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CONTENTS

POSSIBLE SOLUTIONS TO DUAL QUALITY OF PRODUCTS IN THE EUROPEAN UNION

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Abstract: This paper focuses on the dual quality of daily consumption products sold in the European Union. The views and opinions of Slovak consumers on the existence of the dual quality of products on the European market are analyzed, moreover, their attitudes and personal experiences with this problem in Slovakia and other EU countries, especially in Western Europe are examined. As a conclusion, possible solutions to the problem are identified in order to prevent possible mistakes in purchases and even more importantly, to avoid the existence of dual quality of products produced by the same manufacturer assigned to different markets and selling them as identical - in the same package and without any notice of different composition or content.

Keywords: Dual Quality of Products, Daily Consumption Goods.

JEL Classification: Q18, M38, M31.

Introduction

Identifying new markets where the manufacturers can place their products is a natural activity that leads to expanding sales to markets in other countries. Large producers operating worldwide usually sell their products under the same brand in many countries. The customer assumes that it is the same product, i.e. it has the same composition and quality. However, the practice has provided many examples of different attitudes many big companies. Some of them sell products under the same brand which are of different composition or quality in the Western European countries and in the countries of Central and Eastern Europe. The price is roughly the same, sometimes even higher for the lower quality products offered in Central and Eastern Europe.

The main aim of this research was to examine the views, attitudes and experiences of Slovak consumers with the dual quality of products sold and presented as identical on the markets of the European Union and to identify possible solutions to this international issue.

1 Statement of a problem

1.1 Products of the same brand in different quality on the EU market

In the early stages, the sale of products of the same brand of different quality and of different composition was vastly ignored. Later it was individually exposed by customers based on their own experiences, therefore in the Czech Republic, journalists asked independent laboratories to compare the quality and composition of products sold in the Czech Republic and Western Europe. Tests which achieved similar results were also recently performed in Slovakia: the products sold as identical, i.e. the same brand and the same packaging were of double composition or quality and their worse version were offered on the Czech and Slovak markets (Česká televize, 2016).

The representatives of the Slovak Republic were the first ones to point out that if a producer sells the same product and does not state on the packaging that the product exported to Slovakia contains more preservatives than the same product assigned for Western Europe, it is a violation of the law. The problem is mainly addressed by the State Food and Veterinary Administration and the Association of Consumers of Slovakia, which initiated the tests.

As early as 2011, the Association of Consumers of Slovakia conducted a test comparing the composition of selected foods produced by multinational companies and sold in Slovak Republic and abroad. The Association bought identical products in Germany, Austria, Poland, the Czech Republic, Bulgaria, Romania, Hungary and Slovakia. Under the professional guarantee of the State Veterinary and Food Administration, food was tested by the accredited laboratories of the State Veterinary and Food Institute of Bratislava and the State Veterinary and Food Institute Dolný Kubín. According to the test results, several food types such as coffee, beverages, chocolate and spices of the same brand sold in Slovakia and abroad may not have the same taste, composition or weight (Sudor, 2012). According to the Association of Consumers of Slovakia, the quality of the same products was generally worse in the "new EU Member States", while on the other hand, the quality of goods purchased in supermarkets in Germany and Austria reached the highest standards.

Another test was made by the Ministry of Agriculture in 2016 (Ministry of Agriculture and Rural Development of the SR, 2017). From 22 foodstuffs bought in the Slovak Republic and in Austria, only 9 products were the same. Comparison of non-alcoholic beverages, spices, tea, milk and meat products had the worst results.

Similar tests were carried out in other countries. There were tested 21 products from five countries – The Czech Republic, Slovakia, Hungary, Germany and Austria in the Czech Republic and only three products were the same (Leinert, 2017). Furthermore, 96 products in Hungary were compared. The State Veterinary and Food Administration did not find a large violation of the law but a significant violation of ethical principles (Ministry of Foreign and European Affairs, 2017). Many of the products tested did not have the same composition as identical sold in the west.

The issue was addressed in 2015 by 10 politicians representing Slovakia, Croatia, Slovenia, Romania, Hungary, Malta and Italy. They called on the European Commission to stop consumer discrimination and to prevent them from supplying lesser-quality goods to Eastern Europe (Nagyová, 2015).

The European Commission first recommended leaving the solution to individual countries. However, the representatives of the countries were concerned, in addition to expressing their discontent with the fact that the producers divide consumers into first category consumers and second category consumers, they also pointed to the danger of product confusion and their potential negative impact, on the health of the population (Chavas, 2017; King et al., 2017; Santeramo et al., 2018; Stratton et al., 2015).

When it comes to classifying different product quality from the same manufacturers offered on different markets as identical products, i.e. under the same brand and in the same packaging, this problem can consider at several levels: ethics, legislation, ethics and legislation, economics, others.

1.2 National legislation

If we look for solutions in current legislation, for example, the Commercial Code talks about unfair competition. For unfair competition, the law regards: deceptive advertising, misleading labelling of goods and services, the risk of confusion, stealing of the business' image, products or services of another competitor, bribery, breach of business secrets, and the threat to consumer health and the environment.

However, the risk of confusion and parasitic reputation concerns different products and different manufacturers. In the case of the same producer, it is not, in our opinion, appropriate to apply this approach. However, we believe that this may involve misleading labelling of goods and services, not only in relation to Slovak consumers but in relation to any consumer. Products with a different quality in expectation of a "standard European" quality can be bought by Western European customers in Slovakia, expecting the quality they are getting used to in the given product. And we can definitely call it unethical. Even though the packaging contains the different composition, the consumer who buys the product anywhere in Europe and does not read the details on the packaging, assumes that the composition is the same and may feel mislead.

Different types of products marketed as identical may also endanger the health of consumers, in terms of allergens. Consumers who are accustomed to a particular product and their composition on their domestic market may, in the expectation of the same composition (of the same quality), cause themselves health damage when buying a product abroad. Compositions on the packaging of frequently purchased products are not usually being explored by customers.

1.3 European legislation

The European Commission has issued a regulation on novel foods and novel food ingredients (Boer, Bast, 2018) and on providing food information. In 2005, the Unfair Commercial Practices Directive (Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005, "Unfair Commercial Practices Directive") became into force. In its appendix No. 1 are mentioned those practices which are considered unfair in each case. The list lacks the practice of unethical labelling of the same manufacturer's products even though the composition or quality is not the same.

Furthermore, the Slovak seminar on dual quality of products in Brussels also welcomed representatives from the sector of producers. Some manufacturers denied the duality of the products they offered and voiced doubts about the correctness of the test methods used (Director of the European Brands Association). Other manufacturers have acknowledged the difference and claimed that reasons behind this issue lie in customers' interests in other tastes or other laundry washing habits. But especially food manufacturers and handlers are responsible for food safety and health of consumers (Zanin et al., 2017) so they should accept their responsibility.

At present, the European Commission is negotiating with representatives of Central and Eastern European countries, as well as with manufacturers. Experts should work on an identical methodology for comparing product quality and composition. Sixteen countries in the European Union may soon be involved in testing.

2 Methods

In order to achieve the aim of this paper, a primary research was conducted during a period from January 2018 until mid March 2018. The sample file consisted of 123 women and 79 men. The largest group of respondents was between 16 to 35 years old and with secondary education. The survey was conducted through a questionnaire which contained 21 questions, five of which were sociological, 7 closed and 9 semi-closed questions.

Tab. 1: Structure of base file based on respondent's gender

Gender	Number of people	Percentage
Female	62 217	59.99%
Male	41 480	40.01%
Total	**103 697**	**100.00%**

Source: (Own elaboration based on data from the Statistical bureau of the Slovak Republic, 2018)

To verify the representativeness of the sample we used Chi-square test. The decisive criterion was set to verify if our sample file is representative based on the gender of respondents. We set the null hypothesis which assumes that the sample is representative. The alternative hypothesis is an assumption of non – representativeness of the sample. From the mathematician point of view the hypothesis are formulated as:

H0 = F(x) = G(x); H1 = F(x) ≠ G(x)

Statistics testing in SPSS software is based on formula A.1 previously used by Maloney and Byard (2013); Veselovská et al. (2014); Závadský, Hiadlovský (2014):

$$X^2 = \sum\nolimits_{j=1}^{r} \frac{(n_j - m_j)^2}{m_j} \approx X_{(r-1)}^2 \tag{1}$$

where:

X2 - is Pearson statistics,

r - is line,

n - is overall frequency in the base set,

m - is measured frequency.

The base file consists of all people living in Poprad region in 2017, who are older than 15 years old. The calculated X2 is at the level 3,077 which indicates that the results of this test prove that our sample is representative.

Three main were formulated in order to further explore opinions and experiences of people with dual quality of products:

Hypothesis H1: We assume that, there more than 50% of people have negative feelings towards practice of dual quality of products.

Hypothesis H2: We assume that, there is a positive dependence between the opinion on who should be responsible for solving the problem of dual quality of products and education level of people.

Hypothesis H3: We assume that, there more than 80% of people are interested in being informed about dual quality of products.

Furthermore, a descriptive statistics was used in order to analyze the information. Several issues were also examined in terms of special relationships between factors. Particular correlation coefficients were calculated according to Equation 2 (Maloney, Byard, 2013). In order to verify the hypothesis H2 we used Pearson correlation test.

$$r = r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

(2)

where:

xi, yi – are defined as a value of i-element belonging to dataset {x1,...,xn},

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n}x_i$$ - the sample mean and analogously for $\bar{y}$.

We used binomial test to verify hypotheses H1 and H3. Values were calculated according to the Equation 3 (Maloney, Byard, 2013):

$$b(x;\ n,\ P) = nCx * Px * (1 - P)n - x$$

(3)

where:

b = binomial probability,

x = total number of "successes" (pass or fail, heads or tails etc.),

P = probability of a success on an individual trial,

n = number of trials.

3 Problem solving

The results of our research show that 87% of respondents have already heard about the problem of dual quality of goods of the same brand in the EU. They mainly heard about the problem with meat and meat products, sweets and detergents. We learned that 66% of respondents learned about this issue from the media, 58% had their own experience and 42% had acquaintance with such experience. In terms of personal experience, respondents (or their acquaintances) encountered a dual quality problem with detergents, sweets and meat and meat products. For these goods, they also consider this problem to be the most serious, however, it would require further research in order to find out the reasons behind.

Up to 88% of respondents are bothered by such practice and only 1% of them stated that they do not care. We looked into how the gender affects this issue and it was discovered that it has no affect on attitude towards this practice (correlation coefficient at the level -0.081 with statistical significance at the 5% level), therefore we can conclude that the dual quality of products interests men and women equally. Furthermore, we provide evidence of the attitude towards the issue of dual quality of products (Tab. 2). We tested the hypothesis H1 in order to examine the level of negative feelings towards this practice. We assumed that there more than 50% of people have negative feelings towards practice of dual quality of products. This hypothesis was confirmed by binomial test. Therefore, we can assume that the majority of people feel effected by this malpractice.

Tab. 2: Attitude towards the practice of dual quality of products based on gender

Attitude towards the practice of dual quality of products	Gender	
	Female	**Male**
strong negative feelings	54,10%	48,75%
rather negative feelings	36,07%	36,25%
undecided	9,02%	13,75%
not interested	0,82%	1,25%

We also examined the assumption that there are products of which the dual quality the customers are more aware (Tab. 3). Our results indicate that women are slightly more aware of dual quality of various products such as meat, fish, milk, sweets, cosmetics, cleaning and washing products and clothes. On the other hand men show higher awareness when it comes to all types beverages.

Tab. 3: Awareness of dual quality structured by the product and gender of respondents

Type of product	Gender	
	Female	**Male**
Meat and meat products	62.30%	58.75%
Fish	24.59%	18.75%
Milk and milk products	44.26%	33.75%
Non-alcoholic beverages	22.13%	28.75%
Alcoholic beverages	6.56%	7.50%
Coffee	15.57%	22.50%
Tea	10.66%	13.75%
Spices	9.02%	13.75%
Sweets	55.74%	50.00%
Cosmetics	45.90%	37.50%
Cleaning products	42.62%	41.25%
Washing products	55.74%	47.50%
Clothes	17.21%	15.00%

According to half of the respondents, national institutions (e.g. national trade inspections, national testing centers, etc.) should address this problem. According to 46%, the European Commission should address the solution. Our results indicate that there is no significant dependence between the opinion on who should be responsible for solving the problem of dual quality of products and education level of people, since the correlation coefficient for these two factors is at level -0.04. This was however, our

assumption in hypothesis H2, which could not be confirmed by Pearson correlation test. There is however, a medium direct dependence between the opinion on who should be responsible for solving the problem of dual quality of products and size of place of residence (0.193), which indicates that people living in smaller townships are more nationally oriented in this issue and people living in larger cities believe this problem should be solved on higher levels of government such as the European union.

4 Discussion

The dual quality of products marketed in the European Union's single market is a current problem with great importance caused by producers by supplying lower quality products to Central and Eastern Europe in the same package as higher quality products for consumers in Western Europe. The price difference is often minimal, even though the price for the consumer in Central and Eastern Europe is sometimes even higher for the same product in the same package. The problem mainly concerns products such as food and detergents. Even thou it is a serious problem, there is lack of surveys within this topic. We provide primary survey, but we don't have any other to compare it with.

Several surveys on similar topics have recently been conducted. According to our research, most respondents are bothered by goods imported into our country in other, generally lower quality than in Western countries. As a result of GfK Slovakia's research, Slovak consumers prefer a higher quality of food to a lower price. Already in 2008, 1000 participants were surveyed out of which most respondents stated the quality and freshness of food as decisive factors when purchasing food products (GfK, 2008). Further research on a sample of 1000 respondents in 2015 also suggested that consumers prefer the freshness and quality of products when purchasing food (GfK, 2015). In 2016 the Post bank analysed buying behaviour of Slovak consumers (Kušnírová, 2016). The results they achieved from their analysis indicate that Slovak consumers are interested in high quality foodstuffs and in Western regions of Slovakia they are willing to pay even higher price for them. The same opinion concerns buying sport shoes and equipment. According to the test performed by Czech agriculture and food inspection authority, Czech consumers are also bothered by dual quality of food products (Šefrová, 2016). Based on the comparison of research results, we can conclude that importing products of lower quality is not correct and does not suit Central and Eastern countries consumers.

Another research was conducted by GfK in March 2017. According to the results, up to 16% of respondents buy products abroad because they consider foreign products to be superior (GfK, 2017). Our research shows that up to 52% of respondents have their own experience of dual quality food, and 37% of respondents are familiar with such experience. This comparison shows that the citizens of Slovakia are aware of this problem and try to solve it by purchasing goods directly abroad or by purchasing such goods from people who import it for resale here.

In the opinion of almost half of respondents in our study, the European Commission should address the issue of dual quality of food. However, according to available information sources, this problem has long been avoided and claimed to be a problem for individual countries (Čimová, 2017). Until September 2017, Jean-Claude Juncker admitted that no EU consumers should be considered "second-rate consumers" and that consumers in the SR, CR, and Hungary deserve the same quality as

consumers in Western Europe (European Commission, 2017). However, a legislative solution to this problem at the European level would take at least two to three years.

According to our respondents, the issue of dual quality of goods is both ethical and legislative. However, according to available sources, manufacturers do not admit that this would be a legislative problem (Nagyová, 2015). They state the information on the composition of the goods can be found on its packaging, so no law is violated. The fact that consumers become accustomed to a certain quality in Western countries and do not read all of the inscriptions provided on the packages in other countries is seen by manufacturers as a problem of consumers and their habits and tastes which does not allow the existence of the ethical dimension of the whole problem.

In united Europe, consumers should not be broadly divided into Western European consumers who are assigned high-quality goods and consumers in Central and Eastern Europe which are provided with lower-quality products. In order to prevent the negative consequences of such behaviour, manufacturers need to adopt legislative measures to ensure that the products of the same producer in the same packaging intended for different markets are clearly distinguished so that the consumer can identify them immediately. At the same time, it is imperative that product quality is regularly monitored and that the results of surveys should be available to consumers in the media or in the reports of the relevant institutions.

Conclusion

Addressing this issue has long been a challenge for individual countries and therefore they struggle to move it to a European level. On the other hand, the European Commission is against that and prefers to keep the responsibility at national levels. There is a clear need for the two levels to work together to create a legislative and ethical framework in which the national institutions of the individual countries communicate with the people and educate them in this area.

There are several proposals to solve this problem. Some concern the manufacturers themselves and their labelling of dual quality goods. Others focus on legislative adjustments, whether at national or European level. Other suggestions concern information sharing and consumer education in this area. For some suggestions, we also asked respondents, and their preferences are also provided in terms of individual proposals.

One possible solution to this problem could be a directive created ideally at European level on unfair commercial practices. This directive should be complemented by statements that will sufficiently and clearly treat equally designated products of the same producer as unfair practices in a manner that could mislead the consumer. This would eliminate the problem completely on both legislative and ethical levels. Several respondents in our research have stated that the only possible solution for them exists in the hands of manufacturers: to stop producing and distributing dual quality goods. According to them, the existence of several versions of the same product of different quality, different prices for different countries are inadmissible. It is a question of how this solution would be considered by manufacturers and whether such a directive could be enforced at all. Particular attention should be paid to food

and its composition, as the different composition of the food can lead to health damage, for example due to allergies (Davis, Kelso, 2018).

Based on the results of the research, it is advisable to eliminate the risk of purchasing a dual quality product for the consumers through a sufficiently distinctive indication of the difference on the product packaging directly by its manufacturer. Up to 81% of respondents consider it appropriate to distinguish different quality products from different packaging and different prices. This recommendation should be supported by European Union legislation as it provides a single united market. The solution would be to use different packages for different quality goods. Products that are superior may have a distinctive "original" on the front of the packaging at the product name. Products of lower quality should also be marked equally as "second quality" or "modified composition". At the same time, a lower quality product needs to be distinguished by a lower price. Another solution would be to ensure that goods produced and sold in a uniform quality in all countries are labelled with a single label, e.g. European Commission Label (Řeháková, 2017).

Hypothesis H3 focused on peoples' interest to be informed about this issue. We learned that up to 94% of respondents are interested in being informed about dual quality of goods. Furthermore, using the binomial test we managed to confirm this finding and with it also the related hypothesis. Most of the respondents would prefer to be informed about this issue through the media. It is also appropriate to inform consumers via periodical reports from either the Ministry of Agriculture and Rural Development of the Slovak Republic or the Slovak Trade Inspection, which could become the basis of information for journalists who serve as mediators for local consumers.

Our proposal is also to organize a campaign under the aegis of the European Commission and national ministries to educate and inform consumers on this issue as well as on how to protect and defend against unfair practices by manufacturers.

Another option to keep consumers informed is to create a website that would be dedicated to this issue. This solution would be preferred by 21% of respondents. Already in 2017, Czech Commissioner Věra Jourova and the Slovak Minister of Agriculture Gabriela Matečná proposed a website project as a joint effort by the V4 countries, Slovenia, Croatia, Bulgaria and Romania (Česká televize, 2017). The Slovak Republic was to be responsible for it. Although the site was to be created in the fall of 2017, it is still has not come to exist.

Up to 80% of respondents expressed willingness to inform other consumers of identified cases of dual quality. Furthermore, the dependence between gender and willingness to inform others was examined. The correlation coefficient for this relationship was only 0.082, which does not indicate any significant dependence. Men and women are equally willing to provide information about their personal experiences with dual quality of products.

Most respondents (45%) would prefer a dedicated website as a reliable information source. This portal would provide an option to directly enter information, photos, etc. after registration. Another 40% would be willing to share information on social networks where they could also directly insert information on a special profile. The correlation coefficient is at the level -0.240, which indicates that there is an indirect

medium correlation between age of respondents and preferred type of information sharing medium.

Acknowledgement

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SUPPLIER EVALUATION: A COMPARISON OF THE APPROACH OF CZECH AND GERMAN INDUSTRIAL COMPANIES

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Abstract: The present article deals with supplier evaluation in Czech and German companies. It addresses the question of whether there are differences in evaluation criteria and methods between Czech and German companies. The article consists of three interconnected parts. The first part presents the results of a literature review that focused on the current trends in supplier evaluation. The subsequent part describes the research methodology. The research was conducted through a questionnaire survey of a sample of 180 Czech and 70 German companies operating in the automotive and related industries. The next part presents the results of the research. The research results have shown that the completeness and timeliness of deliveries is the most important criterion for companies in both countries. Compared to German companies, Czech companies put more emphasis on the price level, the openness of calculations and the supplier's communication. German companies attach greater importance to quality, indemnity insurance and soft criteria such as an ethical approach. In terms of evaluation methods, it can be concluded that companies in both countries apply rather simpler approaches. In both countries, the same three evaluation methods are most commonly used – scoring model, ABC method and point evaluation.

Introduction

The present article focuses on a comparison of approaches to supplier evaluation in Czech and German companies. Germany is the Czech Republic's most important trading partner. In 2015 Germany accounted for nearly a third the Czech Republic's total exports. At the same time, Germany is also the most important partner in terms of imports. Its share in total imports was 26%. In mutual trade, road vehicles are the most important commodity, accounting for 20% of Czech exports and 14% of Czech imports to/from Germany (Král, 2016).

The objective of the research is to compare supplier evaluation methods, including the criteria used in such evaluations, between Czech and German industrial companies. The research was mainly carried out in companies related to the automotive industry, which is an important sector of the Czech economy. The automotive industry represents roughly a quarter of Czech industrial production and accounts for almost 7.5% of GDP (AIA, 2015). At the same time, given the ownership structure (Škoda Auto is part of the VW Group), there is strong cooperation between Czech and German companies in this sector.

1 Theoretical background

Given the specific nature of the industrial market – namely the close links between suppliers and customers – supplier selection and evaluation is a very important step for every industrial company. In a company, supplier evaluation is usually first carried out as early as supplier selection, but certain routine reviews of the company's current suppliers are also carried out. Routine evaluations mainly determine compliance with pre-defined criteria and requirements. A positive evaluation of current suppliers is a prerequisite for continued cooperation. A negative evaluation results in modifications to or complete termination of the business relationship (Nenadál, 2006).

On the customer's side, supplier selection is based on defining certain criteria, which are specified using basic indicators that follow from the company's line of business. This specification is a prerequisite for the actual evaluation process (Pffefferli, 2002). The main criteria for supplier evaluation include finance, logistics, competitiveness, quality and supplier services (Simić, Svirčević and Simić, 2015). These criteria can be described as traditional. A very important component of supplier evaluation is trust between the supplier and the customer and willingness to share information (Yang, Zhang and Xie, 2017). In addition to traditional criteria, new criteria such as process orientation, efficiency, project management orientation, solution orientation or sustainability are attracting increasing attention during evaluation (Schätzle and Jacob, 2017). For some customers with an environmental focus, the supplier's environmental image plays an important role in evaluation, as it contributes to the supplier's overall value to the customer (Hänninen and Karjaluoto, 2017). Supplier evaluation can be extended to include criteria such as the introduction of an environmental management system, waste disposal programme, energy performance, green design or recycling rate (Yazdani, Chatterjee, Zavadskas and Zolfani, 2017).

Some criteria can be considered universal in that they are applied across all industries. However, each industry has some specificity, which is also reflected in supplier evaluation. In the automotive industry, which is largely the focus of this article, great emphasis is placed on innovation. The driving force of these innovations is key suppliers in the supply chain (Chang, 2017). An important criterion in supplier selection can thus be the supplier's innovation performance, which can be measured by the number of patents (Trautrims, MacCarthy and Okade, 2017). In addition, as stated in the article of Schätzle and Jacob (2017), evaluation in the automotive industry is most often carried out by the procurement manager, who has a broad understanding of the supplier industry.

Various methods can be used to select and routinely evaluate a supplier. In principle, the methods can be divided into empirical and algorithmic ones. Empirical methods are those evaluation methods that are based mainly on experience, intuition and logical judgment. By contrast, algorithmic methods are based on mathematical methods and model problem solving (Pernica, 2004). Recently, advanced methods which use genetic algorithms (Simić, Svirčević and Simić, 2015) or fuzzy multi-criteria decision-making (Wang, 2015) can also be encountered in supplier selection and evaluation. An extensive literature review (see Wetzstein, Hartmann, Benton and Hohenstein, 2016) has shown a certain conflict between the complexity of supplier evaluation and the applicability of methodologies. Greater objectivity of information

usually means that the evaluation uses a more complex methodology and is more time consuming, and vice versa. Wetzstein, Hartmann, Benton and Hohenstein (2016) have also pointed out that, in the past 10 years, research into supplier evaluation has been dominated by mathematical models. Green, sustainability and strategic oriented supplier-selection are becoming new evaluation themes (Schätzle and Jacob, 2017; Hänninen and Karjaluoto, 2017; Wetzstein, Hartmann, Benton and Hohenstein, 2016; Yazdani, Chatterjee, Zavadskas and Zolfani, 2017).

In principle, the supplier evaluation and selection process can be divided into three phases: determining (the weights of) the evaluation criteria, determining the performance score, and ranking suppliers according to the calculated scores. This is a typical multi-criteria decision-making task (Wang, 2015; Yazdani, Chatterjee, Zavadskas and Zolfani, 2017).

In terms of the further focus of the research in this article, selected evaluation methods are characterized: point evaluation, multi-criteria evaluation (AHP), scoring model, ABC method, graphical evaluation, Gordon's rating model, comparative method and profile analysis. These methods have been selected on the basis of the literature research as most frequently occurring (e.g. Pfefferli, 2002; Tomek and Vávrová, 2014).

Point evaluation consists in assigning a certain number of points to each individual evaluation criterion, according to its significance. The result is the supplier's total number for all criteria (Venkata, 2013).

In an evaluation using the scoring model, each criterion is multiplied by its weight and the sub-results are added up (Azambuja and O´Brien, 2012). Also, it should be taken into account that some of the criteria are minimization-type criteria, and some are maximization-type criteria. This contradiction can be resolved for example through applying a weighted sum approach, see e.g. Jablonský and Dlouhý (2004).

The ABC method is an evaluation approach that uses the Pareto principle to divide suppliers in order to adopt a differentiated approach to them. The letters A, B, C are used to classify suppliers depending on how important they are for achieving the company's objectives. These suppliers, which are classified as A, are thus more important to the company than the other suppliers (Hoffmann, Beck and Füger, 2012).

Graphical evaluation is based on a graph consisting of a circle whose centre represents the lowest number of points that can be achieved for all evaluation criteria for the given supplier. There are lines running from the centre of the circle to its edge, which show the various evaluation criteria. Depending on the degree to which the criteria have been fulfilled for the supplier, points are placed within the circle. The size of the area determines the final evaluation of the suppliers. The larger the area, the better the quality of the supplier (Irlinger, 2012).

Gordon's rating model works with five areas: timeliness of deliveries, delivery time, product quality, purchase price and payment deadline. The supplier receives a certain number of points for each area and is placed in the respective category depending on the total number of points. The company's rating provides information on the extent to which the supplier meets its requirements and how it is doing compared with other suppliers (Gordon, 2008).

Next, there is the comparative method, which is based on assigning of a certain number of points to the indicators being evaluated, where the evaluation depends on the resulting value achieved. The key to successfully using the comparative method lies in assigning the primary number of points to each criterion and setting the limits for the evaluation of the resulting values. The largest number of points is assigned to the most important criterion (Pekarčíková and Trebuňa, 2011).

In profile analysis, all suppliers are taken into account. The objective is to identify the best ones. At the same time, profile analysis also points out the minimum requirements that the customer requires to be met by the supplier. It helps identify the suppliers that best meet these requirements (Janker, 2009).

2 Methodology

The research was conducted using the questionnaire survey method. The questionnaire consisted of a total of 27 questions, which were mostly closed-ended or semi-open-ended, only one (the final) question was designed as open-ended. The questionnaire was developed in Czech and subsequently translated into German so that both Czech and German companies could be approached with the same questionnaire.

The research focused mainly evaluation process documentation, supplier evaluation methods and selected evaluation criteria. 180 companies from the Czech Republic and 70 companies from Germany were approached, i.e. the sample comprised a total of 250 companies. These were mostly companies from the automotive and related industries, such as the glass and plastics industries. The companies were approached based on the author's professional contacts – the purpose of this was to ensure, among other things, a higher response rate and greater trust among the companies when completing the questionnaire. Therefore, this is not a random sample that would be representative in terms of statistical data processing. On the other hand, the research collected internal, relatively sensitive information that is not publicly available and companies have no obligation to publish it. In such a case, simple random sampling was not possible. The questionnaire was distributed electronically (by e-mail) to industrial companies, which were given 30 days to complete the questionnaire. Companies that failed to return a completed questionnaire within this time limit were asked again by e-mail or phone to complete it and were given an additional time limit for completing it (approximately 14 days). Data collection took place in the period from September to December 2016.

Of the 250 companies that had been approached, 181 companies responded to the questionnaire. The response rate was thus 72%, which is an above-average rate for a questionnaire survey. The high response rate can be attributed to the very fact that the companies were contacted based on the author's professional contacts. Of the 181 questionnaires received, 75% (135 companies) were from the Czech Republic and 25% (46 companies) were from Germany.

Both small enterprises and medium-sized and large enterprises participated in the research. Classification into the different categories was carried out according to EC Regulation No 800/2008. The structure of respondents by size is shown in Tab. 1. In both countries, most companies were classified in the category of medium-sized and large enterprises. This was due to the branch of business. In order to operate in the

automotive industry and the supplier industries, adequate human and capital resources are required, which is reflected in the size of the companies.

Tab. 1: Structure of respondents by country

Registered offices	Micro	Small	Medium-sized	Large	Sum
CZ	3	9	39	84	135
DE	0	6	18	22	46
Sum	3	15	57	106	181

Source: Authors

The questionnaires received were subsequently evaluated using MS Excel and the STATGRAPHICS Centurion XVII statistical software. Since the variables do not meet the assumption of a normal distribution, the non-parametric binomial test was used to assess the significance of the differences between Czech and German companies. In this case, the null hypothesis that the relative frequencies in both samples are the same at a given significance level (alpha 5%) is tested.

3   Results of the research
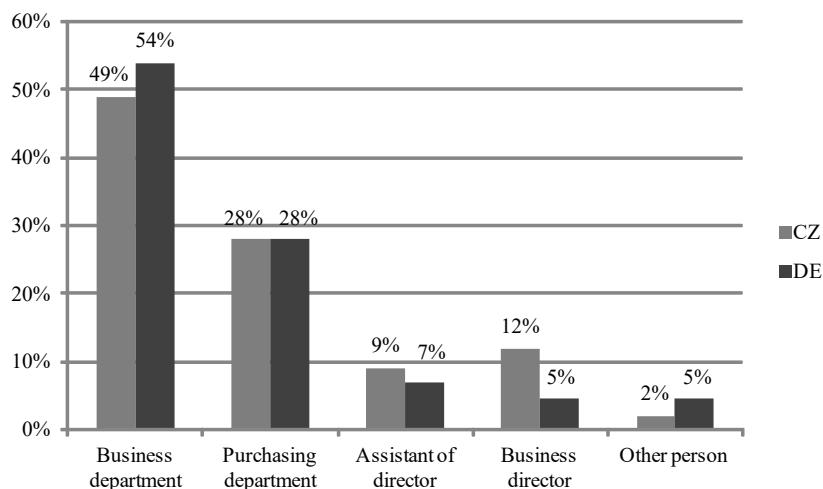
Since all companies answered a total of 27 questions in the questionnaire, a large number of both similarities and differences were identified in supplier evaluation by Czech and German companies. Given the scope of this article, only the most important findings have been selected.

In terms of supplier evaluation documentation, the research showed that in most companies that evaluate their suppliers the supplier evaluation process is documented in some way. This was true in both countries. The supplier evaluation process was documented in 85% and 91% of the companies in the CR and Germany respectively. In this case, the difference that was identified between Czech and German companies is statistically insignificant (at an alpha level of 5%, p-value = 0.3034). In principle, it can be concluded that no significant difference was found in the documentation of the supplier evaluation process between Czech and German companies. In both countries, the standard is that supplier evaluation is documented, and it is rarely otherwise.

In terms of evaluation, the issue of responsibility for this process is crucial. The results of the research have shown that – in companies in both countries – the business department is most often responsible for supplier evaluation (see Fig. 1). The second most common response was the purchasing department. In terms of responsibility for evaluation, the differences between Czech and German companies are not statistically significant (for the commercial department, p-value = 0.5580).
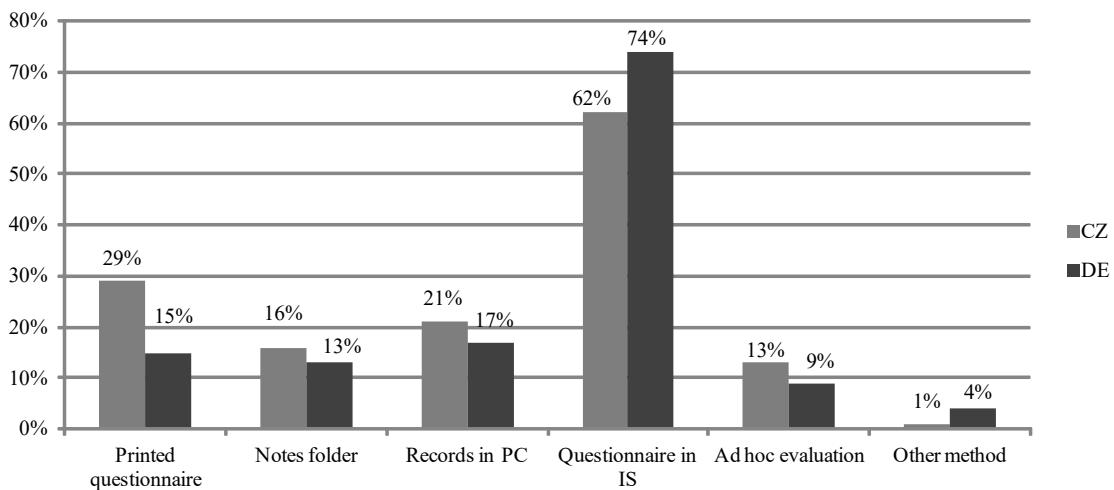
The next question focused on the technical aspects of supplier evaluation. During the development of the questionnaire, it was assumed that companies may use various technical resources. Therefore, companies were allowed to choose up to two responses. The results showed that evaluation is most often carried out using an information system (see Fig. 2). This is the most common option in both countries, and the slightly higher share in German companies is not statistically significant (p-value = 0.1404).

Fig. 1: Responsibility for supplier evaluation

Fig. 2: Technical method of evaluation
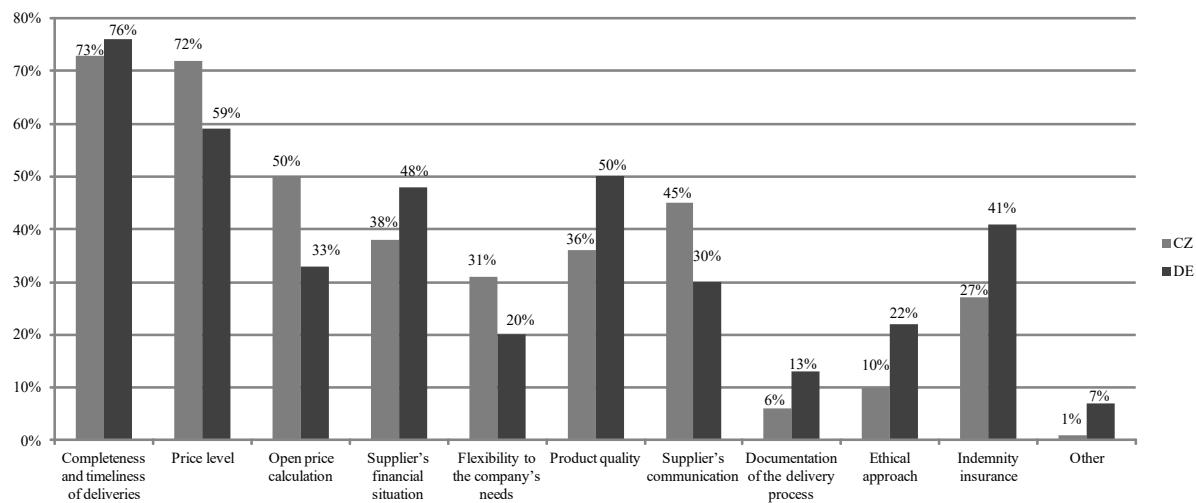
The criteria for supplier evaluation were an important area of the survey. In the questionnaire, each company was asked to list all criteria that were used by the company to evaluate suppliers. It was found that only one company uses mono-criteria evaluation. On the other hand, there were also companies that listed 5 or 6 criteria in supplier evaluation. From the perspective of the various criteria, it can be concluded that the vast majority of companies in both countries place consistent emphasis on the completeness and timeliness of deliveries. However, for other criteria, some differences were identified (see Fig. 3) which are also statistically significant.

This applies to the 'open price calculation' criterion, which is more frequently used by Czech companies (p-value = 0.0456). By contrast, the 'ethical approach' criterion is more frequently applied in evaluation by German companies (p-value = 0.0369). A statistically significant difference at an alpha level of 5% in favour of German companies was also found in the 'other' criterion (p-value = 0.0251), but it only represents a small group. At a significance level of 10%, there are also statistically significant differences in the 'product quality' criterion (more frequent in German companies, p-value = 0.0935), the 'supplier's communication' criterion (more frequent in Czech companies, p-value = 0.0575) and the 'indemnity insurance' criterion (more frequent in German companies, p-value = 0.0750).
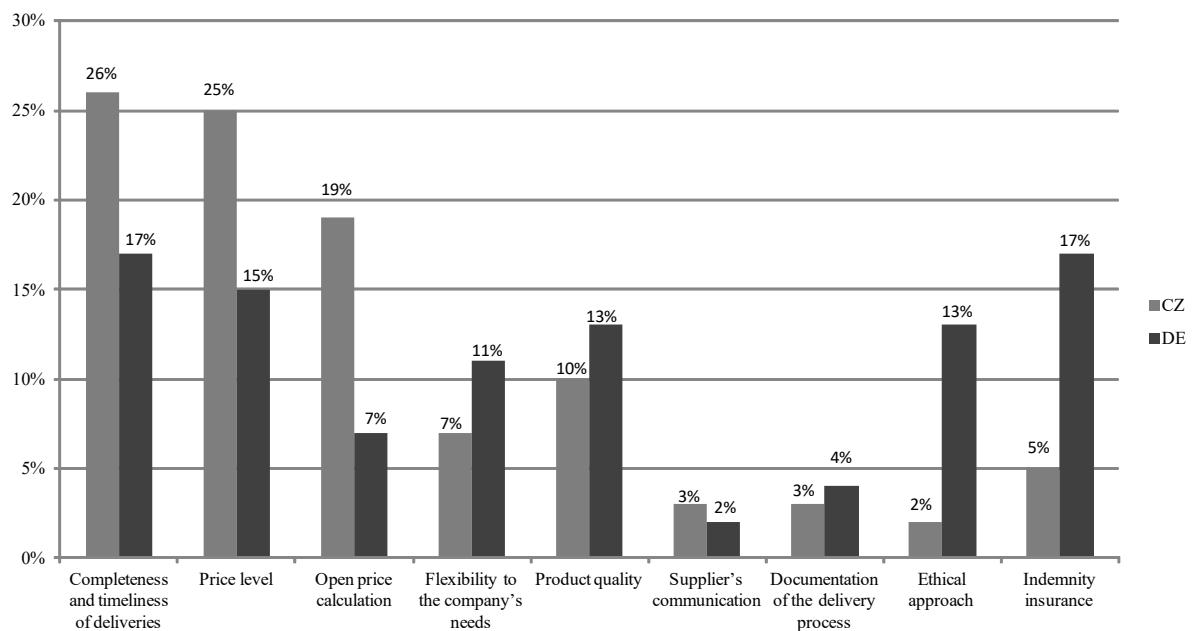
Fig. 3: Supplier evaluation criteria

Source: Authors

The subsequent question focused on the most important criterion in supplier evaluation. The results are broadly in line with the above findings, as this is the 'completeness and timeliness of deliveries' criterion (see Fig. 4). Nevertheless, even in this area, differences between Czech and German companies were identified. Czech customers are more price-sensitive, because they view the 'price level' and 'open price calculation' criteria as more important. However, the difference is only significant at an alpha level of 10%. By contrast, the 'ethical approach' criterion (p-value = 0.0026) and the 'liability insurance' criterion (p-value = 0.0098) were found to be more important to German companies.

Fig. 4: The most important evaluation criterion

Source: Authors

An additional question focused on whether the companies surveyed had an ISO-certified quality management system and whether they also took this into account in evaluating their suppliers. The survey showed that 59% of the companies surveyed in the Czech Republic had an ISO-certified quality management system in place. In Germany, the percentage was as high as 93% of the companies surveyed. The difference

is significant (p-value <0.0000). At the same time, the survey showed that even if Czech companies have an ISO system in place, only 30% of these companies evaluated this factor in their suppliers. For German companies with an ISO system, 52% evaluated this parameter in their suppliers. Again, the difference is statistically significant (p-value = 0.0071). This means that German companies are more often interested in ISO certification and, at the same time, more often require it from their suppliers.

The next question examined whether companies were interested in quality management systems other than ISO. In the case of Czech companies, half of respondents indicated that they did not consider other quality systems in their suppliers. For German companies, a negative response was only received from about a quarter of respondents. The difference is significant (p-value <0.0046). At the same time, German companies not only more frequently investigate and, where relevant, require other certified quality systems, but they also more frequently take this criterion into account in their own supplier evaluation.
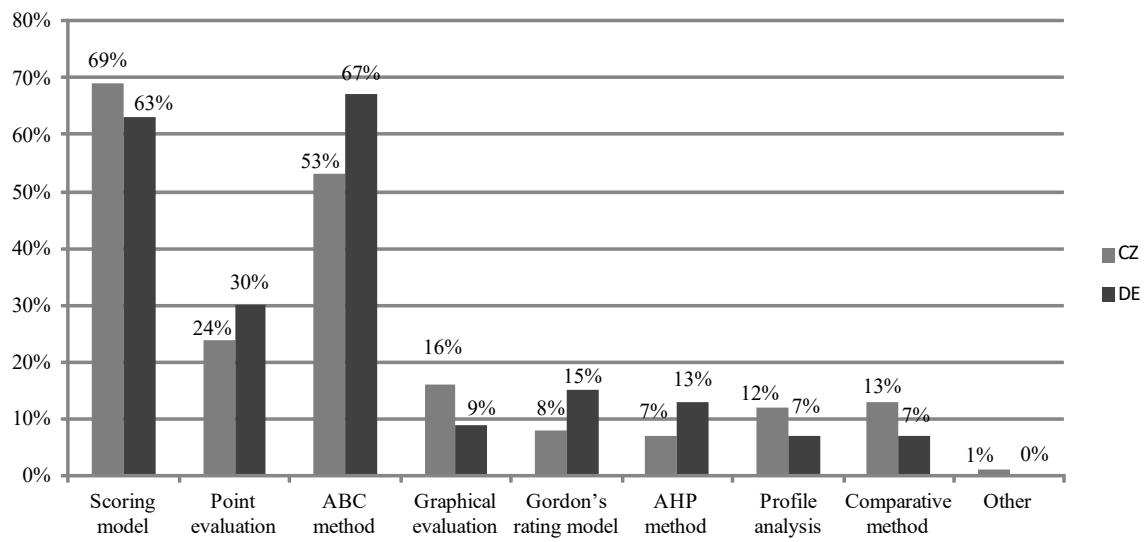
Suppliers' financial situation is a very often-used evaluation criterion, as it may affect the timeliness, quality and reliability of deliveries. This is a commonly used supplier evaluation criterion in both countries, see Fig. 3. The difference in the frequency of use of this criterion is not statistically significant (p-value = 0.2329). The survey also investigated how suppliers were reviewed in financial terms. The conclusions are practically identical for companies in both countries. Companies most frequently obtain data from public registers such as the commercial register or the insolvency register. This option was indicated by 46% of Czech and 50% of German companies, followed by the 'combination of different methods' option (37% of Czech and 45% of German companies).

