the service provision. In the late 20th century, the computer and Internet brought service 3.0 that focused on the self-service enabled by mobile technologies. Self-services reduced the labour intensity and improved customer experiences. In recent times, new service technologies allow service 4.0 that integrates the empathic, frictionless end-to-end processes enabled by new emerging digital technologies. (Rehse, Hoffmann, & Kosanke, Tapping into the Transformative Power of Service 4.0, 2016)

Using Service 4.0 technologies enable to actively monitor the status of a device. As a next step, this constant control enables service providers to apply the information proactively. They offer help to customers before receiving a service request or even resolve faults remotely without involving the customer into the process.

To reach the service 4.0 status, the service offering should be transformed from reactive, experience-based, and standardized into proactive, data-driven and customized status. And service delivery should be altered from manual interfaces, heterogeneous, separated systems and predefined service delivery path into virtual interfaces shared and open infrastructures and dynamic, real-time paths. These fundamental service transformation will change the locations of service delivery as well. The focus will be not on the remote (offshore, nearshore) service centres but the seamless omnichannel delivered in the multi-locational model and many times on virtual base. (Oshri, 2011)

According to BCG research, service 4.0 has four significant benefits (Rehse, Hoffmann, & Kosanke, Tapping into the Transformative Power of Service 4.0, 2016):

- Greater flexibility, such as by implementing simplified data workflows and shared open infrastructures.
- Faster speed in developing an initial idea into a new service or responding to customer requests, such as by using improved IT and new ways of working.

- Higher productivity, such as through increased automation of process steps and support tasks.
- Better quality, such as by deploying real-time monitoring and quick interventions to prevent foreseeable errors.

Industry 4.0 includes nine technological drivers. (Colotla, és mtsai., 2016) Service 4.0 is very similar to Industry 4.0 and also has some core technologies, which could be conceived as adaptation these technologies in service area but has some different technologies as well. According to Tieto (2018), Service 4.0 technologies could be categorized by some typical functions like intelligent connectivity, intelligent data distribution or intelligent service application platforms. Based on the literature, the Service 4.0 framework includes the following technologies (Rehse, Hoffmann, & Kosanke, Tapping into the Transformative Power of Service 4.0, 2016) (Tieto, 2018) (Borchersen, 2018) (Manyika, Chui, & Ramaswamy, 2017):

- Big Data and Analytics: develop deeper insight into customer behaviour, preferences, and pathways.
- Internet of Things and ubiquitous connectivity: create an ongoing connection in areas as varied as on-the-spot service provision and remote monitoring.
- Cloud computing: manage huge data volume in open systems and provide services on demand.
- Smart/Mobile Devices: develop an ecosystem of applications and services that utilize high-performance devices.
- Augmented Reality (AR): provide workers with real-time necessary information when needed in areas as varied manuals, pricing, and alerts that improves decision-making and work procedures.
- Cognitive computing: simulate human thought processes and provide intelligent, virtual assistants with the automation of decision making and learning from the past.
- Robotic Process Automation (RPA): replace humans in work processes that are entirely rule-based.
- Virtualisation: free services from reliance on specific software and hardware and ensure flexibility, adaptability, and robustness.
- Bionic Computing: use of biological methods combined with digital technology. It interacts naturally with virtual agents, digital devices and services.
- Edge computing: distributed IT architecture, where data processing happens close to the source, which quick-up the operation.

- Social Media: social media are platforms that allow users of that platform to generate content and engage in peer-to-peer conversations.
- Blockchain: a distributed and secured peer-to-peer system that could speed up information movement.

2.2. Business service sector in Hungary

Over the last 50 years, the export of working capital has significantly accelerated and its geographical structure has been changed. Except for one or two declining years, growth was unbroken. Growth was twice as fast as exports and two and a half times as fast as total world production. Behind this phenomenon, the effects of several mutually reinforcing factors are, such as the development of transport and communication technologies and the intensifying privatization wave. Capital investments were primarily from the US, EU countries and Japan. Since the 1990s, new opportunities have opened up, mainly in infrastructure and services, which have further strengthened capital outflows. The main reason for this was that states focused on infrastructure development, and multinational and transnational companies relocated their service activities abroad. This has greatly accelerated the development of the business services market. This was also due to the fact that business services, a relatively crisis-resistant segment of the economy, was able to continue to grow during the recessions of the last two decades.