The next question focused on audit by customer as part of supplier evaluation. The responses showed that 45% of respondents in the Czech Republic carried out audits at their suppliers. For German companies, this was a half of the companies – the difference is not statistically significant (p-value = 0.5569).

In the subsequent part of the research, certain sub-aspects of evaluation were investigated. For example, it was found that 36% of Czech and 30% of German companies carried out tests and inspections of deliveries in their own laboratories. Given the size of the samples, the difference cannot be considered significant (p-value = 0.4596). Inspections of packaging are conducted by 84% of Czech respondents and 93% of German respondents. Again, the difference is not significant (p-value = 0.1254). In addition, no significant differences were found in the certified competence of some employees. Most Czech (72%) and German (67%) respondents do not evaluate this factor in their suppliers. P-value is 0.5198; the difference thus cannot be considered significant.

Setting the evaluation criteria must only be considered to be the first step of an evaluation. The second important step is the evaluation method used. As part of the research, it was investigated which evaluation methods were applied by companies in practice. Given that companies can combine various evaluation methods, multiple response options could be chosen. Companies indicated one to three responses. The results are shown in Fig. 5.

Fig. 5: Supplier evaluation methods used

Fig. 5 shows that only three evaluation methods are widely used in practice. For Czech respondents, these are the scoring model, followed by the ABC method and the point method. For German respondents, the most commonly used methods are the ABC method, followed by the scoring model and point evaluation. In terms of differences between Czech and German respondents, the only difference that is significant is the higher share of the use of the ABC method by German companies (p-value = 0.0980), but it is only significant at an alpha level of 10%.

Additionally, it was investigated whether companies also used some form of visualization of the evaluation. It was found that the vast majority of Czech (93%) and German (96%) companies used a graphical depiction of evaluation results; most often these were graphs and diagrams. In this respect, there are no major differences between Czech and German companies.

The last question was designed as open-ended. Respondents were given the opportunity to briefly describe the way supplier evaluation was conducted in their company. Unfortunately, it turned out that most Czech and German companies were either unwilling to disclose this information or decided not to share it for time or other reasons. In total, 52% of Czech and 61% of German respondents gave no response at all. Only 7 Czech and 2 German companies provided detailed information. However, this sample is so small that it cannot be reliably evaluated. Rather, the responses received can serve as case studies of supplier evaluation procedures.

4 Discussion

Based on the results of the research carried out, it can be concluded that even though there are differences in approaches to supplier evaluation between industrial companies in the CR and Germany, these differences are not substantial. Therefore, the discussion will mainly focus on the question of what may be the causes for the differences between Czech and German companies. It has to be borne in mind that both countries have strong ties resulting from their geographic proximity, a strong tradition of mutual trade and – in particular in the automotive industry – the interconnectedness of supplier-customer relationships. Given the above factors, it

could be assumed (based on the author's experience in automotive industry) that many Czech companies adapt – to a certain degree – their standards and procedures to their key customers. If both the supplier and the customer have similar procedures, standards and customs, their cooperation in deliveries is usually easier in terms of communication, contractual documentation etc.

The research showed that, in some areas, there are no substantial differences in supplier evaluation between Czech and German companies. This applies e.g. to the documentation of the entire evaluation process, the persons responsible for carrying out evaluations and certain evaluation criteria.

In evaluating their suppliers, customers in both countries place consistent emphasis on the completeness and timeliness of deliveries. This was not only the most frequently indicated criterion, but it was also considered the most important criterion in both countries. Similarly, no major differences were found in the evaluation of suppliers' financial situation, audits conducted by customers, technical evaluation tools, and visualization of the evaluation results.

However, some differences have been identified as well. In evaluating their suppliers, Czech companies attached greater importance to price factors. This means not only the price as an amount, but also suppliers' openness in calculating product prices. A more frequently used factor to Czech customers is also communication with suppliers. By contrast, it was found that German companies attached greater importance to ethical principles (social responsibility), quality and indemnity insurance. Furthermore, German companies are more likely to have a certified quality management system in place and they are also more likely to require such a system from their suppliers.

At the same time, the assumption based on literature (Wetzstein, Hartmann, Benton and Hohenstein, 2016) has been confirmed that – for evaluation – companies prefer rather simple and easily applicable evaluation methods to more comprehensive yet also more complex evaluation systems. It came as a bit of a surprise that companies in both countries did not indicate green and environmental evaluation criteria more frequently. This points to the conclusion that even though companies outwardly declare a policy of social responsibility, they neither monitor nor evaluate such a policy in their suppliers.

Conclusion

The present article aimed to compare supplier evaluation criteria and methods in Czech and German companies that operate mainly in the automotive industry. In terms of criteria, it can be concluded that traditional evaluation measures such as the price, quality, timeliness and completeness of deliveries and the financial situation of the supplier tend to be applied in both countries. Modern criteria in the area of environmental and social responsibility are not required by Czech companies virtually at all. For German companies, modern criteria (ethical approach plus the 'other criteria' category) were indicated more frequently, but they can only be viewed as secondary in terms of importance. In evaluating their suppliers, Czech companies also attach greater importance to price and calculations. German companies place more emphasis on the soft factors mentioned above, namely the quality and insurance. In terms of evaluation methods, comparatively simple methods were the most common in

companies in both countries. In both countries, the same three methods are most commonly used – scoring model, ABC method and point evaluation.

In conclusion, it can be noted that a certain degree of similarity between approaches to supplier evaluation was assumed at the beginning of the research, given the relatively close ties between the Czech and German economies and the cooperation between companies from both countries. However, the results of the research also indicated certain differences which may be connected e.g. with trust within supplier-customer relationships and economic factors. The former factor can be deduced from the fact that – during evaluations – Czech companies put greater emphasis on the element of communication with suppliers. At the same time, they give more attention to the price of deliveries, which may be related to profit margins and added value of Czech production.

Also, the limitations of the research need to be pointed out. The results may be influenced by the selection of companies. However, supplier selection and evaluation policy is a sensitive issue that companies are unwilling to disclose, even under assurance of confidentiality of information. For this reason, the selection of respondents could not be designed as completely random, but rather a purposive selection of respondents had to be used, because such respondents were more likely to be willing to cooperate.

Acknowledgement

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K ETICKÉ POLITICE VYSOKÝCH ŠKOL V ČESKÉ REPUBLICE

ON AN ETHICAL POLICY OF UNIVERSITIES IN THE CZECH REPUBLIC

Marie Bohatá, Milan Žák

Abstract: The article presents principal features and three main pillars of an effective ethical policy, i.e. instruments, processes and structures. Under instruments, mainly ethical codes, risk management and whistleblowing are introduced. The part dealing with processes focuses on four areas: conceptualisation and design, communication and implementation, monitoring and assessment, and revision. Ethical commissions, ethics officers and ethics and compliance departments, as well as communication channels serve as examples of supporting structures. Through the experience of enlightened private and public organisations, some leading universities world-wide, as well as their own experience from the public administration, the authors provide recommendations how to develop a systemic approach to ethics management of universities in the Czech Republic. Some first elementary empirical findings on ethical codes and ethical commissions existing in the Czech Republic are also presented.

Keywords: Ethical Codes, Ethical Policy, Risk Management, Whistleblowing, Ethical Commissions, Universities and Colleges.

JEL Classification: A13, D22, D73, I23.

Úvod

Tento článek je věnován systémovému přístupu k institucionalizaci etiky a jeho žádoucí integraci do systému řízení vysokých škol. Zabývá se nejprve teoretickým rámcem, vysvětluje jeho hlavní komponenty v podobě nástrojů, procesů a struktur a uvádí konkrétní doporučení pro subjekty terciárního sektoru, které usilují o posilování etiky a integrity v systému řízení. Článek prezentuje výsledky výzkumného projektu VŠEM „Etika v řízení vysokých škol", jehož cílem bylo poskytnout podněty k vypracování etické politiky českých vysokých škol. Výzkum se opíral o zkušenosti zahraničních univerzit s prosazováním etiky v řízení, relevantní zkušenosti ze soukromého i veřejného sektoru i vlastní zkušenosti autorů v oblasti etiky ve veřejné správě.

1 Formulace problematiky

Etiku chápeme jako nutnou podmínku dobré správy a řízení (governance) a smyslem etické politiky je aplikovat konzistentní přístup k řešení etických problémů jednak uvnitř organizace, jednak ve vztahu k vnějšímu prostředí. Etická politika zahrnuje nástroje, procesy a struktury, přičemž tyto tři pilíře plní odlišné funkce. Inspiraci čerpáme zejména z etického rámce, který pro univerzity a vysoké školy ve Spojeném království vyvinul Institute of Business Ethics (Ethics Matters, 2016) a rámce OECD pro posílení integrity veřejného sektoru (OECD Integrity Framework, 2008), ze zkušeností soukromého sektoru při prosazování etiky v podnikatelských aktivitách a v neposlední řadě i z vlastních poznatků a dlouholetých zkušeností při prosazování etiky ve veřejné správě.

1.1 Nástroje etické politiky

V této části představíme stěžejní nástroje etické politiky používané v současné době a některé z nich probereme podrobněji. Za hlavní nástroje můžeme považovat především krédo nebo jakoukoliv formu deklarace hodnot dané organizace, etický kodex, řízení rizik, řízení kvality, ale i proti-korupční politiku či politiku a systém vnitřního oznamování nekalých praktik (whistleblowing). Etické kodexy představují nejrozšířenější, ale zároveň mnohdy jediný nástroj prosazování etiky na univerzitách a vysokých školách. Z logiky věci vyplývá, že prvním krokem k vypracování kodexu by mělo být vyjasnění poslání a hodnot, k nimž se daná organizace hlásí. Předpokládá se totiž, že od hodnot se odvíjí organizační kultura, která je velmi důležitá pro uplatňování etiky v organizaci (Solomon, 1993; Lynch 1994; van Klooster, Meyer, 2016). Kultura může etické jednání buď podporovat, nebo naopak umožňuje, aby se neetické jednání v organizaci šířilo. Hodnoty bývají nejčastěji artikulovány ve formě **kréda** nebo **deklarace**, méně často jsou uváděny přímo v kodexu. Za určitou formu veřejné deklarace hodnot lze ve vysokoškolském prostředí považovat akademický slib (imatrikulační či promoční), ale jeho složení bývá ve většině případů jen formální záležitostí, a proto jej není možno považovat za efektivní nástroj etické politiky. Tímto tvrzením však nechceme popřít potenciál etického slibu, ale naopak poukazujeme na nevyužité možnosti spojené s jeho vymáháním v praxi.

1.1.1 Etické kodexy

Jak známo, **etické kodexy** v podnikatelské činnosti a veřejných politikách vznikaly jako nástroj seberegulace, tedy jako dobrovolně přijímaný etický závazek dané organizace či profese (White, Montgomery, 1980; Beauchamp, Bowie, 1993; Adams, Tashchian, Shore, 2001) a začaly se masivně šířit nejprve v anglosaských zemích. Největší boom zaznamenaly na přelomu 70. a 80. let minulého století. V kontinentální Evropě zaznamenáváme jejich prosazování - a stejně je tomu i u disciplíny hospodářské/podnikatelské etiky – zhruba o dekádu později. Přední němečtí a švýcarští autoři (Steinmann, Loehr, 1992; Wittmann, 1995; Ulrich, Wieland, 1998) považují přijímání kodexů za projev institucionalizace etiky, přičemž jasně deklarují, že etické kodexy stojí vedle práva a právo doplňují. Steinmann a Loehr (1992, s.67) hovoří o kriticky loajálním doplňku práva. Je třeba zdůraznit, že kodex jako takový není právně vymahatelný, protože ani etické jednání obecně není právně vymahatelné (na rozdíl od institutu práva). Hlavní motivy pro dobrovolné přijímání etických norem a principů lze spatřovat ve snaze zvyšovat kvalitu a integritu prostředí, zlepšovat vnímání organizace jejími partnery i veřejností, ale i předcházet případné regulaci, která by mohla být vyvolána šířením neetických praktik, jež společnost není ochotna tolerovat. Výjimečně však některé organizace vytvářejí kodexy závazné (zaměstnanec firmy dostává při uzavírání pracovní smlouvy kodex k podpisu a jeho porušení může mít pracovně-právní důsledky). Zdá se, že v českém prostředí je přístup k etickým kodexům inspirovaný právem dosti častý, a to nejen pokud jde o jejich formu (např. Etický kodex státních zaměstnanců má formu služebního předpisu náměstka vnitra pro státní službu, Etický kodex ČVUT Praha má formu vnitřního předpisu a nabývá platnosti dnem registrace MŠMT apod.), ale i převažující legalistický tón (Bohatá, 2017).

Při pohledu na vývoj etických kodexů můžeme rozlišit dva základní přístupy. Jeden zdůrazňuje principy a hodnoty, zatímco druhý se zaměřuje na konkrétní návody a pravidla jednání. Každý z nich má své výhody a nevýhody. Hodnotově orientované kodexy vyrůstají ze silné kultury organizace a dále ji upevňují. Rozvíjejí individuální schopnosti

etické argumentace uvnitř organizace, poskytují členům organizace prostor pro interpretaci hodnot v nejrůznějších konfliktních situacích, ale nedávají konkrétní návody, jak řešit etická dilemata. V nepředvídaných situacích se většinou postupuje na základě analogie. Monitorování, zda a jak jsou tyto kodexy dodržovány v praxi, je poměrně obtížné. Naproti tomu v kodexech obsahujících pravidla je diskuze o etických dilematech v organizaci většinou jen velmi omezená. Monitorování, jak jsou dodržovány v běžném životě organizace, je podstatně snazší, ale vznikají obtíže v případě nových situací a problémů. Praxe však ukazuje, že v posledních 10-20 letech se tyto rozdíly často stírají, současné kodexy jsou většinou detailněji rozpracovány (nebo doplňovány dalšími dokumenty) a zahrnují tak v podstatě oba přístupy, tedy jak hodnoty či principy, tak i konkrétní normy či pravidla jednání (Webley, Johnson, 2016).

Kodexy jsou bezesporu důležitým nástrojem pro prosazování etiky v organizaci, ale jejich efektivnost závisí na řadě dalších okolností, jimž se budeme věnovat v souvislosti s procesy a strukturami. Uveďme jen, že tím budeme reagovat i na nejčastější kritiku, která kodexům vytýká především formálnost (jsou to pouze „fráze a krásná slova", nefunkčnost (pokud neobsahují sankce) nebo zdůrazňuje přesvědčení, že chování jednotlivců je určováno hodnotami osvojovanými si od dětství, a nikoliv psanými kodexy, které mohou dokonce omezovat právo jedince zaujímat na pracovišti morální postoje.

1.1.2 Řízení rizik

Řízení rizik bývá definováno jako oblast řízení zaměřená na analýzu a snižování rizik pomocí různých metod a technik prevence rizik, které eliminují existující a odhadují budoucí rizikové faktory. Cílem je omezit pravděpodobnost výskytu rizik a/nebo snížit jejich dopad (Řízení rizik, 2017). Různé typy rizik představují různé typy etických problémů (Beauchamp, Bowie, 1993). V manažerské literatuře věnované řízení rizik se uvádějí čtyři provázané fáze procesu řízení rizik, jimiž jsou identifikace, zhodnocení, zvládnutí (zmírnění) a monitoring. Z velmi široké literatury, která je k tomuto tématu k dispozici, lze uvést rozsáhlou publikaci českých autorů Smejkala a Raise (2013). Z naší perspektivy je účelné rozlišovat tři hlavní oblasti řízení rizik, a to rizika ve vztahu k legislativě, ke zdrojům a ve vztahu ke stakeholders. Ve vztahu ke stakeholders považujeme za ústřední problém riziko reputační.

Z poznatků získaných studiem přístupů uplatňovaných na úspěšných zahraničních univerzitách[1] vyplývá potřeba soustředit se při řízení rizik na tyto komponenty:

- Události, které vysokou školu nebo její pověst poškodily v poslední době (např. za posledních pět let) a přehled takových událostí, ke kterým za stejné období došlo u hlavních představitelů oboru.

- Trendy ve vývoji změn celého prostředí, které by mohly nepříznivě ovlivnit provoz, hospodaření nebo pověst vysoké školy do budoucna:

    - ekonomické prostředí, vztahy ke sponzorům;

    - dynamika poptávky po studiu;

    - legislativní prostředí;

    - technologické prostředí (IT, bezpečnost);

    - dynamika rozvoje vědy a výzkumu u hlavních představitelů oboru.

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[1] zejména Harvardská univerzita a univerzita v Edinburgu

- Katalog rizik podle pravděpodobnosti výskytu a dopadů:

    - v přijímacím řízení;

    - v provozu vzdělávacího cyklu;

    - ve vědě a výzkumu;

    - ve všech činnostech provozně podporujících hlavní činnosti;

    - ve vztazích k zaměstnancům, partnerům, sociálnímu okolí.

- Systém řízení kvality:

    - vytváření a aktualizace hlavních ukazatelů;

    - systém sebehodnocení;

    - externí hodnocení;

    - řešení stížností;

    - nastavení úrovně závažnosti a časového horizontu dokumentace.

1.1.3 Vnitřní oznamovací mechanismy (whistleblowing)

Veřejná oznámení nějakých nepravostí, k nimž může dojít v nejrůznějších organizacích („whistleblowing"), se stala předmětem značného veřejného zájmu v 70. letech minulého století[2]. V odborné literatuře se jednání stávajícího nebo bývalého zaměstnance nějaké organizace, který upozorní veřejnost nebo oprávněný orgán na neetické nebo nezákonné jednání na pracovišti, začala věnovat soustavná pozornost zejména v 80. letech minulého století. Za základní literaturu v oblasti podnikatelské etiky je považována publikace autorů Miceli a Near (1985), ale předcházela jí řada odborných statí zkoumajících tuto záležitost z perspektivy právní, manažerské, psychologické či sociologické. Je zřejmé, že se jedná o velmi citlivou záležitost jak pro jedince, který s podobným oznámením vystoupí, tak pro organizaci, jíž se oznámení týká. Vnímání takových situací bývá rozporuplné, často převažuje spíš negativní postoj k oznamovateli. Na jedné straně se operuje zásadou loajality (Bok, 2000), na druhé straně tím, že nad nepravostmi nelze zavírat oči a člověk má mravní povinnost bránit zlu (Grant, 2002). Není nijak překvapující, že ke konceptu „whistleblowing" se rozvinula široká diskuze. V reakci na ni většina současných definic zdůrazňuje, že osoba oznamující jedná v dobré víře[3] a nesleduje vlastní prospěch, což svým způsobem legitimizuje porušení zásady loajality vůči organizaci, která je za daný problém odpovědná. Někteří autoři (Vandekerckhove a Commers 2004) přicházejí s konceptem „racionální loajality", který zdůrazňuje, že objektem loajality není sama organizace, ale její poslání a dlouhodobé cíle. Druhou zásadní podmínkou této legitimizace je neúspěšná snaha nebo nemožnost vyřešit problém standardními vnitřními postupy. Z praxe je však známa řada případů, kdy osoby jednající ve veřejném zájmu a které v souladu s druhou zmíněnou podmínkou legitimizace nejprve neúspěšně hledaly možnosti řešení uvnitř organizace, přesto ztratily práci a čelily velkým problémům při hledání dalšího zaměstnání (Alford, 2001). Ve světle těchto zkušeností tedy vyvstal

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[2] Např. únik informací z Pentagonu v r. 1971 (D. Ellsberg), úloha prezidenta Nixona v aféře Watergate v r. 1972 (W.M. Felt,Sr.) nebo radiace v továrně Kerr Mc Gee na výrobu plutonia v r. 1974 (K.Silkwoodová).
[3] Zkušenost však ukazuje, že motivaci bývá těžké posoudit.

požadavek zajistit odpovídající ochranu[4] těm jedincům, kteří jsou odhodláni při prosazování etických principů a veřejného zájmu riskovat své postavení i pověst.

Postupem času můžeme pozorovat slábnutí negativní konotace, již výraz whistleblowing navozuje (ve smyslu „práskání“) a šíření pozitivního vnímání jakožto snahy o nápravu, která je pro organizaci prospěšná (Callahan, Dworkin, Fort, Schipani 2002; Miceli, Near, Dworkin, 2008; Vandekerckhove, 2012). Svědčí o tom ostatně i institucionalizace vnitřního oznamování, k níž dochází v organizacích veřejného i soukromého sektoru. Je však třeba zdůraznit, že jde výhradně o oznamování nekalých praktik či škodlivého jednání uvnitř organizace a potřebnou ochranu oznamovatelů před odvetnými opatřeními ze strany vedení. Mnohé eticky uvažující organizace vypracovávají postupy a struktury pro vnitřní oznamování, protože si uvědomují, že již samotná existence takových postupů a struktur přispívá ke zvyšování důvěry uvnitř organizace i její důvěryhodnosti navenek.

Žádná organizace není ušetřena rizika, že se něco nepodaří. Je proto žádoucí, aby organizace vytvářely kulturu, která podporuje upřímnost a skutečný zájem řešit problémy, aniž by se zaměstnanci museli obávat ztráty zaměstnání či jiných negativních důsledků pro své postavení a další kariéru. Jak můžeme pozorovat především ve velkých společnostech a organizacích, součástí takové kultury je přístup k nezávislé konzultaci/radě, jmenování pracovníků mimo řídící hierarchii, kteří se mají případnými oznámeními nepravostí zabývat, respektování důvěrnosti (pokud si to dotyčná osoba přeje), možnost sdělit informaci či obavu mimo běžnou řídicí hierarchii, ale také hrozba sankce za falešné obvinění. Je zřejmé, že taková kultura není samozřejmostí a její utváření vyžaduje přesvědčivý postoj a úsilí vrcholového vedení, které je ochotno demonstrovat, že vnímá „vnitřní whistleblowing“ jako nástroj ke zkvalitnění fungování organizace. Nejde přitom o nastavení povinnosti vnitřního oznamování, ale povzbuzení, pokud to situace vyžaduje, a ukázání možných mechanismů. Pro organizaci a její důvěryhodnost je efektivnější řešit problémy uvnitř a omezovat tak riziko, že dojde k veřejnému oznámení.

Poznamenejme ještě, že ochrana osob, které se rozhodnou nějaké nekalé praktiky oznámit, se stala důležitým tématem i na evropské úrovni, o čemž svědčí i nedávno zahájená veřejná konzultace v rámci přípravy celoevropského legislativního řešení této problematiky (EOC EU Office 2017).

1.2 Procesy

Do procesů řadíme výběr a vývoj nástrojů a následně jejich implementaci ve strategickém i operativním řízení organizace. Můžeme je uspořádat do čtyř okruhů:

1.2.1 *Konceptualizace a vypracování politiky*

Obsahem konceptualizace (Yahr, Bryan, Schimmel, 2009) jsou procesy spojené se stanovením cílů ve vazbě na poslání a vize, konzultace stakeholders, především zaměstnanců, rozhodování o tom, komu bude etická politika určena, jaká bude její struktura, tj. bude uspořádána dle profilujících činností organizace (pedagogická činnost, věda a výzkum), dle témat (střet zájmů, věda a podnikatelské činnosti, rovné příležitosti) nebo podle konstituentů/stakeholders (pedagogičtí pracovníci, řídící orgány, administrativní pracovníci, studenti). Při vlastním vypracování politiky je zásadní participativní přístup na jedné straně a podpora vrcholového vedení na straně

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[4] Ochrana by se neměla týkat těch osob, které úmyslně oznamují nepravdivé informace.

druhé. Nedoporučuje se svěřit vypracování etické politiky plně do rukou externího poradce. Participace vrcholového managementu je nejen žádoucí, ale je zároveň i podmínkou úspěšnosti. Je třeba zdůraznit, že vypracování etické politiky vyžaduje odhodlání vedení, leadership, dostatečný čas i lidské a finanční zdroje.

1.2.2 Komunikace a implementace

Pokud má být etická politika efektivní, vedení organizace se musí rozhodnout, jakým způsobem ji bude prosazovat a jak zajistí, aby se jí zaměstnanci/členové řídili. Nutnou podmínkou uvedení politiky do života je její znalost a porozumění jejímu smyslu i obsahu. Za nezbytné součásti implementace je proto považováno školení zaměstnanců, trénink a poradenství v případě nejasností. Cílem implementačních aktivit by mělo být utváření obecného povědomí v organizaci, že jednání v souladu s etickou politikou se striktně vyžaduje (je podmínkou zaměstnání v organizaci) a je zásadní pro dlouhodobou udržitelnost organizace. Přitom nestačí etickou politiku šířit jen uvnitř organizace, ale je ji třeba komunikovat i navenek za účelem informování externích stakeholders. Součástí implementace musí být i reportování v případě porušování přijatých principů či pravidel a přijímaní opatření k nápravě včetně sankcí. K tomu je potřeba vytvořit jednak jasné procedury, jednak struktury (viz dále) a zajistit, aby byly všeobecně známy (Ethics Matters, 2016). Zkušenost totiž ukazuje, že právě neznalost existujících mechanismů často odrazuje zaměstnance od informování, ať v pozitivním či negativním smyslu.

1.2.3 Monitorování a hodnocení

Uplatňování etické politiky je třeba sledovat a vyhodnocovat. Osvědčenou praxi představují sebehodnotící dotazníky nebo hodnocení odbornými kolegy (peer review) či hodnocení nezávislými externími posuzovateli. Monitorování a následné přijímání případných nápravných opatření či aktualizace/revize politiky slouží k soustavnému zdokonalování organizace. Hodnocení lze samozřejmě využívat i pro benchmarking a benchlearning.

Zveřejňování hodnotících zpráv a stanovisek vedení organizace k těmto zprávám (podobně jako v případě auditu) je projevem ochoty organizace skládat účty (accountability) a odhodlání prosazovat kulturu otevřenosti, což vede k posilování důvěryhodnosti organizace.

1.2.4 Aktualizace a revize

V rychle se měnícím světě přibývá etických dilemat, objevuje se potřeba nových standardů a vyvíjejí se i očekávání společnosti. Etická politika musí proto reagovat i na aktuální výzvy. Doporučuje se provádět pravidelné aktualizace a v návaznosti na výsledky monitoringu etické politiky a hodnocení i případné revize. Etická politika i její nástroje musí být stále relevantní a pomáhat řešit nově se objevující problémy.

1.3 Struktury/aktéři

Podmínkou funkční a účinné etické politiky je existence podpůrných struktur nebo aktérů s jasně vymezenou úlohou a odpovědností. Ve velkých společnostech dnes existují nejen **určení pracovníci** (Ethics Officers), jejichž náplní je prosazování etické politiky, ale i celé **útvary**. Stále častěji jde o útvary, které zodpovídají zároveň za dodržování právních a etických norem (Ethics and Compliance). Je však třeba poznamenat, že toto spojení může sice přinést určité synergie, ale někdy vede k dominantnímu sledování právních norem na úkor norem etických.

Strukturami rozumíme také kanály, jimiž je možno předávat informace o případném porušování pravidel a etických problémech, náměty k aktualizaci či revizi politiky apod. Velmi rozšířené jsou tzv. **horké linky** nebo **linky pomoci**. Součástí mechanismu této vnitřní komunikace, která bývá často anonymní, jsou i příslušní adresáti, na něž je možno se obracet (jak je uvedeno výše, bývají to jednotlivci, etické komise, útvary pro etiku a „compliance", případně etický ombudsman). Tyto určené osoby nebo funkční skupiny jsou povinny zabývat se jednotlivými náměty a většinou též informovat o dalším postupu a poskytovat zpětnou vazbu.

2 Metody

Pro teoretickou část textu je použita metoda literární rešerše. Zdroji pro tuto rešerši jsou odborné knihy, odborné články a internetové zdroje. Provedený empirický výzkum zahrnul analýzu veřejně přístupných etických kodexů, statutů etických komisí a zápisů z jejich jednání. Byly využity též závěry Komise pro etiku v pedagogické a vědecké práci Rady vysokých škol (RVŠ), která vypracovala v roce 2011 přehled o etických kodexech na vysokých školách v ČR. Další cenné poznatky vyplynuly z rozhovorů s významnými stakeholders, zejména vedením Konference rektorů, Národního akreditačního úřadu a členy etických komisí. V závěrech a doporučeních jsme se opírali o zkušenosti zahraničních univerzit, soukromého sektoru i o vlastní zkušenosti s prosazováním etického řízení ve veřejné správě.

3 Rozbor problému

Empirické poznatky týkající se etické politiky v českém vysokém školství jsou dosud velice omezené. Pomineme-li akademické sliby pro formální způsob jejich přijímání, setkáváme se pouze s jediným nástrojem etického řízení, a to etickým kodexem. Avšak i tady musíme konstatovat převažující formální přístup k jejich přijímání a s tím spojený jen okrajový zájem o jejich implementaci v praxi. Historie etických kodexů je zatím poměrně krátká, ale i přesto je překvapující, že k tomuto tématu se nerozvinula žádná významnější odborná diskuze. V souvislosti s přijímáním kodexů jsou obvykle ustavovány etické komise, které mají napomáhat uplatňování kodexů v praxi. Jsou to v podstatě jediné struktury podporující etickou politiku. Zdá se, že procesům, jejichž důležitost byla objasněna v předcházejícím textu, není zatím věnována vůbec žádná pozornost.

Etické kodexy univerzit a vysokých škol v ČR

Lze se domnívat, že impulzem k přijímání kodexů v českém vysokém školství se stalo schválení **vzorového Etického kodexu pro akademické pracovníky vysokých škol**, k němuž došlo na 5. zasedání sněmu RVŠ v květnu 2007. Tento kodex obsahuje obecné zásady, zásady pro pedagogickou práci a zásady pro vědeckou, uměleckou a další tvůrčí práci. V oblasti vědecké práce a výzkumu se plně shoduje s Etickým kodexem výzkumných pracovníků Akademie věd ČR. Není však známo, z jakých dalších zdrojů vychází a zda byl podroben širší oponentuře. Lze předpokládat, že jeho účelem bylo inspirovat jednotlivé vysoké školy, aby si vypracovaly vlastní kodex, který by zároveň odrážel jejich specifika. Je však třeba konstatovat, že některé tento vzorový kodex prostě přejaly navzdory tomu, že některé jeho zásady jsou natolik obecné, že nedávají žádnou představu o hodnotách, k nimž se daná vysoká škola hlásí.

Vzorový etický kodex byl navržen a přijat, aniž by proběhla fundamentální diskuze zaměřená na hodnotovou orientaci českého vysokého školství. Domníváme se, že hodnoty, na jejichž prosazování by univerzitní a vysokoškolská sféra měla aspirovat, jsou z velké části společné. Zároveň věříme, že se bude dařit postupně překonávat úzké utilitaristicky zaměřené vnímání etiky omezené na dosahování maximálního zisku pro maximální počet jedinců a prosazující se potřeba udržitelného rozvoje a soudržnosti společenského systému budované na vzájemné důvěře jako hlavní výzvy 21. století povede k prosazování respektu vůči lidem i okolí, odpovědnosti a v neposlední řadě i morálních kvalit těch, kdo vychovávají budoucí generace. Jsme přesvědčeni, že diskuze o hodnotách je stále potřebná, a proto jsme se zapojili do rozvíjení mezioborového dialogu reprezentantů humanitních směrů, který zatím vyústil v definování minimálního souboru společných fundamentálních hodnot vysokého školství. Filozofický pohled zdůrazňuje (Havlíček, Krbec, 2014 s. 33) že původní místo hodnot je v našem chtění, rozhodování a jednání", zatímco z ekonomického pohledu jsou hodnoty charakterizovány jako obecné cíle společnosti založené na konsensu a na harmonizaci společenských zájmů (tamtéž s.114).

Zmíněný dialog byl zahájen především jako dialog filozofů a ekonomů pod vedením filozofa Václava Němce a ekonoma Milana Žáka. Dále byli k diskusi přizváni zástupci různých vysokých škol včetně studentů a členové Společnosti pro etiku v ekonomice, podnikání a správě. Pracovní verze kréda/hodnotové deklarace byla dána k dispozici zainteresované odborné veřejnosti prostřednictvím článku v časopise Andragogika (Bohatá, Žák, 2017a) a článku Náměty k definování etické politiky vysokých škol (Bohatá, Žák, 2017b). Smysl celé této iniciativy i vlastní pracovní text Deklarace byl představen vedení hlavních institucionálních stakeholders, tj. České konferenci rektorů, Radě vysokých škol a Národnímu akreditačnímu úřadu. Účelem zahájeného rozsáhlého konzultačního procesu je nejen dosažení konsenzu a sdílené interpretace jednotlivých hodnot, ale i vytvoření pocitu spoluvlastnictví, který je pro anticipované přijetí stěžejního společného dokumentu zásadní.

3.1 Etické komise na univerzitách a vysokých školách v ČR

Pokud jde o struktury fungující v českém vysokém školství, dosud existují pouze etické komise, které dohlížejí na implementaci etických kodexů (Bohatá, 2017). Témata, jimiž se podle dostupných informací komise dosud zabývaly, jsou poměrně úzká a většinou se jednalo o plagiátorství a porušování publikační etiky. Podle našich poznatků jsou jednání komisí neveřejná a zveřejňované zápisy velmi strohé, takže v podstatě neexistuje zpětná vazba a není využívána potenciální výchovná funkce působení těchto orgánů.

Etické komise se zabývají případy individuálního porušování kodexů. Dosud v ČR neexistuje žádné pravidelné ani ad hoc monitorování, jak se kodexy v praxi dodržují, ani žádné hodnocení jejich efektivnosti. Zdá se, že po přijetí kodexů zatím nenásledovaly žádné další kroky, které by nasvědčovaly aktivnímu využívání kodexu jako účinného nástroje řízení.

3.2 Výuka aplikované etiky na univerzitách a vysokých školách v ČR

Pomineme-li ryze humanitní obory, jejichž integrální součástí je vědní disciplína etiky, lze konstatovat, že situace v oblasti aplikované etiky není příliš uspokojivá. Nemáme sice k dispozici žádné statistické informace, ale můžeme se opřít o poznatky a zkušenosti členů Společnosti pro etiku v ekonomice. Členové tohoto občanského

sdružení, které bylo založeno v r. 1994, si jako jeden z prioritních úkolů stanovili zavedení výuky předmětu etika a ekonomie či hospodářská/podnikatelská etika na české vysoké školy a fakulty ekonomického a správního zaměření. Ve druhé polovině 90. let minulého století se dařilo tento cíl úspěšně naplňovat (Bohatá, Němcová, 2014). V současné době se však zdá, že jak nabídka, tak i poptávka po obdobných kurzech jsou poměrně nízké, a navíc často se jedná jen o kurzy volitelné. Bylo by jistě užitečné situaci v dané oblasti seriózně zmapovat.

Podstatně příznivější je situace v oblasti lékařské etiky, která je vůbec nejstarší oblastí aplikované etiky. Má své nezastupitelné místo ve vzdělávání lékařů po celém světě a je tomu tak i v ČR.

4   Diskuze

Na univerzitách a vysokých školách v ČR zatím nacházíme pouze jediný nástroj etického řízení, jímž jsou etické kodexy. Až na řídké výjimky při jejich vypracování nebyli konzultováni stakeholders, kodexy nejsou komunikovány, jejich implementace není ani řízena ani monitorována a vyhodnocována. Pokud jde o podpůrné struktury, existují pouze etické komise, jejichž posláním je projednávat případy porušování etických kodexů a přijímat stanoviska. Fungují jen jako poradní orgán rektora a jednají neveřejně. Anonymními oznámeními se nezabývají. Podle informací, jež mají autoři tohoto článku k dispozici, neexistují žádné horké linky nebo linky pomoci. Určení osob, které mohou poskytnout nezávislou radu či asistenci v případě potřeby, se dosud nestalo běžnou praxí.

Zdá se, že problematice vnitřního oznamování nepravostí (whistleblowing) není věnována pozornost. Nejde přitom jen o chybějící řešení pro vysoké školy. V ČR dosud neexistuje žádný právní předpis, který by komplexně upravoval problematiku oznamování nekalého jednání. Současná dílčí právní úprava je roztříštěna v zákoníku práce, trestním zákoníku, správním řádu a služebním řádu, a navíc se jedná o oznamování protiprávního, nikoliv neetického jednání v rozporu s veřejným zájmem. Stranou zájmu zůstává i řízení rizik, přestože na řadě vysokých škol se tato problematika přednáší.

V kontextu etické politiky stojí bezesporu za zmínku i vlastní vzdělávání v oboru etiky. Situace v ČR je obecně velmi neuspokojivá. Na základních a středních školách se etika vyučuje jen zcela výjimečně a zdá se, že po slibném uvedení nových kurzů aplikované etiky na řadě vysokých škol v polovině 90. let minulého století, se tyto kurzy v současné době ocitají spíše na periferii zájmu.

Pro vypracování etické politiky českých univerzit a vysokých škol navrhujeme postupovat v následujících na sebe navazujících krocích:

1.   Vyjasnit žádoucí hodnotovou orientaci a hodnoty publikovat (např. formou deklarace či kréda).

2.   Vypracovat nebo revidovat existující etický kodex s ohledem na definované hodnoty.

3.   Definovat rizika a vypracovat systém jejich řízení.

4.   Provést analýzu vnitřní komunikace v rámci organizace a nastavit kanály a mechanismus vnitřního oznamování s cílem zkvalitňování činnosti organizace.

5. Zavést monitorování uplatňování etického kodexu a efektivity vnitřní komunikace.

6. Vypracovat mechanismus komunikace k etickým otázkám s externími stakeholders.

7. Pověřit pracovníka/útvar, který bude odpovídat za implementaci kodexu, zajišťovat trénink a konzultace a bude komunikovat s Etickou komisí, pokud je ustavena. Bude též v kontaktu s vrcholovým vedením a jako úkolem bude upozorňovat na potřeby aktualizace či revize kodexu.

Závěr

Etická politika uplatňovaná některými osvícenými organizacemi veřejného i soukromého sektoru může být inspirací pro univerzity a vysoké školy. Jejich zkušenosti, jakož i zkušenosti úspěšných zahraničních univerzit napovídají, že efektivní etická politika znamená mnohem více než vypracování a přijetí etického kodexu. Etický kodex hraje důležitou roli a lze tvrdit, že tvoří páteř celkové etické politiky, ale sám o sobě není dostatečným nástrojem etického řízení. Měl by být doplněn ještě dalšími nástroji, jako např. deklarace hodnot či krédo, řízení rizik apod. Součástí politiky, která mj. napomáhá i dodržování zásad a pravidel stanovených kodexem v každodenním životě organizace, jsou procesy a je podporující struktury. Procesy lze shrnout do čtyř okruhů, a to konceptualizace a vypracování etické politiky, komunikace a implementace, monitorování a hodnocení, aktualizace a revize. Nezbytnou podmínkou efektivní implementace etické politiky je určení odpovědného pracovníka/útvaru a vytvoření fungujícího systému vnitřní komunikace.

Je zřejmé, že vypracování etické politiky a její uvedení do praxe je velmi náročnou záležitostí. Vyžaduje silné odhodlání vedení, leadership, dostatečný čas i lidské a finanční zdroje. Vzhledem k tomu že úspěšné zahraniční univerzity etické politiky vypracovaly a snaží se je uplatňovat, lze se domnívat, že je jen otázkou času, kdy i přední české univerzity nastoupí tuto cestu. Pobídkou by mohla být snaha zvyšovat kvalitu veškerých činností i reputaci v pedagogické i vědecko-výzkumné sféře v celosvětovém měřítku.

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WHAT ENCOURAGES HOUSEHOLDS TO SORT WASTE: EXTERNALLY ENABLED CONDITIONS, INTERNAL INCENTIVES OR ECONOMIC ENFORCEMENT?

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Abstract: Municipal waste formation and management are contemporary issues in a modern world. Residents' participation is very important trying to utilize and recycle it because municipal waste is mainly generated by households'. For this reason, waste collection and sorting at home becomes crucial starting point solving problems created by waste. Aiming to examine what encourages households to sort waste we analysed following: (i) is it enough to create waste sorting system to encourage households to sort waste or (ii) waste sorting habits depend on lifestyle, environmental awareness and socio-demographic characteristics, or (iii) there is a need to introduce economic incentives to stimulate waste sorting. Theoretical analysis revealed that the main factors potentially affecting sorting habits are infrastructure at municipal level, economic instruments, socio-demographic characteristics and individual motivation. Empirical survey of Siauliai city households grounded on chi-square statistics and estimations of logistic regression showed that internal incentives and externally enabled conditions highly impact households' waste sorting behaviour. Moreover, results of the research clearly show that economic incentives embedded into existing waste management system are not strong enough to shape households' behaviour.

Keywords: Municipal Waste, Waste Sorting Determinants, Infrastructure, Awareness, Motivation, Logistic Regression.

JEL Classification: C39; Q53, Q58.

Introduction

Waste formation and management are among the main problems in a modern world and the importance of taking appropriate care of waste has been discussed for a long time. The purposeful management of waste based on social, economic and environmental aspects is one of the main conditions of harmonious development, trying effectively and economically to use environmental resources, reducing environmental pollution, increasing the health level of a society and improving the quality of life.

There are no existing habits of waste sorting in Lithuania; however, the system allowing sorting waste has already been formally created. The European Union, Lithuanian Government and Municipalities spent a lot of money to develop waste collecting systems. The containers are built by the apartment blocks, private houses, roadsides, rest stops and elsewhere. However, the everyday waste collection and especially recycling have not been yet fully implemented, because the amount of recycled waste is extremely low.