Central and Eastern Europe have also been the winner of this transformation. It was primarily as a result of the enlargement process of the European Union that companies' investment focus shifted from Scandinavia to the Iberian Peninsula and then to Central and Eastern Europe. Today, business services markets have emerged in almost every country in the region, with approximately 2 million jobs created so far, but also one of the most important employers in the domestic labour market and the largest tenant in the Hungarian A-class office market. The most important business services markets are Poland, Romania, the Czech Republic, and Hungary.

The key players in the business services segment are the in-house services centres of multinational corporations, the so-called shared service centres (SSC) and the outsourcing service providers (BPO). In the Hungarian business services market, the shared service centres are dominated, numbering 110, typically operating as subsidiaries of multinational companies, and employing 55,000 employees directly. The number of employees is still growing with 8-10% per annum. The number of companies operating in the entire business services sector (e.g. legal, accounting, auditing, etc.) can be up to hundreds. The segment delimitation remains a problem as they do not have a precise statistical classification of such companies, so the exact market size and economic weight of the segment can only be estimated for the time being. (Marciniak, 2015)

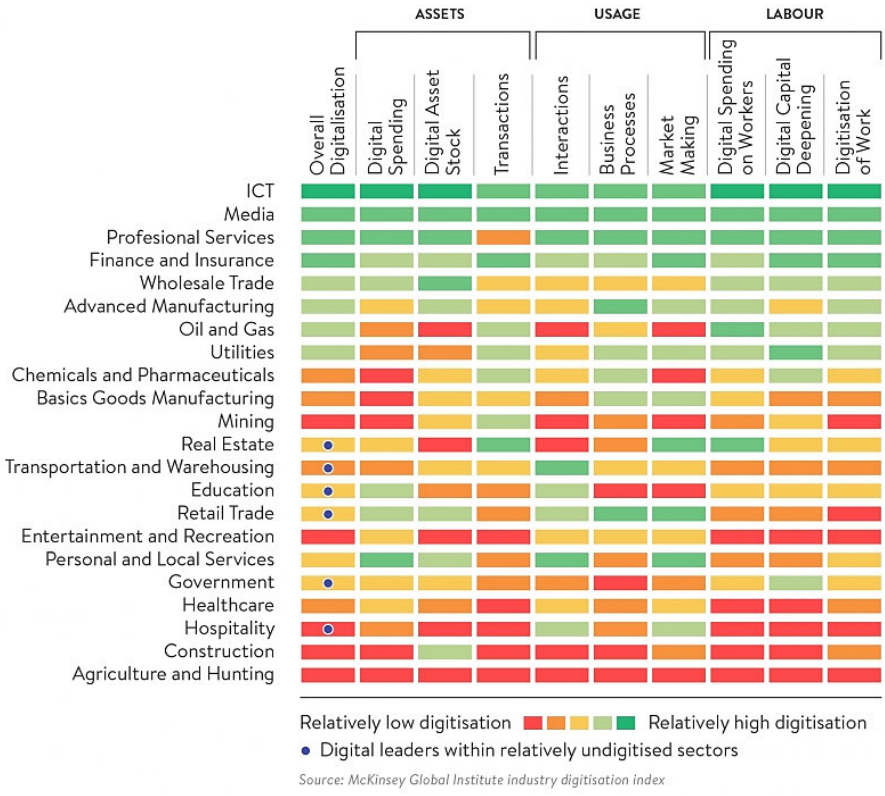
In general, business service sector covers those services that are delivered to other organizations or organizational units. Typically these services are provided from business service centres and include varied services of IT, F&A, HR, SCM, Procurement, etc. This sector is highly digitized and standardized that ensure good basic for automation but less than manufacturing. (Marciniak, 2017)

2.3.Digital Technologies in the Business Service Sector

There are several researched, which analysed the potential of digitalization and digital maturity in different segments of the economy. Generally those segments that are digitized have higher digital maturity and advances for further steps into digitalization and automation with new digital technologies.

The ICT, Media, Professional Services and Finance and Insurance are those economic segments that have the highest potential. According McKinsey Global Institute (MGI) research, companies can automate at least 30% of the activities in about 60% of all occupations by using new digital technology available today and these findings are true for business service sector as well. The business service sector is highly digitized in assets, usage, and labour as well.

Figure 1: Industry digitization index



Source: (Novak, et al., 2018)

The high level of digitization means a strong basis for automation. Due to the automation, the service centres became more productive and efficient while accomplishing the same amount of work. Today the automation is in infancy but it began to eliminate the low-skilled and repetitive work in business service centres. As the automation technologies become mature, jobs of BSCs will be at risk as well. The focus shifted to higher-skilled work. It is important that new jobs required to manage new digital technology, do not always go to those who lost their positions or even stay in the same country. Many of these new jobs are creating in a closer location to the clients that can turmoil the location-selection methodologies on the business service market. (Sethi & Gott, 2017) (Khan, Rahul, & Lunawat, 2017)

3. Methodology/Method/Model/Conception of analysis

Two empirical research methodologies were used to answer the research questions:

- Questionnaire survey: an online, self-completed questionnaire survey was conducted with the Hungarian Service Industry and Outsourcing Association (HOA) and the National Investment Incentive Agency (HIPA).
- Interview study: based in part on the results of the questionnaire research, we conducted a series of interview studies without the above research partners with the help of three authors and one research assistant. In the course of the study, we visited four service centres in Hungary, where we conducted face-to-face and focus group interviews with the top managers of the centres (centre manager and technology development managers). The aim of the interviews is to deepen the understanding of large, complex organizations, to explore different circumstances, organizational and strategic capabilities, and to explore new digital technology projects.

3.1. Empirical data (documentation background) and analysis

In the questionnaire survey, the total population were 110 service centres and 71 (64%) responded. The response rate is considered representative based on a number of characteristics such as location, number of companies and service portfolio. The research targeted the centre's top executives through email and telephone inquiries. The aim of the survey was to gain a comprehensive understanding of the most important digital technology features of service centres. 1/3 of questions focused on the technology deployed in business services centres. The survey was completed during the summer and autumn of 2018. The questionnaire survey was conducted as part of an annual comprehensive benchmarking study, thus covering 120 other questions in a number of other study areas.

In the interview series, 15 interviews with 22 interviewees were involved in the selected 2 service companies in Budapest and 2 in the country. The interviews

were conducted in the autumn and winter of 2018 in each case with the help of personal 1-1.5 hour interviews.

3.1.1. New service delivery models emerging

In Central-Eastern European (CEE) region, there are about 2.000 BSCs with 2 million workers employed in them. The whole CEE region and within Hungary counts an important nearshoring location on the global market. Hungary had about 110 international BSCs with about 55.000 employees but the segment is in progress. However it is getting a more and more significant segment in the Hungarian economy as well, but new shoring models emerged that could influence service delivery operation geographically.

Earlier the focus was on the onshore model that means provision from the same location where the clients are. From the early times of the 1980's, the big international companies turned to the offshore model to reach the advantages of far locations like India or China. As a specific response to problems of offshoring brought the popularity of nearshore model in the 1990s.

As the focus changed in the last decades, now new models emerged: no-shoring, next-shoring, and bot-shoring. No-shoring means no relocation but the activity remains at the same location and using technologies to automate it. Bot-shoring means automating the activity and relocating to a new location where the software robots (bots) of service automation could operate at the lowest cost. Next-shoring does not mean re-shoring but reviewing the location selection (shoring) strategy to be close to the customers and centre of innovation at the same time.

For the CEE region, it is vital to react to the new models to retain and improve its current position on the global service delivery market.

3.1.2. Intelligent service delivery model

While the most exciting part of digital transformation is better understanding and serving customer needs, organizations can gain tremendous opportunities by digitizing their internal operating processes (Suska & Weuster, 2019) (Westerman, Bonnet, & McAfee, 2014).

Business service centres are organizations that organize their operations on a process basis and typically provide service activities to other departments of the parent company or to other external clients. As a result, these organizations have an extremely high potential for digitalisation and automation, as they provide a large number of, often repetitive, standardized processes, typically with IT support.

One or two decades ago, business services centres aimed to cut cost and enhance their efficiency. The solution was to consolidate and standardize the processes and optimize the operation with different technologies and management models.