Active residents' participation is important in waste utilizing and recycling system because its foundations are household waste collection and sorting, which are preferably carried out at the place of formation that is home. In order to implement it successfully, benevolent society's participation is a must, which depends on certain factors. And here it is important to clarify – is it enough to create waste sorting system to encourage

households to sort waste or perhaps habits depend on lifestyle, environmental awareness and socio-demographic characteristics, or maybe there is a need to introduce economic incentives to stimulate waste sorting. Generalizing the abovementioned, the paper aims to determine to what extent externally enabled conditions, internal incentives and economic enforcement influence households' decision to sort municipal waste.

The rest of the research is organised as follows: Section 2 presents theoretical background of factors determining households' waste sorting habits. The background of the methods, model and variables used in the analysis are explained in section 3. Section 4 presents the results of empirical analysis and section 5 concludes the paper.

1 Theoretical background of waste sorting determinants

Research on waste sorting determinants has been in focus for the last decades (see Tab. 1), but there is no unanimous opinion for this question. The main argument is that it is difficult to rate the actions and motives of individuals due to a variety of determinants, which usually are not related to waste or environmental protection.

Tab. 1: Summary of determinants for household waste sorting

Determinants	Indicators	Source
Infrastructure at municipal level	Average distance to collection sites	Jesson, 2009
	Type of containers	Burnley, 2007
Economic instruments	"Pay as you trough" system	Reichenbach, 2008; van Beukering et al., 2009; Huang et al. 2011; Ulfik, Nowak, 2014
Socio-demographic	Education level	Benítez et al., 2008
	Degree of urbanization	Johnstone, Labonne, 2004
	Household size	Johnstone, Labonne, 2004; Martin et al., 2006; Benítez et al., 2008; Abdoli et al., 2011
	Households income	Monavari et al., 2012
	Age	Martin et al., 2006; Vicente and Reis, 2008
Individual motivation (environmental concern / awareness)	Moral norms	Visschers et al., 2016; Kirakozian, 2016; Czajkowski et al., 2017
	Culture	Crociata et al., 2015
	Group feedback	Abrahamse et al., 2007; Carrico, Riemer, 2011

Source: Authors' analysis based on the literature listed in the table.

According to research the person's choice to sort and comply with required municipal waste management rules depend on the complex of multiple social factors, but they can be divided into three main groups.

The primary and necessary condition for waste collection is sorting **infrastructure**, for which to implement the financial resources are needed. Ordonez et al. (2015) emphasize that sorting infrastructure has to be designed for the user. Following the logic "sorting by possibility", waste sorting infrastructure becomes necessary objective

condition to execute the waste sorting (Hage et al., 2009). This is the position followed by the structural paradigm representatives (Spaargaren, 2011), who claim that infrastructure is one of the most important factors in environmental habits.

Individual motivation (environmental concern / awareness). Each technological innovation, each infrastructure operates successfully only when the majority of its participants positively appreciate it and participate in various activities organised by institutions. Only timely presented, reasoned, objective, science-based and easily accessible environmental information is an assumption which affects society's change and civil activity. Research (see Tab. 1) also show that it is important to consider which social impact approaches are appropriate to various groups of society.

According to Adomavičiūtė et al. (2012), willingness to sort can be based on motivation, which can be divided into internal and external. Internal motivation and behaviour are based on personal opinion, understanding and self-respect. Also the part of internal motivation is considered to be an approach to the environment (discussed above). External motivation is based on someone's or something's impact, for example, it could be **economic factors**, such as increased taxes.

Studies (see Tab. 1) have revealed that household's decision to sort municipal waste influenced by socio-demographic factors of household's head, such as age, education and income. The approach to waste sorting under different age groups was examined – younger people are more open-minded to ecological ideas, while older people are more oriented to the purpose, however to accept eco-friendly (sorting precisely) ideas as desirable and suitable for them, they are hesitant as easily as younger people (Martin et al., 2006). In terms of gender – women are more environmentally responsible and more inclined to sort than men. Education and workplace – people with higher education and better job position are more environmentally responsible and tend to sort more it can be said that public values are considered to be the main sorting motivation factor and the significant influence on their realization has various objective determinants, such as infrastructure, information and others.

2 Data and research methods

The research was conducted in Siauliai city and its object was households. The data was collected (from 2017 October 1 to November 15) using an online questionnaire with estimated sample size (Barlett et al. 2001):

$$ss = \frac{Z^2 \cdot p \cdot (1-p)}{c^2} \qquad (1)$$

where ss – sample size; Z – Z value (we used 1.96 for 95% confidence level); p – percentage picking a choice (we used 0.5 for sample size needed); c – confidence interval, expressed as decimal (we used 0.05 = ±5%).

Because our population is finite (according to data of Statistics Lithuania, on December 31, 2016 there were 42 843 households in Siauliai city) we corrected our sample for finite population:

$$css = \frac{ss}{1 + \frac{ss-1}{pop}} \qquad (2)$$

where pop – population size.

It was estimated that at least 396 heads of households have to be interviewed and 409 participated in the survey. We used non-random assignment to the sample. This way of collecting data could potentially lead to biased sample when certain groups from the population would be over-represented or under-represented. Tab. 2 provide information do the main characteristics of the sample correspond to characteristics of the population and it can be stated that sample reflects the characteristics of the total population.

Tab. 2: Socio-demographic characteristics of sample and population

Socio-demographic characteristics of household's head		In sample, %	In population, %
Gender	Male	42	44
	Female	58	56
Age	18 – 30	50	35
	31 – 40	15	20
	41 – 50	14	18
	51 – 60	13	15
	Over 60	8	12
Education	Secondary education	10	8
	Vocational school diploma	21	25
	Higher education	69	67
Family status	Single	32	35
	With family	68	65
Social status	Pupil, student	17	19
	Employed	67	60
	Unemployed	4	5
	Housekeeper	4	4
	Retired	8	12
Income per head	Up to 400 Eur	29	32
	400 – 800	56	55
	Above 800	15	13

Source: own calculations based on survey and data of Statistics Lithuania December 31, 2016

We employed cross-tabulation to show the relationship (or lack thereof) between two variables. In all cases one of the variables is households' waste sorting habits (considered as outcome variable) and other approximates externally enabled waste sorting conditions or environmental awareness of household's head, or economic incentives to sort waste (considered as cause variable). Although there could appear to be some relationship between the cause and outcome analysing cross-tabulation graphically, to have stronger evidence that the observed relationship is anything more than random variation a number of tests could be applied. One of the most commonly used tests is chi-squared. The advantage of this test is that it is appropriate for almost any kind of data. Pearson chi-squared tests null hypothesis that the variables are

independent. The lower the p-value, the less likely it is that the two variables are independent (unrelated). In case when the p-value is lower than 0.05, the two variables are related.

Abovementioned test will be applied in the first part of the research to determine how externally enabled conditions are related with households' waste sorting habits. These factors later will be used as control variables in the model to determine what socio-demographic characteristics of household's head are important while deciding to sort or not to sort waste. We will employ binary logistics regression because our outcome variable is categorical for estimating the model that links household's waste sorting habits with their head's socio-demographic characteristics (see Tab. 2) and controls externally enabled conditions.

Nevertheless logistic regression is similar to a linear regression model, but is more suitable to model where the dependent variable is binary. We also will be able to use logistic regression coefficients to estimate odds ratios for each of the independent variables in the model. Besides, logistic regression is applicable to a broader range of research situations and more flexible.

The regression model for our empirical estimations is composed as follows:

$$P(Y) = \frac{e^{(\beta_0 + \beta_1 X_1 + \cdots + \beta_6 X_6 + cC + \varepsilon)}}{1 + e^{(\beta_0 + \beta_1 X_1 + \cdots + \beta_6 X_6 + cC + \varepsilon)}} \tag{3}$$
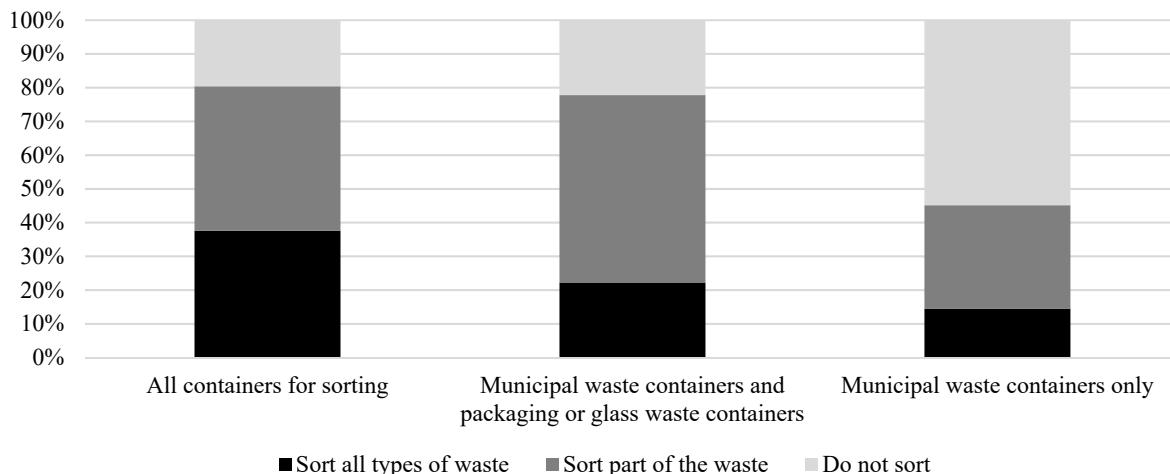
where *P(Y)* is a probability that household will fully or partly sort waste, a situation when household does not sort waste at all in the model is considered as the benchmark value. $x_1,\ldots,x_6$ marks all six independent variables, i.e. characteristics, starting from family status (see above). *C* characterises a vector of variables that we might like to control in our model. $\beta_1,\ldots,\beta_6$ and vector *c* as usual marks the regression coefficients, giving information how strongly and in which direction independent variables affect the odds ratio of the dependent variable, and ε stands for error term.

3 Empirical results and discussion

3.1 The influence of externally enabled waste sorting conditions

Results of the analysis show that availability of containers for sorting is strongly associated with households' waste sorting habits. 37.6% of households sort all types of waste and just 19.6% do not sort at all if all containers for waste sorting are available. If municipal waste containers are available, just 14.5% of households are fully involved in waste sorting and 54.8% do not sort at all. Direct relationship between variety of containers available for sorting and increasing probability for a household to sort waste is uncovered in Fig. 1. Strong relationship between two cross-tabulated variables is also proved by very low p-value of chi-squared test (<0.001).
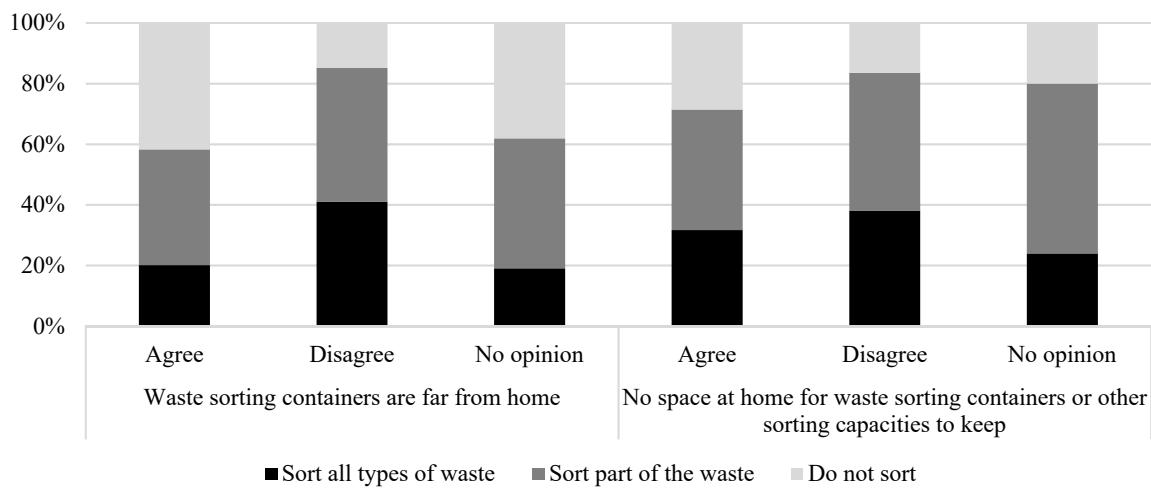
Fig. 1: Availability of containers for waste sorting and waste sorting habits

Another important factor that is related to externally enabled waste sorting conditions is location of waste sorting containers. Uncomfortable (far from home) placement of containers discourages households to sort waste. 14.9% of household does not sort waste if waste sorting containers are nearby and 41.7% if they are far away. Direct relationship between how far away from home are waste sorting containers and probability to sort waste is presented on the left side of Fig. 2. P-value of chi-squared test linking these two variables is small and indicates that they are statistically related.

Fig. 2: Agreement with the statements regarding waste sorting conditions and waste sorting habits

We could also hypothesize that conditions at household level (e.g. availability of place at home to keep separate containers for waste sorting) could be also related to their waste sorting behaviour. Nevertheless that distribution in terms of waste sorting behaviour is slightly different between households that agree and disagree with the statement "There is no space at home for waste sorting containers or other sorting capacities to keep", they are too small to be statistically significant (p-value of chi-square test is 0.099).

The abovementioned findings are also confirmed by households' answers to the question "What, in your opinion, would encourage waste sorting?" An absolute majority highlighted the importance of properly installed waste sorting sites and convenient places for waste sorting containers. Household also pointed out importance to use stickers on sorting containers with the exact information about waste sorting. All those are closely related to waste management system that is organised at municipal level.

3.2 The importance of socio-demographic characteristics and environmental awareness

In this section we provide analysis results of socio-demographic characteristics' influence on decision to sort waste after controlling externally enabled conditions, which, as previous analysis already revealed, are very important. We estimated several models using different sets of household head's socio-demographic characteristics to minimize probability of collinearity, because a lot of socio-demographic characteristics potentially correlate with each other (for example, age and education level, age and social status, education and income level and etc.). We think that just gender and family status are uncorrelated. Tab. 3 presents estimation results.

Tab. 3. Estimation results

Factors in the model	Estimated β coefficient when dependent variable is probability to sort (fully or partly) waste (benchmark group – does not sort at all)			
	(I)	(II)	(III)	(IV)
Constant	−0.388	−0.613	−1.128**	−1.653*
Living with a family	0.532**	0.487*	0.454*	0.249
Female	0.313	0.316	0.458*	0.457*
Education level				
vocational school diploma	−0.755			
higher education	−0.869			
Income				
400 – 800		−0.488		
above 800		−0.452		
Business				
unemployed or housekeeper			−0.20941	
retired			2.081***	
Age				
from 31 to 40				0.280
from 41 to 50				1.536***
from 51 to 60				1.015**
61 and above				2.630***
N	409			

Factors in the model	Estimated β coefficient when dependent variable is probability to sort (fully or partly) waste (benchmark group – does not sort at all)			
	(I)	(II)	(III)	(IV)
McFadden R-squared	0.134	0.132	0.151	0.186
Likelihood ratio test: χ2	62.006	61.058	69.529	85.698
p-value	<0.001	<0.001	<0.001	<0.001

*, ** and *** indicates significance at the 10, 5 and 1 percent level respectively.
[1]Benchmark group – Municipal waste containers only. [2]Benchmark group – No opinion.
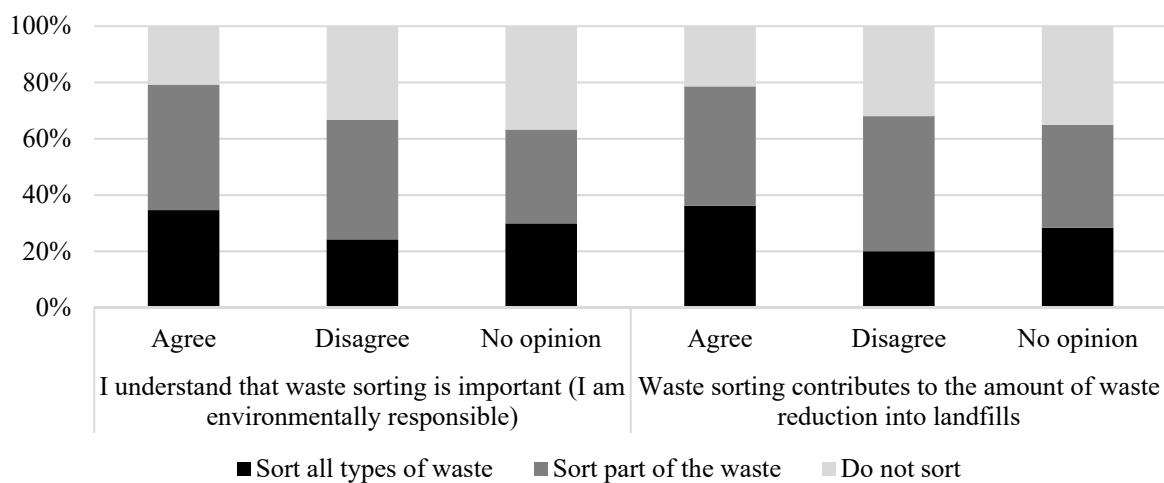
All estimations (I-IV) revealed that after controlling externally enabled conditions for waste sorting (additional factor included in all estimations, but not listed in the table) household's waste sorting habits depend just on two analysed characteristics of household's head – employment status and age. It should be mentioned that both of them are closely related, because just retirement status statistically significantly increases probability to sort waste and that status is strongly linked to age. For a retired head of household there is 8 times more likely to sort waste than for pupils, students and employed. Increase in age is also linked with higher probability to sort waste – for a household with a head from 41 to 50 is 4.6, from 51 to 60 is 2.6 and form 61 and older is 13.9 times more likely to sort waste than for household with a head less than 30 years old.

Another characteristic that is strongly related to personality and potentially correlates with waste sorting habits is environmental awareness. Fig. 3 shows the results of cross-tabulation between household's head environmental awareness and waste sorting habits.

Fig. 3. Agreement with the statement regarding environmental awareness and waste sorting habits

34.6% of household with a head that treat themselves as environmentally responsible sort all types of waste and 20.8% do not sort at all. On the contrary, on third of those who state that they do not identify themselves as environmentally friendly, do not sort waste and almost one fourth sort all types of waste. Nevertheless, the differences in distribution regarding waste sorting habits between households that head identify or not themselves

as environmentally responsible are not very big (as we can see on the left side of Fig. 3), chi-square identifies them as statistically significant (p-value is equal to 0.023), i.e. environmentally responsible behaviour is inseparable from waste sorting. Similar results we also observe in case of answers provided to other question used to identify environmental awareness (see right side of Fig. 3). If we proxy environmental awareness by understanding that waste sorting contributes to the amount of waste reduction into landfills, it is directly linked to higher probability to sort waste – 36.1% of households with environmentally concerned head sort all waste, and if not – 20%. P-value of chi-square linking these variables is equal to 0.035, indicating that relationship exists.
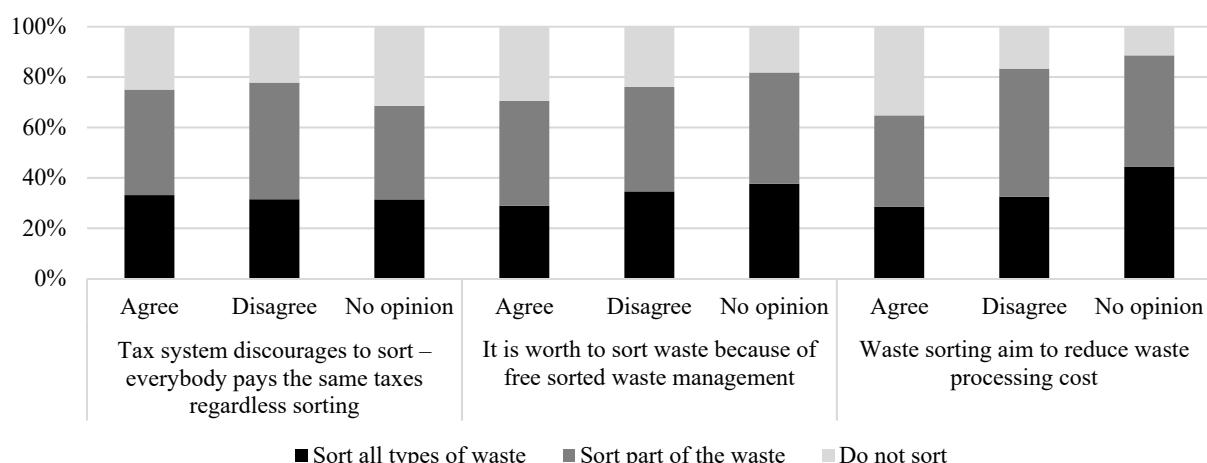
To conclude, after controlling externally enabled conditions for waste sorting, environmental concern of household's head still remains important factor that encourages to sort waste. It could explain cases, when people sort waste even if there are no right conditions created for that. Waste sorting remains time-consuming activity – business (and that is in inverse relationship with age) decreases probability to sort waste.

3.3 The importance of introducing economic incentives

Previous studies (see Tab. 1) show that economic factors, such as taxation, i.e. differentiated tax for households upon waste sorting, introduce economic incentives for households to change their behaviour regarding waste sorting. To reveal whether head of household understand the economic usefulness of waste sorting, that leads to lower waste processing cost, and whether collectively funded waste sorting system encourage them to participate in this process, we aim to investigate how subjective opinion of household's head regarding economic factors correlates with households' behaviour.

The analysis of the results shows that economic incentives embedded into existing waste management system are not strong enough to shape households' behaviour. Agreement with the statement that existing tax system discourages to sort because everybody pays the same taxes regardless sorting does not correlate with households' sorting habits (see left part of Fig. 4).

Fig. 4: Agreement with the statement regarding economic factors and waste sorting habits

P-value of chi-square test that links these two variables is 0.874. Understanding that waste management system is collectively funded and it is free to join it does not encourage

household to sort waste – distribution of their waste sorting behaviour is not linked (see middle part of Fig. 4) with the agreement with the statement that "It is worth to sort waste because of free sorted waste management" (p-value of chi-square test is 0.344).

Understanding that waste sorting aims to reduce waste processing cost is linked with households' waste sorting habits (p-value of chi-square test is <0.000), but what is surprising – agreement with this statement reduces probability to sort waste (see right part of Fig. 4). It could be explained by taking into account that households share part of waste sorting cost, i.e. it is time consuming process that needs extra space at home and households that sort waste recognise that as incensement in waste processing cost.

Answers to the question "What economic factors, in your opinion, would encourage waste sorting?" show, that households relatively disagree with the idea to fine households for not sorting – just one third of households think that such policy would be useful. What is surprising here, that households that do not sort waste are not more strict against fining compared with others. Much more acceptable policy for the households would be lower tax for people who sort waste. About two thirds of households agree with that and this part does not vary much regarding waste sorting habits, i.e. even those who do not sort waste think that such policy would be encouraging.

Conclusions

Public values are considered to be the main waste sorting determinant and various others, such as infrastructure, awareness and motivation have significant influence on their realization. The main and primary waste sorting condition is municipal waste collection and sorting infrastructure. The next necessary step is information provided to the population about the municipal waste management and collection rules. After all, the formation of the environmental regulations and motivation to manage municipal waste are important.

The survey of determinants, influencing households to sort or not to sort municipal waste, revealed that in Siauliai city households are influenced by externally enabled waste sorting conditions, such as infrastructure and this is related to implemented waste management of municipality. This view is also supported by the researches of Jesson, 2009, Abdoli et al. (2011), Ulfik, Nowak, 2014, Ordonez et al. (2015). Analysing socio-demographic characteristics of household's head it can be said that only two examined characteristics – employment status and age influence the sorting habits of households. Environmental awareness increases probability to sort waste, i.e. environmentally responsible behaviour is inseparable from waste sorting. The results of the research come in line with previous researches that state that recycling is the personal responsibility of each person (Vicente, Reis, 2008; Adomavičiūtė et al., 2012; Abrahamse, Steg, 2013; Crociata et al., 2015; Visschers et al., 2016; Kirakozian, 2016; Czajkowski et al., 2017).

The analysis of the results clearly shows that economic incentives embedded into existing waste management system are not strong enough to shape households' behaviour. So it can be stated that internal incentives and externally enabled conditions, such as infrastructure of containers have higher impact on municipal waste sorting behaviour in Šiauliai city than economic enforcement.

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SECTORAL AND INTERNATIONAL DIVERSITIES IN THE PERCEPTION OF BANK FINANCING: EVIDENCE FROM SLOVAK AND CZECH SMES

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Abstract: Banks' approaches in SMEs financing, being aware of loan conditions and transparency of credit terms are significant facts to improve ability of SMEs to manage their financial and credit risks and to reduce obstacles in their bank credit access. In this context, the research not only aims to compare different sectors in country level but also purposes to make comparison between countries that SMEs' operate in same sector, regarding their perceptions of these facts. 972 Slovakian and Czech SMEs are analysed by Chi-square and Z score statistics to find the differences between selected groups and individual responses. The results of the research confirm that more trade firms positively perceive the selected facts than service firms in Slovakia, however, aspects of Czech service and trade firms do not differ. Moreover, Slovakian trade firms are more agree that they have knowledge about loan conditions than Czech trade firms do. On the other hand, more Slovakian firms negatively perceive banks' approach to them than Czech SMEs. Regarding to entrepreneurs' knowledge about lending terms, no significant differences exists between the Czech and Slovakian service firms. Furthermore, loan conditions are not transparent for more Slovakian service firms than Czech service firms.

Keywords: SMEs, Bank financing, Slovakia, Czech Republic, Loan Conditions.

JEL Classification: G21, L26, O16.

Introduction

Contributions of Small and Medium-sized Enterprises (SMEs) to value addition of economies, job creation and economic growth of countries cannot be underrated. According to SAFE 2016 Survey, 99.8% of non-financial firms are SMEs in EU-28. SMEs are flexible and quickly adapt to new demands of their clients (Kljucnikov et al., 2016). In order to launch a business and enlarge it, entrepreneurs need financing (Wangmo, 2015). Although many financial obstacles exist in bank financing for SMEs, bank credit still the major external resource for them (Irwin and Scott, 2010).

The obstacles that SMEs face are related with their lack of financial resources, collaterals, assets, and abilities to manage their credit and financial risks. Most of SMEs have high transaction costs, a low amount of cash flows, high risk premiums, underdeveloped relationships with financial institutions (Ardic et al., 2012), bad credit reputation and track records (Beck et al., 2006), high lending rates (Beck et al, 2008), and opaqueness (Berger and Udell, 1998). Moreover, government regulations (Bougheas et al., 2006), structure of banking system (Berger and Udell, 2002) and financial sector (Osano, and Languitone, 2016) and characteristics of owner are other determinant factors in their financial risks that include the process of getting loans and credit risk (Belas et al, 2016). In this regard, being aware of loan conditions, banks approaches on lending and transparency of the lending terms that banks provide to SMEs are important factors to reduce the financial and credit risks of SMEs.

Some studies analyse the differences between age, education level, gender (Belás et al., 2016) size (Belás et al 2015a; Tolbaa et al., 2016), legal structure of SMEs, (Tolbaa et al., 2016) and being informed about credit conditions. Regarding to transparency of loan conditions, Belas et al. (2015a) and Sobekova-Majkova (2011) investigate the size of firms. Kljuchnikov and Belas (2016) also examine impacts of gender, age, education level on the perceptions of banks' approaches. Corresponding to differences between countries, Ključnikov and Sobeková–Majková (2016) observe gender, experience and education of the Czech and Slovakian entrepreneurs and their perceptions of financial and credit risks in both countries. But the investigation of the differences between sectors in a country and sectoral differences in the same country regarding entrepreneurs' perception of the field of financing is missing.

In this context, the research aims to identify and compare the perceptions of SMEs from difference sectors, also to explore and make comparisons in the perceptions of SMEs in same sectors of different countries corresponding with their aspects of loan conditions, bank approaches and SMEs' knowledge about credit terms. The contribution of the research is twofold. Czech Republic and Slovakia have similar economic conditions and the differences between Czech and Slovak SMEs are not quite usual. Therefore, finding differences in these countries regarding to perceptions of the chosen facts can create an important value addition. Moreover, having sectoral differences in the same country's SMEs about the perception of bank financing can also make contribution to the SMEs financing literature.

The rest of the paper is structured as follows: statement of the bank financing obstacles, sectoral and country differences in relation with banks' lending will be provided in section 1. Methods of the research will be clearly explained in section 2. The results of the research will be described in section 3. Discussion part will take a part in section 4. Lastly, a brief conclusion about the research will be presented.

1 Statement of a problem

SMEs can be described as "major engine of economic growth" (Belas et al., 2014a: 31) because they create many job opportunities and significant value addition for economies. The Czech and Slovakian SMEs' percentages for creation of workforce more than average of Europe, 72.1% and 66.8% respectively while their percentages for value addition of economies 54.4 and 54.5 (EC Annual Report on European SMEs 2016/2017). Considering to distance to frontier score from World Bank (2017) for getting credit index that shows the performance of economies and access to finance, scores of Czech Republic and Slovakia are 70 and 65 respectively on the scale of 100.

It seems that Czech Republic and Slovakia have similar results from above mentioned indicators and so somebody can expect that perception of banks' attitudes, knowledge about loan conditions and its' transparency can be similar for Czech and Slovakian entrepreneurs. But many factors exist in the loan conditions of various countries, its transparency and banks' approaches and these factors differently affect entrepreneurs' ability to manage their firms' financial and credit risks. This is because loan procedures are interconnected with credit and financial risks (Belas et al., 2014b).

Corresponding with banks' approaches, having more information about characteristics of SMEs and those firms' financial and credit risks can make financial institutions to get more opportunities to encourage those businesses (Kljucnikov and

Sobeková-Majková, 2016) also can make them to provide reduced financial constraints. Belas et al. (2015) outline that although entrepreneurs in Czech Republic and Slovakia have similar characteristics, Czech entrepreneurs are more agreed that banks accept their needs and help them compared to their Slovakian counterparts. The reasons why Slovakian entrepreneurs do not have positive perception about banks' approach can be higher level of required collateral and lack of financing options (Kljucnikov and Sobekova-Majkova, 2016) complicated credit approval, many procedures for lending and too tight credit evaluations that Slovakian banks implement for SME lending (Ivanova, 2017).

Being aware of credit and market conditions can make firms to cope with financial and credit risks (Belás et al., 2015b), provides access to finance (Osano, and Languitone, 2016) because it mitigates the financial obstacles for SMEs (Dong and Men, 2014) and entrepreneurs gain abilities to manage these risks (Kozubíková et al., 2015). Ability of managing credit risk has positive relationship with the performance of SMEs in the credit repayment process (Nyamboga et al., 2014). Entrepreneurs who know credit conditions of different banks cannot be prone to make credit application to the banks that charge them with higher interest rates and higher costs (Rahman et al., 2017) also ask for more collateral (Khalid and Kalsom, 2014). Moreover, by understanding banks' credit evaluation policies, SMEs can get more bargaining power to negotiate with banks regarding to loan terms (Behr and Güttler, 2007). Firms that have lack of relationships with banks, lack of experience in loan application, never received or applied loans can be less informed about loan conditions (Kirschemann, 2016). Kljucnikov and Belas (2016) find that Czech entrepreneurs are not well informed about loan conditions of commercial banks. Similarly, Koisova et al. (2017) reveal that Slovakian entrepreneurs have lack of information about lending terms.

Concerning to loan transparency, banks can inform SMEs about collateral requirements (Fatoki and Asah, 2011) and can make advertisements for their loan products so entrepreneurs can know which credit option is better for them (Pandula, 2015). According to Koisova et al. (2017) most of Slovakian entrepreneurs are disagreed with the fact that bank lending is transparent. Kljucnikov and Belas (2016) also confirm that credit terms are not transparent for Czech entrepreneurs.

Regarding to the sector of firms, the sector that SMEs operate can be a determinant factor to perceive the bank credits differently because capital structure (Dietsch and Petey, 2002), the amount of debt and tangible assets (Abor, 2007) and access to finance can differ regarding to firms' industry (Zarook et al., 2013). Moreover, commercial banks are disposed to provide loans for sectors that have higher level of profits (Dohcheva, 2009) and lower level of risks (Ramlee and Berma, 2013). Industries that have more tangible assets have more advantages to provide collateral to the banks. In this regard, service firms are less likely to get bank credit because of having lack of assets to collateralize (Abor, 2007) so banks can evaluate them as risky and can be disposed to fulfilling their needs. On the other hand, Lejpras (2009) interprets that firms in service sector need lower level of capital. Hence, they can prefer using their internal sources and they might not search for loans from external sources. For these reasons, entrepreneurs in service sector might not have knowledge about lending terms and its transparency. Kathuria et al., (2008) outline that companies in service sector usually carry on their businesses in internal markets. But,

entrepreneurs in trade industry have abilities to produce a wide variety of products and being able to adapt quickly the uncertain conditions (Agbim, 2013). Abor (2007) reveals that compared to service sector, SMEs in trade industry have more tangible assets. By having this advantage, they can provide more collateral and can get better lending terms. However, Belas et al. (2015a) do not find any differences between Czech firms that operate in various sectors and their perception of banks' attitudes.

2 Methods

SMEs differ regarding to numbers of employees, total turnover and balance sheet total. According to the European Commission no. 2003/361/EC, staff headcount is less than 10 for micro enterprises, is between 10 and 49 for small enterprises and is between 50 and 249 for medium enterprises. The study uses two different data that include SMEs from Czech Republic and Slovakia. Data collection processes separately performed in these countries by applying questionnaire surveys. The questionnaire for Slovakian SMEs was fulfilled by 438 SMEs in 2016. In order to fit the purpose of the study, 266 Slovakian firms that operate in trade and service industries are selected and 172 SMEs are excluded due operating in different sectors. The data from Czech Republic was collected in 2015 through the questionnaire of the quality of business environment that was fulfilled by 1141 respondents. In accordance with the aim of the study, 706 firms from trade and service industries are chosen and 435 SMEs are not included the Czech sample because of being in various industries. Tab. 1 depicts the structure of the samples.

Tab. 1: The structure of the selected samples

Variables		Slovak SMEs % and Number of respondents	Czech SMEs % and Number of respondents
Length of doing business	More than 10 years	44% (116)	54% (381)
	Maximum 10 years	56% (150)	46% (325)
Education	Minimum university	68% (180)	37% (262)
	Less than university	32% (86)	63% (444)
Gender	Men	67% (179)	68% (479)
	Women	33% (87)	32% (227)
Sector	Trade	37% (99)	45% (320)
	Service	63% (167)	55% (386)
Size of firms	Microenterprises	76% (201)	73% (515)
	Small and Medium	24% (65)	27% (191)
Age of entrepreneur	Minimum 45 years old	33% (88)	43% (304)
	Less than 45 years old	67% (178)	57% (402)
Total		**100% (266)**	**100% (706)**

Source: (Authors' Results)

The research focuses on three same survey questions from the both questionnaires: "The Banks accept our needs and help us" (Question 1); "SME entrepreneurs do thoroughly know the conditions under which banks provide loans to them" (Question 2); "The conditions under which banks provide loans to SME entrepreneurs are transparent" (Question 3). Five-point Likert scale is used to evaluate responses from these three questions as follows; 1-totally agree, 2–agree, 3–hold no position, 4–

disagree, 5–completely disagree. The research sets three scientific hypotheses to analyse the differences between perceptions of (a) Slovakian and (b) Czech trading and service firms. The study also makes assumptions in these hypotheses by using the information that is provided in "Statement of a problem". These hypotheses are;

H1(a, b): A statistically significant difference exists between the perceptions of entrepreneurs in trading and service firms regarding to banks' approaches on them. The study assumes that SMEs in trade sector will be more agreed with Question 1 than service firms do.

H2(a, b): There is a statistically significant difference between the aspects of trading and service industries regarding to their knowledge of bank credit conditions. The study presumes that compared to service firms, trading firms will more positively perceive the Question 2.

H3(a, b): A statistically significant difference exists between the opinions of entrepreneurs in trade and service industries in relation with the transparency of banks' lending terms. The study professes that service firms are less likely to agree with the Question 3.

The study also set outs three other hypotheses to investigate whether differences exist in the aspects of trade firms in Slovakia and Czech Republic regarding to selected issues about bank financing. So following hypotheses are made;

H4: There is a statistically significant difference between the perceptions of Slovakian and Czech trade firms regarding to the Question 1.

H5: A statistically significant difference exists between the opinions of Slovakian and Czech trade firms in relation with the Question 2.

H6: There is a statistically significant difference between Slovakian and Czech trade firms' point of views concerning to the Question 3.

The following three hypotheses are made to examine the different opinions of Slovakian and Czech service firms about bank financing;

H7: A statistically significant difference exists between the aspects of Slovakian and Czech service firms in relation with the Question 1.

H8: There is a statistically significant difference between the Slovakian and Czech service firms' perceptions regarding to the opinion from Question 2.

H9: A statistically significant difference exists between Slovakian and Czech service firms' considerations relating to the issue of Question 3.

In an attempt to find out whether statistically significant differences exist between chosen variables (sectors and countries) or not, the research employs Chi-Square, Z score and Pearson statistics at 5% significance level. The research accepts the alternative hypotheses in case of having p values that are lower than 5% and then rejects null hypotheses. The null hypotheses suggest the nonexistence of statistically significant differences between the selected variables. Furthermore, P values from Z score are performed to examine whether the differences from individual responses are statistically significant or not. In order to gain results from Z score and Chi square statistics, the research uses open-source software that exists in the following website: http://www.socscistatistics.com/tests. Moreover, the study also applies Microsoft Excel to analyse the data and to find the percentages and other descriptive statistics.

3 Problem solving

The tables that are provided in this section depict the surveys' results and the calculations of the study regarding to the Slovakian and Czech entrepreneurs' perceptions about banks' attitudes in the credit markets (Question 1), knowledge of lending conditions (Question 2) and the transparency of these conditions (Question 3). Tab. 2 illustrates the findings between Slovakian SMEs.

According to results from Tab. 2, P values from Chi-Square test are significant because they are less than 5% significance level and it confirms the fact that differences exist between trade and service firms regarding to their perceptions of the Question 1. Around 39.39%, 42.42% and 41.42% of respondents in trade firms are agree and completely agree with these opinions respectively. But these percentages for service firms are just 22.75%, 25.75% and 26.95% respectively. Furthermore, P values from Z score **(0.030, 0.048, 0.0146)** are also significant because of being less than 5% significance level. These values suggest that the differences between trade and service sectors are statistically significant. Particularly, compared to service firms, trade firms in Slovakia are more agreed with the selected issues. By having these significant results, the study accepts the following hypotheses; H1a, H2a and H3a.

Tab. 2: Sectoral Differences between Slovakian Trade and Service Firms

	Question 1		Question 2		Question 3		P values from Z-score
	Trade	**Service**	**Trade**	**Service**	**Trade**	**Service**	
Completely agree and agree	39 **(39.39)**	38 **(22.75)**	42 **(42.42)**	43 **(25.75)**	41 **(41.41)**	45 **(26.95)**	**0,0030 *** 0,0035 * 0,7039 *
Hold no position	9 (9.09)	39 (23.35)	20 (20.20)	47 (28.14)	35 (35.35)	63 (37.72)	**0,0048**** 0,1498** 0,1645**
Completely disagree and disagree	51 (51.52)	90 (53.90)	37 (37.38)	77 (46.11)	23 (23.23)	59 (35.33)	**0,0146 ***** 0,6965*** 0,0384***
Total number of SMEs	99	167	99	167	99	167	
Chí-square	13.017		8.0715		7.0695		
P-value from Chi-Square	**0,0014**		**0,0176**		**0,0291**		

Note: * results from Question 1, ** Question 2, *** Question 3.   Source: (Authors' results)

Tab. 3 shows that the P values from Chi-square and Z score are not significant at 5% significance level because all P values are higher than 5%. These results suggest that differences between trade and service firms do not exist in Czech Republic regarding to chosen statements. For this reason, the study rejects H1b, H2b and H3b hypotheses. In Tab. 4, the study presents the comparative statistics of Slovakian and Czech trade firms.

Tab. 3: Sectoral Differences between Czech Trade and Service Firms

	Question 1		Question 2		Question 3		P values from Z score
	Trade	Service	Trade	Service	Trade	Service	
Completely agree and agree	133 (41.56)	138 (35.75)	80 (25.00)	98 (25.39)	98 (30.63)	98 (25.39)	0,1141 * 0,0601 * 0,8650 *
Hold no position	79 (24.69)	120 (31.09)	99 (30.94)	126 (32.64)	153 (47.81)	205 (53.11)	0,9044 ** 0,6312 ** 0,5754 **
Completely disagree and disagree	108 (33.75)	128 (33.16)	141 (44.06)	162 (41.97)	69 (21.56)	83 (21.50)	0,1211*** 0,1615*** 0,9840***
Total number of SMEs	320	386	320	386	320	386	
Chí-square	4.1003		0.3487		2.6961		
P-values from Chi-Square	0,1287		0,8399		0,2597		

Source: Authors' results

In the Tab. 4, P values from Chi-square are less than 10% so they are significant at 10% significance level. By having these findings, the research proves the existence of the differences between Slovakian and Czech trading firms. P value from Z score is not significant (0.7039>0.05) for the respondents that are agree and completely agree with the Question 1. For this reason, Slovak and Czech trade firms that positively perceive the banks' approaches do not differ. But considering to respondents that are completely disagree and disagree with banks' attitudes, more respondents exist in Slovakia than Czech Republic (51.52% and 33.75% respectively) and this difference is statistically significant (0.0466<0.05).

Tab. 4: Differences between trade industries in Slovakia and Czech Republic

	Question 1		Question 2		Question 3		P value from Z score
Trade sector	Slovakia	Czech	Slovakia	Czech	Slovakia	Czech	
Completely agree and agree	39 (39.39)	133 (41.56)	42 **(42.42)**	80 **(25.00)**	41 **(41.41)**	98 **(30.63)**	0,7039 * **0,0008 *** **0,0014 ***
Hold no position	9 (9.09)	79 (24.69)	20 (20.20)	99 (30.94)	35 (35.35)	153 (47.81)	0,0008 ** 0,0384 ** 0,238 **
Completely disagree and disagree	51 **(51.52)**	108 **(33.75)**	37 (37.38)	141 (44.06)	23 (23.23)	69 (21.56)	**0,0466*** 0,0292*** 0,7263***
Total number of SMEs	**99**	**320**	**99**	**320**	**99**	**320**	
Chí-square	15.1319		11.7482		5.3648		
P-values from Chi-Square	**0,0005**		**0,0028**		**0,0684**		

Source: (Authors' results)

Therefore, the study accepts H4 hypothesis confirming the differences between Czech and Slovak trade firms. Other p values from Z score are significant at 5%

significance level **(0.008 and 0.014 < 0.05)** and present that the differences between perceptions of Slovakian and Czech trade firms are significant. According to the results, the study corroborates that more Slovak trade firms are agree and completely agree with the Question 2 and the Question 3 than Czech trade firms. By owing these results, the research accepts H5 and H6 hypotheses.