Now, new digital technologies may not only change the processes and foster efficiency but transform the whole operation of centres to reach a new stage in their evolutionary path. Using the automation technologies, the service centres could replace the repetitive, transactional work with software robots and get new higher value-added work for human labour freed-up. Due to the automation, business centres could extend their scope of processes from transactional back-office to more customer-focused front-end. It changes the focus of operation from process optimization to customer experiences (CX). This transformation needs new generation service models.

Utilizing the benefits of automation for business service providers is also a result of a constrained and proactive attitude:

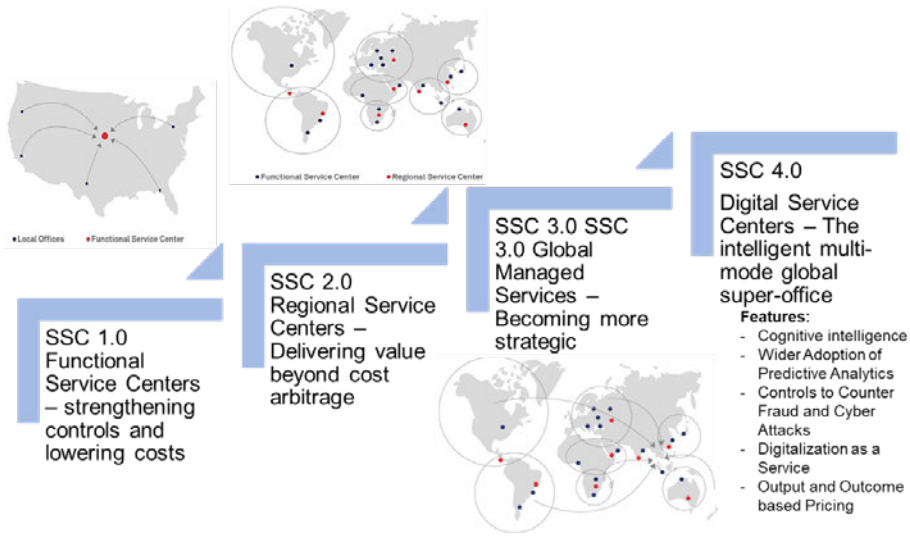
- It is a business must: Business Service Centres are suppliers and need to follow corporate needs (B2B market) based on changing customer needs. Service Centres serve other organizational units of other manufacturing, service companies or the parent company. If digital channels are used with customers, then service providers must also follow this.
- Proactive attitude: Service Centres are in constant competition, even internal service centres (captive centres) that only provide services to their parent company. Service innovations are aimed at improving service levels and reducing costs. This is a condition for survival. This creates a constant transformation pressure on the operation of the centres.

Thus, the use of new digital technologies from the digital transformation process serves primarily digital optimization. However, as new technologies are being adopted, service centres are significantly transforming many of their features:

- process automation primarily focuses on low value-added activities, freed-up workforce provides the opportunity to perform higher value-added work, thus positioning the portfolio of service centres and the entire sector up the value chain;
- if software robots replace the human workforce for certain activities, it is not labour arbitrage that determines deployment and service migration decisions for new service centres, but rather a low-cost server operation and the presence of automation professionals (Sowinski, 2016);
- New technologies such as smart chatbots or virtual assistants make some front-office activities robotic (Bornet, 2017);
- Voice recognition, face recognition, and other cognitive technologies accelerate customer service, omnichannel service systems become widespread;
- Jobs with higher added value require a more specialized workforce, as opposed to previous practice, where many foreign-language graduates have been trained in many cases;
- Digitization enables better personalization of services.

The evolution of service centres is addressed by many evolutionary models. These models incorporate several (usually 4-6) different development stages. The evolution of digital transformation can be easily integrated into these models. There is a potential business service evolution model that interprets four stages of development, where the most advanced level is the intelligent services centre.

It includes the following stages:



1. Functional service centres: cost reduction, labour arbitrage, fixed pricing, centralization
2. Regional service centres: use centralized data to enhance business performance (lean, six sigma, etc.), FTE-based pricing, focus on process development changes beyond labour arbitrage
3. Global / Integrated Managed Services: With the proliferation of big data, service centres are providing advanced analytics to the company. Technology makes it possible to automate certain processes. The focus is on balancing the efforts of process control, efficiency, and automation. Cloud-based technologies are spreading as-a-service and agile solutions. The integration of technology, infrastructure and services ensure scalability and rapid market penetration. The RPA emerged.
4. Intelligent Service Centres: Voice recognition, cognitive intelligence, the widespread use of predictive analytics, output and outcome-based pricing, new as-a-service solutions (e.g. automation, transition, transformation). Less relevant is the achievement of previous levels of development, and the digital service centre model may work for a functional service centre. What is essential, however, is that the service centre has the appropriate process maturity. Standardization, consolidation, and harmonization are essential for this.

The intelligent service delivery could be the most advanced stages as the upper model shows but it could be a development stage for those services centres that remain at a lower stage of the evolutionary path.

4. Results and discussion

The sector is highly digitized with big robust transactional systems like ERP, CRM, SCM, and other legacy systems but also use modern, specific IT software like ticketing systems, performance measurements systems, etc.

It is a matured sector in age, size, measurement and control mechanisms in most of the countries and has advanced pricing and cost allocation approaches for the best service delivery operation.

In the sector, there is a continuous change from the moment of its formation. The service portfolio is expanding vertically and horizontally as well. Earlier it was more a vertical development but as the model testified its success with efficiency, nowadays the expanding is more and more horizontally. There is a transition to higher value-added, more complex work that needs a higher educated, skilled workforce with wider competences. However the recruitment became global but it is not easy to find appropriate labour for these jobs. Because of hunting for talents is a global competition among the different segments and in many countries there is labour shortage of needed people.

In the last three decades, the manufacturing and service jobs, which were typically concentrated in geographical clusters earlier, began to move offshore and nearshore locations. Many scholars thought that modern ICT systems will democratise the labour markets and in the future, it will be not significant where the worker lives. But the reality is the opposite. The venue for production and service provision became the most significant factor, especially for high-skilled labour. Based on it, the location will continue to be vital for the opportunities of human labour in the future as well.

4.1. Digital Maturity of Hungarian Business Services Centres

The existing of business services is based on standardized and highly digitized processes that are supported by big, stable transactional IT systems and advanced management methodologies. The business service centres have to support their internal or external clients with their own IT systems, which means multiple ERP, CRM, and SCM systems support in parallel. The Software as a Service (SaaS) solutions and cloud technologies are vital for high-level and low-cost service provision. In back-office and front-office operation, the ticketing systems became standard solutions for communication and managing service failures but there is a lot of specific and unique software for teleworking and home office working that is very popular in the sector.

The business service market is a matured segment, 48% of business services centres (BSCs) are over 11 years of operation in Hungary. The age of operation also could be important in service delivery model. 47% of them are operating in captive centre model, 33% of them as a hybrid centre that means provide services not only for internal (in-house) clients but externally as well. It could be understood as a multi-sourcing strategy or a mix of shared services and outsourcing models. (Marciniak, 2015)

The expansion of Global Business Services (GBS) model could be seen by the figures that 61% of business services centres have global service provision and only 3% of them support a single country. The responsibility of working has also been grown. 42% of global process owners are performing the task from Hungary. 71% of them represent themselves in international management, which shows a wider scope of authority. The ratio of profit centres is shrinking (67%), but the investment centres are coming into forefront (6%), which could also indicate a market-focused transformation on the market. 61% of service centres apply pricing based full cost + profit margin. 82% of these centres use SLA with their clients. However 49% of them maintain transactional service as the main service portfolio but 80% of them is focusing on high-value-added functions. Altogether there are several changes in the value-addition, complexity of service portfolio, necessary skills and competencies of workforce. One of the technologies that can decrease labour shortage is self-service applications. 61% of the respondents used customer self-service applications in service provision, which was 20% progress in one year. (Oshri, 2009) (Oshri, 2011).

4.2. New Digital Technologies in the Hungarian Business Services Centres

Based on the research data, the most important driver (26% of the respondents) of operation developments was the optimization by digitalization and service automation.