Tab. 5: Differences between service sectors in Slovakia and Czech Republic

Service sector	Question 1		Question 2		Question 3		P value from Z score
	Slovakia	Czech	Slovakia	Czech	Slovakia	Czech	
Completely agree and agree	38 **(22.75)**	138 **(35.75)**	43 (25.75)	98 (25.39)	45 (26.95)	98 (25.39)	**0,0026 *** 0,0643 * **0 ***
Hold no position	39 (23.35)	120 (31.09)	47 (28.14)	126 (32.64)	63 (37.72)	205 (53.11)	0,9282 ** 0,2937 ** 0,3681 **
Completely disagree and disagree	90 **(53.90)**	128 **(33.16)**	77 (46.11)	162 (41.97)	59 **(35.33)**	83 **(21.50)**	0,7039 *** 0,0009 *** **0,0006 ***
Total number of SMEs	**167**	**386**	**167**	**386**	**167**	**386**	
Chí-square	21.3213		1.2221		14.4808		
P-values from Chi-Square	**0,00002**		0,5427		**0,0007**		

Source: (Authors' results

Tab. 5 presents the results from Slovakian and Czech service firms corresponding with the chosen statements. Considering to the results, the study finds the differences between perceptions of Slovak and Czech service firms in relation to banks' approaches **(Q1)** and transparency of credit conditions **(Q3). (P value from Chi-Square; 0.00002 and 0.007 < 0.05).** However, aspects of service sectors in both countries do not differ regarding to their knowledge of loan conditions **(P value from Chi-Square is 0.5427>0.05).** Due to having no difference between service firms, the study rejects H8. The results from Z score substantiate the existence of significant differences between Slovakian and Czech service firms for the opinions of banks' attitudes and transparency of loan conditions **(P values from Z score; 0 and 0.0006<0.05).** In accordance with these results, the research accepts H7 and H9 hypotheses. More Czech SMEs in service industry positively perceive banks' attitudes than Slovakian service firms. On the other hand, more Slovakian service companies negatively perceive the transparency of loan conditions than Czech service companies.

4 Discussion

To carry their activities in international markets, to make more innovations, and to have high amount of production may force trade firms to look for financing from external sources more actively. Moreover, Slovakian trade firms in this study might have had more tangible assets, might have adapted quickly the unstable conditions, might have been more innovative compared to Slovakian service firms so these characteristics of trade firms could have made the banks to be more interested with Slovakian trade firms. These facts can be the reason why Slovakian trade firms more positively perceive bank financing compared to Slovakian service companies.

The reason why no differences exist between the perceptions of service and trade sectors in Czech Republic regarding to bank financing can be discouraged borrowers in both sectors. For instance, Domeher et al. (2017) finds that significant difference exists between the amounts of applied credits and the amounts of received loans for trade firms. These situations can be possible for Czech service firms too and Czech firms in both sectors might have felt that they would be rejected when they make credit application. By having this fear of being rejected, they might not have been interested with banks' credits.

In this study, more Slovakian trade firms positively perceive the facts than Czech trade firms and the reason for this can be the education level of Slovakian respondents. According to data of this research, around 57% of Slovakian respondents in trade sector have minimum bachelor degree while only 31% of Czech entrepreneurs are graduated from university. Highly educated people can actively seek for new opportunities (Rauch and Rijsdijk, 2013) and are informed about loan options and terms (Ogubazghi and Muturi, 2014). For these reasons, Slovakian trade firms in this study could have had more information about loan conditions and its' transparency than their Czech counterparts.

The reason for being more disagree with the transparency of lending conditions for Slovakian service firms can be the relationship between those firms and banks. This is because relationships make it possible to decrease contracting problems (Berger and Udell, 2002). Comparing to Slovakian service firms, Czech firms are more experienced and older in the research data. For this reason, Czech service firms can have more relationship with banks that can be more interested with their needs and support them. This can be another reason why the differences exist between Czech and Slovakian firms regarding to the selected facts.

Those results can present significant information for governments, policy makers and banks to see the differences between perceptions of SMEs in various sectors and countries. Hence, they can close this gap by providing educations for entrepreneurs to make them more informed about loan conditions. Moreover, by creating efficient regulations, governments can increase the transparency of loan conditions and make banks to focus more on SMEs' demands and needs regarding to financing.

Conclusion

Understanding of loan conditions, transparency of these conditions and banks' attitudes to firms can enable SMEs to manage their financial and credit risks and to face with reduced bank loan obstacles. In this regard, the purpose of this research is to explore, identify and compare the perceptions of SMEs from difference sectors and countries regarding to those issues. In accordance with this selected aim, 972 Slovakian and Czech SMEs are investigated.

Although Slovakia and Czech Republic have similar economic conditions, the study finds statistically significant differences between SMEs in these countries. Comparing to trade sectors in both countries, more Slovakian trading firms think that they are aware of loan conditions that banks give them and they feel that these conditions are transparent. On the other hand, more Slovakian trade firms do not perceive that banks are interested with their needs and encourage them. Considering service industries in both countries, Slovakian firms negatively feel banks attitudes in

financing while more Czech firms positively perceive banks' approaches on SME financing. Regarding to knowledge of credit conditions, no differences exist in the service sectors of both countries. In addition, more Slovakian service firms do not feel that banks conditions are transparent for them than Czech service firms do.

When it comes to comparison of trade and service industries, the results confirm the existence of sectoral differences between Slovakian firms. Slovakian trade firms more positively perceive banks' approaches to them, knowledge of credit terms and transparency of these conditions than service firms. But, no significant differences exist between trade and service sectors in Czech Republic regarding to these facts. Even though significant differences in various sectors and countries are found, the study has some limitations. The research is only focused on bank loans, its conditions and the banks' approaches to entrepreneurs. Moreover, the study is limited with trade and service sectors and limited with SMEs from Slovakia and Czech Republic. By including more sectors, more sources of financing, more countries and more characteristics of firms and entrepreneurs, the researchers can have wide-ranging studies regarding the topic of this research.

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BUDGETING AND CZECH COMPANIES: CONNECTED CONCEPTS OR TWO DIFFERENT WORLDS?

Jiří Dokulil, Ján Dvorský, Boris Popesko

Abstract: The presented article is focused on the traditional managerial accounting tool, budgeting, and its application into field of the Czech firms. The study examines the parameters of the budgets in the enterprises operating on the Czech market and investigates factors which influence the usage of the budgeting in these firms. While the first part of this paper summarizes the level of the knowledge in the particular field, the research process is defined in the following step. The main part of the article consists of questionnaire-survey results and hypotheses testing by P-value test.

Keywords: Budgeting, Planning, Perminology, Performance Measurement, Czech Firms.

JEL Classification: M41, M19.

Introduction

Budgeting has been considered as one of the most widespread managerial accounting tools. Although it is a universal method used in various types of enterprises, the professional literature shows differences in approaching of budgeting across countries. Based on these facts, the aim of this study is to identify what terminology has been used in companies operating in the Czech Republic and what parameters of budgets have been used in these firms. To achieve this target, the authors designed the web-based questionnaire survey.

1 Statement of a problem

The theoretical basis of budgeting was closely described in the monographs and handbooks of managerial accounting (Garrison, Noreen & Brewer, 2014, Crosson & Nedles, 2014, Horngren, 2012). Hilton and Platt (2013) state that budgeting has been the most widely used managerial technique to facilitate planning and management. Budgets are defined as detailed types of business plans (Drury, 2015) or as targets and plans supplemented by financial values (Hanninen, 2013). According to Ostergren and Stensaker (2011), budget is a common accounting tool which is used by organizations to implement strategies.

1.1 Terminology

From above characteristics it has been evident that budgeting is often connected with planning activities. But paradoxically, just as in other areas which are not regulated by legislation, the terms "plan" and "budget" are not used uniformly. Král (2012) claims that differences in definitions of these terms are visible not only in the Czech literature, but also in the Anglo-Saxon and German-speaking countries. His long-term research of the use of these terms brought following results.

Tab. 1: Differences between usage of terms plan and budget

Concept	Anglo-Saxon approach	German approach
Plan	Output of the planning process expressing factural (or natural) objectives and instruments of their achievement.	System of determination of target indicators for enterprise as a whole, traditionally for long-term objectives, but vurrently in shorter time intervals.
Budget	Value expression of objectives.	Determination of value-assigned tasks for internal departments and for particular activities in the enterprise.

Source: (Král, 2012 - adjusted by authors)

When we compare these approaches to use of terms, both of them confirm that the plan is the result of the process of target setting and identifying of tools to achieve it. The difference is evident in defining the concept of budget. The Anglo-Saxon countries define the budget as the value-based plan, but in German-speaking countries the value-based plan is called plan. The concept "budget" is used in German-speaking countries only at the internal level, for costing in centers or departments of the enterprise (Eschenbach, 2000; Král, 2012).

Král (2012) claims that the Czech approach to terminology is close to the German practice. In relation to the past legislation, concept "budget" is in the Czech Republic often seen as a tool for the value management of enterprise units (centers), especially in those areas where we can expect relatively large differences between reality and desirable result. Popesko and Papadaki (2016) define the budget as the plan transformed into monetary units. This definition has been accepted, in small modifications, also by other Czech authors (Fibírová, Šoljaková & Wagner, 2007; Hunčová, 2007; Kotěšovcová & Janoušková, 2007, etc.).

1.2 Budgeting purposes

Budgets serve to a number of useful purposes. According to Drury (2015), this concept includes planning, coordination, communication, motivation, controlling and evaluating of the performance. Blocher and his team (2002) added to this list allocation of resources and recalls that budgets are widely connected with performance measurable. Hansen, Mowen and Heitger (2015) remind the important role of budgeting in the decision-making process. According to survey by Pietrzak (2013) almost 90% of firms use budgeting for planning, coordination of activities or for motivation and evaluation of staffs.

Because budgeting system is basically used for several purposes, some authors emphasize a danger that these purposes may conflict each other (Drury, 2015; Samuelson, 1986). Becker and his team (2016) point out that the period of dynamic change and economic crises has emphasized the benefits of selected budget functions - in particular the allocation of resources. Arnold and Gillerkirch (2015) noted that only recent studies began to more closely analyze interactions between budgeting functions. For example, use of flexible budgets may be beneficial for planning but unproductive for performance evaluation. This statement is confirmed by study of Arnold and Artz (2015) who claim that anticipated target adjustments reduce targets' performance incentives and their motivational effects.

1.3 Criticism of traditional budgeting systems

Traditional budgeting systems are characterized especially by the annual period of compilation and prediction of basic financial indicators (Neely, Bourne, Adams, 2003). Hope and Fraser (2001, 2003) published two studies which show that traditional budgeting is unsuitable in today's turbulent age. It is confirmed by Ekholm and Wallin (2011) who proved that managers consider the fixed annual budget as being less useful when the environmental uncertainty increases.

Considerable criticism regarding with the fact that traditional budgets are focused on results, not on causes; traditional budgets support outdated stereotypes of thinking; and are disconnect to enterprise strategy (Hansen, Otley & Van der Stede, 2003; Hope & Fraser, 2003; Neely, Bourne & Adams, 2003). Libby and Lindsay (2010) criticized budgets for being-time consuming. Critical view to traditional budgeting is supported by Hope and Fraser (2003) who promotes the KPI (key performance indicators) to use for management control. In their opinion, traditional budgeting should be removed as fundamentally flawed. This view is shared by Neely, Sutcliff and Heyns (2001) who have compiled a list of the twelve most cited weaknesses of traditional budgeting.

1.4 Alternative budgeting systems

Dissatisfaction with existing budgeting procedures created a space for alternative budgeting methods. As examples of modern approaches the authors consider Activity-Based Budgeting (Cooper & Kaplan, 1998), Beyond Budgeting (Hope & Fraser, 2003) and Zero-Based Budgeting (Wetherbe & Montanari, 1981).

Alternatively, the way to eliminate the weaknesses of traditional budgeting is implementation of the multidimensional performance measurement systems (PMS) which is built on a combination of financial and non-financial indicators (Popesko & Papadaki, 2016). The balance of PMS provides a variety of indicators which offer a holistic approach to manage of all organization's components. The non-financial indicators are often related to customer satisfaction (Anderson, Fornell, Lehmann, 1994), product quality (Berman, Wicks, Kotha, Jones, 1999), employee morale, efficiency and utilization of corporate assets, product development (Abdel-Maksound, 2007), preparedness, ability to learn, innovation and the use of information (Dobrovic, Lambovska, Gallo, Timkova, 2018).

1.5 Budgeting practice in the Czech Republic

In the Czech Republic many studies have been published with focus on public budgets (Mansfeldová, 2005, Grebeníček et al., 2013). Budgeting practice in Czech companies were examined by Šoljaková and Fibírová (2008) who researched that 52% of responded companies consider budgets as a traditional significant tool useful for decision making and control. About 11% of Czech companies use budgets in a traditional form, but it is only a formal tool required by financial institutions or owners and it does not play an active role in the organization. Popesko and his team (2015) found out that about 89% responded companies use budget for control purpose. Most firms in the sample planned to improve their budgeting systems in the future and they excluded to abandom them.

Despite these significant findings we must observe that some topics have not been sufficiently covered by existing survey (for example terminology, usage of non-financial indicators in the budget) which opens a space for future researches.

Based on these facts, the aim of this study is to identify what terminology has been used in companies operating in the Czech Republic and to find out the parameters of budgets in these firms comparing with the budgetary parameters in other countries. To achieve this target, the authors designed the web-based questionnaire survey.

2 Methods

2.1 Respondents selection

The targeted group of respondents was determined according to the following criteria: the economic sector where the company operates; the size of the organization (expressed by number of employees and annual turnover). The targeting group of respondents includes organizations from the profitable sector which have an arbitrary number of employees (this number cannot be zero), and in the past period they have reached an annual turnover of more than 1 million in Czech crowns. Based on these conditions, self-employed entrepreneurs were excluded from that sample.

The basis to determine these criteria was the result of pre-research realised in the second half of 2017 where only 6 of 26 small companies (23,8 %) responded that they use a budget. Based on this experience, the authors assumed that research of determinants of budgeting and planning systems selection is useful only in organizations with above-mentioned parameters.

2.2 Data collection

The required data was provided by managers who are employed in economic departments of companies from profit sector (according to the parameters in chapter 2.1). These individuals were addressed by contact information available in the Albertina database. Totally, about 1490 companies were addressed and 136 of them completed the questionnaires (total rate about 9,1 %). Input information was collected from December 2016 to July 2017 via a web-based anonymous questionnaire.

The structure of the respondents - according to the economic sector: manufacturing 55 (40.4%), automotive 7 (5.1%), construction 10 (7.4%), engineering 10 (7.4%), agriculture 7 (5.1%), services 4 (2.9%), energetics 3 (2.2%), others 40 (29.4%).

The structure of the respondents – according to the number of employees – less than 50 employees 33 (24.3%), 50 – 100 employees 39 (28.7%), 100 – 250 employees 40 (29.4%), more than 250 employees 24 (17.6%).

2.3 Hypotheses

The following hypotheses were formulated to achieve the main goal of the article:

H1: There are statistically significant differences in the frequency of the enterprise groups according to the number of employees in relation to the fact whether the enterprise compiles a budget. The size of the enterprise (according to the number of employees) is a statistically significant factor that affects the fact whether the enterprise compiles a budget.

H2: There are statistically significant differences in the frequency of the enterprise groups according to the number of employees in relation to the purpose of budget in the enterprises. The size of the enterprise (according to the number of employees) is a statistically significant factor that affects the number of budgetary purposes in the enterprise.

2.4 Research methods

The knowledge of descriptive statistics (contingency and association tables, descriptive characteristics - relative and cumulative number), needed to application Z-test, was used to evaluate the formulated hypotheses. Subsequently, the authors utilized statistical methods as absolute abundance and simple classification of the statistical character. In the simple sorting method, an attention was focused on the expression of the relative number of enterprises according to the selected statistical features (number of employees in the enterprise, the fact whether the company compiles the budget and purpose of budgeting in the enterprises). From other methods, which have been used in the study, we could mention the classification according to two statistical features and the dependence between qualitative plural statistical features (contingency table, contingency intensity). The contingency intensity was measured by Pearson coefficient of contingency based on a square contingency.

The comparison of the selected groups of enterprises according to the selected statistical features determined the significance of the statistical character and the statistical hypotheses were verified using the above-mentioned tests. The statistical hypotheses were verified at 5% significance level. If the p-value reached a lower level than 0.05, then we have rejected the zero hypothesis on the variability independence.

The Z-score test was used to detect significant statistical differences between the individual changes in the statistics in selected groups of entreprises. The p-value of the standard (standardized) normal distribution has been used to evaluate the Z-score parameters. The conditions for the Z – test realization (normal distribution of the statistical character and a large amount of the sample) was fulfilled. The calculation was carried out through the sophisticated statistical software SPSS Statistics.

3   Research results

3.1 Results of the questionnaire survey

The initial set of questions is focused on terminology and aims to find out the answer to the first part of the study's objective: "to identify what terminology has been used in companies operating in the Czech Republic". The fundamental question was whether companies work with the concept of budget.

Tab. 2: Use of budget

Do you use a term "budget" in your company?	Frequency	Percentage
Yes	88	64.7%
No	48	35.3%

Source: (created by authors)

As it is clear from the results, budgets are compiled in most of the addressed companies. A detailed view confirms that budget is predominantly applied in medium-sized and large companies. The opposite trend was shown in a group of small

businesses. From 32 small companies, which were participated in the survey, only 10 of them use the term budget in their practice (31.25%).

For the companies who answered negatively to this question (48 enterprises), the survey ended and they did not continue to other questions. Totally, 88 companies remained to be a part of the survey.

Tab. 3: Assessment of the statement correctness

Statement	Answer	Frequency	Percentage
The plan is used in your company as a document showing goals and activities leading to goals.	Yes	76	86.4%
	No	12	13.6%
The budget is used in your company as a plan expressed into monetary units.	Yes	79	89.8%
	No	9	10.2%

Source: (created by authors)

The above statements were selected from the literary research. The selection of the statements to the questionnaire was carried out by consultations in companies during the pre-survey.

The first declaration corresponds to the German approach mentioned in the literary research. The research results confirmed a validity of this statement in the Czech economic environment. Companies which disagree with this claim (13.6% of respondents) use the term "plan" in the following senses: the plan is a drawing of project documentation; the plan displays only targets, not activities to achieve them; the plan is used only in financial form; other respondents do not use this term or do not know about its using in their company.

The second statement is rather close to the Anglo-Saxon approach. This definition was confirmed almost by 90% of the respondents operating on the Czech market. The rest of the survey participants use the concept "budget" in alternative forms: the budget is a plan expressed not only in financial but also in natural units; the budget is just one part of the plan; the budget is an amount of funds earmarked to achieve the plan; some respondents use budget only for selected parts of the plan.

The following set of questions deals with budgetary parameters. The authors investigated the purposes of budgets in the enterprises and indicators which are observed in budgets.

Tab. 4: Budgetary indicators

Which indicators are monitored in your company´s budget?	Frequency	Percentage
Revenues – costs	79	89.8%
Incomes – expenses	47	53.4%
Assets – liabilities	39	44.3%

Source: (created by authors)

The above results show that the most common practice is a combination of various indicators. Only from seventeen responses it is clear that the respondents use exclusively revenues and costs, seven companies observe only incomes and expenses in the budget and one respondent monitors only assets and liabilities.

Monitoring of financial indicators is a typical feature of traditional budgeting. However, it is necessary to consider that financial indicators are the result of many external factors and it is not possible to clearly identify the causal relationship between

real business performance and financial performance. In the current business environment, we can see cases where the company has increased its productivity, but due to a fall in market prices or a legislative restriction of entire sector, it has achieved worse financial results than in the previous period. This is the reason why many businesses have turned their attention to non-financial performance indicators. The level of usage of these indicators in the enterprises illustrates the following table.

Tab. 5: Use of non-financial indicators

Does your company monitor non-financial quantities in the budget?	Frequency	Percentage
Yes	43	48.9%
No	45	51.1%

Source: (created by authors)
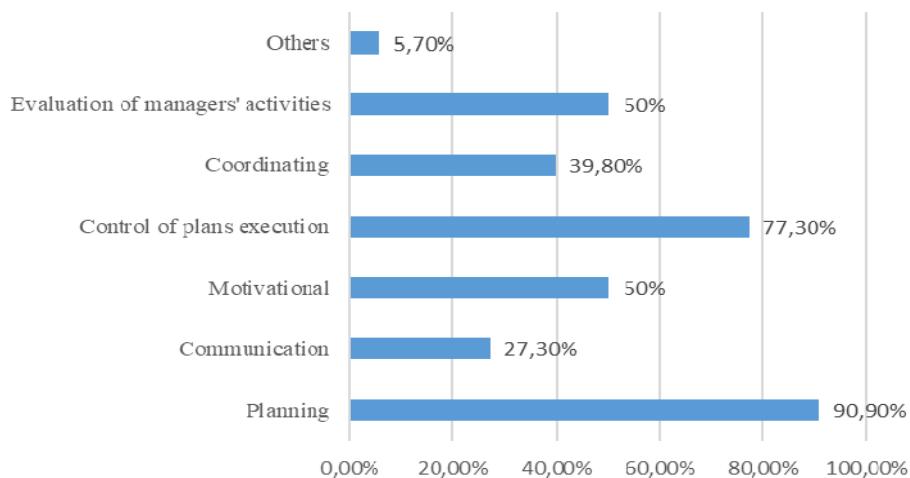
The companies which responded "yes" in the previous question were asked to specify what indicators they use. Their answers are displayed here: Productivity per hour; Average earnings; Utilization of production capacity; Costs of reclamation; Number of scrap in production; Volume of material processing per person; Return on investment; Cover contribution; Profitability and liquidity; Inventory turnover; Time of order process; 10 specific KPI´s. In next responses, the terms "quality" and "efficiency" were appeared, but without any further concretization. In four cases, an empty field was filled in this question.

As can be seen from the answers, enterprises have a very different view to non-financial indicators determination. It is also evident that some of above indicators are incompatible with the usual parameters of non-financial indicators. For example, "average earnings" is a typical financial indicator which is dependent on sales volume and marketing situation. The same objections can be mentioned for indicators "return on investment", "cover contribution" and primarily for profitability and liquidity which are traditional tools of financial analysis.

These results point to a low level of awareness about the issue of non-financial indicators in the Czech business community. It is quite obvious that the financial quantities have a much longer tradition in the Czech corporate sector.

Another question was focused on the purpose of the budget in the enterprise.

Fig. 1: Purposes of budgeting.

Source: (created by authors)

The spectrum of responses was chosen based on the findings from the literary research. Respondents also could choose "others" to specify budgeting purposes which were not included in the offered answers.

Most respondents use the budget for planning and controlling. However, the results show that the budget can serve for multiple purposes. Half of the respondents uses budget for motivation or evaluation of managers, almost 40% use it for coordination and less than 30% for communication. Other respondents mentioned these purposes of the budget: a basis for price offer; a necessary condition set by grant provider; a basis for the procurement; a plan to get a credit; a tool for authority delegation.

3.2 Hypotheses testing

In the chapter "Methods" two hypotheses have been defined and in this part of the article will be tested. The first hypothesis included the statement that the size of the enterprise (according to the number of employees[1]) is a statistically significant factor that affects the fact whether the enterprise compiles a budget. The results of its testing are given below.

Tab. 6: Testing of H1

Number of employees	Do you use a term "budget" in your company?		Z-test
	Yes	No	P-value
Less than 50 employees	11 12.5%	22 45.8%	**-4.334** **<0.001**
50 – 100 employees	27 30.7%	12 25%	0.700 0.484
100 – 250 employees	30 34.1%	10 20.8%	1.622 0.105
More than 250 employees	20 22.7%	4 8.3%	**2.104** **0.036**
Total (%)	88 100%	48 100%	Total: 136 enterprises
Chi-square	**20.074**		
P-value	**< 0.001**		

Source: (created by authors)

The results, displayed in Tab. 6, show that there are statistically significant differences between enterprises groups according to the number of employees and the fact whether the enterprises compile the budget. The number of employees is a statistically significant factor and has an impact on budgeting (Chi-sqaure = 20.074; P-value <0.001). Based on these facts, the hypothesis H1 is accepted. There are also significant differences in budgeting between groups of enterprises with number of employees up to 50 (P - value <0.001) and between groups of enterprises with more than 250 employees (P - value = 0.036).

The second hypothesis stated that the size of the enterprise (according to the number of employees) is a statistically significant factor that affects the number of budgetary purposes in the enterprise. The total number of responses about the purposes of

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[1] The authors have chosen the number of employees because it is one of three enterprise size indicators according to the European Commission methodology (2003/361/ES). The number of employees can be considered as the easisltly available input information to determine the size.

budgeting in the enterprise was 300. The table below shows the structure of respondents according to the size of the enterprise (number of employees) and three most frequent purposes of the company's budgeting (planning, control of plans execution, evaluation of manager's activities) according Fig. 1.

Tab. 7: Testing of H2

Number of employees	Purposes of budgeting			Z-test (P-value)
	Planning (A)	Control of plans execution (B)	Evaluation of managers' activities (C)	A / B A / C B / C
Less than 50 employees	9 11.2%	12 17.6%	5 11.4%	0.267 0.984 0.363
50 – 100 employees	24 30%	19 27.9%	10 22.7%	0.787 0.384 0.615
100 – 250 employees	27 33.8%	24 35.3%	19 43.2%	0.841 0.298 0.401
More than 250 employees	20 25%	13 19.1%	10 22.7%	0.389 0.779 0.646
Total (%)	80 100%	68 100%	44 100%	
Chi-square	3.161			
P-value	0.788			

Source: (created by authors)

The output from Tab. 7 is the finding that there are no statistically significant differences between the groups of enterprises according to the number of employees and the budgetary purpose. The number of employees is not a statistically significant factor and does not affect the purpose of budgeting in enterprises (Chi-sqaure = 3.161; P-value = 0.788). Based on these facts, the hypothesis H2 is reject. There are no significant differences in budgeting functions for selected enterprise groups by number of employees (A / B, A / C, B / C: P – value> 0.05).

Conclusion

The authors wanted to examine some interesting phenomena discussed in the professional literature and among practitioners. Their survey brought the following findings.

The term „budget" has been predominantly used in medium-sized and large companies. Understanding of a term „plan" in the Czech Republic has been close to the German approach, while understanding of a concept „budget" in the Czech Republic has been adequate to the Anglo-Saxon approach.

Companies operating on the Czech market mostly use a combinations of several indicators in the budget. Revenues and costs have been the most common of them. Approximately half of the respondents have declared that they use non-financial indicators in the budget. However, a detailed exploration showed that the perception of non-financial indicators is not uniform in the Czech enterprises and many firms do not

understand the meaning of these indicators. Most respondents have used the budget as a planning and controlling tool.

For a better understanding of a whole issue, the authors were looking for relations between evaluated variables. Therefore, they have compiled two hypotheses with the following results:

H1: The size of the enterprise is a statistically significant factor that affects the fact whether the enterprise compiles a budget. This hypothesis was accepted. H2: The size of the enterprise is a statistically significant factor that affects the number of budgetary purposes in the enterprise. This hypothesis was reject.

As a limiting factor of this research the authors perceive the use of only one type of research method. The advantage of a quantitative survey is a capture of a large sample of respondents, but according to the expert knowledge (for example conclusions of the Trends in Accounting Research Conference 2017, Kaunas), this way does not lead to detailed understanding of the issue. This is a reason why the authoring team plans to expand the information from this research through a qualitative research based on the structured interviews in companies.

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ARE PRODUCT INNOVATION-ORIENTED FIRMS PREPARED FOR EFFECTIVE PRODUCT CUSTOMIZATION?

Vít Chlebovský, David Schüller, Stanislav Škapa

Abstract: Growing demand for customized solution offers instead of standardized products is reality in many business sectors on both B2B and B2C markets. While this approach is well developed in some B2B sectors it is not that often in majority of B2C markets. Rapid technology development within past years gives more possibilities to increase production flexibility in wider range of production sectors. This will lead in increasing level of product customization shortly.

Purpose of this article is to summarize the research on how the product innovation oriented companies are prepared in terms of their internal infrastructure for effective customized product solution development and delivery to their customers. Two interlinked researches were performed through Czech, Austrian, German and Swiss product innovation oriented manufacturing companies. Quantitative research compares whether and how customized product offer is communicated by companies to their market. Qualitative research was performed in form of five case studies to deeper observe and study internal technical and production infrastructure of the selected companies. Results of performed quantitative research were statistically evaluated and tested. Outcomes of qualitative research gives deeper knowledge of the infrastructure used in selected companies for development and production of customized products. The research proves increasing focus of the companies on offer individualization.

Keywords: Customer Solutions, Relationship Marketing, Product Customization, Market Orientation, Product Management, Machine Building Sector, Solution Management.

JEL Classification: M11, M31.

Introduction

For many decades competitive advantage was primarily based on technological aspects connected with a company's ability to develop and manufacture products. Thus items like capital, raw materials, production capacity and capability or human resources were scarce (Kellen, 2003). The situation has changed dramatically within the past few decades with the international business environment's globalization. Increased competitiveness in this environment has led to increased focus on customer requirements (Franceschini et al., 2015) and relationship processes (Tuli et al., 2007). Thus superior knowledge of customers and their needs is the new scarcity (Kellen, 2003) and the capability to offer solutions (Biggemann et al. 2013). Efforts towards customer requirement knowledge led to the rapid development of relationship marketing and customer relationship management, known as CRM (Payne & Frow, 2005). CRM is a great help to companies trying to increase their business competitiveness. On the other hand, CRM concentrates primarily on aspects outside the company, namely towards customers, and a stronger internal focus on solution development processes is also crucial (Bennett et al., 2001).

1 Statement of a problem

1.1 Conceptual background

In order to develop complex approach methodology to customized product development and management, the Customer Solutions Management concept was introduced in Chlebovský (2016). The Customer Solutions Management (CSM) concept encompasses a strong focus on customer requirements through solution development and its delivery and implementation to a further focus on success measurement, control and requirement revisions for the next complete cycle.

CSM is based on Customer and Market Orientation concepts developed in the past and also uses principles of Total Quality Management (TQM), Project Management and Knowledge Management as supporting tools. Especially in manufacturing companies, an efficient CSM concept cannot exist without strong ICT tools supporting business processes in information systems such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Business Process Management (BPM), Product Lifetime Management (PLM), Manufacturing Execution System (MES) and Advanced Planning and Scheduling (APS).

1.1.1 Customer Orientation and Market Orientation

A strong orientation towards customers was being discussed as early as in Strong (1925). A more detailed definition of customer orientation was then described in Saxe & Weitz (1982). They define customer-oriented selling as the practical application of marketing concepts to the individual personal interaction between salesperson and customer. They also introduced the SOCO Scale (Sales Orientation – Customer Orientation Scale) for measurement of customer orientation. The sales approach of customer orientation is typically sorted into relationship selling and adaptive selling (Wilson, 1995). Focusing on customer expectations has been seen as a very important part of customer orientation (Weitz, 1981).

The market orientation business approach was first introduced in Drucker (2012), where a marketing-oriented approach was introduced as an alternative to the product oriented concept. A more systematic concept of market orientation was presented in Webster (1988) and later also in Kohli & Jaworski(1990), Jaworski & Kohli (1996), Narver & Slater (1990) and Ruekert (1992). All these sources present the influence and relation of a company's market orientation to its business performance. They also define the basic principles of market orientation in customer focus, competition focus, stakeholder focus and focus on company flexibility. Two models for market orientation measurement were developed – MKTOR by Narver & Slater (1990) and MARKOR by Kohli, Jaworski & Kumar (1993). Both models' primary focus is on customers. While MKTOR is primarily based on measurement and feedback, MARKOR emphasizes proactivity of personnel throughout the company structure.

Even though there are noted contradictions between customer and market orientation based on internal conflicts between sales and marketing departments in the company (Kotler, Rackham & Krishnaswamy, 2006), there are also joint approaches of both concepts (Shapiro, 1988).

1.1.2 Customer Need Identification & Prioritization and Solution Development

An important basis for customer solution focus is customer needs identification and prioritization. Identification and consequent prioritization of customer requirements is part of various customer satisfaction models. Kano et al. (1984) deals with must-be, one-dimensional and attractive requirements of products. A more complex approach combining customer requirement identification, prioritization and product development can be seen in Total Quality Management (TQM) models (Akao, 1990). Many authors are working with the Quality Function Deployment (QFD) model based on the TQM approach. QFD (Akao, 1990; O'Connor, 1994; Cohen, 1995) is a concept of product development based on superior customer requirement knowledge working with the so-called House of Quality Matrix (Wasseman, 1993). Some authors combine KANO and QFD concepts (Matzler & Hinterhuber, 1998; Tan & Pawitra 2001) to achieve greater effectiveness in the product development process.

Customer solution development has to be processed after customer requirement identification and prioritization. Manufacturing companies especially have to be strong in engineering to ensure effective innovations (Garcia, R., & Calantone, R. 2002). Working in innovation cycles requires parallel activities in marketing and engineering. Thus concurrent engineering and simultaneous engineering were introduced (Ma et al. 2008). Both concepts enable parallel innovation cycle management and higher flexibility of the organization leading to lean production concepts (Womack et al. 1990).

In order to ensure the required flexibility and efficiency within an organization, strong project-based management is crucial. Such companies are called Project Based Firms (PBF) (Whitley, 2006). Jones et al (1997) shows that strong project-based management leads to a lighter organizational structure of the company. Several authors also describe the relation between project-based management and marketing, primarily seen in relationship marketing and networking (Webster, 1992).

Besides project-based management of the company, a strong focus on product management and effective knowledge management are also important inside the organization. Product management is typically seen in the process basis of Product Lifetime Management (PLM) (Gorchels 2003). Successful product management requires product managers to have a strong personality (Katsanis et al., 1996), because of an unclear definition of competences in the organization whereby product managers have to coordinate activities through various company departments. Major processes that have to be handled by product managers are branding, marketing communication, product stock planning, pricing management and distribution management (Tyagi & Sawhney, 2010).

Effective knowledge management gives a company a strong tool for enhancing internal know-how and experiencing real-time sharing (Wasko & Faraj, 2005).

1.1.3 ICT Infrastructure supporting the Concept

It is evident in the 21st century that such a complex approach to customer solutions requires an ICT system support. The reality in the majority of firms is that unrestrained development of their ICT infrastructure that does not necessarily reflect the required systemic and strategic business strategy (Gudanescu et al., 2010). This unrestrained development is significantly influenced by rapid and unrestrained development of the entire ICT sector. ICT system implementation in any company thus becomes a very complex and multidisciplinary task that requires precise adaptation of implemented ICT

tools according to the company business strategy (Marchand et al. 2001). To ensure full and efficient ICT tool support to the business processes within the company, processes have to be in line with the so-called ICT requirement pyramid (Gudanescu et al., 2010).

There are many published texts related to ICT support of product development and production processes. Typically, those publications are focused on a particular phase such as the design stage or process planning, while some are more complex covering multiple phases (Fu Qiu et al, 2008). Generally the ICT support of the internal processes is covered within Competitive intelligence of the company (Calof & Wright, 2008, Molnár & Střelka, 2012).

The coordinated use of described concepts and tools towards customer solutions is not often seen in companies. It is more likely found in B2B-oriented companies than in the B2C sector. Rapid technological development in recent years has increased production flexibility in a wider range of manufacturing sectors. This will shortly also lead to increased levels of product customization in higher quantity and mass production sectors (Chlebovský, 2016).

ICT infrastructure in the production companies typically consists of the following information systems: ERP (Enterprice Resource Planning, BPM (Business Process Management), PLM (Product Lifecycle Management), MES (Manufacturing Execution System) and APS (Advanced Planning and Scheduling). All the systems require mutual cooperation and coordination in the company (Videcká, 2016).

2   Research Methods

In order to map how well companies are prepared for the described trend of increased need for individualized products from the customer side, the following two pieces of research were performed: The first one was quantitative and involved product innovation-oriented companies in both the B2B and B2C sectors. This research should answer the following research question:

Q1: Is product innovation-oriented B2B firms' internal infrastructure supporting product customization more developed in comparison to B2C companies?

The quantitative research was undertaken by analysing and comparing whether and how the customized product offered is communicated by selected product innovation-oriented manufacturing companies to their customers in both the B2B and B2C sectors and how it is supported by ICT infrastructure.

Besides the quantitative research, qualitative research was also performed. Qualitative research was made in the form of five case studies to more deeply observe and study the internal technical and production infrastructure of the selected companies.

Both pieces of research were undertaken in Czech, Austrian, German and Swiss product innovation-oriented companies.

Quantitative research was undertaken by analysing the selected companies' capability to offer product customization and its support via ICT tools. The European company database Amadeus provided by Bureau van Dijk was used for the company selection in all four countries under the same search criteria. According to Yamane (1967) two basic criteria are needed to determine the appropriate sample size: the level of precision and confidence level. In socio – economic sciences the confidence level $\alpha = 0.05$ is usually

used. For the purposes of the paper the level of precision +/- 10% was used. The confidence level is α = 0.05. On the basis of these criteria the 100 companies are appropriate sample size in relation to the size of population.

Sample set covers 100 manufacturing firms (25 in each country) with the highest number of registered patents. Patent statistics are widely used as a good metric and indicator of the product innovation-orientation of the company and thus the number of registered patents was used as a selection criteria within the search strategy.

Database searching was processed for each country in the following steps:

1. Region/Country/region in country: The Czech Republic / Austria / Switzerland / Germany, 2. NACE Rev. 2 main section: C. Manufacturing 3. Number of patents: Top 25. When it comes to business sectors, the most involved in all countries are machine-building in B2B and automotive in both B2B and B2C. There are also strong food processing and pharmaceutical sectors in Switzerland covering both B2B and B2C markets.

The second step was the definition of proper metrics to be evaluated in each selected company. Based on discussions with experts, the metrics shown in Tab. 1 were selected.

Tab. 1: Used research metrics

Metric	Available values
Communicated offer of individualized product/solution	0 - no, 2 - part of products, 5 - all products
Modular product structure	0 - no, 2 - part of products, 5 - all products
Available tools for individual product specification	0 - no, 2 - limited (f.e. inquiry sheet), 5 - actively used
Product configurator	0 - no, 2 - part of products, 5 - all products

Source: authors

The sum of the points gained by each company provides an overall product customization index. The theoretical maximum that can be gained by a company is 20 points. MS Excel was used to register the measured values in evaluation sheets. The data stored in MS Excel was further processed in order to test given hypotheses. Statistical tests were performed to test research hypotheses using statistics software.

Qualitative research is very often used to observe, describe and prove research models in specific organizations (Eisenhardt, 1989, 1991). Thus case study research was chosen in this situation.

Since the machine-building sector is one of the most covered by quantitative research, there were five companies selected that represent the full supply chain in the machine-building sector from component production through distribution to final machine-building and assembly. The selected companies also represent different size categories from large global corporations through to medium and small businesses to micro companies. They are located in all European countries involved in this research: Switzerland, Germany, Austria and the Czech Republic. All five companies represent the B2B sector.

A research case study template was created prior to the research execution primarily covering the following groups of information: company business basics, product group characteristics, marketing and sales process characteristics, product customization capabilities, strategic development plans, ICT systems used, and competition

characteristics. All groups of information described were specifically focused on current and future capabilities of the companies in customer solutions development.

Data collected for the case study protocols were obtained from three major sources:

1. Secondary source research within the past four years – primarily financial reports, annual reports (if applicable) and Amadeus database data (Bureau Van Dijk, 2015) were used.

2. Observations inside all five companies at regular intervals within the period 2013 – 2016.

3. In-depth interviews with company managers at all management levels in all companies. Interviews were performed in the period of June to September 2016.

3 Problem solving

Quantitative research

General outcomes of the quantitative research are summarized in Tab. 2. It shows the value calculations of product customization index gained by researched companies.

Tab. 2: Quantitative research outcomes summary

Target market	Maximum	Minimum	Average	Median	Variance	St. deviation
B2B	17	0	11.91	12	12.73	3.57
B2C	17	0	10.34	11	33.00	5.74
Company location:						
Czech Rep.	15	0	8.6	9	18.58	4.22
Austria	17	6	12.38	12	10.49	3.17
Germany	17	4	10.92	12	24.75	4.87
Switzerland	17	0	10.8	12	19.58	4.34

Source: authors

Based on the research question respective zero and alternative hypotheses were formulated:

H10: Product innovation oriented B2B firms' internal infrastructure supporting product customization is more highly developed in comparison to B2C companies.

H11: Product innovation oriented B2B firms' internal infrastructure supporting product customization is not more highly developed in comparison to B2C companies.

Statistical testing of hypothesis H10 and H11 were performed based on the values gained. For the statistical testing a sample set from companies from all involved countries divided into two groups was created – the first group were companies targeting business customers (B2B) and second group involves companies targeting consumers (B2C). Out of a total 100 companies involved in the research, 65 were in the B2B group and 35 in the B2C group.

It is necessary to conduct the test of normality to find out if parametric or non-parametric testing will be used. The Shapiro-Wilk test is used to test the normal distribution of data.

H0 The data sets come from normal distribution.

HA The data sets do not come from normal distribution.

Tab. 3: Tests of Normality
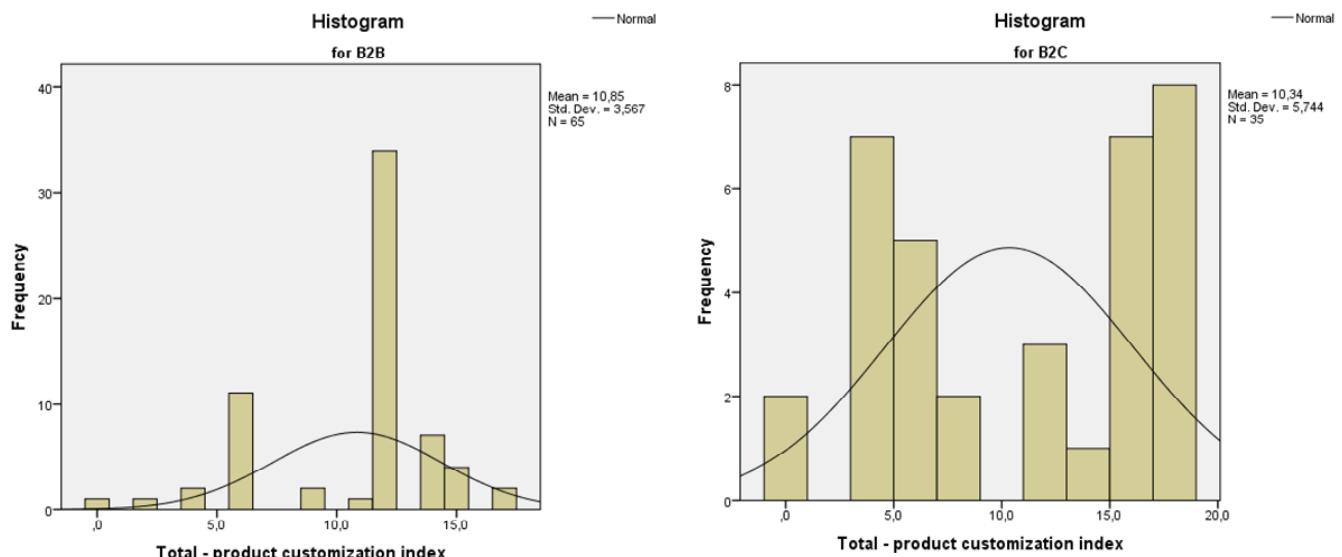
B2B / B2C		Shapiro-Wilk		
		Statistic	df	Sig.
Total – product customization index	B2B	0.832	65	0.000
	B2C	0.864	35	0.000

Normal distribution of data is not proven. P-values (Sig.) are lower than the chosen significance level 0.05. The H0 hypothesis about the normal distribution of data is rejected.

The following histograms show the distribution of data.

Fig. 2: Histograms for B2B and B2C companies

The non-parametric Mann-Whitney U test is used to test the H10 hypothesis. The test is based on the rank of values and compares the means of selected data sets. Results are shown in Tab. 4 and Tab. 5:

Tab. 4: Ranks

B2B / B2C		N	Mean Rank	Sum of Ranks
Total - product customization index	B2B	65	50.36	3273.50
	B2C	35	50.76	1776.50
	Total	100		

On the basis of the average mean rank it is obvious that the data sets are very similar. If there is a statistically significant difference, it will be found out by statistical testing.

Tab. 5: Test Statistics[a]

	Total - product customization index
Mann-Whitney U	1128.500
Asymp. Sig. (2-tailed)	**0.947**

a. Grouping Variable: B2B / B2C

P-value of Mann-Whitney U test is 0.947. It is higher than the value of significance level 0.05 thus the H0 is rejected. There is no statistically significant difference between B2B and B2C.

Qualitative research

Tab. 6 and Tab. 7 summarize results of the qualitative research. Tab. 6 shows a brief summary of the capability and approach to individualized product development. It also shows metrics measures of each company gained from within the quantitative research. Tab. 8 shows the actual internal ICT infrastructure of the 5 involved companies.

Tab. 6: Qualitative research results summary – company basics and individualized product development capability

	AAA	BBB	CCC	DDD	EEE
Company size / number of employees	large / 2000+ worldwide	Medium / 200 in Germany	Medium / 20 in Austria and Czechia	Small / 20 in Czechia	Micro / 10 in Czechia
Annual turnover (mil. EUR)	250+	25	12	4	1,5
Product type	components	Components	Components, services	Systems / machines	Systems / machines
Internal focus	Product technology	Customized solutions, technology	Customized solutions	Customized solutions	Product technology
Capability of product individualization	Limited but growing with configurable products	Good, stable	Insufficient engineering	High	Limited
Communicated offer of individualized product/solution	Yes, all products	Yes, all products	Yes, all products	Yes, all products	Yes, part of the products
Modular product structure	Yes, part of the products	Yes, part of the products	Yes, part of the products	Yes, part of the products	Yes, part of the products
Available tools for individual product specification	Yes, actively	Yes, actively	Limited	Limited	Limited
Product configurator	Yes, part of the products	No	No	No	No

Source: authors

Tab. 7: Qualitative research outcomes summary – use of ICT systems in selected companies to support customized product offer

Company	ERP	CRM	BPM	PLM	APS	MES
AAA	Yes	Yes	Limited	CAD/CAM	Yes	Yes
BBB	Yes	Limited	No	CAD/CAM	No	No
CCC	No	Yes	Yes	Limited	No	No
DDD	Yes	No	No	CAD	No	No
EEE	Limited	No	No	CAD	No	No

Source: authors

This summary shows that typical company ICT infrastructure does not cover all the required systems. The research undertaken also confirms general statistics that are summarized in Tab. 8.

Tab. 8: Summary of secondary source statistics available

Information System	Available statistics summary
Enterprise Resource Planning (ERP)	ERP systems were used by 36% companies located in the EU in 2015. At the same time there are significant differences in ERP system use by company size – it is used by 30% of small companies, by 60% of medium sized and by 80% of large corporations.
Customer Relationship Management (CRM)	CRM systems were used by 31% companies located in the EU in 2015. At the same time there are significant differences in CRM system use by company size – it is used by 28% of small companies, by 47% of medium sized and by 60% of large corporations.
Business Process Management (BPM)	According to research undertaken among global managers, they see 25 – 40% of company processes fully automated.
Product Lifecycle Management (PLM)	CAD systems are used by the vast majority of manufacturing companies. It is used by almost 100% of medium and large manufacturing companies.
Advanced Planning and Scheduling (APS)	The APS system is not used by many companies. There are no detailed statistics available.
Manufacturing Execution System (MES)	The APS system is not used by many companies. There are no detailed statistics available.

Source: modified from Eurostat statistics (2015)

4 Discussion

Both pieces of research undertaken, quantitative and qualitative, show important results that can be summarized as follows:

The statistical tests performed show that there are no differences in internal infrastructure supporting product customization in B2B and B2C companies. Looking more deeply into the data collected within the quantitative research, the following outcomes can be seen:

- Companies in both the B2B and B2C sectors are doing well in product modularity and availability of the tools needed for individualized product specification. The average and median values of both company groups are equal in these two criteria.
- Results regarding the ability to communicate product individualization capability shows the advantage of B2B-oriented companies. B2B sector-oriented companies gained an average value of 4.2 out of a maximum 5.0 compared to 1.94 gained by B2C sector-oriented companies.
- B2C companies on the other hand are excellent in the product configurator criterion, where the median is 2.0 in comparison with 0.0 in the B2B group of companies.

These results are in accordance with the actual business experience where companies in the B2B sector are offering very flexible product individualization in comparison with the B2C sector, where product modularity and easy module configuration is typically the preferred choice of product individualization.

An important result of the quantitative research is also a comparison based on country of company location. It is evident that Czech companies are behind their counterparts from more highly developed economies in overall ability to offer and communicate individualized product solutions to their customers.

Qualitative research results mapping ICT infrastructure of the selected companies show that companies involved in the research are well-equipped when it comes to

digitalization of their research and development processes using CAD systems. Companies are also well-equipped when it comes to basic operational information systems – they typically use any of the ERP systems. On the other hand, additional ICT infrastructure is very limited or even almost non-existent. Among the companies researched, APM and MES systems are only used by the global corporation AAA. Even the CRM system is not used by all the companies researched.

Conclusion

This article presents a summary of two pieces of interlinked research undertaken on a product innovation-oriented firm's capability to offer individualized product solutions to their customers. The focus of the research was on the firm's internal infrastructure, primarily the ICT tools needed to offer customized product solutions to customers.

The quantitative research analyses whether and how the customized product offered is communicated by selected product innovation-oriented manufacturing companies in B2B and B2C sectors in the Czech Republic, Austria, Germany and Switzerland.

The qualitative research is in the form of five case studies to more deeply observe and study internal technical and production infrastructure of the selected companies with a primary focus on the ICT system infrastructure that is essential for the capability of individualized products offered to customers.

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VLIV STRUKTURY ZÁVISLOSTÍ NA PŘESNOST MĚR TRŽNÍHO RIZIKA

EFFECT OF THE DEPENDENCY STRUCTURE ON THE MARKET RISK ACCURACY

Tomáš Jeřábek

Abstract: *Knowledge the dependence between risk factors is very importance in risk management. The failure of traditional approaches to market risk measure motivates to investigate the relationship between financial markets. The aim of this paper is to examine the dependence between stock index returns and foreign exchange rate returns for six selected economies. In this context, it is detected evidence of dynamic and asymmetric dependence. It is empirically demonstrated that application of asymmetric dynamic copula improves the Value at Riks as well as Expected Shortfall estimates. Overall, the results show that the dependence structure of international financial markets is more complicated than the structure predicted by the traditional approaches to market risk measure.*

Keywords: *Value at Risk, Copula, Risk Management, Asymmetric Dependence.*

JEL Classification: *C13, C32, G11.*

Úvod

Riziko lze definovat jako nebezpečí, šanci špatného důsledku, ztrátu nebo vystavení se ztrátám. Zatímco pro mnoho lidí má riziko značně negativní konotaci, může představovat také příležitost. Pokud by ve finančním odvětví neexistovalo riziko, neexistovala by rovněž valná většina subjektů, vytvářející toto odvětví, viz Jorion (2009). Jde o to, že finanční instituce jsou schopny vytvářet produkty a služby, díky kterým svým klientům poskytují větší finanční jistotu, založenou na optimalizaci přítomných rizik. Riziko v bankovnictví se týká potenciální ztráty, ke které může dojít v důsledku dění některých událostí. Riziko vzniká kvůli nejistotě spojené s událostmi, které mohou způsobit ztrátu, přesněji řečeno, konkrétní událost může nebo nemusí nastat, ale pokud k ní dojde, způsobí ztrátu (Berkowitz a O'Brien, 2002).

Neustále rostoucí globalizace ve finančním sektoru nutí finanční instituce k provádění operací na mezinárodních finančních trzích. Neúspěch tradičních metod pro měření rizik a optimalizaci portfolia motivuje k dalšímu výzkumu složitých a dynamických vztahů typických pro tyto trhy. Například Czado et al. (2012) v souvislosti se zmiňovanou krizí upozorňují na asymetrii v rozdělení výnosů na různých typech finančních trhů. Tedy prvořadým cílem současného výzkumu by mělo být hledání nových a vhodnějších modelů, jež dokáží tyto vztahy lépe zachytit.

Z hlediska měření a řízení rizik na mezinárodních finančních trzích je velmi důležité pochopení struktury závislostí na akciovém a měnovém trhu. Cílem této práce je nejprve zkoumat strukturu závislostí na vybraných finančních trzích, a to ve smyslu asymetrické a v čase proměnlivé závislosti. V této souvislosti je dále hledána vhodná metodika pro odhad VaR a ES při aplikaci na jak rozvíjející se, tak rozvinuté finanční trhy.

1 Formulace problematiky

Výzkumné práce zabývající se problematikou asymetrické a dynamické závislosti uvádějí významné důkazy o dvou typech asymetrií ve výnosových rozděleních. První typ asymetrie se vztahuje k jednorozměrným rozdělením jednotlivých aktiv, kde je tato asymetrie řešena aplikací asymetrických modelů podmíněné volatility, jako například GJR-GARCH nebo EGARCH, viz například Brooks (2008). V případě druhého typu jde o asymetrickou závislost mezi jednotlivými rozděleními. Důkazy o existenci asymetrické závislosti mezi výnosy finančních aktiv byly publikovány v několika pracích, jako například Christoffersen, et al. (2012). Tyto práce dále potvrzují skutečnost, že výnosy různých typů finančních aktiv vykazují vyšší závislosti v krizových obdobích než v růstových fázích hospodářského cyklu. Tato skutečnost se projevila i v souvislosti s nedávnou finanční krizí, kdy aktiva, u jejichž výnosů bylo před krizí zaznamenáno vzájemně odlišné chování, najednou v době krize vykazovaly společný vývoj, viz Christoffersen a Langlois (2013). Důvody tohoto chování lze spatřovat ve zvýšené volatilitě finančních výnosů v krizových obdobích, přičemž právě podobný vývoj volatility má za následek zvýšenou závislost mezi těmito výnosy. Tyto jevy nelze v rámci oblasti finančního modelování ignorovat, a to přinejmenším ze dvou důvodů. Za prvé, ignorace asymetrií mezi výnosy aktiv může způsobit podstatné podhodnocení skutečných ztrát. Za druhé, v případě období spojeného s větším tržím rizikem, budou výsledky tradiční diverzifikace portfolia založená na korelacích mezi výnosy jednotlivých aktiv značně zavádějící, viz například Patton (2004) nebo Hong et al. (2007).

Závislosti jsou v tomto článku modelovány primárně pomocí kopul. Hlavní výhodou kopul je schopnost modelovat nelinearitu v závislostech, a to účinnějším způsobem, než nabízí například Spearmanův koeficient pořadové korelace. Ovšem v minulém desetiletí se do popředí zájmu dostala rovněž problematika asymetrie závislostí. Nguyen a Bhatti (2012) nebo Basher et al. (2014) se touto problematikou zabývali podrobněji a na různých datech ukazují přítomnost asymetrické závislosti na chvostech, což naznačuje vyšší společnou pravděpodobnost poklesu nebo vzestupu trhů. Z toho důvodu jsou kromě eliptických kopul v posledních letech uplatňovány rovněž jejich asymetrické verze, konkrétně sešikmená normální a sešikmená Studentova kopule. Za účelem diagnostiky asymetrie v závislostech lze použít několik měr, přičemž k nejpopulárnější patří závislost mezi chvosty rozdělení (tail dependence), viz Patton (2012).

2 Metody a data

V rámci datového souboru uvažujeme denní časové řady měnových kurzů vybraných měn vztažených k euru. Dále pak uvažujeme denní časové řady korespondujících akciový indexů. Všechny časové řady pokrývají období od 2.1.2003 do 31.8.2016. Celkem pracujeme se vzorkem 6 států, do kterého spadá USA, Švýcarsko, Japonsko, a dále pak Brazílie, Indie, Mexiko. Jednotlivé státy byly vybírány tak, aby byly obsaženy rozvinuté i rozvíjející se finanční trhy. Tab. 1 a 2 prezentují základní statistiky sledovaných řad ve formě výnosů. Konkrétně v první tabulce jsou uvedeny data pro rozvinuté finanční trhy, v případě druhé tabulky se jedná o rozvíjející se trhy. Pro výnos $r_{i,t}$ akciového indexu v hodnotě $P_{i,t}$ v čase t, resp. měnového kurzu $S_{i,t}$ v čase t platí

$$r_{i,t}^P = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}, \text{ resp. } r_{i,t}^S = \frac{S_{i,t} - S_{i,t-1}}{S_{i,t-1}} \tag{1}$$

Z Tab. k 1 a 2 je patrné, že u všech řad docházíme k nenulové šikmosti. Konkrétně v případě Mexika lze sledovat kladné sešikmení u obou řad, přičemž z hlediska nižší

hodnoty je možné usuzovat na mírnější převahu extrémně vysokých výnosů oproti extrémně vysokým ztrátám. V případě ostatních ekonomik naopak vidíme záporné sešikmení, jež je nejvíce zřetelné u Švýcarského franku vůči Euru, tedy zde naopak převažuje výskyt extrémně vysokých ztrát. Z tabulky je dále patrná poměrně vysoká špičatost, jež je pro finanční řady typická, a je způsobena přítomností extrémních ztrát, resp. extrémních výnosů. Opět v případě výše zmiňovaného CHF je špičatost nejvýraznější.

Tab. 1: Popisné statistiky jednotlivých výnosů – rozvinuté trhy

Statistika	USA		Japonsko		Švýcarsko	
	USD	SP500	JPY	NKY	CHF	SMI
Střední hodnota	-0,0001	0,0002	0,0000	0,0001	-0,0001	0,0001
Směr. odchylka	0,0063	0,0124	0,0076	0,0154	0,0047	0,0121
Šikmost	-0,107	-0,206	-0,532	-0,455	-7,486	-0,113
Špičatost	2,416	9,354	7,324	6,737	283,420	6,773
JB test	0,00***	0,00***	0,00***	0,00***	0,00***	0,00***
LB Q	0,353	0,00***	0,124	0,378	0,00***	0,00***
ARCH-LM	0,00***	0,00***	0,00***	0,00***	0,00***	0,00***

Zdroj: vlastní zpracování (statistická významnost: *10%, **5%, ***1%)

Tab. 2: Popisné statistiky jednotlivých výnosů – rozvíjející se trhy

Statistika	Indie		Mexiko		Brazílie	
	INR	NIFTY	MXN	MEXBOL	BRL	IBOV
Střední hodnota	0,0002	0,0006	0,0003	0,0005	0,0002	0,0004
Směr. odchylka	0,0070	0,0147	0,0078	0,0124	0,0108	0,0178
Šikmost	-0,130	-0,086	0,379	0,058	-0,166	-0,050
Špičatost	3,960	8,814	6,735	5,899	7,051	4,291
JB test	0,00***	0,00***	0,00***	0,00***	0,00***	0,00***
LB Q	0,00***	0,00***	0,011**	0,00***	0,029**	0,00***
ARCH-LM	0,00***	0,00***	0,00***	0,00***	0,00***	0,00***

Zdroj: vlastní zpracování (statistická významnost: *10%, **5%, ***1%)

Na základě výše uvedeného lze předpokládat nesplnění předpokladu normálního rozdělení výnosů, což potvrzují výsledné p-hodnoty Jarque-Bera testu. Pro účely další analýzy byla ve všech použitých časových řadách sledována přítomnost autokorelace, tj. vzájemné závislosti mezi jednotlivými prvky řady a dále hereskedisticity, jež indikuje nekonstantnost rozptylu časové řady. Aplikace Ljung-Box Q testu řádu 12 potvrdila, že na 5% hladině významnosti přítomnost autokorelace nebyla potvrzena u 3 řad, konkrétně v případě směnných kurzů USD/EUR a JPY/EUR, a dále u japonského indexu Nikkei 225 – viz p-hodnoty uvedené v Tab. 1 a 2. Pro ověření heteroskedasticity byl použit ARCH-LM test. Jak ukazují výsledky p-hodnot, na 5% hladině významnosti potvrzujeme přítomnost heteroskedasticity u všech použitých řad. Podrobný popis použitých testů uvádí například Brooks (2008).

Pro analýzu závislostí mezi akciovým indexem a korespondujícím měnovým kurzem byla použita jednak Personova korelace, jež je schopna odhalit lineární závislosti a dále Spearmanova pořadová korelace indikující rovněž nelineární závislosti. Výsledky jsou uvedeny v Tab. 3.

Tab. 3: Korelační analýza

Korelace	USA	Japonsko	Švýcarsko	Indie	Mexiko	Brazílie
Pearson	-0,102	0,277	-0,176	0,245	0,207	-0,169
Spearman	-0,087	0,227	-0,127	0,208	0,174	-0,102

Zdroj: vlastní zpracování

Z tabulky je patrné, že v případě USA, Švýcarska a Brazílie potvrdily oba přístupy negativní korelaci. Právě negativní korelace mezi výnosy akciového indexu a směnného kurzu je očekávaným výsledkem, jež plyne ze vzájemného vztahu obou veličin. Zde vycházíme ze situace, že akciové indexy a měnové kurzy, mezi nimiž závislost měříme, mají tendenci ke vzájemně opačnému vývoji, tj. pokles hodnoty akciového indexu bývá doprovázen depreciací souvisejícího měnového kurzu. A pro růst akciového indexu je opět charakteristická apreciace příslušného kurzu. Konkrétně, růst výnosů akciového indexu vyvolá zájem investorů, jež směňují své finanční prostředky do měny akciového indexu za účelem realizace investice do daného indexu. Větší měřítko uvedených operací způsobí apreciaci měnového kurzu vztaženého k požadovanému indexu. Jinými slovy tedy růst akciového trhu v určité zemi je doprovázen poklesem příslušného měnového kurzu.

U zbývajících států docházíme k pozitivní korelaci, jež zřejmě vychází ze skutečnosti použití těchto měn v rámci carry trade obchodování[1]. Právě JPY je známým příkladem tohoto typu obchodování – hojně využívaný až do roku 2008. V případě Indie je INR v posledních letech druhou nejstabilnější měnou měnou na rozvíjejících se trzích (po indonéské rupii), viz Bloomberg (2016), což investoři využívají právě v rámci carry trade obchodování. V případě Mexické měny je carry trade obchodování realizováno prostřednictvím vstupu do dlouhé pozice v domácí měně na swapovém trhu, viz BIS (2015).

Vzhledem k přítomnosti autokorelace a heteroskedasticity je pro modelování výnosů použita kombinace autoregresního (AR) modelu a modelu podmíněné volatility. V předcházející části bylo na vybraných akciových indexech a měnových kurzech ukázáno, že rozdělení jejich výnosů neodpovídá normálnímu rozdělení, přičemž jak jejich střední hodnota, tak rozptyl se mění v čase. Za účelem zachycení problému podmíněné střední hodnoty a rozptylu, na každou z použitých řad aplikujeme AR(1)-GJR-GARCH(1,1) model s aplikací Studentova rozdělení, viz Brooks (2008).

2.1 Modelování závislostí

Za účelem ověření, zda se v závislostech mezi výnosy akciového indexu a příslušného měnového kurzu vyskytuje asymetrie, aplikujeme chvostovou závislost, představenou Pattonem (2012). Zmiňovaný koncept měří závislosti mezi stejnými částmi chvostů rozdělení. Praktické aplikace těchto měr představují například Christoffersen et al. (2012) nebo Elkamhi a Stefanova (2014). Při použití pro představená data ovšem vzniká problém, že uvedené míry nebudou schopny indikovat skutečnou přítomnost asymetrické závislosti. Namísto toho by bylo vhodnější měřit závislosti na vzájemně opačných částech chvostů jednotlivých rozdělení. Vzhledem k předpokládané negativní závislosti mezi výnosy akciových indexů a měnových kurzů, případná asymetrie závislostí může říci, zda převažuje závislost mezi dolním chvostem

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[1] Jedná se o investiční strategii, jejíž cílem je prodat měnu s nízkou úrokovou sazbou a investovat do měny s vyšším úrokem, viz například Burnside (2011).

rozdělení, vztaženém k akciovému indexu a horním chvostem rozdělení souvisejícího s měnovým kurzem (míru této závislosti označme jako λ_{DH}), anebo naopak je větší síla závislosti mezi horním chvostem akciového indexu a dolním chvostem měnového kurzu (pro míru závislosti označme λ_{HD}).

Tab. 4 pak představuje výsledky chvostové závislosti mezi rozděleními reziduí akciového indexu a příslušného měnového kurzu. Druhý a třetí řádek uvádí hodnoty λ_{DH} a λ_{HD}, Čtvrtý řádek pak představuje jejich rozdíly, přičemž s rostoucí hodnotou rozdílu roste přítomná asymetrie ve sledovaných závislostech. Výsledky ukazují, že ve všech případech dochází k větší či menší formě asymetrie závislostí. Konkrétně u většiny párů akciový index-měna se projevuje silnější závislost na levém chvostu, $\lambda_{DH} > \lambda_{HD}$, tj. současný pokles akciového indexu a depreciace měnového kurzu. Tento výsledek je v souladu například s Patton (2012). Výjimkou je Švýcarsko a Brazílie, kde je vidět naopak silnější závislost na pravém chvostu, tedy silnější závislost při růstu akciového indexu a současné apreciaci švýcarského franku, resp. brazilského realu než závislost při poklesu indexů a současné depreciaci příslušné měny. Tento výsledek lze dát do souvislosti s měnovými intervencemi, které v rámci sledovaného vzorku dat probíhaly v obou státech.

Tab. 4: Závislost mezi chvosty rozdělení akciového indexu a měnového kurzu

	USA	JAP	SWIS	IND	MEX	BRAZ
λ_{DH}	0,029	0,038	0,032	0,097	0,064	0,062
λ_{HD}	0,016	0,031	0,044	0,089	0,059	0,073
$\lambda_{DH} - \lambda_{HD}$	0,013	0,007	-0,012	0,008	0,005	-0,011

Zdroj: vlastní zpracování

2.1.1 Kopule

Nejúčinnější možností, řešící uvedené problémy Pearsonovy korelace, představuje použití kopulí. Jedná se o velmi silný nástroj pro modelování závislostí, protože nepožaduje předpoklad normality jednotlivých rozdělení, viz například Harvey (2013). Kopule je funkce, jež umožňuje propojit odlišná jednorozměrná rozdělení do formy vícerozměrného rozdělení, a to bez ztráty jakékoliv informace. Tento koncept byl představen Sklarem (1973). Vzhledem k přítomnosti asymetrie a dynamiky závislostí pracujeme v rámci modelování závislostí jak se symetrickou, tak asymetrickou a rovněž s dynamickou kopulí. Za účelem kompletní představy o vhodné kopule aplikujeme rovněž dynamickou asymetrickou kopuli. Konkrétně jako symetrickou a v čase konstantní kopuli uvažujeme Studentovu kopuli. Dynamická kopule je dána podmíněnou Studentovou kopulí. Asymetrická kopule je dána sešikmenou Studentovou kopulí. Konečně, dynamická asymetrická kopule je vyjádřena prostřednictvím podmíněné sešikmené Studentovy kopule.

Za účelem odhadu parametrů uvedených kopul lze použít tři základní přístupy, připomeňme, že se jedná o MLE, IFM nebo CML, viz například McNeil et al. (2015). Vzhledem k výsledkům poskytnutým například Kimem at al. (2007), jež ukazují, že CML poskytují z uvedených metod nejpřesnější výsledky, aplikujeme zde právě tento semiparametrický přístup. Cílem aplikace uvedených kopul je zjistit, jak jsou schopny přispět k přesnému popisu struktury závislostí mezi akciovým indexem a souvisejícím měnovým kurzem.

3 Rozbor problému

V této části pro výše představených šest dvojic akciový index-měna provádíme odhady měr Value at Risk (VaR) a Expected Shortfall (ES). Cílem je nalézt vhodnou kopuli, jejíž použití zpřesňuje získané odhady. Tyto odhady jsou realizovány prostřednictvím Monte Carlo simulace, jejíž postup je představen níže. Za účelem srovnání aplikujeme rovněž tradiční metody odhadu VaR a ES, konkrétně se jedná o:

- základní parametrický přístup s předpokladem normality rozdělení výnosů obou aktiv (VC),
- modifikaci základního parametrického přístupu představená v RiskMetrics, tj. použitím modelu EWMA pro modelování volatility výnosů (RM),
- neparametrickou historickou simulaci s historickým vzorkem obsahujícím, jak 250 (HS250), tak 500 posledních pozorování (HS500).

Výsledky jsou následně podrobeny zpětnému testování s cílem ověřit robustnost použitých modelů. V případě VaR jsou použity Kupiecův nepodmíněný test (UC) a dále Christoffersenův kombinovaný podmíněný test (CC). Pro ES, stejně jako v předcházející kapitole, používáme hodnocení prostřednictvím střední absolutní chyby (MAE).

3.1 Výnosy indexo-měnových párů

Označme výnos $i-$tého akciového indexu jako r_i^P a výnos ze souvisejícího i-tého směnného kurzu jako r_i^S. Připomeňme, že pro r_i^P, resp. r_i^S platí (1).

Předpokládejme, že v čase t investujeme 1 EUR na i-tém akciovém trhu při měnovém kurzu $S_{i,t}$, kde $S_{i,t}$ představuje množství i-té měny získané za 1 EUR v čase t. V případě, že aktuální cena akcie na tomto trhu je $P_{i,t}$ (v i-té měně), pak celkově můžeme získat $\frac{S_{i,t}}{P_{i,t}}$ akcií. Nyní pro hodnotu realizované investice v čase $t+1$ v i-té měně platí

$$V_{i,t+1} = \left(\frac{S_{i,t}}{P_{i,t}}\right)P_{i,t+1}, \tag{2}$$

kde $P_{i,t+1}$ představuje cenu akcie v čase $t+1$ na i-tém akciovém trhu. Pro hodnotu investice v domácí měně (EUR) v čase $t+1$ pak platí

$$V_{t+1}^{EUR} = \left(\frac{S_{i,t}}{P_{i,t}}\right)\frac{P_{i,t+1}}{S_{i,t+1}}. \tag{3}$$

Nyní lze (3) vyjádřit v následujícím tvaru

$$V_{t+1}^{EUR} = \left[\frac{1}{1+\left(\frac{S_{i,t+1}-S_{i,t}}{S_{i,t}}\right)}\right]\left[1+\left(\frac{P_{i,t+1}-P_{i,t}}{P_{i,t}}\right)\right] \tag{4}$$

a dále dosazením vztahů z (1) získáváme

$$V_{t+1}^{EUR} = \frac{1+r_{i,t+1}^P}{1+r_{i,t+1}^S}. \tag{5}$$

Všimněme si, že V_{t+1}^{EUR} lze rovněž chápat jako změnu hodnoty investice v čase $t+1$ oproti času t. Vzhledem k této skutečnosti lze (5) upravit do podoby vztahující se k výnosu změňované investice, konkrétně $V_{t+1}^{EUR} = 1 + r_{t+1}^{EUR}$. Nyní logaritmizací (4) získáváme

$$\ln(1 + r_{t+1}^{EUR}) = \ln\left(1 + r_{i,t+1}^{P}\right) - \ln\left(1 + r_{i,t+1}^{S}\right) \tag{6}$$

a následným zohledněním skutečnosti, že pro malé $x \in R$ platí $\ln(1 + x) \approx x$, pro výnos i-té investice

$$r_{t+1}^{EUR} = r_{i,t+1}^{P} - r_{i,t+1}^{S}. \tag{7}$$

3.2 Realizace odhadů

Odhady VaR a ES jsou koncipovány jako jednodenní se spolehlivostí 95% a 99%. Odhady jsou vytvářeny pro období od 2.1.2007 do 31.8.2016, tj. celkem 2400 hodnot. Jako trénovací vzorek volíme prvních 250 hodnot, což odpovídá počtu obchodních dnů v kalendářním roce (pro první realizovaný odhad používáme data za období roku 2006) a tento vzorek rolujeme přes celé sledované období. Pouze připomeňme, že v případě historické simulace pracujeme rovněž vzorkem 500 posledních hodnot.

Pro získání odhadů VaR a ES při aplikaci uvedených kopul postupujeme následovně:

1. Na každou z 12 proměnných (akciových indexů nebo měnových kurzů) aplikujeme AR(1)-GJR-GARCH(1,1) model s jedno-rozměrným Studentovým rozdělením a s cílem získání předpovědí podmíněných středních hodnot a podmíněných rozptylů. Výsledným produktem modelů je pro každou proměnnou řada standardizovaných reziduí $z_{1,t}, \dots, z_{12,t}$

2. Prostřednictvím semiparametrické CML metody odhadujeme parametry Studentovy, sešikmené Studentovy, podmíněné Studentovy a sešikmené podmíněné Studentovy kopule.

3. Prostřednictvím Monte Carlo simulace (zvlášť pro každou z kopul) pro i-tý akciový trh ($i = 1, \dots, 6$) a jednotlivá predikční období $t \in [1, 2400]$ generujeme 20 000 jedno-krokových (jednodenních) předpovědí. Pro konkrétní j a t získáváme matici o rozměrech $20\,000 \times 2$, kde první sloupec odpovídá předpovědím indexových výnosů a druhý pak měnovým výnosům pro období $t + 1$.

4. Ze získaných výnosů vytváříme $20\,000 \times 1$ rozměrný vektor, představující předpovědi jedno-denních výnosů j-té cizoměnové investice (pro $t + 1$).

5. Realizace 95%, resp. 99% VaR jako 5%, resp. 1% kvantil vektoru cizoměnových výnosů a následně realizace 95%, resp. 99% ES.

4 Výsledky a diskuze

Za účelem hodnocení získaných výsledků začínáme neformálním zpětným testováním v podobě uvažování podílu $\hat{\alpha}/\alpha$ mezi empirickou a teoretickou pravděpodobností neúspěchu metody, a to ve smyslu podhodnocení skutečné ztráty. V případě teoretické pravděpodobnosti pracujeme s hodnotami odpovídajícími hladinám významnosti jednotlivých odhadů, tj. $\alpha = 0{,}05$ a $0{,}01$. Empirická pravděpodobnost je určena jako relativní podíl mezi počtem chybných odhadů vedoucích k podhodnocení skutečné ztráty a počtem všech odhadů. Tab. 5 představuje pozorované poměry pro $\alpha = 0{,}05$, poměry odhadů odpovídajících 1% hladině významnosti, tedy $\alpha = 0{,}01$, jsou uvedeny v Tab 6.

Tab. 5: Poměry $\hat{\alpha}/\alpha$ pro 1-denní 95% VaR odhady

Metoda	USA	JAP	SWIS	IND	MEX	BRAZ
AD	1,0979	1,1319	1,1149	1,1319	0,9787	1,0128
A	1,1538	1,1837	1,1896	1,1399	1,0796	1,0960
D	1,1891	1,1795	1,1378	1,1585	1,1299	1,0513
S	**1,2785**	1,1963	1,0416	1,1677	1,1737	1,1237
RM	**1,3191**	1,2170	1,2340	1,2255	1,1830	1,0723
VC	**1,3872**	**1,1830**	1,0638	1,2085	**1,2596**	1,0723
HS250	**1,3362**	1,1660	**1,2851**	1,2085	1,2170	1,1319
HS500	**1,3191**	1,1489	**1,3277**	**1,2426**	1,0809	0,9857

Zdroj: vlastní zpracování

Tučně vyznačené hodnoty představují odhady, jež dle UC testu poskytují statisticky významně chybné odhady. Tučné orámování pak značí nejpřesnější odhad. Výsledky ukazují, že nejpřesnější výsledky jsou poskytnuty aplikací dynamické sešikmené Studentovy kopule. Ovšem aplikace ostatních kopul přináší rovněž uspokojivé výsledky. U ostatních metod nejsou výsledky napříč všemi sledovanými páry jednoznačné.

Konkrétně v případě 5% hladiny významnosti poskytuje dobré výsledky rovněž RM metoda – založená na parametrickém odhadu s aplikací EWMA pro modelování volatility a korelace. Rovněž historická simulace poskytuje v některých případech celkem dobré výsledky.

Tab. 6: Poměry $\hat{\alpha}/\alpha$ pro 1-denní 99% VaR odhady

Metoda	USA	JAP	SWIS	IND	MEX	BRAZ
AD	1,1915	1,1064	1,1489	1,0638	0,9362	1,1064
A	1,2796	1,2369	1,2897	1,1371	1,1298	1,1132
D	1,3977	1,1726	1,1797	1,2914	1,1644	1,1244
S	1,4896	1,3079	1,1554	1,3641	1,2136	1,1992
RM	**2,3830**	**2,1702**	**2,0426**	**1,7021**	**2,1702**	**1,4894**
VC	**3,1064**	**2,3830**	**2,5106**	**2,1277**	**2,8085**	**2,0426**
HS250	**2,0000**	**1,8298**	**1,9149**	**1,6596**	**1,8723**	**1,9149**
HS500	**2,4255**	**1,8298**	**1,6596**	1,4894	1,4468	1,2340

Zdroj: vlastní zpracování

Za účelem komplexnějšího porovnání Tab. 7 pro každý z testovaných modelů prezentuje průměrné hodnoty a směrodatné odchylky sledovaných poměrů. Směrodatná odchylka v tomto případě určuje míru odchýlení daného poměru od hodnoty 1 – viz předcházející kapitola. Z tabulky je patrné, že napříč sledovanými daty jsou metody založené na kopulách výkonnější než ostatní čtyři testované přístupy. Konkrétně nejlepšího výkonu je dosaženo použitím asymetrické dynamické kopule. Průměrný poměr empirické a teoretické pravděpodobnosti je při aplikace této kopule nejblíže jedné a zároveň zde docházíme k nejnižší průměrné odchylce kolem jednotkového poměru.

Jinými slovy, počet chybných odhadů je přes všechna pozorovaná data podobný, bez výraznějších výkyvů. Mezi výkonem AD Studentovy kopule a ostatními kopulemi je relativně výraznější rozdíl. Nejméně přesná je z uvedených kopul symetrická Studentova kopule, jejíž aplikace v porovnání s ostatními kopulemi poskytuje volatilnější odhady.

Tab. 7: Průměry a odchylky poměrů z Tab. 5 a 6

	0,05		0,01	
	Průměr	SD	Průměr	SD
AD	**1,0780**	**0,2412**	**1,0922**	**0,2994**
A	1,1404	0,3584	1,1977	0,5164
D	1,1410	0,3628	1,2217	0,5896
S	1,1636	0,4375	1,2883	0,7593
RM	1,2085	0,5416	1,9929	2,5438
VC	1,1957	0,5510	2,4965	3,7763
HS250	1,2241	0,5743	1,8652	2,1351
HS500	1,1858	0,5448	1,6809	1,9104

Zdroj: vlastní zpracování

Ze zbývajících metod podává nejlepší výkon historická simulace, ovšem zde je třeba poukázat na výraznější odchylky v poskytovaných odhadech. Nejhoršího výkonu je dosaženo prostřednictvím základního parametrického přístupu, jehož odhady jsou zatíženy výraznou odchylkou.

Za účelem realizace zpětného testování prostřednictvím formálního přístupu je použit kombinovány podmíněný (CC) test. Získané výsledky potvrzují zjištění uvedená výše, a sice že modely založené na aplikaci kopul mají výrazně nižší počet zamítnutí CC testu než aplikace ostatních přístupů. Například přesnost odhadů použitím základního parametrického přístupu a historická simulace HS250 jsou zamítnuty pro všechny sledované páry. Tab. 8 pro větší přehlednost uvádí pro jednotlivé přístupy počty zamítnutí UC a CC. Z tabulky jasně vyplývá výrazná preference AD Studentovy kopule. Co do přesnosti je na druhém místě je asymetrická kopule a dále dynamická (symetrická) kopule, jež při 1% hladině významnosti nedosahují rovněž žádného zamítnutí. Jako nejméně přesná se z použitých kopul jeví symetrická Studentova kopule. Na druhou stranu, v porovnání se zbývajícími přístupy, i tak poskytuje tato kopule kvalitní výstupy

Tab. 8: Počty zamítnutí v rámci UC a CC testů

	0,05		0,01	
	UC	CC	UC	CC
AD	0	0	0	0
A	0	1	0	0
D	0	2	0	0
S	1	2	0	1
RM	1	4	5	5
VC	3	6	6	6
HS250	2	6	6	6
HS500	3	6	3	4

Zdroj: vlastní zpracování

Kromě VaR byly výše představené metody použity k odhadu ES. Za účelem hodnocení přesnosti predikovaných ztrát byl použit aparát střední absolutní chyby (MAE), přičemž čím menší hodnota, tj. čím menší chyba, tím vyšší přesnost. Výsledné hodnoty pro jednotlivé modely a použité páry dat jsou v uvedeny v Tab. 9 pro $ES_{0,99}$.

Tab. 9: Zpětné testování 99% ES (hodnoty MAE)

Metoda	USA	JAP	SWIS	IND	MEX	BRAZ
AD	0,0085	0,0145	0,0088	0,0110	0,0094	0,0059
A	0,0102	0,0165	0,0107	0,0116	0,0127	0,0085
D	0,0087	0,0157	0,0092	0,1244	0,0099	0,0076
S	0,0120	0,0159	0,0125	0,0160	0,0141	**0,1023**
RM	**0,0195**	**0,0272**	**0,0159**	**0,0207**	**0,0165**	0,0098
VC	0,0095	0,0159	0,0110	0,0115	0,0082	0,0070
HS250	0,0097	0,0151	0,0098	0,0088	0,0072	0,0053
HS500	0,0005	0,0126	0,0027	0,0011	0,0009	0,0005

Zdroj: vlastní zpracování

Tučně jsou vyznačeny největší chyby, vztahující se k nejméně přesným odhadům, naopak zvýrazněné orámování náleží nejpřesnějším odhadům. Pokud nejprve srovnáme výsledky u jednotlivých kopul, pak je z tabulek patrné, že nejvyšší přesnosti dosaženo pro AD Studentovu kopuli. Konkrétně, nepřesnější ES odhady jsou poskytnuty prostřednictvím historické simulace s historickým vzorkem 500 posledních hodnot. Naopak nejméně přesné odhady poskytuje aplikace RiskMetrics přístupu. Pokud ale porovnáváme pouze přístupy založené na kopulích, tak stejně jako v případě VaR, je nejlepšího výkonu dosaženo prostřednictvím AD kopule. Ovšem vzhledem k neilicitabilitě ES, viz například Gneiting (2011), je výsledky v Tab. 9 uvažovat pouze jako orientační.

Získané výsledky potvrzují existenci asymetrické a dynamické závislosti na mezinárodních finančních trzích, a to jak rozvinutých, tak rozvíjejících se ekonomik. Tyto skutečnosti způsobují selhání běžně používaných metod, založených na aplikaci lineárních korelací. Dále zohlednění těchto závislostí při předpovídaní budoucích ztrát, poskytuje méně volatilní odhady, než při použití tradičních metod.

Celkově zjišťujeme výskyt asymetrické závislosti mezi akciovým indexem a odpovídajícím měnovým kurzem. Konkrétně závislost jejich levých chvostů je ve většině případů vyšší než závislost pravých chvostů, což naznačuje že, současný pokles hodnoty akcií a depreciace odpovídajícího měnového kurzu je častější než opak, tedy růst hodnoty akcií a apreciace měnového kurzu. Důvod častějšího výskytu uvedené formy asymetrie vyplývá především ze samotného charakteru použitých výnosů, kdy častěji dochází k záporným výnosům (tj. k poklesu cen) – viz záporné šikmosti použitých dat v Tab. 1 a 2. K podobným výsledkům dochází rovněž například Lin (2011). Kromě toho byly také poskytnuty důkazy proti v čase statické závislosti mezi akciovým portfoliem a příslušným měnovým kurzem. Tento výsledek znamená, že závislosti se mění v čase a tedy nacházíme dynamickou strukturu závislostí mezi akciemi a měnovými kurzy. Dynamika ve struktuře závislostí finančních výnosů je v současné době v centru hlavního zájmu výzkumníků, viz například Christoffersen a Langlois (2013) nebo Patton (2012) a je dána výraznější dynamikou ve volatilitě finančních výnosů.

Získané výsledky o dynamické a asymetrické závislosti mají důležité důsledky pro měření a řízení rizik. Výsledky zpětného testování ukazují, že hodnocený model asymetrické dynamické kopule poskytuje lepší předpovědní výkon než jiné široce používané modely, a to jak 95%, tak 99% hladině spolehlivosti.