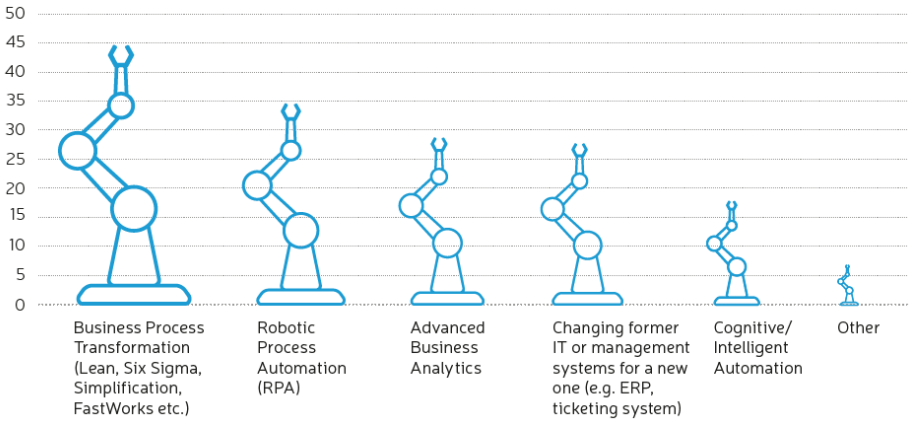
As the new digital technologies are expanding in all segments, the business service centres began also to adopt several of them. The most important driver of changes in the sector caused by the process automation solutions. 76% of them use automation technologies for services delivers. Nowadays the sector focuses mostly on the robotic process automation (RPA), which is programmed, trigger-based automation to handle structured data and standardized processes. It automates repetitive tasks and replaces the human intervention to streamline and speed-up (15-20 times quicker) the business service processes. It helps the sector to be more efficient without losing workforce. RPA is getting more and more popularity among the business services centres. The progress of RPA deployment was 24% in one year.

However RPA could significantly develop process efficiency in the sector, but it needs high level of human intervention and could not handle the unstructured database. As automation solutions are developing, deep learning

or cognitive tools will be part of service delivery automation. The data shows that only 13% of respondents experienced any kind of resistance against automation initiatives.

Besides the RPA implementations, several BSCs have technological support with chatbots and big data analytics. There are other technologies in business service centres that have pilot projects like cognitive automation and blockchain. Within several business services centres, there are many pilots for utilization of these technologies. However Service 4.0 framework includes but there were no or few traits of utilization augmented and virtual reality or IoT in the business service sector.

Figure 2: Role of technologies among the drivers of BSCs



Source: own research

The new service technologies implemented in BSCs could contribute to the cost-cutting aims of parent companies and help improving process excellence.

5. Conclusions

Business service is a highly digitized service segment as globally, so as in Hungary. The time- and location-independent operation of service centres need high-level utilization of ICT technologies. In the last 5 years, there is an increasing service automation trend that is determinant within the main technological developments of service delivery centres.

Today the main impact of digitalisation is limited to the efficiency improvement of the process operation in these service centres, which is the primary purpose of existing business services. Adoption of new digital technologies connects to the need to streamline further the operational processes. The holistic view, the digital transformation of the whole service organization is not so clear yet. It may be a real scenario that the business centres will not lead their transformation but the new market circumstances will force to do it. In many segments of

services industries, new approaches emerged, which could change the whole business service segment as well.

The new service technologies are very similar in this segment to the industry, only some new technologies exist here, which is not in focus in Industry 4.0. Nowadays the main driver of the sector change is robotic process automation and cognitive automation because there are several mature software vendors on the market and best practices how to reach great benefits in really quick implementation time. The cognitive part of this software is quite new but could mean the main differentiation factor in the vendors market. The automation does not increase job-loss but fosters quality change in the sector. It is necessary to educate current and potential employee of the sector to exploit better the possibilities of these technologies.

Beyond the big popularity of automation technologies, many implementations with chatbots, big data analytics, virtualisation, cloud services, cybersecurity solutions could be discovered in the services centres. But there is less implementation of other service technologies like augmented reality, blockchain, smart devices or IoT. 5G is coming into forefront, which could be a new driver of digitized technologies to extend the presence and their impact on the different fields of operation.

However, there are several new digital technologies implemented or in pilot within the BSCs but the primer aim is to support the current operation with streamlining and fine-tuning and not to renew the logic or scope of service provision yet.

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