Závěr

V rámci tohoto článku byla poskytnuta empirická studie vztahující se ke struktuře závislostí na mezinárodních finančních trzích. Celkově zjišťujeme výskyt asymetrické závislosti mezi akciovým indexem a odpovídajícím měnovým kurzem. Konkrétně, závislost jejich levých chvostů je ve většině případů vyšší než závislost pravých chvostů, což naznačuje že, současný pokles hodnoty akcií a depreciace odpovídajícího měnového kurzu je častější než opak, tedy růst hodnoty akcií a apreciace měnového kurzu. Kromě toho byly také poskytnuty důkazy potvrzující přítomnost dynamické závislosti mezi akciovým portfoliem a příslušným měnovým kurzem. Tento výsledek znamená, že závislosti se mění v čase a tedy nacházíme dynamickou strukturu závislostí mezi akciemi a měnovými kurzy. Za účelem zachycení a zohlednění této asymetrické a dynamické struktury závislostí je navrženo použití podmíněné sešikmené Studentovy kopule, jež kromě zmíněné asymetrie a dynamiky umožňuje zachytit rovněž nelinearitu v závislostech a také přítomnou nenormalitu vícerozměrného rozdělení.

Získané výsledky o dynamické a asymetrické závislosti mají důležité důsledky pro měření a řízení rizik. Za účelem prezentace užitečnosti navrhovaného modelu AD kopule při předpovídání tržního rizika, je provedena jeho aplikace v rámci realizace odhadů VaR a ES. Výsledky zpětného testování ukazují, že hodnocený model poskytuje lepší předpovědní výkon než jiné široce používané modely, a to jak 95%, tak 99% hladině spolehlivosti. Model AD kopule proto může být pro finanční instituce a regulatorní orgány ideální volbou pro zajištění větší robustnosti řízení rizik na mezinárodních finančních trzích. Tedy struktura závislosti na mezinárodních finančních trzích je komplikovanější než struktura, kterou předpokládají klasické přístupy. Tento výsledek lze následně využít při realizaci optimální alokace aktiv na mezinárodních finančních trzích, kdy zohlednění asymetrie a dynamiky závislostí může být ekonomicky důležité.

Poděkování

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DATA ANALYSIS OF EUROPEAN UNION STATES: YOUTH BEHAVIOR IN DIGITAL WORLD

Miloslava Kašparová, Jan Barva

Abstract: The paper deals with data analysis of young people behaviour (in age from 16 to 29 years) in digital world living in the European Union States. For this analysis, ten selected indicators from the area of digital world (focused for example on working with Internet, on social networks, on the Internet banking, on searching of information about travelling, about goods and services, e-mail communication and calls) and two economic indicators (gross domestic product per capita and unemployment rate) were chosen. Derived attributes were calculated in the data pre-processing phase. Selected algorithms of the agglomerative hierarchical clustering (as are the nearest neighbour method, the furthest neighbour method, the centroid clustering, the median clustering and the Ward method etc.) were used to find groups of similar objects (individual states of the European Union) based on the chosen indicators. Values of average coefficients of growth were used for clustering. The best results of clustering were achieved by the Ward's method; the data was divided into three clusters. Identified groups of European Union States were described by mentioned indicators.

Keywords: Digital world, Youth, Model, Hierarchical Cluster Analysis.

JEL Classification: C38, J19

Introduction

Existing societies build more and more closer links between utilization of digital technologies and participation in society life and functioning. Promotion of use of information technologies by individual states is a condition for participation of these states in global information economy. Effective utilization of information technologies is more and more a condition of competitiveness for organizations. On the level of an individual digital inclusion becomes more and more one of social inclusion factors and that is true for all important areas such as education, work life, social life or communication with state institutions (Digital Literacy Strategy of the Czech Republic for the period 2015 to 2020, 2015).

The potential of digital technologies can be fully used only if people understand their benefits, if they are able to manage and operate them and to use them in practical life. One of the benefits of information society, knowledge society respectively, is also acquisition, rehabilitation and deepening of individual's digital competencies. (Digital Literacy Strategy of the Czech Republic for the period 2015 to 2020, 2015) Czechs are mostly behind in more demanding computer skills, in an international comparison across the European Union (EU).

Computer skills are also highly demanded by students in terms of their future involvement in the labour market. Those in these skills in the Czech Republic (CR) stand above the average and over the group of employees.
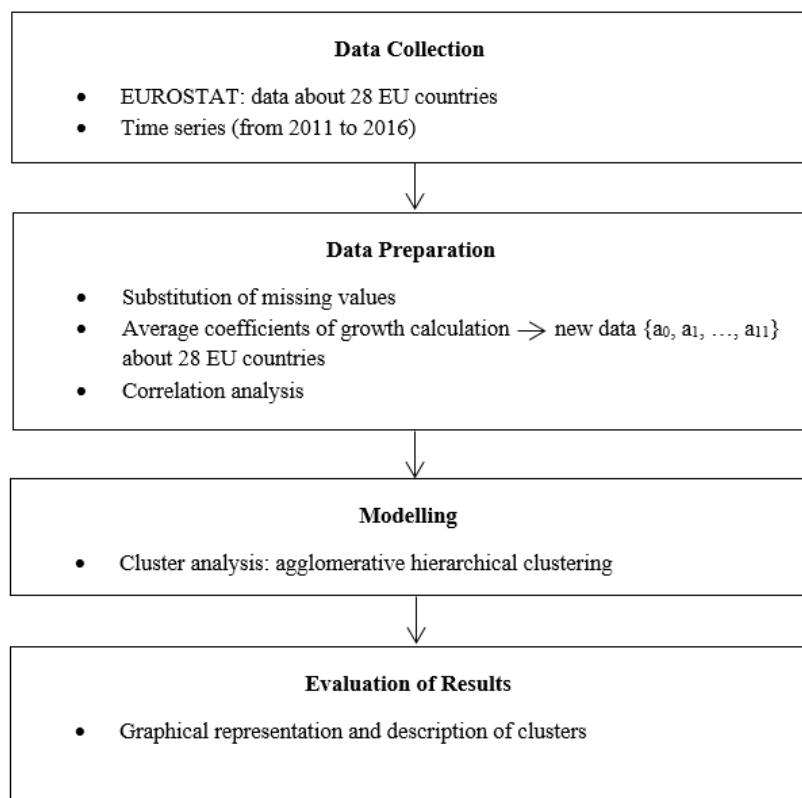
Currently the use of mobile phones also dominates next to Internet usage (in comparison with EU countries, the proportion of people in age from 16 to 74 years using Internet in the CR is the same as the European average (82% of individuals at that age

use the Internet on that territory). In the CR, 98% of individuals older than 16 years use mobile phones at present. (Czech Statistical Office, 2017a)

The objective of this article is to analyse data about behaviour of young people living in the CR and in other EU member states in digital world based on selected attributes by means of selected cluster analysis algorithms. To analyse in found groups whether the interest in selected Internet activities is constantly increasing in the EU countries in selected age group.

This analysis focuses on ones of the most important activities that people can do by Internet (e.g. internet banking, using of social networks, searching of information about goods and services, about travelling and accommodation or sending e-mails etc.). In addition, it focuses on the resulting indicators in specific years including selected economic indicators that use to classify of economies and their distribution according to the stages of economic development and to inform about the labour market situation. After the data collection phase and data pre-processing phase a selected method of the cluster analysis is followed. Basic steps of this analysis are illustrated in Fig. 1.

Fig. 1 Design of the model creation

Data Collection
- EUROSTAT: data about 28 EU countries
- Time series (from 2011 to 2016)

Data Preparation
- Substitution of missing values
- Average coefficients of growth calculation $\rightarrow$ new data $\{a_0, a_1, \ldots, a_{11}\}$ about 28 EU countries
- Correlation analysis

Modelling
- Cluster analysis: agglomerative hierarchical clustering

Evaluation of Results
- Graphical representation and description of clusters

Source: Authors

1 Problem formulation

1.1 Target group definition
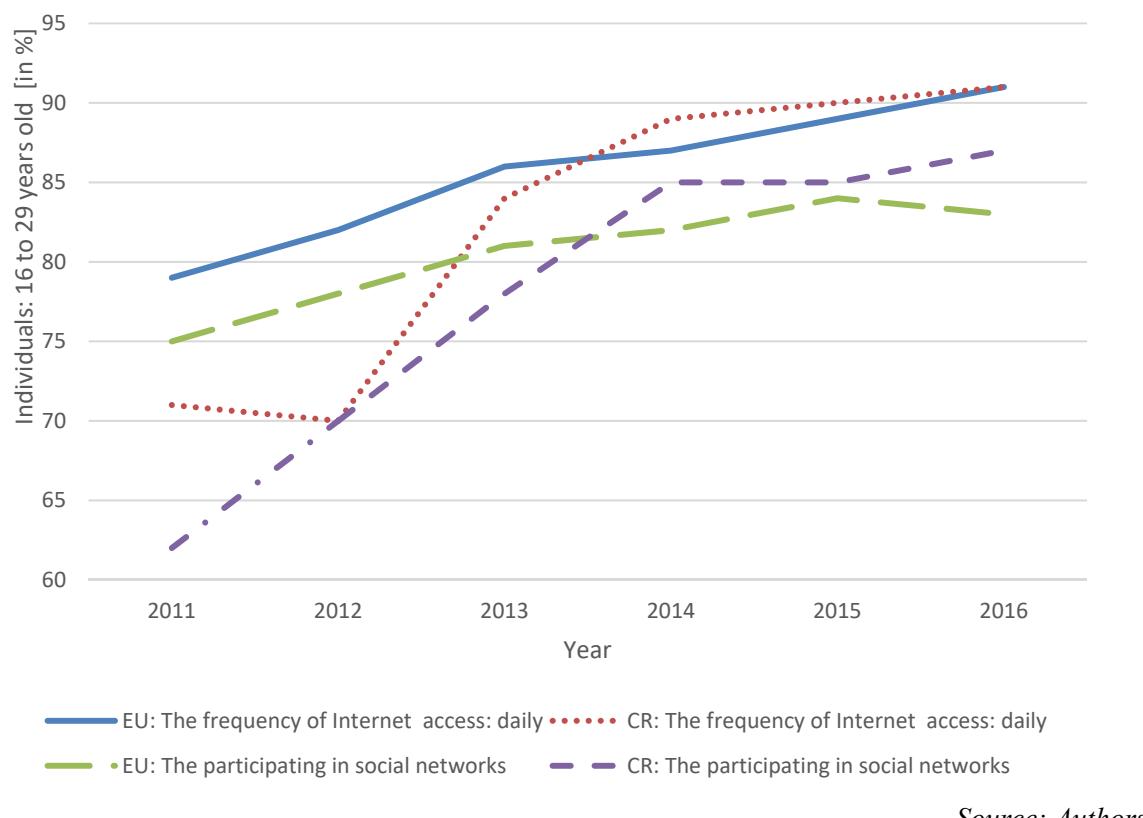
According to the Czech Statistical Office (Czech Statistical Office, 2017) the age group of youth (young people) is distributed into five-year categories in the following way: 15 – 19 years of age, 20 – 24 and 25 - 29 years of age.

Eurostat (Eurostat, 2017) distributes the age groups according to the type of attribute into the following categories: 15 – 19 years of age, 16 – 19, 20 – 24 and 25 - 29 years of age and merged categories: 15 – 29 years of age and 16-29 years of age. This last mentioned category was chosen for the following evaluation.

From a comparison of the last ten years (to 2016) follows that some forms of internet use were already common at the end of the last century. A dynamics of their development was not so noticeable. A searching of information about goods and services or about travelling and accommodation are examples of these activities. However, an extension of the social networks is a major phenomenon on the Internet. For this reason, data are available from 2011, when 24.6% of people in the Czech Republic over 16 years old were active on the social networks. About these networks, it is speaking also as about matter of generations. Reading online news, newspapers and magazines are other similar phenomena. In this sector of the economy, there has been a fundamental change in the reader's relations in their transition to the Internet. In 2007, only 20% of the Czech population aged 16 and over were reading online news (newspapers and magazines), in 2016 it was already 62.2%. (Digital Literacy, 2017) The Fig. 2 and Fig. 3 show the using of the Internet, the Internet banking, the social networks and the seeking information about health in the age group from 16 to 29 years old in the period from 2011 to 2016 in the CR relative to the European average of the EU countries.
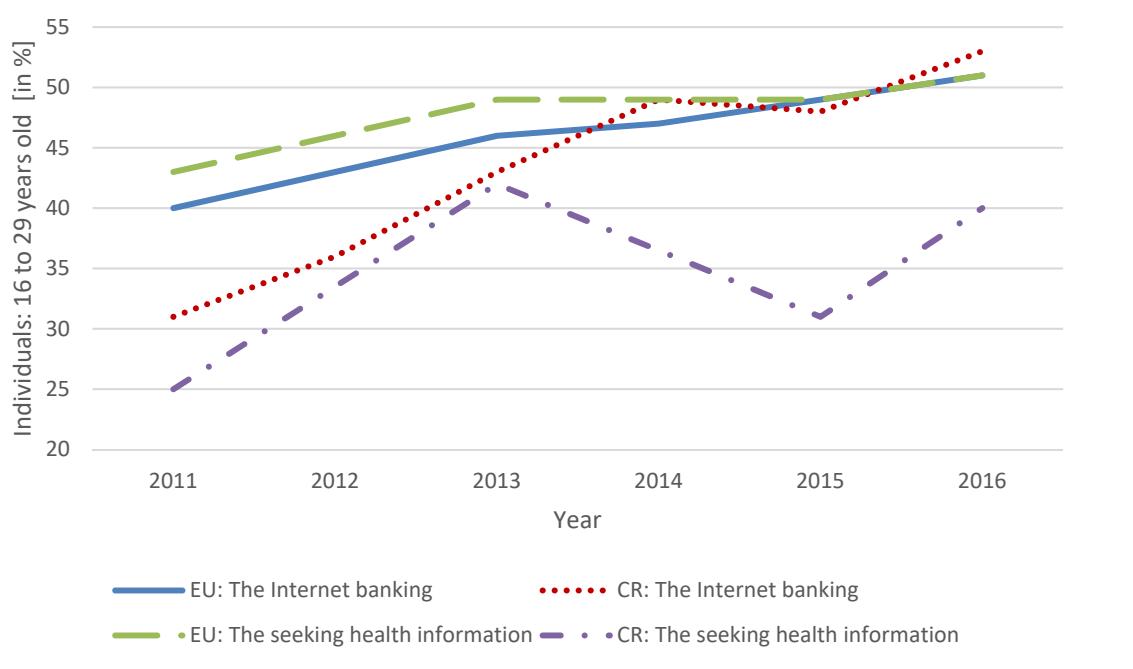
Fig 2 shows slight decrease in interest of participation in the social networks based on the European average (EU countries), while since 2011 in the CR, the interest about this activity is still increasing. Using of Internet in this age group in the CR achieved the same values as the European average (EU countries) in year 2016 and still increases. In Fig. 3, we can see that the interest in the Internet banking is mostly rising; and since 2011 in the CR, there has been a great increase in interest in this activity. It slightly has exceeded the European average (EU countries) in 2016. Large differences between percentage values in the CR and EU are visible in interest of people in seeking health information. The European average (EU countries) is rather slightly rising, but in the CR, values fluctuate significantly. There was a decline of 11% in 2015 relative to 2013. In 2016 this activity has increased by 9% compared to 2015 and is still increasing.

Fig. 2 The daily using of Internet and the participation in the social networks by the young people in the years from 2011 to 2016

Fig. 3 The seeking health information and the Internet banking by the young people in the years from 2011 to 2016

1.2 Data collection

Selected indicators (attributes, indicators, variables) from EUROSTAT database describe the monitored age group, from 16 to 29 years of age, in individual EU countries

in the digital world. Economic indicators describing the individual EU countries were added to these selected indicators. Values of all the above-mentioned indicators were reported for years 2011 to 2016 and were selected by (Digital Literacy, 2017) and on the basis of the availability of the data in the Eurostat database. The following list is a complete list of the selected indicators:

- Digital world (values of attributes in %): individuals who use Internet daily; individuals who use (receive/send) e-mails (data are available from 2012); individuals active on the social networks (missing values per year 2012); individuals who sell products or services on Internet; individuals who search for products or services on Internet; individuals who use Internet banking (missing value of the UK in 2011); individuals who search information about health on Internet (missing values per year 2012 and 2014); individuals who make calls and video calls on Internet; and individuals who search information about travelling and accommodation on Internet.

- Economic indicators: real gross domestic product (GDP) per capita; and long-term unemployment (in %).

2 Methods

This presented work deals with the application of clustering methods and its objective is to find groups of similar objects (EU member states) in the given area. Under the pre-processing phase the following steps were implemented: substitution of missing values in the time series, creation of derived indicators by using selected rate of time series dynamics and a correlation analysis.

2.1 Data pre-processing

The missing values occurred in the several indicators. Firstly, it was necessary to substitute them. According to the objective of the transformation, it can be proceeded by ways stated for instance in (Hančlová & Tvrdý, 2003), (Řezanková et al., 2009).

Missing values within the time series (except the beginning and the end of the time series) have replaced by the arithmetic average of the preceding and the following period (important for graphical representation of development – Fig. 2 and Fig. 3). Missing values at the beginning or at the end of the time series were predicted by using a trend curve of the given time series.

After filling the missing values, the development of the observed indicators has illustrated by means of the average growth coefficient $\bar{k}$ (Arlt et al., 2002). This coefficient determines what should be the rate of growth (decline) in order to change the value of the indicator from the original first value y_t to the last value y_n (Ramík & Čemerková, 1998, p. 86); it demonstrates the average change of time series values for one interval. Average growth coefficients (coefficient) were calculated according to this formula (1):

$$\bar{k} = \sqrt[n-1]{k_2 \, k_3 \, \dots \, k_n} = \sqrt[n-1]{\frac{y_n}{y_1}}. \tag{1}$$

In total nine attributes (from digital world) a_1, a_2, …, a_9 and two economic attributes a_{10} and a_{11} describing all 28 EU member states were derived on the basis of average growth coefficients from years 2011 to 2016 (Tab. 1).

Tab. 1: Data dictionary

Attribute	Range	Description of attribute
a_0		EU Member State
a_1	<0.99125; 1.09206>	Individuals using Internet daily
a_2	<0.97501; 1.0296>	Individuals using e-mail
a_3	<0.98876; 1.0702>	Individuals active on social networks
a_4	<0.83255; 1.2686>	Individuals selling products and services on Internet
a_5	<0.94294; 1.06608>	Individuals searching for products and services on Internet
a_6	<0.99041; 1.12888>	Individuals using Internet banking
a_7	<0.93053; 1.1487>	Individuals searching health information on Internet
a_8	<0.94409; 1.22176>	Individuals making calls and video-calls on Internet
a_9	<0.91967; 1.05436>	Individuals searching information about travelling and accommodation on Internet
a_{10}	<0.96901; 1.03112>	Real Gross Domestic Product per Capita (GDP)
a_{11}	<0,88903; 1,26484>	Rate of the long-term unemployment

Source: Authors

Prior to the start of the cluster analysis, itself correlation analysis was executed with regard to the value of the correlation coefficient. The Pearson's correlation coefficient (correlation coefficient) is the basic rate of similarity between two objects or two attributes expressed as quantitative data (Meloun & Militký 2002), (Ramík & Čemerková, 1998).

The high correlation value (0.753) was achieved between attributes a_1 (Individuals using Internet daily) and a_3 (Individuals active on the social networks) and higher value (0.473) between a_1 (Individuals using Internet daily) and a_6 Individuals using Internet banking). Based on the correlation coefficient values, the attribute a_1 has eliminated from data. The final data contained 28 EU countries described by 12 attributes a_0, a_2, a_3, …, a_{11}.

2.2 Cluster analysis

Clustering (Maimon & Rokach, 2005), (Han & Kamber, 2006), (Kasparova et al., 2013), (Kralik et al., 2016), (Petr et al., 2010) is the process of grouping a set of physical or abstract objects into classes of similar objects. (Han & Kamber, 2006) A data matrix is an input to such clustering. Identification of groups (clusters) is an output of such clustering. A cluster (Han & Kamber, 2006; p. 383) is a collection of data objects that are similar to one another within the same cluster and are dissimilar to the objects in other clusters. Objects are clustered according to the degree of similarity or dissimilarity.

Many clustering methods were developed, each of which uses a different induction principle. There are two main groups of the clustering: partitioning (these methods

relocate instances, by moving them from one cluster to another, starting from an initial partitioning (Maimon & Rokach, 2005; p. 75) and hierarchical methods. A hierarchical clustering method works by grouping data objects into a tree of clusters (dendrogram).

A dendrogram is commonly used for the representation of the process of hierarchical clustering (Han & Kamber, 2006; p. 410). It shows how the clusters are related to each other. It is a tree; the heights of the branches correspond to the distances between the clusters. (Chen et al., 2008; p. 566) A dendrogram cut at a given level defines a partition of the data cases into different k groups, where k increases by one at a time as the aggregation index (coefficient) decreases. Choosing the level of the cut, and by that the number of the resulting classes in the partition, can then be done by looking at the dendrogram (Chen et al., 2008; p. 363) and on the basis of an agglomeration schedule (the agglomerative schedule is a numerical summary of the cluster solution; a good cluster solution sees a sudden gap in the distance coefficient; the solution before the gap indicates the good solution (IBM Knowledge Center (2018)), too.

For acquisition of clusters the following agglomerative hierarchical clustering algorithms were used as described e.g. in (Řehák & Brom, 2015), (Chen et al., 2008), (Řezanková et al., 2009), (Maimon & Rokach, 2005): the nearest neighbour method, the furthest neighbour method (also called complete-link clustering), between-groups linkage, within-groups linkage, centroid clustering, median clustering, and Ward method (Řehák & Brom, 2015).

3   Problem solving and discussion

The agglomerative hierarchical clustering was used to examine similarities of multidimensional objects (EU countries) in IBM SPSS Statistics. Continuously the above-stated clustering methods were used (Barva, 2017). On the basis of the dendrograms comparison (in total seven dendrograms) and evaluation of the values of indexes in agglomerative schedule, the best results of clustering were achieved by the Ward's method (according to the achieved results of clustering in this area, as well as results of clustering in other areas (e.g. (Kralik et al., 2016), (Kasparova, 2016)), this method is the most appropriate for realisation of clusters. Data was divided into three clusters (Fig. 4).
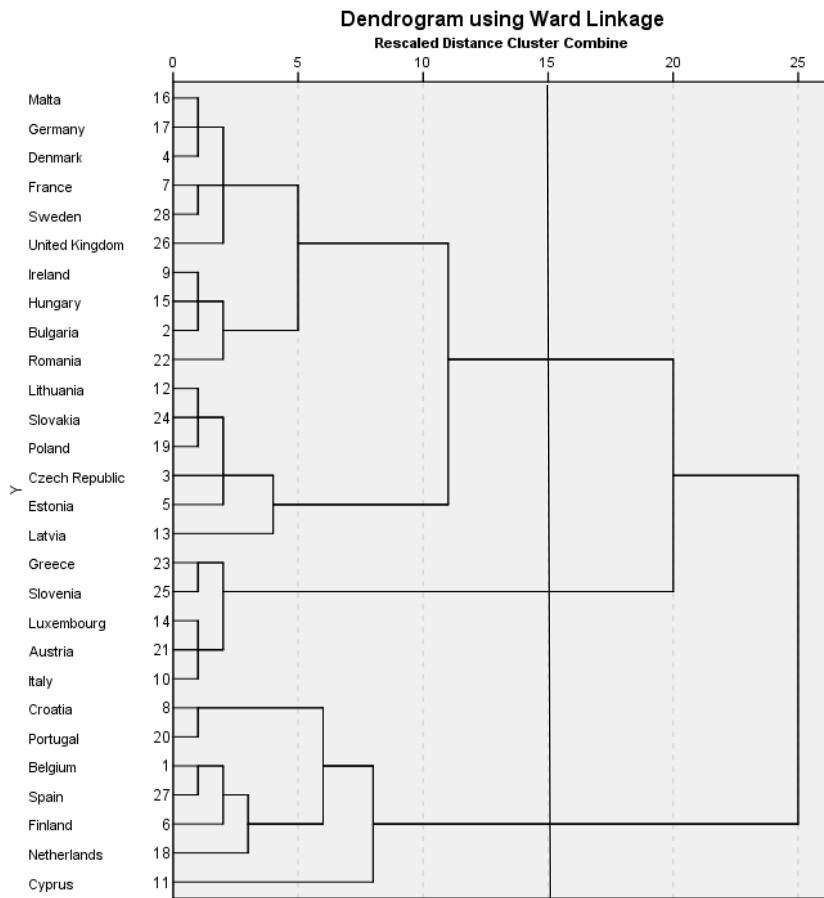
3.1 Interpretation of achieved results

Cluster characteristics according to the model are the following:

Cluster 1 contents these 16 EU countries: Bulgaria, the CR, Denmark, Estonia, France, Ireland, Malta, Lithuania, Latvia, Hungary, Germany, Poland, Romania, Slovakia, the UK and Sweden. It was created primarily based on similarity of economic attributes. In this cluster mainly the states with lower value of GDP per capita, lower than is the EU average, in the observed time period from year 2011 to 2016, are presented. The EU average is 26 900 EUR per capita (with the exception of Denmark, France, Ireland, Germany, the UK and Sweden). Contrary to that the average GDP growth coefficient for these states (with the exception of Denmark) is of growing character. In these countries, long-term unemployment rates decline the fastest in the observed period, which indicates their overall economic growth and increase of production capabilities in these states'economies. Regarding the geographic attributes these states are not concentrated in some specific territory, but they are scattered along the entire EU territory.

The following similarities were found between countries in this first cluster in the area of digital literacy. There is an interest in calls and video calls by Internet with exception three countries: the CR, Estonia and Latvia in the given period – we can see the similarity these countries in the dendrogram in the Fig 4; and the e-mail communication is rather declining or does not expose the change. There are significant values of the average growth coefficient in the activity of the Internet banking in all countries in this cluster in exception of Sweden. In this country, there is the decrease of this activity compared to 2011. In the participation in the social networks (in exception of Sweden and Latvia), the countries are typical with value of this coefficient up to 1.05; the higher values was only achieved Romania (1.07). It means, the interest in this activity has annually grown in average by 5% in these countries.

Fig. 4: Dendrogram: the model by Ward's method

Cluster 2 is the smallest group with five countries: Greece, Slovenia and Luxembourg, Austria and Italy. This cluster is typical for its growing long-term unemployment caused primarily by increased limit of retirement age on one hand (Svoboda, 2014), (Czech Social Security Administration, 2017) and at the same time by influx of labour force from abroad on the other hand. Values of the average GDP per capita growth are slightly declining (with the exception of Austria, value of the average growth coefficient is 1.001).

The most represented Internet activities are the following: the increasing value of the attribute concerning Internet banking, social networks (countries have values of the average growth coefficients up to 1.05) communication by means of e-mail mailbox (with the exception of Italy, 0.994) and the declining value of sales of products and

services on Internet in the observed period. On the other hand there is growing interest in searching information about goods and services with exception of Italy (this activity has annually decreased in average by 5.7%). Since 2012 it has seen a decline in interest of young people in this activity in this country. The interest in seeking information about health is rather declining (with exception Luxembourg, the average growth coefficient is 1.051; this activity has annually increased in average about 5.1%). In this cluster, it is a typical interest in calls and video calls by Internet. The significant values we can see in Slovenia (the value of average growth coefficient is 1.145), Greece and Luxembourg (more than 1.090).

Cluster 3 contents these seven EU countries: Belgium, Finland, Croatia, Cyprus, the Netherlands, Portugal and Spain. It is represented by those states where generally speaking it is possible to say that their youth more and more discover benefits of Internet technologies. That means email and electronic communication, utilization of the social networks and sales of products and service on Internet. The significant values were achieved for this last activity "selling goods and services" (countries as Croatia (the value of the average growth coefficient is 1.27) and Portugal (1.25), Cyprus (1.18) and Spain (1.15)); and as well as in the activity of searching for information about health and about healthy life style (Belgium (1.084), Croatia (1.07) and Portugal (1.063). It means this activity has annually increased by more than 6% in these countries. Growing penetration of Internet services is evidenced by the fact that growing percentage of youth makes calls or video-calls via Internet (the significant values of the average growth coefficient were achieved for Finland (1.222), Belgium (1.130), Portugal (1.157) and Croatia (1.129). Compared with 2011 there was a significant increase in interest of young people in the given activity with the exception of Netherlands where the average coefficient of growth for the observed period declines (0.993).

Regarding the economic indicators this cluster is characterized by increasing average coefficient for long-term unemployment, however for the indicator GDP per capita the value of the average coefficient of growth is constant or it slightly declines.

In the framework of this model the CR is put into cluster 1. The typical characteristics of this cluster are GDP growth and long-term unemployment (rate) decline. In comparison with the EU average values the CR however reaches in GDP only 60% of the EU average. On the contrary, regarding the long-term unemployment it does not reach even half the value of the EU average. In the CR GDP slowly but steadily grows each year.

In the Fig. 4 we can see that the CR is very similar with Estonia. The same behaviour of youth is in activities "using e-mails" (a_2) and "searching information about travelling and accommodation on Internet" (a_9). In addition, other Internet activities are popular too (e.g. for the CR is typical the participation in social networks (1.111; this activity has annually increased in average by 11.1%), the seeking information about health (1.099) or finding information about goods and services (1.04)) in exception of calls and video calls (0.979). It means that this activity of young people has annually decreased in average by 2.1%. Latvia, Poland, Slovakia and Lithuania (see Fig. 4) have also the more significant similarity with the CR based on given economic attributes and the behaviour of the young people using Internet. The young people in the CR are more active than young people living in Slovakia in given Internet activities (in exception of calls and video calls). The same values of the average growth coefficient were achieved for sales of

products and service on Internet (1.020). In means that this activity has annually increased in average about 2% in these two countries.

Conclusion

The analysis of data about behaviour of young people living in the CR and in other EU member states in digital world based on selected attributes by means of selected cluster analysis algorithms was the objective of this article.

Model, that compared youth in digital world living in EU countries, was created on the basis of the Ward's method. The values of the input attributes described situation in time series year 2011 to year 2016. The acquired data was pre-processed. Missing values were substituted and average coefficients of growth for the observed indicators were calculated. Groups (clusters) of EU states with characteristics were identified by means of selected algorithm of the agglomerative hierarchical clustering. The achieved results of modeling were described.

According to the modelling outputs the CR is not anyhow specific regarding the average values identified for the EU as an entity. On the contrary it is possible to state that youth in the age from 16 to 29 years of age living in our country is, based on their behaviour in digital world, ranked among more advanced countries. *(note: the results of modeling were described in the previous parts of this article including behavior of czech young people in the digital world)* This is possibly a reflection of prior financial funds invested into elementary schools. These financial funds, mostly originating from various subsidies programs financed by the EU, supported the development of technical and information infrastructure of elementary and secondary schools. This is demonstrated currently exactly on the group defined as youth with higher level of digital literacy and ability to perceive the ever developing up-to-date information technologies.

This positive finding should not however be the only criterion. On the other hand in some EU countries (Finland, France, Germany, Italy, the Netherlands and Sweden) we can already see slight decline in the amount of time and in the frequency of time spent by youth on the Internet. This is without any doubt also the outcome of the fact that youth want to lead their lives in a different way.

The overall perception of the digital world leads not only youth to the need of continuous education, of working on oneself and of being adaptable and creative. Such is the world of information technologies, permanently new, youthful, developing and fast changing. These days young people have permanently available „at hand" all information and a mobile Internet connection becomes to be almost a natural thing for the observed group of people.

Acknowledgement

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BUSINESS MODEL RESEARCH PROPOSAL: NOVEL BUSINESS MODEL CONCEPTS BASED ON SUSTAINABLE MULTIPLE CUSTOMER VALUE CREATION IN A SELECTED INDUSTRY

Peter Kita, Iveta Šimberová

Abstract: *The article's objective is to propose a research framework that could describe an industry, structured by the industry's specific performance indicators, through the lens of its business models as well as identify the specific features of novel business models. The approach is based on combining various approaches to business model research and propose a methodology which examines an selected industry, in this case a sector of the Czech chemical industry, through the lens of its business models and aims to provide novel business model concepts based on sustainable multiple customer value creation. The framework connects the theoretical concepts of business models, sustainable value added, and multiple customer value creation. The framework appropriates environmental and social aspects of the business model's value proposition to the underlying strategy and gauges it by sustainable value added. The resulting business model concepts serve as an overview and incentive to further develop novel business model designs within the selected industry.*

Keywords: *Multiple Value, Sustainable Business Model Concept, Sustainable Value Added, Majority Business Model, Minority Business Model, Chemical Industry.*

JEL Classification: *M21*

Introduction

The issue of approaches aimed at determining the business model relates to the changes in the environment that indicates that the contemporary economic ideas are not sustainable any more, new approaches in business organization include sustainability as the key essence which needs to be considered. The need to search for viable answers to this development is proving to be increasingly acute. The changing link between the business model and the company is one of the critical issues that is seemingly clear. But it is not quite evident what roles, responsibilities and functions should be defined and resolved within this transformation. Business activities have a large influence on the economy, environment, and society. Although, sparking the interest of many authors in recent years, business model research has mostly remained limited to case studies. Though shedding light on the outliers of an industry's dominant context and market forces, there has not been much research describing an industry through the lens of its business models.

The article's objective is to propose a research framework that provides an overview of the utilized business models within an industry, structure them by the industry's specific performance indicator, and provide novel business model concepts. The resulting conceptual business models are centered around sustainable customer multiple customer value creation and can serve as incentives to develop novel business models by providing

evidence of the impact of incorporating elements promoting sustainable multiple customer value creation into the business model. The scientific goal is to combine various approaches and propose a methodology which examines an industry through the lens of its business models and provides novel business model concepts based on sustainable multiple customer value creation. The research framework as described in the article is designed specifically for the chemical industry, specifically CZ NACE 20.1 manufacture of basic chemicals, fertilizers, and plastics.

The first part introduces the theoretical background and assumptions for the proposed research framework. This part ties these concepts together on a theoretical level. The second part describes the proposed research framework methodology and provides a systematic guide for data processing to formulate the wished business model concept. The third and last part discusses the shortcoming and possible uses of the research framework.

1 Statement of a problem

Business model research is often limited to case studies focused of outliers or small samples of outliers often representing dramatic or disruptive business model innovation. There is an absence of a framework that would study an industry through the scope of its business models and provide novel business model concepts. To identify and develop these concepts the framework seeks to answer these questions:

1   How to discern novel business model designs?
2   How the elements of novel business models connected to the company's strategic orientation?
3   How is this orientation reflected in the company's economic, environmental, and social performance?

1.1   The business model and business model research

A company is successful for a certain time and given the risk of stereotype-based failure, stress is put on changing the business model to adapting in the competitive environment (Doz, Kosonen, 2010). Permanent or sustainable value creation relies on successful adaptation and restoration of the basic corporate business model on a continuous basis that contains substantiation of how the organization creates supplies, and captures value (Osterwalder, Pigneur, 2010). While this necessity to change the business model to adapt to the changes in the competitive environment and life cycle of the enterprise is evident from latest literature reviews, there is only little theoretical and empirical evidence about what is necessary to accomplish this change beyond only the recognition that strategy is important and that experimenting plays a certain role. (Teece, 2010, McGrath, 2010; Demil, Lecocq, 2010). Achtenhagen, Melin, Naldi (2013) point out the fact that companies can shape, adapt, and renew their business models successfully and can support and improve their value creation from a long-term perspective. Many authors explain particular elements of the business model relating to value co-creation, e.g. the value proposition, value creation network, value delivery, value capture, network value, value structure, profit equation etc. (Johnson, Scholes, Fréry, 2002; Dion, Wolff, 2008; Šimberová, 2008; Dumoulin, Guieu, Meschi, Tannery, 2010; Porter, Kramer, 2011; Bocken et al. 2014;)

The business model can be described as a set of decision, which has rigid or flexible outcomes (Cliffe, 2011). These decisions determine the logic how a company creates, delivers, and captures value (Osterwalder, Pigneur 2010). The decisions manifest themselves in elements and relationships that describe a company's business logic (Afuah, 2014). In this respect, tools like business model canvas represent these elements and relationships in a clear way (Osterwalder, Pigneur 2010). Boons, Lüdeke-Freund (2013) classify the nine components of the business model canvas and distinguish the following elements of a generic business model concept:

- Value proposition: what value is embedded in the offered product/ service;
- Supply chain: how are upstream relationships with suppliers structured and managed (key partners, key activities, key resources);
- Customer interface: how are downstream relationships with customers structured and managed (channels, customer relations, customer segments)
- Financial model: costs and benefits from their distribution across the business model's stakeholders (revenue streams, costs).
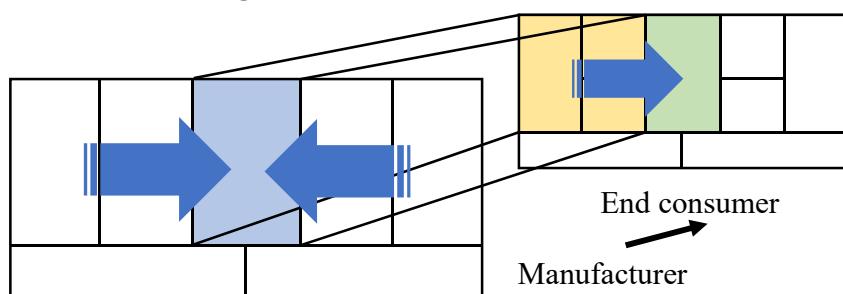
Joyce, Paquin (2016) enlarge the concept by adding two extra layers according to the "triple bottom line" concept (Elkington 1994) to create the "Triple bottom line business model canvas". This canvas is a useful tool to display the mechanics of multiple value creation layers by layer (economic, environmental, and social). The vertical and horizontal coherence and multiple appearances of the same elements represent the synergies extending throughout layers and which strengthen the value proposition (Moutot, Bascoul 2009). Such tools help identify the decisions (elements and relationships), i.e. the narrative of the business within the industry's context but do not provide the reasoning for their conception and configuration in the first place. Most of business model research revolves around case studies which reveal specific patterns by asking "how" and "why" questions (Yin, 2013) to determine the decisions behind business model conceptualization. Slávik (2014) conducted research across industries and formulated their majority business model construct, portraying the most employed business model structures in each industry, and a minority business model construct representing differentiating elements. In later research, Slávik et al. (2014) studied them via statistical analysis using Pearson's correlation coefficient to reveal statistically significant relations among elements. Chen and Chiu (2015) took another path by focusing on the value proposition and respective value networks in their case-based model. Unfortunately, neither perspective provides a way to measure and control the environmental and social impacts a business model. Gauging the performance and aiding the business model to become more sustainable has always proven difficult due to the difficult nature of quantifying environmental and social impacts.

1.2   The business model, sustainability, and strategy

The company's logic employed to produce, transmit, and acquire value can be observed via its business model. Therefore, multiple customer value must become a strategic part of the business model. A part of the detailed strategic plan achieved via organizational structures, processes, and systems (Osterwalder, Pigneur, 2010). In the past decade, research on business models and sustainable innovation has expanded. In management literature there is a clear linkage between the business model of a company and its innovation activities alongside with the issue of its sustainability (Boons, Lüdeke-Freund, 2013; Teece, 2010, Bocken et al. 2014). New perspectives on business models maximize value creation by improving relationship management with customers, employees, and other stakeholders in so-called business networks and partnerships extending beyond national borders. Harrison, Freemen, 1999; Mitchell, et al, 1997; Bryson, J. M., 2003; Winn, Keller, 2001; Kotler, Keller, 2007; Payne, 2005 and others deal in their studies with individual aspects of creating such relationships.

Sustainability offers vital business goals for stakeholders, incl. the investors, customers, and politicians (Epstein, Roy, 2003; Hart, 2007; Pfeffer, 2010; WBCSD, 2008; WEF, 2009; Worldwatch Institute, 2008). In this respect many authors, theoreticians and practitioners outline the importance of the business model based on the development of sustainable consumption and production (Tukker et al., 2008; Tukker, Tischner, 2006; Wells, 2008). For instance, Tukker et al. (2008) indicate that the business models are the meta-factors and strategic innovations are understood as the elements that could support the accommodation and adaptation of cleaner products and processes, sustainable supply chains and other changes leading towards sustainability. Wells (2008, p. 80) stresses that alternative business models are the core ones for achieving sustainable consumption and production. Tukker et al. (2008) note, that businesses are best prepared for the positive reaction to sustainable challenges through radical innovations of products, services, and novel business models. During the last decade, finding the answers to questions regarding the relationships between society and business is led rather towards the development of the concept of corporate social responsibility (CSR). Jonker, de Witte (2006) analyze CSR in a way where examining and organizing inside the organizations is summarized in an exhaustive way and critically compare CSR to multiple value creation. Ultimately, a great deal of progress has been made from the initial interest in business models to the development of novel business model concepts.

Fig. 1: Value transcendence

End consumer

Manufacturer

Source: author's own research

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Within the context of sustainable development, a business model's performance or impact cannot be measured only by its economic output. If economic, environmental, and social dimensions form the pillars of sustainable development, then there exists a business model or logic the value creation of each pillar. The business model serves as a narrative for the underlying strategy but also is a strategy of its own. This narrative determines the choice of elements and the kinds of value it provides, creates, and captures. Hence, value manifested in the value proposition transcends into the supply of the customer (Fig. 1).

Thus, the value created by the business model needs to be measured on all three pillars of sustainable development to evaluate the chosen strategy. Sustainable value creation has an extensive body of work concerning sustainable development indicators from international organizations like the OECD (Nardo et al., 2005), UN (2001), and many other authors. Figge, Hahn (2004) propose "sustainable value added" as a method to gauge the environmental, economic, and social value added of an industry. Sustainable development's definition imposes not limiting the consumption of future generations, i.e. long-term running of the company. This brings forth the concept opportunity costs and greater efficiency. Therefore, focusing on opportunity costs rather than externalities to reconfigure the business model enables companies to cut cost and become more efficient and comparing the output value added or destroyed opposed to the benchmark value. Kocmanová et al. (2016) have enlarged this method by taking into consideration corporate governance and have revamped the set of variables.

Pairing sustainable performance with the business model provides space for a better understanding how the business chooses (Ben Romdhane, 2016): which technologies are used in the offered products/services; how to structure or restructure the financial model (or social and environmental impact model) to better answer consumer needs; how to assemble the technological process; the targeted segments (customers and final consumers); value capture mechanisms.
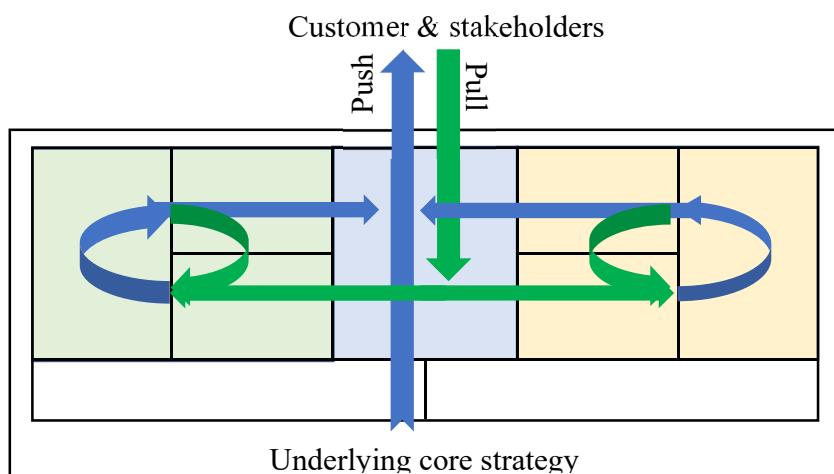
1.3   Sustainable multiple customer value creation and the business model

The notion of multiple values (Freeman, Wicks, Parmar, 2004) has been coined during sustainability reporting efforts (Marberg, Jonker, 2007). The theoretical framework of multiple value creation as a business foundation was formulated by McVea and Freeman in stakeholder theory (McVea, Freeman, 2005). The notion is based on the concept of the "triple bottom line" (Elkington, 1998). Thus, multiple customer value applies sustainable development principals. In this respect, assessing the choice of production technologies, production process, and distribution, i.e. the business model, to promote eco-efficiency ensuring that the product/service exceeds the customer's economic expectations (Nidomolu, Prahalad, Rangaswami, 2009; Červený, Hanzelková, Keřkovský and Němeček, 2013).

Multiple customer value is an incremental and differentiating part of the value proposition. It is manifested in business decisions leading to the satisfaction of environmental and social expectations of both customers as well as the stakeholders partaking in the company's success. In this respect, partaking stakeholders aid the understanding of customer expectations. Sustainable multiple customer value supposes a

long-term relationship emphasizing mainly customers and other stakeholders. The relationship is described by two trends which are heavily supported by technology (Le Vely, 2015). First, a push strategy integrates sustainable multiple customer value creation in terms of market differentiation pushing products/services aiding the customer's eco-efficiency (water usage, energy storage, etc.). Hence, the business model is described by the expectations of its customer and stakeholders impacting its configuration and its performance. Contrary, a pull strategy aids the understating of customer expectations which leads to lowering opportunity costs (Fig. 2). This relationship serves to contribute to the company's success economic success, such as cost savings, competitiveness or sales increase, risk reduction, improved profitability, customer retention, reputation, etc. (Schaltegger et al., 2012).

Fig. 2: Sustainable value creation

Customer & stakeholders

Underlying core strategy

Source: author's own research

2   Problem solution

The research supposes a survey inquiry within a defined industry (context), as is in this case the Czech chemical industry, CZ NACE 20.1 manufacture of basic chemicals, fertilizers, and plastics. This industry was chosen due to its innate nature, companies must assess the entire life-cycle of their products and dispose of technology to calculate their impacts accurately. This offers a choice a wide array of environmental indicators that come into consideration (greenhouse gasses, waste water, energy consumption, etc.). The chemical industry is capital intensive and subject to heavy environmental regulation and auditing. This pressure to uphold the regulation limits the industry's business models but also represents a challenge for differentiation. Due to the capital intensity, changing the business model requires much consideration and investment.

Thus, the framework supposes that within a narrow context of an industry the business models will follow a certain design (majority business model) affected by the same regulations, trends, technology, etc. Representing a level playground. The business model configurations should differ from one another because of their individual circumstances providing a differentiated value proposition and performance. To this end, the work of Chen, Chiu (2015) can serve as a basis to choose business model elements. The proposed

elements by the authors should be further refined for comprehension and relevance to the given context of the industry. In the case of the Czech chemical industry, the elements were first reduced to 52 and then further refined and reduced to 32, as a result of semi-structured interview with company representatives. Thus, relevant survey questions and variables are established by conducting several case studies to reveal past, current, and anticipated trends within the industry (Yin, 2013). The survey aims to answer the three stated questions:

Tab. 1: Resulting rough data set

Source: Author's own research

- **Question 1:** How to discern novel business model designs?

To discern novel business models, traditional ones must be identified. Thus, a comprehensive selection of elements must match the industry's context. Elements are

	Business model elements				Sustainable value added aggregates			Environmental and stakeholder orientation	
	E_1	E_2	...	E_n	SVA_c	SVA_e	SVA_s	O_e	O_a
Company 1	1	0	...	1	0	1	1	x/100	x/100
Company 2	1	1	...	0	1	1	1	x/100	x/100
⋮		⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
Company n	1	0	...	0	0	0	1	x/100	x/100

represented by 1 and 0, whether the element (E_1 to E_n) is present or not in the company's narrative, i.e. the business model (Fig. 1).

- **Question 2:** How the elements of novel business models connected to the company's strategic orientation?

Classification of principal stakeholders and interaction with them, including the customer. Stances towards the environment and stakeholders are weighed on Licart scales. The sum of attributed weights represents are compared to the maximum possible score to gauge the company's orientation towards the environment (O_e) and other stakeholders (O_a).

- **Question 3:** How is this orientation reflected in the company's economic, environmental, and social performance?

Calculating the sustainable value added (Figge, Hahn, 2004) from a relevant set of economic, environmental, and social indicators. This provides set of three indicator aggregates: economic growth (EG), environmental impacts aggregated (EIA), and social impacts aggregated (SIA) with positive or negative values relevant to a benchmark value.

2.1 Data processing

Collected data are processed in the following steps:

1. **SVA calculation** (Figge, Hahn, 2004). Depending on sample size, triage by groups of aggregates may be relevant.

2. **Appropriation of performance and strategic orientation to the business model.** Each company is now described by a set 3 performance indicator aggregates, it's business model elements, and two coefficients relating to its environmental and societal orientation.

3. **Descriptive statistics.** Overview of central tendencies and dispersion within the data set (Saunders, Lewis, Thornhill, 2016).

4. **Correlation** Slávik et al. (2014) used a modified Pearson's correlation coefficient to describe statistical correlations among the business model elements due to the binary nature of the data.

5. **Majority and minority business model construction** (Slávik 2014). The majority business model describes the context of the industry and a "wire-frame" business model a new company would need to adopt when entering. Thus, serving as a basis to discern novel business models within the industry. The minority business model represents, following the definition of sustainable multiple customer value creation, an array of differentiating business model elements derived from their respective strategies. If the appearance of elements within the data set is higher than 51 %, it is appropriated to majority business model. Otherwise, it is appropriated to the minority business model.

6. **Creation of the business model concepts.** These concepts are based on the elements with the lowest counts depending on the sample size. These elements and their correlating elements (from the minority business model construct) serve as a basis for the concepts. To provide a complete picture about the concept, an average of the sustainable value added of the respective sustainable value added and strategic orientation coefficient can be calculated. Once the concept is completed with the necessary data, the concepts are traced back to the original case data and compared. The comparison provides an overview of which specific companies include these elements into their business model.

Discussion

The resulting business model concepts consist of elements belonging to both the majority and the minority business model. The majority business model represents the core business model construct of that industry, thus without any unique differentiation. The minority business model lacks the most prevalent and only contains an array of differentiating elements. The reason to split the subset of business model elements into the majority and minority business model constructs is addressed by question 1. Therefore, to discern the novel business model elements from the traditional or widespread business model elements. Elements must be carefully selected to be comprehensible for the respondent, not very specific, not too general, and not numerous. In the case of the Czech chemical industry, a set of 32 elements was chosen in cooperation with company representatives. Another drawback may be the binary nature of the data, representing limits for statistical analysis.

Based on the given theory the assumption is that minority business model elements serve as differentiating parts creating a unique value proposition. These elements are inserted into the business model to achieve improved performance and result from the

relationship with the customer and other partaking stakeholders. Referring to question 2, these elements are a representation of the company's strategy towards sustainable development and its stakeholders, since every element will modify the relationship with stakeholders or introduce new ones. To underline and validate the argument to implement a specific element into the business model; question 3 explores how these affect the economic, environmental, and social results of the business model containing the given element. The resulting business model concepts, after being compared with the business models in the data set may serve as incentives to further develop their business models and thus achieve greater efficiency. By providing and overview of the utilized business model with a valid argument supported by the performance indicators, the concepts may serve to define what sustainability means in given industry and by means of including which element it is achievable, since a sustainable business model concept does not exist. This stems from the fact that sustainable development doesn't provide the specific business model contents but rather provides a process to balance and control economic, environmental, and social values (Boons, Lüdeke-Freund, 2013).

Conclusion

Sustainability is becoming an increasingly necessary reality which, according to many contemporary authors, will influence corporate decision-making on all levels in the future. In other words, sustainability will be embedded into all companies´ routines from the strategic level down to the operational level. In this context, this paper aims to present a research framework proposal that should describe the business models used in a specific industry and create sustainable business model concepts based on sustainable multiple customer values creation.

To briefly state the intended results and contributions of the proposed framework it aims to provide overview of the utilized business models within selected industry; structure these business models by relevant indicators; create a majority business model and a minority business model construct; provide business model constructs based on sustainable multiple customer value creation in the selected industry. To these ends, the presented research framework was designed specifically for the chemical industry, directly for CZ NACE group, 20.1 manufactures of basic chemicals, fertilizers, and plastics; due to its innate nature and narrow context. The novelty of this approach is represented by providing a framework which can examine an industry through the lens of its business models and provide evidence to further develop existing business models to promote on sustainable multiple customer value creation.

Although, being designed for a very specific industry this does not exclude its modification for broader utilization, especially in the context of the increasing interest towards business model sustainability in other industries. The cited works of Chen, Chiu (2015); Slávik (2014); Slávik et al. (2014); and Figge, Hahn (2004) serve as a foundation for further industry wide business model research but the set of business model elements, stakeholders, relationships, and performance indicators will differ depending on industry. For example, a software company will have difficulty gauging its greenhouse gas output compared to chemical production facility, thus a different measure must be introduced.

Possible future research using this framework should be aimed at the business model dynamics to capture how a change in strategy influences the choice of business model elements and, subsequently, its performance; and vice versa. Other possibilities are, for example, the development of indicators or a methodology to overcome one of the major shortfall of a narrative approach, i.e. indicate the importance of an presence.

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DETERMINANTS OF CUSTOMER ENGAGEMENT ON FACEBOOK BRAND PAGES

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Abstract: *Social media such as Facebook, Twitter, Youtube or Wikipedia have become an important element of the communication mix in a number of organizations. A subcategory of Social media is social networks where both customers and businesses can upload their own digital content. The massive amount of this content has to be filtered in some way. The usual and logical choice is the engagement of users as the decisive factor. Content that has the most interaction is also visible to other network members. Therefore, customer engagement on the social network has not only marketing but also technical benefits. This study aims to identify the determinants of customer engagement on Facebook brand pages using a questionnaire survey on a representative sample of 454 Czech Facebook users. The theoretical model was based on Functional, Hedonic and Social Values which were introduced as determinants of Customer engagement. Structural equation modelling methods were used to identify a possible relationship between latent constructs. The final verified model identified Hedonic and Social value as determinants of Customer engagement on social network Facebook.*

Keywords: *Brand, Customer engagement, Facebook, Social media, Social networks.*

JEL Classification: *M31*

Introduction

According to the We Are Social study (2017), 3.7 billion people worldwide are connected to the Internet. This accounts for half of the Earth's population. Of this, 2.8 billion active social media users and 2.6 billion users access social media via their mobile phone. In a year-on-year comparison with 2016, a number of the Internet users raised by 10% and social media users raised even greatly 21%. For active social media users on mobile devices, the growth rate is the highest (30%).

In Europe, there are 839 million people connected to the Internet, which is 73% of the European population. Furthermore, 412 (49%) millions are active in social media and 340 million (40%) use mobile devices to visit social media applications and web pages. However, the growth is a bit slower in Europe. Compared with 2016, there is only 3% more people connected to the Internet, 5% more new social media users and 11% new mobile users. Global usage of the main social networking sites, Facebook, YouTube and Twitter, has grown to a scale that can only be described as ubiquitous (Hoffman and Novak, 2012).

The same study (We Are Social) also shows the number of users of individual social networks where Facebook leads with 1.89 billion, far in the hangout is Chinese Qzone with 632 million and Tumblr with 555 million active users. Facebook has 319 million users aged 45 and more daily. Hence, it is no more only „generation Z thing". In the Czech Republic, nearly five million people each month access Facebook. Of which 3.7 million are active on this social network daily. On Czech Facebook, the most numerous group is within the 25-34 years range, the second 35-44 and the third 18-24.

In the environment where communication possibilities are dynamically evolving, the one-way communication paradigm system of thinking is obsolete (Hoffman and Novak, 1996). Promotion as a part of the marketing mix is changing to marketing communication and brings new challenges for companies that in many cases require a re-evaluation of the present way of marketing communication strategy. The effort to keep the customer and provide quality customer care goes far beyond the transaction. Moreover, it goes far before transaction on social media. Building a long-term engagement with customers through social networking is a topic that today not only businesses reflects but also a number of research studies does (Doorn et al., 2010; Jahn and Kunz, 2012; Greve, 2014; Hollebeek, Glynn and Brodie, 2014; Vries and Carlson, 2014; Hollebeek, Conduit and Brodie, 2016).

1 Statement of a problem

There are situations where many customers are constantly online and have unlimited access to social media platforms via their mobile phone. Clearly, there are two related concepts that are fundamental to social media. First, it is Web 2.0 which enabled users to upload their own text, pictures and videos and interact more deeply with website environments. Web 2.0 has enhanced content and file sharing applications, which in turn have shaped the creation and distribution mechanisms for user-generated content (Daugherty et al. 2008). The User-generated content (UGC), as a second concept, is equally important for marketing communication discipline. It can be seen as the sum of all ways in which people make use of Social media (Kaplan and Haenlein, 2010). It is, indeed, the fabric of social media and one of the manifestations of online customer engagement. Consequently, the term Social media is sometimes conveniently substituted by the term Consumer-generated media (Mangold and Faulds, 2009).

Consumers are doing more frequently information search about brands and products on social media (Vollmer and Precourt, 2008). For companies, these platforms offer opportunities for presentation and communication with customers. There are dozens of ways to manage this communication in favour of the brand, but today, even more than in the past, brand communication has to have a clear meaning for the customer while being up to date. Despite the urgent need for a quality knowledge, there are many unanswered questions in social media marketing area (Lamberton and Stephen, 2016).

1.1 Motivation to use social networks

Before it is possible to define engagement on social networks one should understand the basic motivation to use the platforms. Some research teams have revealed the reasons for entering social networks. For example, the demonstrable effect on the way of use has a personality type. Extroverts generally participate in more groups and have more friends than introverts. However, motivation to use the social network is not affected by personality (Ross et al., 2009). Further, Sheldon (2008) determined the influence of gender on the acceptance of this technology as well as the behavioural specifics. The results of the study among the students led to the finding that women are motivated by the maintenance of friendships, having fun and making time seem to pass more quickly. Men, in comparison, make use of the network more likely to create new friendships and meet new people. The results of another study (Joinson, 2008) show a higher use of the social network among younger people

and women. Age as a determinant of social network acceptance has also been confirmed (Acquisti and Gross, 2006).

Other authors have already devoted their research to the regular users. Therefore, their attempt was not to describe motives for social networking, but reasons for repeated visits (Lin and Lu, 2011). As the two most important factors, they chose the **enjoyment** and **usefulness**. They tested these concepts in relation to the intention to use the network in near future (intentional repetitive behaviour). According to the results, the greatest influence on the intention to use the social network is enjoyment. Furthermore, this empirical study suggests that the closeness to the friends and relatives and the fun the social network offers are key elements that determine whether the user will re-access the Facebook.

Last but not least, the reasons for tracking brands on social networks are studied as well (Logan, 2014). She used a theory of planned behaviour and the technology acceptance model on Facebook and Twitter users. According to her research, it is not possible to use the theory of planned behaviour to describe the reasons for following brands, since it is an impulsive decision supported by the current social pressure and the motivation significantly influences the information needs of the users, the usefulness (the feeling of the benefits gained from the given action) and ease of use (the belief that the network interface user-friendly).

To conclude, people are extensively using social networks all over the world. Specifically, it is Facebook which is the most popular among Internet users. There is a set of motivation to utilize these technologies and to maintain its usage as a common part of the life. We already know from a literature review that the reasons to enter and use social networks are to connect with friends and family, find new friends and to gain access to instant communication platform. In the area of branding and brand, the motivation to follow brands on social networks is twofold. First, it is information gathering and use of this information in decision making. Second, it is the enjoyment of the actions done online and emotional brand building experience. While the research has shown the motives to follow brands, there is still a question which of these antecedents affects Customer engagement as well.

1.2 Customer engagement

Developing Customer engagement allows management to better understand customer needs as it is linked to specific and real customer behaviour. The result of building customer engagement is, in addition to increasing the effectiveness of marketing activities, to increase the economic efficiency of business by saving the cost of marketing research. If companies better understand the reasons for fan involvement, they can use them to interact, integrate and engage their customers and convert them from regular users to real followers of their brands (Jahn and Kunz, 2012).

Customer engagement is defined as a multidimensional concept involving cognitive, emotional, and behavioural dimensions. Doorn et al. (2010), believe that the engagement goes beyond the scope of transactions and can be specifically defined as a customer's behavioural manifestation that has a strong meaning beyond buying. Behaviour beyond this purchase can be both positive and negative. The example of negative engagement behaviour toward the brand is an organization of actions against the company. On the contrary, the online following of consumers, who actively

participate in a company's online activities, is regarded to be highly valuable to a company (Dijkmans et al. 2015).

It is also important to note that, although the theoretical concept of engagement is a customer dominant, it may focus on a much wider network of actors, including other potential customers, suppliers, the general public, regulators and employees of the company. For the purpose of this study on the concept of engagement, we will deal with customers, but it is worthwhile to remember that this expression can also be realized by the above-mentioned interest groups.

1.3   Functional, Hedonic and Social value

Information seeking behaviour is one of the motives to visit Facebook fan page. The customer's goal is to get information about the brand itself, its products, provided services, actual prices or any other type of functional value in form of the information. Hence, the fan page works as an aggregator of valuable content for a buying decision. The customer can seek advice or reduce risk during the decision-making process (Muntiga et al. 2011). This **functional value** of the Facebook page is largely under the control of the brand itself. Functional experiences have long been documented in the literature on technology acceptance (Davies, 2011) and provide an important rationale for content creation on the social network. Jahn and Kunz (2012) found empirical evidence of a significant, positive influence of functional value on usage intensity of the brand Facebook fan page. Similarly, Vries and Carlson (2014) argued, that consumers with higher perceptions of functional value are more likely to have higher usage intensity with the page. In conclusion, the functional value can be considered as one of the important determinants of Consumer engagement.

Social networks offer a new dimension of entertainment and connectivity. Sheldon (2008) empirically tested the model in which the entertainment played a major role as a predictor of Facebook usage. People do not go shopping or search for news from their favourite brands there that often. In most cases, they are simply not set up to communicate with a brand when visiting a social network. One of the ways to attract the customer's attention is to create interesting content that will not only be entertaining but also enjoyable and fun. Referring back to Lin and Lu (2011) and the research which showed a significant effect of enjoyment on social network usage, entertainment is a non-disturbing way of getting attention. Customers want to have fun on social networks, enjoy the experience and gain **hedonic value** from it. Vries and Carlson (2014) offer an example of hedonic value: customer using a fan page may do this in their spare time knowing that this particular brand uploads interesting and entertaining content in relation to that brand, and/or topics related to what the brand personifies and symbolises.

The last concept discussed here is grounded in the theory of social network participation. Broadening relationship to others as a determinant of social network usage has been researched in many studies (Dohlakia et al. 2004; Jahn and Kunz, 2012; Sheldon, 2009). Therefor, a value which is generated by the fan page for customers can also have a sociale dimension. Interpersonal communication with other person or persons with similar interests in products and brands is the essence of social interaction. Hence, the **social value** associated with interactions with other fans on the brand page can be hypothesized as an important determinant of engagement. This

topic in online social media context has been previously researched by Daugherty et al. (2008) who discovered that the motivation to form online content is the most affected by the interest in social interaction.

In sum, these three theoretical determinants form the research question: Which one of these three concepts influence the engagement and therefore is a good predictor of Consumer engagement behaviour on the branded Facebook page? The overall goal of the study is to test theoretical assumption about relationships between four constructs related to consumer engagement on social media.

2 Methods

To achieve the goal of this research, it was necessary to use the deductive approach of testing a predefined theoretical framework. Research philosophy was therefore mainly positivism, the nature of the method was quantitative and the research strategy was the survey method. The technique of data collection was an online questionnaire which was sent to 840 respondents. It was distributed through the research agency IPSOS. Though, there was one limitation for respondents to enter the study. Only those who stated their favourite brand on social network Facebook were allowed to proceed since the rest of the questionnaire was related to the specific brand. In other words, they answered the questionnaire about their favourite brand they follow on Facebook. This social network was chosen because of its enormous popularity both here and globally. There are over two billion active users on the planet. The research agency provided raw data without any standardization. The data were subjected to the analysis of suspicious response patterns by measuring the standard deviation (Hair et al., 2017). Respondents (cases) with a negligible standard deviation and those who filled in a number of cases using the same ratings were excluded from the sample for further statistical processing. Respondents who do not track any brand on Facebook and therefore do not use the platform to communicate with companies were also excluded. Specifically, these were people who said they followed some kind of community or interest group and not a brand. Overall, 54% of the respondents were kept in the sample (Tab. 1).

Tab. 1: Sample Characteristics

N=454	Frequency	Percent
Gender		
Female	207	45.6
Male	247	54.4
Education		
Elementary school	37	8.1
Certificate of apprenticeship	129	28.4
High school	190	41.9
University	98	21.6
Age		
Up to 29	141	31.1
30-39	101	22.2
40-49	98	21.6
50+	114	25.1

Source: own research

The questionnaire consisted of a set of questions about the engagement factors derived from previous studies (Jahn and Kunz, 2012, Vries and Carlson, 2014). Respondents expressed their opinions on the six-point Likert scale ranging from "Totally agree" to "Totally disagree." Neutral response option was not provided to the respondents since it was possible to express their views or report their past behaviour to all questions.

2.1 Measurement model definition

Based on the established scales the questionnaire was designed to measure the latent variables **Functional**, **Hedonic** and **Social value** of the fan page and **Consumer engagement** as a main behavioural construct. For each latent construct, there were at least three questions asked (indicators). The questions were translated to the Czech language by two independent persons to ensure unambiguous meaning. Final translations were then compared and mismatching sentences were further discussed. Each item has its code comprising construct code and a question number. These codes are used later to describe the model and study results.

Tab. 2: Measured Constructs and Indicators

Construct (CODE)	No.	Item (indicator)
Functional value (FUNCVAL)	1	The content of the fan page is helpful for me.
	2	The content of the fan page is functional for me.
	3	The content of the fan page is practical for me.
Hedonic value (HEDONIC)	1	The content of the fan page is fun.
	2	The content of the fan page is pleasant.
	3	The content of the fan page is entertaining.
Social value (SOCVAL)	1	I can meet people like me on this fan page.
	2	I can find out about people like me on this fan page.
	3	I can interact with people like me on this fan page.
Engagement on fan page (ENGA-GEMENT)	1	I react to the content on the fan page with emoticons.
	2	I am active on the brand page and I'm engaging.
	3	I am engaging in discussions that take place on the fan page.

Source: own elaboration based on Jahn and Kunz (2012) and De Vries and Carlson (2014)
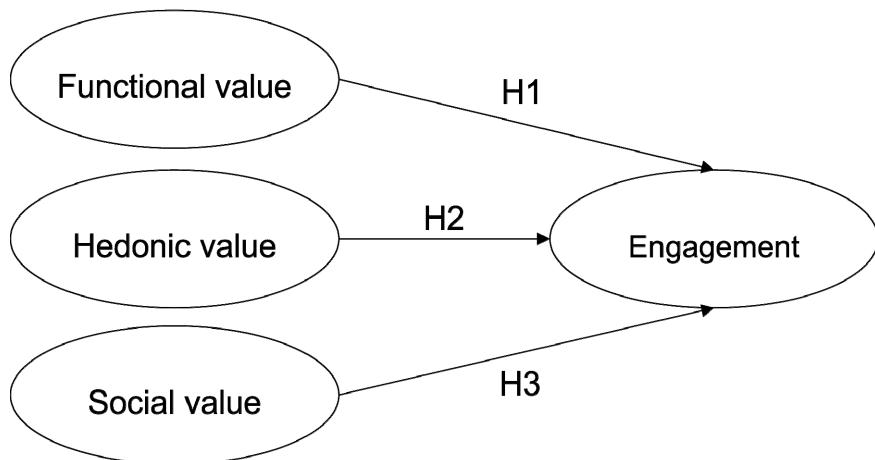
From the Tab.. 2 one can assume the relationship between the constructs. There are three constructs with exogenous characteristics. Hence, the Functional, Hedonic and Social value of a Facebook brand page for the customer are independent variables and Engagement as an endogenous variable is theoretically explained by these three factors. All four constructs were used to create a model in Figure. 1. Effects between the constructs are defined by three hypotheses:

H1: Perceived Functional value of brand Facebook page has a positive effect on Engagement on the page.

H2: Perceived Hedonic value of brand Facebook page has a positive effect on Engagement on the page.

H3: Perceived Social value of brand Facebook page has a positive effect on Engagement on the page.

Fig. 1: Structural Model

The structural model was tested by the following procedure. First, the Confirmatory Factor Analysis and the calculation of individual correlations of latent and measured variables was performed. This is regarded in literature as evaluation of measurement model (Lei and Wu, 2007). Second, the structural model was assessed and regression weights calculated for statistical hypothesis testing. Last, the model was modified through hypothesis evaluation and modification indices to secure the best possible fit to the data. In this final stage, the research becomes exploratory compared to the first two stages which were confirmatory.

3 Problem solving

In advance of the results of the study, the important measures of reliability and validity are presented. In Tab.. 3 there is a report of internal consistency (Cronbach's Alfa, composite reliability) and convergent validity (average variance extracted). Cronbach's alfa should be at least 0.7 (Nunnally and Bernstein, 1994), composite reliability (CR) values between 0.7 and 0.9 can be regarded as acceptable (Hair et al. 2017) and average variance extracted (AVE) levels higher than 0.5 is recommended (Bagozzi and Yi, 1988). Additionally, the average variance extracted should be lower than composite reliability. Overall, we can assume the measurement model met the basic criteria. There is only a small deviation from the standards in one case. Consequently, the Hedonic value should be treated with caution in further analysis. Cronbach's alfa values were computed using IBM SPSS Statistic 21 and CR and AVE in Excel based on the IBM Amos output.

Tab. 3: Measured Constructs and Indicators Used in Survey

	Cronbach's alfa	Composite reliability	Average variance extracted
FUNCVAL	.835	.845	.646
HEDONIC	.734	.738	.493
SOCVAL	.822	.803	.576
ENGAGE	.843	.820	.604
Minimum	.700	.700	.500

3.1 Hypothesis testing

Three hypotheses were verified in the model. Effects of the exogenous variables on endogenous engagement were statistically tested using regression weights from IBM Amos output. First hypotheses, Perceived Functional value of brand Facebook page has a positive effect on Engagement on the page, was rejected. The two remaining were accepted (Tab. 4).

Tab. 4: Results of Hypotheses Tests

Hypothesis	Paths	Path coefficient (β)	p-values	Evaluation
H1	FUNCVAL -> ENGA	.145	.222	Rejected
H2	HEDONIC -> ENGA	.390	***	Accepted
H3	SOCVAL -> ENGA	.417	***	Accepted
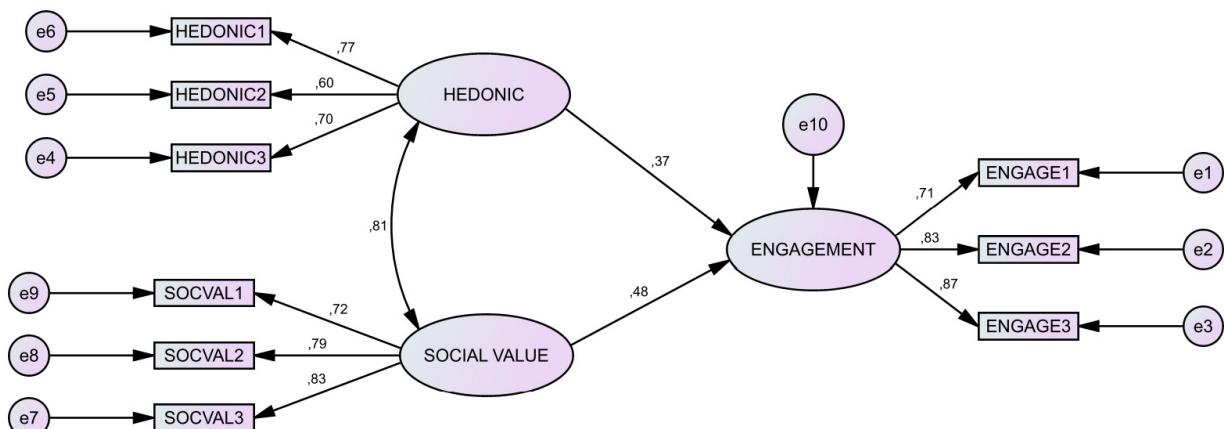
Source: own research

If the statistical significance of path coefficients is not confirmed, the structural equation modelling technique enables model modification. In this case, the hedonic values of fan page content and Social value from interactions on the fan page with others were logically left in the model.

3.2 Modifications and model fit

The model was re-drawn into the statistical program AMOS. Eliminating one of the exogenous variables could result in significant changes in the overall structure. Thus, the statistical significance of path coefficients and modifying indices was re-performed. Program output tables did not show other possible model modifications. The final version of the model is in figure 3.

Fig. 3: Modified Structural Model

Source: own elaboration in IBM AMOS

Model fit was performed using standard measurement indices recommended by a variety of SEM handbooks (Hair et al. 2017; Schumacker and Lomax, 2016; Kline, 2015). Precisely, it was the normal chi-square (χ^2/df), the Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI). For these indexes measured and recommended model levels are in Tab. 5.

Tab. 5: Modified Model Fit

Fit Index	χ^2/df	GFI	AGFI	RMSEA	CFI	TLI
Measured Level	1.957	.978	.958	.046	.988	.982
Recommended Level	< 3	>.95	>.95	<.07	>.95	>.95

From resulting scores, all of the indexes met the theoretical assumptions of model fit. Hence, the model can be regarded as a good fit for the data description.

4 Discussion

Interestingly, findings of this research are inconsistent with those from Jahn and Kunz (2012) and De Vries and Carlson (2014). Despite the fact that Jahn and Kunz (2012) used fan-page usage intensity and this research used Consumer engagement as an endogenous variable. The possible explanation for this is the cultural context in which both studies took place. Plus De Vries and Carlson (2014) used students as the research sample. In the Czech Republic, with participants from all age groups and employment status, the results showed no relationship between functional value and engagement. This finding is important for all Facebook page administrators who aim to get user engagement and have a communication strategy which is focused on reach. Informational and fully functional content will hardly deliver the desired outcomes to the content strategy.

People who perceive the hedonic value of Facebook fan page content show significantly more Customer engagement. The relationship between these variables has some implications. If a company wants to gain customer engagement, it must focus on attractive content that does not necessarily relate to products. It should primarily be a pleasure and then sell. The dialogue on different topics beyond the transaction will lead to building a relationship through continuous interaction and form the basis for future engagement. Today, content marketing is spoken in professional practice. The experience from online communication on the Facebook fan page is not only important in terms of positively influencing customer's feelings toward the brand, but according to this research, it will also build up the customer's engagement on the long term basis.

The fact that social value has an important role in social networks is obvious. It is essentially the basic principle of these platforms. So far, however, it has not been clear whether any interactions with others on brand fan page have any commercial significance. Social value has the highest regression scales in the model, which explains a large portion of the variability of the engagement variable. Not only are that social connection interesting and motivational for Facebook usage generally. It has also an important meaning for those who follow a brand and are part of the brand community. Managers should think about whether their Facebook page offers such a platform for the community growth. The question is whether their site is a place where communication beyond the business communication also occurs. If there is a customer-customer communication as well, the sign of a brand community can be seen and work with. Therefore, a good starting point for marketer in analysing own Facebook fan page is to look for interactions between customers and then create a platform for the emergence of these.

Conclusion

Companies that want to succeed in the interconnected social media world must understand the new rules of the game. Specifically, in social networking environments such as Facebook, it is a communication that leads to the increase in Customer engagement, which is behaviour beyond business transactions. Customer engagement has a positive effect on reach on many popular social media platform. Only engaging content is filtered to the most users. Otherwise, the users would be overwhelmed by the quantity of user-generated content. Consequently, such a behaviour in an algorithm-driven environment will ensure the reach of communication to larger target audiences.

The overall goal of the study was to test theoretical assumption about relationships between four constructs related to Customer engagement on the most popular social network Facebook. To achieve the goal, a deductive approach was used when the theoretical model was based on previous studies and concepts. A questionnaire survey among consumers in the Czech Republic has demonstrated the validity of all theoretically designed constructs and, in two cases, their influence on Customer Engagement. Functional Value that customers feel when they follow their favourite brand on the social network does not lead to higher values of Customer Engagement. Hedonic and Social value, on the other hand, does. These results tell us that consumer's entertainment, fun and interaction with another user on the branded Facebook page site is a good predictor of consequent engagement. It does not mean that consumers do not just pragmatically look for brand or product information on Facebook to be sure about the brand trustworthiness. It means it is simply not relevant for Consumer engagement. Depending on the communication strategy, the plan to pursue higher engagement have to be rooted in actions generating hedonic or social value for the user. In everyday business practice, we can see more and more brands recognizing the utility of entertaining content, however, using the Facebook brand fan page as the fans social value creator is still in its infancy.

In managerial practice, it would be also useful to verify the results after implementing the suggested recommendations. As often shown, customers in questionnaire surveys do not always accurately describe their attitudes and behaviour. Subsequent research could, therefore, focus on evaluating the implementation of recommendations, particularly in the field of creating a social interaction platform on branded fan sites. This research showed a strong connection between engagement and social value which is delivered by a fan page. Another stream of research which would be valuable in the domain of marketing communication on social networks is its subsequent effect on business performance and overall market competitive advantage.

Besides, there is a possibility to measure the efficiency of specific determinants of engagement. Cvijikj and Michahelles (2013) have already started the research stream dealing with the relation between post characteristics and online engagement. They categorized media types such as text status, picture, video or link, and added also the posting time. However, in this type of research, the survey method should be substituted with data from Facebook pages as an exact representation of the engagement. Moreover, the Facebook Newsfeed Algorithm has to be taken into consideration since this data organizing tool will largely influence the outcomes of any research dealing with Facebook data and thus influence reliability of a study.

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DESIGN MANAGEMENT: DOES COLLABORATION WITH A DESIGNER BRING BUSINESS PROSPERITY?

Jan Kramoliš, Pavel Taraba

Abstract: *Business prosperity is most often mentioned regarding economic results (for instance profit, sales, sales growth, brand value growth, high demand for products). One of the factors that can be used today in rival competitive struggles is design. The very perception of the role of design as an opportunity is an essential prerequisite for increasing business prosperity. It is, therefore, logical to look at who is the creator of quality design in companies. Companies can solve this problem internally or hire a designer. The question is, which of the variants increases businesses prosperity. The aim of the paper is to clarify this relationship, i.e. whether a company's cooperation with the designer brings business prosperity. Secondly, the strong belief among companies in the Czech Republic that the cooperation with the designer is very expensive is considered. For interpreting results basic statistics indicators and tests of hypotheses (p-value) were used. Results from tests confirmed that most companies that collaborate with a designer believe that design helps to achieve business prosperity. The results also indicate that reluctance to cooperate with a designer because it is too expensive is not confirmed.*

Keywords: *Designer, Design Management, Business Prosperity, Business Risk, Design Thinking, Collaboration with Designer.*

JEL Classification: *M21, O31.*

Introduction

The fact that a company's success is built on quality people is a well-known truism. In the current hypercompetitive environment many factors affect whether a business will be successful, with the prosperity of a company described most often in terms of economic results (e.g. profits, sales, sales growth, brand value growth, increasing demand for products). One of the key factors operating in today's competitive struggle is design, often described in terms of the shape and appearance of the product and its packaging; the product's functional properties; or the interior of the location in which the products are offered. In addition, design is strongly reflected in the appearance of marketing materials and brands (company logo, web pages, advertising, etc.). The question of whether a company can thrive based in large part on design has been dealt with in studies by Kramolis (2015) and Kramolis and Stankova (2017), the results of which show a clear link between design and prosperity. The connection is even stronger if the company is located in a hypercompetitive environment such as the national market of the Czech Republic. Our current "*global*" world is not unipolar, but in fact represents thousands of worlds within which each factor varies greatly - from the wider region, to the (spatial or web) site, finally to the community and individuals. In this new, turbulently evolving space, the capacity for innovation and rapid change triumphs. Globalization itself creates enormous pressure on organizations. SMEs must better develop products, understand the risks and opportunities in the market as well as ensure their own sustainability (Kozubíková et al. 2015). The bilateral concept of risk (threat / opportunity) is found not only in standards and guides, but is also increasingly applied in practice by the leading companies within spheres of activity (Hillson, 2009). The

conception of the role of design as an opportunity is an essential prerequisite for increasing efficiency. It is, therefore, logical to consider who is the creator of quality design in companies. Companies can resolve this issue internally or hire an external or freelance designer, with the question remaining as to which of these variants will increase business prosperity. In this context, there is a risk that if a company does not address this issue in the right way, it will lose its current position within the competition. The result may be a loss of market share because of a lack of innovation which results in a reduction in sales, as competitors have incorporated better design to entice new and more customers, and have thus increased turnover. The well-informed buyers of today can also, rightfully or not, quickly begin to evaluate certain products as obsolete. As a result, the demand for these "*old-fashioned*" items will drop as substitute products with enhanced design begin to take over market share. As more of these design-based goods come with greater speed from conception to production to the market, the overall reputation of companies who fall behind can quickly become damaged, thus they begin to lose more customers even in unrelated fields.

The aim of the paper is to clarify this relationship, i.e. whether a company's cooperation with the designer brings business prosperity. Moreover, the strong belief among companies in the Czech Republic that the cooperation with the designer is very expensive is considered.

1 Literature review
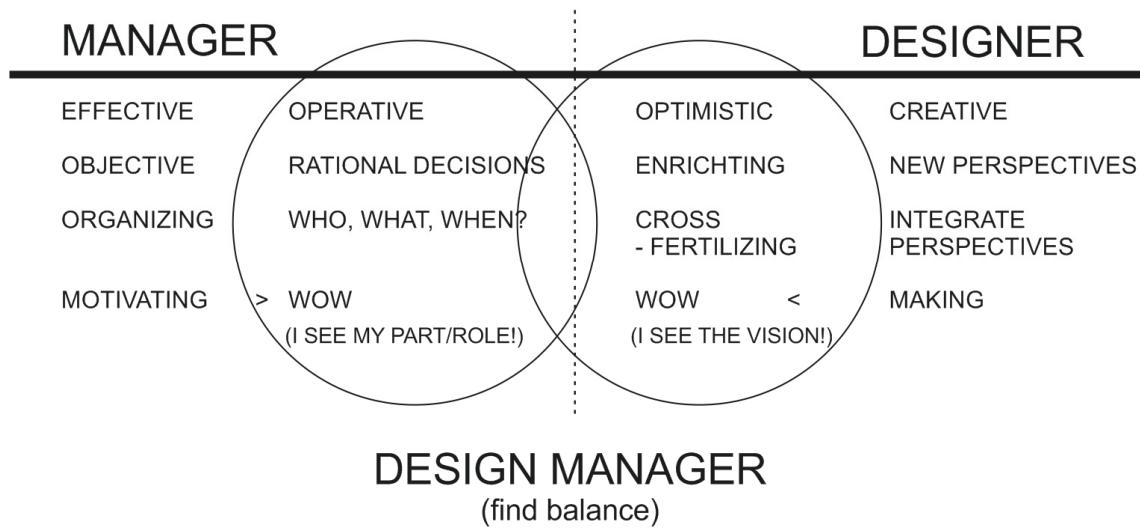
Searching for more effective ways to provide higher values for customers than the competition has become the key issue in today's competitive environment. The traditional view of the value process has lost its potential, as mass markets have split up into countless micro-markets, each of which has its own needs, expectations, and preferences. The new understanding of value provision consists simply in harmonizing the process by selecting, creating and communicating higher value (Šimberová, 2014). According to Šašek (2010), for the customer, value, either tangible or intangible, lies within a specific product. The marketplace creates this value to meet the customer's needs, requirements and expectations, thus fulfilling its essential mission. One of the ways of doing this is to innovate the quality of the product by the designer. A number of our peer-reviewed papers (Kramoliš, 2017; Richtr, 2012, Hanek and Vinšová, 2013) mention the influence and position of a designer in the company and its connection to the prosperity of the company and innovation.

Authors Žáková, *et al.* (2015) showing approaches to design sophistication represents four levels of intensity. It uses a scale which ranges from no consideration of design at all, to a purely aesthetic view (the "*final touch*") to a compound influence of design on the entire production process (maximizing product quality and reliability while minimizing production and distribution costs, knowledge from market research and customer requirements, marketing some and branding, etc.), and, finally, to an overarching view taking into consideration the whole company and its overall objectives.

Oakley (1990) focuses on human resources, describing the distinctions between manager and designer, which consist primarily of differences regarding personality, habits, behavior, style of work and education. It is these differences that managers should be aware of to be able to work efficiently with designers. At the same time, Gemser and Leenders (2001) also deal with the human factor and point to the connection

between the talents of designers and the design itself. The use of designers with limited effectiveness can have far-reaching negative consequences for a company. Berghs (2011) also examines personnel issues in design management in a discussion which outlines the scheme of the design manager, the figure who has the task of finding a balance between the designer and the manager of the company. The design manager is aware that individuals work and think in entirely different ways, and thus he resolves the challenge of both parties communicating effectively in line with the company's goal.

Fig. 1: Design manager's scheme

A balance must be found between these two views. Mozota (2010) claims that management and design have a constrained relationship. Designers perceive management input as "constraint by administration and project management," whereas managers perceive the vagaries of design often as the "*rising power of perception and emotion in purchasing decisions.*"

King (2002) defines the ideal structure for design management, which he terms the Basic Performance Unit, a team integrating the various abilities, knowledge and experience of all the individual members. The BPU categorical purpose is to achieve the central goal notwithstanding the individual interests of team members. This aggregation is more flexible than larger workgroups, as it can quickly build and change focus. This team should consist of individuals from various departments who have been assigned to the BPU for the sole purpose of designing a new product or new solution. Two subtypes can emerge: a "*core product*" team or a "*work*" team. The author also presents a conceptual design management map.

The benefit of the design is not just for companies; it also improves the lives of people. The executive summary *The Design Economy* (2015) lists specific design-related figures and their impact on the UK economy:

- Design as part of the creative industry in the economy accounts for approximately 7.2% of gross added value.

- Between 2009 and 2013, this added value by the creative industry grew faster than usual.

- Employees using work equipment (which were innovated in design) achieved a 41% higher labor productivity.

Research also shows that companies that invest in design and use it strategically (although not necessarily having personnel employed full time as designers) achieve a better performance indicator per employee.

Hanek and Vinšová (2013) also deal with the opposite perspective, i.e. by defining "*what is not design in marketing*": art; luxury; waste of money; mere appearance; amateurism. At the same time, they add that "A good designer is a partner for a client, who helps him to find a solution to the problem or situation." The authors deal with the idea of design costs, in which central aspects of pricing (sketch fees, copyright licenses, royalties) are listed, with the highest value based on the creative contribution of the author (designer). Hanek and Vinšová (2013) also describe how for a company to achieve prosperity it needs a whole range of resources (designer, effective advice, maintaining consistency, determining a systematic approach, patience and time). The authors also mention the relationship between emotion and design with prosperity of the company: "When a customer chooses from similar services or products, he/she chooses the one who attracts his/her attention by its appearance or by a novel solution to a problem."

One critical theory is NIH (Not Invented Here), a model through which a prejudice is delineated against ideas and innovations that originate from outside a particular organization. NIH syndrome is based on four aspects of social dynamics (Lidwell, 2010): the belief that skills inside the company are better than external skills; fear of loss of control; the desire for recognition and status; and significant emotional and financial investments in internal initiatives. NIH syndrome is based on the perception of superiority, with this bias often omnipresent in companies that routinely build on its successful innovations. Thus past successes efficiently sabotage a company's willingness to even consider using external resources (such as hiring an external designer). As a rule, a redress of this situation requires significant organizational changes or a complete change in leadership. The best way to deal with NIH is prevention. It is advisable to alternate team members within projects. When outsiders are involved in the strategic and evaluation phases of the design process, fresh ideas and new perspectives often emerge.

1.1 The innovation of utility value

The innovation of utility value (or technological innovation) includes the degree to which the product is modified in terms of use, or new different features are added compared to products already sold on the market. Technological innovation also refers to the user's relationship to the product. This capacity of gauging the product's potential relationship to the user is the major difference between the objectives of the engineer and the designer. The engineer looks for a solution to a particular function (for example, he determines the force of a bolt in a certain design) but does not consider what the user thinks about the product. Calculations are the mode within which the engineer works. (Krippendorff, 2008). The role of the designer is to invent industrial objects for mass reproduction: cars, furniture, clothing, etc. The designer is located at the intersection of the technical, commercial and cultural spheres. Depending on the specific activity, roles include graphic designer (who works on graphic presentations of products and

documents, including multimedia and web design), product designer, packaging designer, industrial designer and fashion designer. Design activities are typically carried out either by design agencies or by other related companies. (Žáková, *et al.*, 2015)

Sedmerová and Žišková (2010) have also revealed findings related to the direct relationship between design and business prosperity: Designers, managers and policymakers should confer on the notion of design support as an important tool in the innovation process; Designers should also be trained in the fields of management and marketing, i.e. understanding design management in the context of company structure, using surveys and market analyzes, heeding the customer's wishes and making clear arguments; The efficacy of design investment should be carefully measured in terms of results.

1.2 Design thinking

In terms of intentions regarding the results of production within company strategies, the result of design thinking represents both value for the customer as well as a competitive advantage for the company. According to Dunne and Martin (2006), design thinking combines the generation of novel ideas with their subsequent analysis and assessment. The designer generates an idea or a number of ideas, deductively analyzes these ideas up to their logical consequences, forecasts results, and tests ideas in practice. Mozota (2002) presents three different ways of design thinking that add value to a business: Integration: The use of design capabilities as a resource that improves the production process along with the range of products and brands, as well as enhances internal corporate culture; Differentiation: The designer or company can bring a competitive advantage to its investors through branding and building existing customer loyalty as well as by targeting a new audiences; Transformation: The use of design thinking in terms of the current market. Being able to generate new business opportunities by creating changes through novel products designed for the company's existing target groups. Therefore, design thinking can play a key role in the development of novel products, and thus an essential market share can be gained. Beverland, *et al.* (2015) highlight two basic rules for marketing managers. The first is to use design thinking, while the second is to organize the management systematically in such a way as to encourage brand ambidexterity. Telling managers to think in the same creative ways as designers do can be dangerous, and care should be taken not to cross the line between the manager and the designer. Many companies have their own systems and structures within which the exact position of the designer and brand manager is ensured, along with where the functions might overlap. This clarity of roles creates a very strong relationship. Delivering added value (design) to an organization's customer can itself be perceived as a project. There are many risks from different sources during the life cycle of a project that may be perceived as a threat. According to Taraba, Hart, and Pitrová (2016), project risks may be categorized as Managerial (for instance internal communication, project management, project development, personnel issues), Environmental (competition, market, company environment), Financial (market, price, currency, inflation and credit risk), Technical (suppliers, product complexity, failure, malfunction, quality), Business-oriented (knowledge of customer environment, contract quality, customer relations). In addition, Lazáni, *et al.* (2017) deal with the issue of the business environment specifically in the Czech Republic. These authors reveal findings

in particular areas regarding risk perception, risk elimination as well as the courage to invest in risky ventures.

2 Problem formulation

The aim of this article is to clarify the relationship between the firm and the designer, and to determine whether the company's cooperation with the designer (internal or external) brings business prosperity. This issue is based on the thesis by Richtr (2012), who claims that a company's prosperity and cooperation with the designer are inseparable from one another. Based on this theory a certain business risk can be determined, i.e. that the company will not prosper if it does not cooperate (well) with the designer. Sedmerová (2010) states that there is a strong belief among companies in the Czech Republic that the cooperation with the designer is quite expensive, even prohibitively so. This attitude is the reason why companies are reluctant to cooperate with designers. Thus the secondary aim of the article is to confirm or refute this thesis.

2.1 Methods

Data to address the issue came from primary research conducted in 2016 in the Czech Republic. The main tool for data acquisition was a smart electronic questionnaire built using Google Form technology. The resulting data file was then cleared of all invalid and incomplete records, with the final data set used in the compilation containing 121 valid records. A research questionnaire was administered to 600 companies. The addressed companies were chosen after meeting these parameters: 1) each firm is a producer of products who are able modify the design or packaging of the products; 2) each firm has the potential to employ design marketing communications materials (CID); 3) each firm offers services (banking, insurance) in which design can be used; 4) each firm recognizes that they are in a competitive environment and are searching ways toward prosperity by differentiating products by design. Data from the questionnaires were processed in Microsoft Excel using pivot tables. The obtained values were converted into a yes/no binary structure, coded respectively as 1 or 0. These data adjustment was necessary to help determine completion rates and conversion rates. Subsequently, statistical tests were performed using the tools XLstatistics and MedCalc Software (one variable - one-way classification).

2.1.1 Statistical tests

To test the hypothesis that for one classification table all classification levels have the same frequency, only one discrete variable must be identified in the dialog box, with the null hypothesis being that all classification levels have the same frequency. The Chi-squared statistic is the sum of the squares of the differences of the observed and expected frequency divided by the expected frequency for every cell (Campbell, 2007):

$$x^2 = \sum \frac{(observed\ count - expected\ count)^2}{expected\ count} \tag{1}$$

A single classification factor for testing the hypothesis that for one single classification table, all classification levels have the same frequency, at which point only one discrete variable is identified in the dialog form. In this case, the null hypothesis is that all classification levels have the same frequency. If the calculated P-value is low (P<0.05), then the null hypothesis is rejected. In a single classification table, the mode

of the observations is the most common observation or category (the observation with the highest frequency). A unimodal distribution has one mode; a bimodal distribution, two modes. Computational notes of the P-value defined the significance level, with the P-value calculated using a general z-test (Altman, 1990; Fleiss et al, 2004):

$$z = \frac{p - p_{exp}}{se(p)} \tag{2}$$

where p is the observed proportion; p_{exp} is the null hypothesis (or expected) proportion; and *se(p)* is the standard error of the expected proportion:

$$se(p) = \sqrt{\frac{p_{exp}(1 - p_{exp})}{n}} \tag{3}$$

As a "*majority*" the threshold value was set at the percentage 61.79% calculated from φ (sectio aurea) or often referred to as "*golden mean*". (Bejan, 2009; Lidwell, 2010)

$$\varphi = \frac{1 + \sqrt{5}}{2} \tag{4}$$

Other statistical indicators used to compile an overall outlook included the arithmetic mean, median value, variance (s^2) and standard deviation (*SD*).

2.1.2 Hypotheses

To fulfil goals of paper, two basic hypotheses were defined (with each hypothesis having a null and alternative version). These hypotheses were tested at significance level p-value 0.05 by statistical tools XL statistics (X^2) and MedCalc Software (z-test).

$H1_0$: The majority of companies which collaborate with a designer is not convinced that design helps to achieve business prosperity.

$H1_A$: The majority of companies which collaborate with a designer is convinced (believes) that design helps to achieve business prosperity.

$H2_0$: Companies do not collaborate with a designer because of other reasons except the high cost.

$H2_A$: Companies do not collaborate with a designer because that the high cost is not worth it.

When compiling hypotheses, it was not taken into account whether the company has an internal designer or collaborate with an external designer.

3 Results

3.1 Collaboration with a designer and business prosperity

The first issue examined deals with the relationship between company prosperity and designer collaboration. The hypothesis (H1) below is based on the proposition that majority of the addressed companies (based on the "*sectio aurea*" definition of majority) which are collaborating with designer have achieved resultant business prosperity. The proportions for each answer were calculated (Yes=0.76; No=0.24). Using XL statistics

software, the p-value=0.011563 was calculated along with Confidence Intervals for p-value (Level=0.95): ME=0.108757; Lower=0.649308; Upper=0.866821. In MedCalc Software the test for one proportion was calculated as follows: Z-statistics: 75.55; significance level P < 0.0001; 95% Confidence Intervals of observed proportion = 63.26 to 85.78.

Therefore, based on above performed tests, $H1_0$ is rejected and $H1_A$ is confirmed. As a result, it can be stated that: "The majority of companies which collaborate with a designer are convinced that design helps to achieve business prosperity." Considering the variable of business size could provide more detailed insights. Tab. 1 shows the business structure of the file (business size according to number of employees).

Tab. 1: Pivot table: Number of firms which collaborate with a designer according to business size

Business size (number of employees)	Business prosperity achieved?		Observed proportion (yes)
	Yes	No	
Micro (1-10)	10	0	1.00
Small (11-50)	11	1	0.91
Medium (51-200)	10	1	0.90
Large (201 and more)	16	2	0.875
TOTAL	47	4	-

Source: present authors.

The last column in Tab 1. (observed proportion) indicates that the majority of firms collaborate with designer, and, further, they judge prosperity most often in micro companies (1.0), then in medium sized (0.91) and small businesses (0.90). Large businesses also evidently perceive this connection very strongly (0.879).

H1, which takes into account the data position and variability, could bring another insight into the examined issue. From the data collected in research, the following statistical indexes were calculated: characteristics of the data position (arithmetic mean and median value) and characteristics of the data variability (variance and standard deviation). Other basic calculated statistical indexes included the number of values (n)=62, arithmetic mean = 0.76, variance (S^2) = 0.18 and standard deviation (SD)= 0.43, along with median value = 1 (according to the binary data type). The data clearly suggests that companies which work with a designer genuinely perceive prosperity because of this collaboration.

3.2 Collaboration with designer is too expensive?

The second area examines the question of why companies are generally afraid to collaborate with a designer. The hypothesis below is based on the fact that most (*sectio aurea*) of the companies do not want to collaborate with a designer because of the widely accepted view that "collaboration with designer is too expensive." The question in the questionnaire examining this issue was constructed as a multiple choice one. The results are represented as the overall finding of the answers checked "too expensive." The proportions for each answer were calculated (Yes=0.20; No=0.80). Using XL statistics software, the p-value=1 was calculated along with confidence intervals for the p-value (Level=0.95): ME=0.113679; Lower=0.086321; Upper=0.313679. Using the software tool MedCalc, statistical tests were performed for one proportion as follows: Z-statistics: 0.377; significance level P = 0.7061; 95% confidence interval of observed proportion = 0.00 to 7.50.

Therefore, based on the tests above, $H2_0$ is confirmed and $H2_A$ rejected. As a result of these calculations the null hypothesis is confirmed and therefore it cannot be stated that: "*Firms do not collaborate with a designer because they believe it is too expensive.*" The result clearly shows that the claim "*Most companies do not want to collaborate with designers.*" is unreasonable. H2 regarding characteristic of data position and variability could better explain the data file from the statistical point of view. From the data collected in research, the following statistical indexes were calculated: characteristics of the data position (arithmetic mean and median value) and characteristics of the data variability (variance and standard deviation). In more detail of calculation of selected statistical indexes of file (from which it was made hypothesis verification test) is: Number of values of tested issue n=50. Where arithmetic mean = 0.2; variance (s^2) = 0.16 and standard deviation (*SD*) = 0.4. median value = 0 (according to the binary data type). Additional statistical indicators are skewness value 1.5 and kurtosis value 3.25.

4   Discussion

The main objective of this part of our project was to determine if companies in the Czech Republic in 2016 saw a positive connection between cooperation with a designer and business prosperity. From the test data that was obtained in the research, the following hypothesis was confirmed: "Most companies that collaborate with the designer believe that design helps to achieve business prosperity." It should be mentioned, that was not taken into account whether it concerns an internal or an external designer.

Authors are aware of the limitation that the research did not detail specific economic data (number of orders, sales, profit, increase of brand value). Nevertheless, this basic information regarding design and the economic prosperity of a company is significant for managers. The strongest findings regarding this relationship was located in micro and small businesses (more than 90%). It should be noted that most companies are defined as *sectio aurea* out of the number of companies in the surveyed file. At the same time, these results are supported by claims by Richtr (2012), Vinšová and Hanek (2013), who also claim that a company's prosperity and collaboration with the designer are inseparable from one another.

The second area to be investigated in this regard is to verify the general assertion that occurs in companies. This is an issue that has not yet been empirically investigated to our knowledge. The problem is that most companies believe that cooperation with a designer is too expensive. Sedmerová (2010) states that among the companies in the Czech Republic there is a strong belief that the cooperation with a designer is very expensive, thus companies do not want to cooperate with designers. Another aim of this paper was to confirm or refuse this thesis. Of course, for the company cooperation with a designer is an extra cost from the economic point of view and thus creates a certain risk, i.e. leading toward a decisive shift in the company's break point. If the cooperation with the designer has not increased the sales of the products or has not allowed it to increase the price, i.e. achieving the same sales figures, then this risk becomes much higher. The reason may be a low quality designer or ineffective cooperation. Gemser and Leenders (2001) also deal with this issue. These authors point out that ineffective designers can have far-reaching negative consequences for a business. Another risk is the excessive costs associated with high corporate debt and unrealistic expectations of products sales. This issue of profit and return has been mentioned by Oakley (1990). Nevertheless, the results of the statistical testing of the research clearly indicate that expense is not the deciding factor which causes the reluctance of businesses to cooperate with a designer. Therefore, this hypothesis is not confirmed.

The majority of companies that do not currently cooperate with a designer did not indicate that cost was the reason why. These include firms that in the past collaborated with a designer as well as those who have never done so. Only one-fifth of companies stated that in general cooperation with a designer is too expensive. It is quite understandable that the work of a quality designer will be costly. This issue has been pointed out by Best (2016) in her model of quality, time and cost. The author states that it is not possible to get quality design in both a short time as well as at a low price. A similar theory was published by Ambrose and Harris (2010), who, however, put forth a simpler paradigm. In their model there are only two variables: cost and result. At the same time, these researchers do envision an ideal situation in which the design outcome comes at low cost but at high quality, but they concede that this goal is a practically unreachable. To sum up, it cannot be said that most companies are afraid of collaborating with a designer because it is too expensive.

Conclusion

The results of statistical hypothesis testing clearly confirm the existing relationship between design and business prosperity. Specifically, companies that cooperate with a designer see real benefits from this collaboration, i.e. increased prosperity, which is such a valuable asset in today's highly competitive market.

As for the general assertion that cooperation with a designer is too expensive, therefore companies are afraid to embark on it, the results of 2016 research show that such trepidation in the Czech market exists only to a limited extent. Most companies in Czech Republic do not consider designer collaboration too costly, but firms have other reasons for being reluctant to partake in the process. These rationalizations for the lack of need for a designer are manifold and as such cannot be elucidated on here. This issue may become a theme for future research by our team.

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PENETRACE EKONOMICKÝCH ICT SLUŽEB DO EKONOMIKY – SROVNÁNÍ ZEMÍ V4

PENETRATION OF ICT BUSINESS SERVICES INTO THE ECONOMY – COMPARISON OF V4 COUNTRIES

Martina Kuncová, Petr Doucek, Ota Novotný

Abstract: *The article focuses on the integration of funds and information and communication technology (ICT) services into the European countries' economy and compares the level of penetration of ICT into their economy and society. We analyzed the penetration of ICT into economy in term of main area - the use of Internet economic services. This area is divided into two parts where we focus on Internet economic services in areas of e-commerce and e-business. For a comparison with the European countries with especial attention to V4 countries, we used public open data from 2010 – 2014 provided by Eurostat, the Office of the European Union, the World Bank and the Czech Statistical Office. We compared the results, using the multi-criteria decision analysis method TOPSIS. The overall comparison of the trend in Europe's informatization between 2010 and 2014 for V4 countries is made for all analyzed indicators at the end of the article.*

Keywords: *Multi-criteria Analysis, Impact of ICT on Economy, Information Society, ICT Internet Services, E-commerce Services, Ee-business Services.*

JEL Classification*: O52, L86, H11, C44.*

Úvod

Politické, ekonomické a kulturní procesy členských zemí Evropské unie jsou významným způsobem podporovány zaváděním informačních a komunikačních technologií (ICT). Význam ICT pro chod společnosti je v současné době značný, a proto i jejich celkové dopady na ekonomiku a sociální procesy jsou významné. Koncepce a představy informační společnosti jako takové jsou např. dále rozpracovávány v pojetí Franka Webstera (1994), který vymezuje informační společnost z pohledu pěti základních kategorií – technologické, ekonomické, profesní, územní a kulturní. Proto ani není příliš překvapivé, že v dnešní poměrně technicky až technokraticky orientované společnosti se nejvýrazněji akcentují první dvě dimense:

1. technologická (používání různých informačních technologií, míra nasazení Internetu, počet občanů, kteří používají ICT pro různé činnosti běžného života apod.) a
2. ekonomická (přesněji řečeno ekonomicko manažerská – procenta vynaloženého zisku nebo HDP na investice nebo výdaje do ICT, podpora určitého typu procesů prostřednictvím ICT apod.) např. pro obecnou úroveň ekonomiky České republiky. (Kuncová, Doucek, 2013)

Spolu s budováním znalostní společnosti roste i význam ICT a jeho skutečnou úlohou a vlivem na ekonomiku regionů, zemí a celých skupin států se zabývá stále větší počet odborníků. První komplexnější studií o vlivu ICT na ekonomiku je studie (Dedrick, Gurbaxani a Kraemer, 2003), která se zevrubněji zabývá vztahem ICT a

ekonomickou výkonností společností, sektorů ekonomiky, národních ekonomik a jejíž autoři v ní uvádějí, že analyzovali na 50 empirických studií z let od roku 1985 do roku 2002. Již v této studii autoři dospěli k názoru, že vliv ICT na ekonomiku v čase roste.

Rozvoj nasazování počítačů způsobil v devadesátých letech v USA dramatický nárůst produktivity práce a s tím i spojený růst HDP. Ten rostl každoročně v období od 1973–1995 přibližně 3 % a v období 1995–2000 dosáhl roční hodnoty dokonce 4,8 % (Council of Economic Advisors, 2001).

Odvrácenou stranou integrace ICT do společnosti i ekonomiky je nárůst závislosti na nich a tím i růst rizika z jejich používání. Tato rizika nejsou v ekonomice rozptýlena rovnoměrně. Poměrně největší jsou v těch zemích nebo oborech (např. finanční služby, služby telekomunikačních operátorů apod.), kde je integrace největší (Rippel a Teplý, 2011). Metodiky a způsob měření a řízení těchto rizik s jejich následnou eliminací jsou předmětem zkoumání např. prací (Rippl, Suchánková a Teplý, 2011). Zvláštní kapitolou jsou pak tzv. kybernetická rizika, tj. rizika, která vznikají z toho, že příslušné služby nebo produkty jsou poskytovány pomocí počítačových sítí. Jejich analýzou se zabývá např. Eling a Schnell (2016) a měřením např. Doucek (2008).

Po roce 2000 se bouřlivý ekonomický růst poněkud zpomalil i díky tomu, že státy méně investovaly do ICT. Od roku 2008 došlo ve světové ekonomice ke krizovému vývoji. Toto období krize a těsně po ní je předmětem výzkumné práce autorů Rojko, Lesjak a Vehovar (2011), kteří tyto závěry potvrdili a ve svém článku analyzovali dopad ekonomické krize na výdaje a investice v ICT. Dospěli k závěru, že ekonomická krize měla výrazný dopad na snížení nákladů, z toho ty na ICT nevyjímaje. Pozitivem pro ICT sektory různých zemí bylo, že efekt krize byl plošně nižší než v jiných sektorech ekonomiky a nebyl ve všech zemích stejně silný. Zatím poslední analýzou vlivu ICT na ekonomiku (ICT kapitál) se zabývá práce Zelenyuk (2014), který ovšem analyzuje dopady na ekonomiku zejména ve vyspělých zemích.

Významnou prací, která se věnuje vývoji vztahu ekonomiky a ICT v České republice, je komplexní analýza od autorů Fischer a Sixta (2009). Jejich statisticky zjištěné výsledky z národních účtů se ve finále rozcházejí s výsledky získanými ekonometrickými postupy, uváděné např. v práci Hančlová et al. (2015). K jiným výsledkům než Fischer a Sixta (2009) dospěli také Hančlová a Doucek (2012); Manďák a Nedomová (2014) či Delina a kol. (2009). Některými dílčími aspekty vlivu ICT na ekonomiku se zabývají ve svých pracích ještě např. Lio a Liu (2006) - vlivem ICT na produktivitu zemědělství, Lin a Chiang (2011) – vlivem charakteristik země na ICT a na produktivitu práce, a Hájek a Mihola (2009) – vlivem TFP (totálních faktorů produktivity) na ekonomický růst v České republice.

Shrnutím výše uvedených prací je možné dojít k závěru, že pro výzkum vlivu ICT na ekonomiku jsou v literatuře uváděny v zásadě tři cesty:

1. **ekonometrický přístup**, který na základě analýzy časových řad formuluje modely vlivu ICT na ekonomiku,

2. **statistický přístup**, který je postaven na analýze národních účtů a z nich vychází pro měření vlivu ICT na společnost,

3. **využití komplexních indexů** – nejčastěji podoblasti indexů konkurenceschopnosti, které se neomezují pouze na kvantitativní přístup jako cesty minulé, ale kombinují kvantitativní i kvalitativní ukazatele.

Při analýze indexů konkurenceschopnosti, jejichž konstrukce byla i naší inspirací, můžeme uvést, že v současné světové praxi jsou nejčastěji používány indexy, které jsou každoročně publikovány v „Ročence světové konkurenceschopnosti" (IMD) a ve „Zprávě o globální konkurenceschopnosti" (GCI).

Základem měření penetrace ICT do společnosti, a tím i její informatizace a následný růst konkurence schopnosti, jsou v Evropě používané ukazatele technologické vyspělosti společnosti v oblasti ICT. Následně je pak rozvíjí využívání informačních služeb pro běžný občanský život a pro ekonomické činnosti. V našem příspěvku se chceme zaměřit na míru **využívání internetových služeb** zejména pro podporu **ekonomických činnosti v oblastech e-commerce a e-business**. Pro potřeby našich analýz jsme mezi Evropské státy zařadili 27 členských států Evropské unie, dále pak Norsko a Island, zařazen je pro srovnání i průměr zemí EU (27 států, neboť Chorvatsko přistoupilo až v roce 2013, z hlediska sledovaných let není do průměru EU zařazeno). Hlavním cílem článku je však porovnat země V4 mezi sebou a zjistit:

1. Jaká je vyspělost jednotlivých zemí V4 při používání informačních a komunikačních technologií pro podporu ekonomických činností.

2. Jaký je v hodnotách zjištěných ukazatelů vývoj mezi lety 2010 a 2014.

1 Využití komplexních indexů

Novotný a Voříšek (2011) uvádějí, že samotný pojem konkurenceschopnost je chápán jako souhrn institucí, metod, opatření a faktorů, které vymezují úroveň produktivity země. Naše současná společnost určitě patří k těm vyspělejším, co se týká nasazení a používání ICT. Zatímco v metodologii GCI (CSGCI, 2015) mají měkká data převahu, tvoří totiž čtyři pětiny individuálních ukazatelů, IMD využívá jen jednu třetinu indikátorů založených na výsledcích výběrových šetření. Rozdílný přístup obou organizací ke konstrukci souhrnného indikátoru konkurenceschopnosti je zapříčiněn neexistencí shody o důležitosti jednotlivých faktorů a o míře jejich vlivu na konkurenceschopnost.

Na jejich základě a na základě principů uvedených v GCI a IMD byl zpracován postup měření digitální konkurenceschopnosti ČR, který byl poprvé publikován v práci Novotný, Voříšek (2011). Digitální konkurenceschopnost je zde podle postupů definovaných na Fakultě informatiky a statistiky (byly využity např. při zpracování projektů GAČR nebo ve zprávách pro NERV České republiky) sledována pro ekonomickou oblast zejména v oblasti ekonomických datových služeb Internetu, a to e-commerce a e-bussiness.

Pro ekonomické datové služby Internetu v oblasti e-commerce jsme využili následujících indikátorů: E_AESELL - Podniky přijímající objednávky přes počítačově řízené sítě, E_ESELL - Podniky prodávající online (alespoň 1 % z obratu), E_AEBUY - Podniky nakupující přes počítačově řízené sítě, E_EBUY - Podniky nakupující online (alespoň 1 % z obratu) (Eurostat, 2017).

Pro oblast e-business jsme srovnávali následující indikátory: E_ERP1 - Podniky mající ERP systém pro sdílení informací mezi odlišnými provozními oblastmi, E_CRM - Podniky využívající programové řešení typu CRM (Customer Relationship Management), E_CRMAN - Podniky využívající CRM k analýze informací o zákaznících pro marketingové účel, E_CRMSTR - Podniky využívající CRM k získání, uchování a využití informací o klientech pro další podnikové potřeby, E_INV2_SISORP

- Podniky odesílající/přijímající elektronické faktury ve standardní struktuře vhodné pro automatické zpracování a sdílení informací elektronicky, E_INV2_ECOM - Podniky odesílající/přijímající elektronické faktury ve standardní struktuře vhodné pro automatické zpracování libovolnou výpočetní technikou (Eurostat, 2017).

2 Sběr dat a metodika zpracování

2.1 Sběr dat

Přehled literatury uvedený v předchozích částech doporučuje sledovat řadu faktorů a ukazatelů, které ovlivňují digitální konkurenceschopnost. Pro empirický odhad digitální konkurenceschopnosti je třeba využít robustní množinu dat. Data pro analýzy byla získána z databáze Eurostat, (http://ec.europa.eu/eurostat/data/database). V článku se pracuje s verzemi jednotlivých ukazatelů k 18. 1. 2016.

2.2 Metodika zjišťování souhrnných indexů

Pro vzájemné srovnání zemí Evropské unie na základě vybraných ukazatelů (kritérií) se nabízí metodika vícekriteriálního hodnocení variant. V modelech vícekriteriálního rozhodování je třeba definovat konečný počet p hodnocených či rozhodovacích variant $(a_1, a_2, \ldots, a_p)$, kterým lze přiřadit charakteristiku či hodnocení podle k kritérií $(f_1, f_2, \ldots, f_k)$. Cílem výpočtů metod vícekriteriálního hodnocení variant může být rozdělení variant na tzv. dobré a špatné (či efektivní a neefektivní), nebo uspořádání variant do pořadí, případně pouze nalezení kompromisní vítězné varianty. Pro porovnání zemí, které v našem srovnání představují hodnocené varianty, je z těchto možností vhodné získání výsledného úplného uspořádání.

Před výběrem metody bylo nutné stanovit kritéria, dle kterých budou země hodnoceny, a následně doplnit chybějící údaje. Stanovili jsme tedy v souladu s principy uvedenými v Novotný a Voříšek (2011) dvě základní oblasti kritérií: ukazatele z oblasti e-commerce a ukazatele z oblasti e-business.

U všech vybraných kritérií jsou dostupné informace kvantitativního typu, což zjednodušuje výběr metody. Jelikož se vždy jedná o procenta, nabízela by se možnost prostého součtu hodnot pro každou zemi za všechna kritéria. To by však mohlo být v určité situaci zvýhodňující (u extrémních hodnot) či naopak diskriminační. Proto jsme se přiklonili k metodě, která zohledňuje také variabilitu dat v rámci jednoho kritéria – a tou je metoda TOPSIS („Technique for Order Preference by Similarity to Ideal Solution"). Data jsou k dispozici za více let a obvykle se mění z roku na rok v řádech jednotek a většinou rostoucím trendem blízkým lineárnímu.

U zemí i, kde chybí hodnota za rok R a zároveň jsou k dispozici hodnoty v roce $(R-1)$ a $(R+1)$, je chybějící údaj (pro kritérium k) x_{ikR} nahrazen lineární interpolací, tj. aritmetickým průměrem hodnot x_{ikR-1} a x_{ikR+1}. V případě, že jde o chybějící hodnotu roku, který je krajním rokem z dostupných pozorování, je tato hodnota nahrazena hodnotou nejbližšího roku u téhož kritéria a téže země. V situaci, kdy chybí údaje za více let a nelze použít výše uvedený postup (dostupná data ze starších let jsou řádově odlišná oproti novějším rokům), je chybějící údaj nahrazen buď průměrem za 27 členských států EU, nebo průměrem EU27 za daný rok, který je vynásoben koeficientem s_i (zaokrouhlen na 1 desetinné místo) získaným pro zemi i z poměru dostupných dat dané země k průměru EU27 (tj. v situaci, kdy je daná země dle dostupných dat v alespoň jednom ze sledovaných let výrazně horší či lepší než průměr EU27). V případě, kdy u daného kritéria nejsou pro určitou zemi data pro žádný ze sledovaných roků, je koeficient určen

na základě průměrování podílů dat z let povahově blízkého kritéria dané země k hodnotám průměru EU27.

Po získání matice obsahující jak varianty (země EU), tak vybraná kritéria a hodnocení všech zemí dle všech kritérií, je možné přistoupit k určení pořadí zemí metodou TOPSIS. Pro začátek předpokládáme, že jsou všechna zvolená kritéria stejně důležitá, tj. váha každého kritéria odpovídá podílu *1/k*, kde *k* je počet kritérií.

V oblasti vícekriteriálního rozhodování je známé nepřeberné množství metod (přehled a popis lze nalézt např. v dílech Fiala (2008) či Figueira et al. (2005). Metoda TOPSIS byla poprvé použita v roce 1981 (Hwang a Yoon, 1981). V odborné literatuře bývá využívána k nejrůznějšímu srovnání a vyhodnocení, např. k hodnocení lokalit na pěstování rostlin (Yong, 2006) či ke srovnání způsobů výroby elektrické energie (Sarkar, 2014). Najdeme ji však i při srovnání zemí, ať už z pohledu postavení zemí s ohledem na cestovní ruch (Hashemabadi a Razmi, 2014), zhodnocení dopadu ekonomické krize na vybrané ekonomické ukazatele v letech 2002-2009 ve vybraných zemích EU a v Turecku (Mangir a Erdogan, 2011) či srovnání zemí EU z pohledu vývoje informační společnosti mezi roky 2005 a 2010 (Latuszynska, 2014). Poslední ze zmiňovaných článků se podobá naší analýze, avšak využívá pouze 8 kritérií k hodnocení zemí včetně drobné modifikace metody TOPSIS slučující sledované období do jednoho (obdoba fuzzy TOPSIS). V našem případě ponecháváme jednotlivé roky odděleně pro získání kompletního uspořádání a možného meziročního srovnání.

Základní myšlenkou metody je předpoklad, že nejlepší varianta má nejmenší vzdálenost od ideální varianty a největší od bazální varianty, přičemž ideální varianta dosahuje nejlepší hodnoty dle každého kritéria (obvykle jde o hypotetickou variantu) a bazální varianta naopak dosahuje nejhorší hodnoty dle každého kritéria.

Níže uvedené vzorce jsou odvozeny za předpokladu, že všechna kritéria jsou maximalizačního typu (tj. je preferována vyšší hodnota). Minimalizační kritéria je třeba převést na maximalizační, a to například odečtem dat od nevyšší možné hodnoty daného kritéria.

Pro výpočet je data nutné normalizovat, tj. převést všechna kritéria na stejnou škálu (0;1). Tato normalizace poupraví extrémní hodnoty.

Normovanou kriteriální matici lze tedy konstruovat podle vztahu

$$r_{ij} = \frac{y_{ij}}{\sqrt{\left(\Sigma_{i=1}^{p}(y_{ij})^2\right)}}, \quad i = 1, 2, \dots, p, \quad j = 1, 2, \dots, k, \tag{1}$$

kde

r_{ij} – označuje normovanou hodnotu pro *i*-tou variantu a *j*-té kritérium a

y_{ij} – původní kriteriální hodnotu pro *i*-tou variantu a *j*-té kritérium po převodu kritérií na maximalizaci.

V dalším kroku je třeba sestavit váženou kriteriální matici **W** = (w_{ij}) podle vztahu

$$w_{ij} = v_j \cdot r_{ij} \tag{2}$$

kde v_j označuje váhu kritéria *j*. Z matice **W** následně určíme teoretickou ideální (*H*) a bazální (*D*) variantu, kde $H_j = max_i\, w_{ij}$, $j = 1, 2, \dots, k$ (*k* udává počet kritérií) a $D_j = min_i\, w_{ij}$, $j = 1, 2, \dots, k$.

Pro každou variantu následuje výpočet vzdálenosti od ideální varianty $d_i^+ = \sqrt{\sum_{j=1}^{n}(w_{ij} - H_j)^2}$ a od bazální varianty $d_i^- = \sqrt{\sum_{j=1}^{n}(w_{ij} - D_j)^2}$. Z těchto vzdáleností je pak v posledním kroku vypočten tzv. relativní ukazatel vzdálenosti od bazální varianty $c_i = \frac{d_i^-}{d_i^+ + d_i^-}$

Varianty jsou poté uspořádány podle klesající hodnoty c_i. Na základě získaných hodnot c_i jsou země rozřazeny do 8 clusterů. Šíře intervalů je pro všechny clustery a všechna srovnání shodná s výjimkou clusteru č. 1 a č. 8. Cluster 1 (c_i od 0,75 do 1) zahrnuje nejlépe hodnocené země (z povahy metody TOPSIS je koeficient c_i v rozmezí 0-1, přičemž hodnoty 1 lze dosáhnout pouze v případě, že by v souboru byla jediná varianta dosahující nejlepších hodnot podle všech kritérií, což se v případě sledovaných zemí nestalo) a cluster 8 naopak země hodnocené nejhůře (c_i je v rozmezí 0-0,15). Ostatní clustery mají pak šířku 0,1 – tj. např. pro cluster 2 je c_i v intervalu 0,15-0,25. Vlastní výpočty a analýzy jsou potom provedeny v programu MS Excel a v programu Sanna.

3   Rozbor problému a diskuze

Vývoj využívání ICT služeb v české společnosti, v souladu s obvykle používanými postupy v Evropské unii, je sledován národními statistickými šetřeními každoročně. Problém dlouhodobějšího sledování využívání ICT služeb spočívá ve faktu, že se v čase postupně mění sledované služby a proto vzorek dat není všechna období stejný. Příkladem může být nasazení technologií ADSL, které např. před deseti lety téměř nikdo nevyužíval. ICT služby, sledované v současnosti, je možné rozdělit na dvě velké oblasti. První z nich jsou **služby infrastrukturní (technologické ukazatele)** – tedy jakých technologií v naší společnosti využíváme, a **služby datové** – která data s rozsáhlé nabídky Internetu využíváme a k jakým činnostem. Z nich se v tomto článku zabýváme **datovými službami**, které v tomto pojetí představují využívání Internetu spojené s činnostmi **e-commerce**, kdy se sledují ukazatele, týkající se elektronického obchodování, prodeje a nákupu zboží nebo služeb pomocí Internetu a posledními sledovanými ukazateli jsou pak služby **e-business**, reprezentující elektronické služby pro podporu podnikatelské činnosti.

3.1 Datové služby Internetu – ekonomické

Jedná se tedy o již zmiňované oblasti e-commerce a e-business. Obecně pak na tyto služby v běžné ekonomické praxi navazuje nasazování prostředků business inteligence (BI). Tyto prostředky potom slouží k hlubší analýze získaných dat a jsou ve stále větší míře nasazovány nejen do podnikatelského sektoru, ale i do sektoru veřejné a státní správy.

3.1.1   E-commerce

V nasazování prostředků e-commerce patří Česká republika mezi vedoucí země Evropy. Vklínila se na druhou pozici mezi tradiční skandinávské lídry integrace informačních technologií do ekonomik a je společně s Dánskem v prvním clusteru. V ČR došlo ve sledovaném období k realizaci řady projektů, které rozšířily již tak vysokou míru využívání informační technologie pro nákup a prodej výrobků a služeb mezi podniky. Povinnost pracovat se systémem datových schránek, základními registry a postupující elektronizace služeb veřejné správy do jisté míry donutila podniky

investovat od ICT vybavení. To je potom využíváno nejen pro komunikaci s veřejnou správou, ale také mezi podniky navzájem.

Tab. 1: Datové služby – E-commerce – výsledky
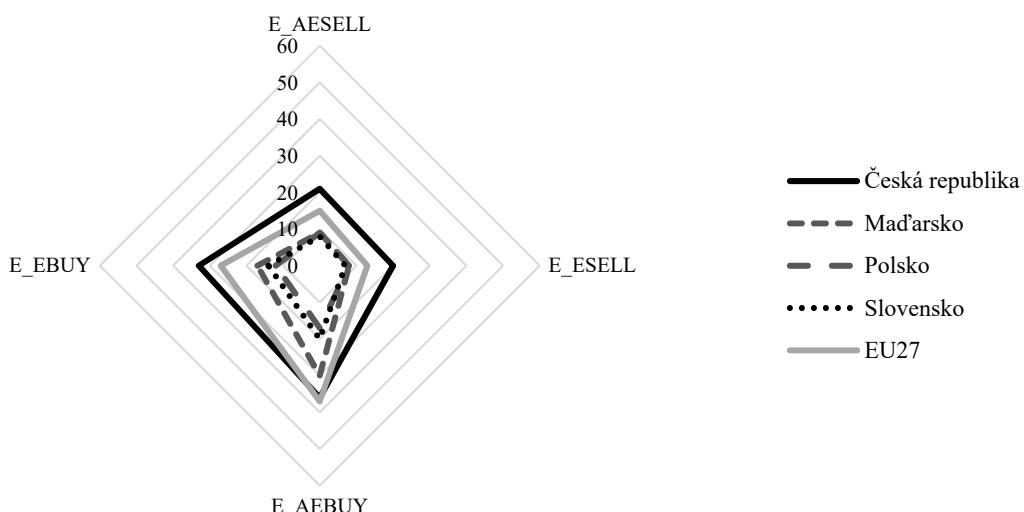
Pořadí v roce 2014 (2010)	Země	Výsledné relativní hodnocení		Cluster	
		2014	2010	2014	2010
2 (10)	**Česká republika**	**0,81187**	**0,51547**	**1**	**4**
15 (17)	**EU27**	**0,39268**	**0,38178**	**5**	**5**
22 (26)	Slovensko	0,26229	0,15900	6	7
25 (23)	Maďarsko	0,25281	0,22825	6	7
26 (27)	Polsko	0,22501	0,15133	7	7

Zdroj: (autoři)

V roce 2010 patřila mezi nerozvinutější země v této oblasti Česká republika (obr. 1). Její vedoucí úloha prakticky ve všech sledovaných ukazatelích již v roce 2010 je patrná i z následujícího obrázku 1. Pouze u ukazatele „Podniky nakupující přes počítačové sítě" (E_AEBUY) se hodnota ukazatele kryje s hodnotou zjištěnou ve státech EU27, v ostatních ukazatelích tento průměr Česká republika jasně převyšuje. Nejméně rozvinuté je používání těchto služeb na Slovensku (šestý cluster). Do stejného clusteru pak patří i Maďarsko. Polsko se zařadilo ve využívání služeb e-commerce dokonce do sedmého clusteru.
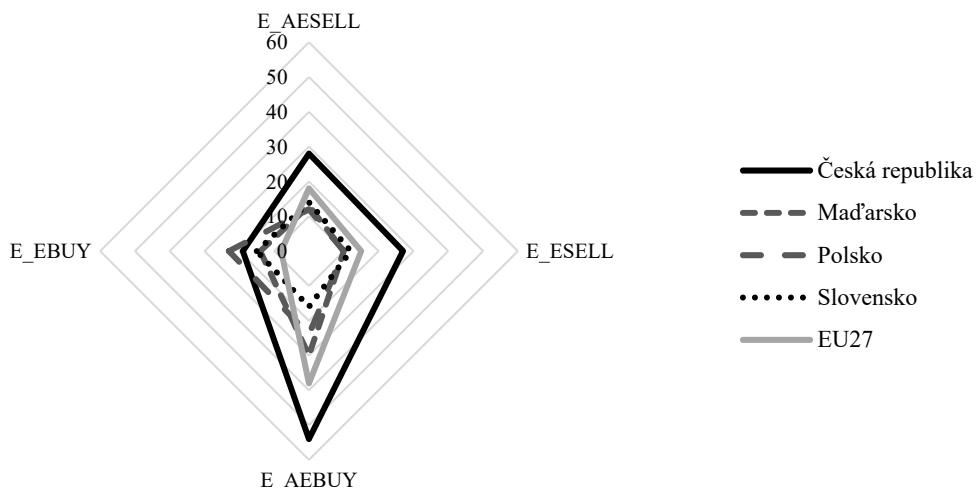
V roce 2010 patřila k nejvyužívanějším službám jasně služba nákup podniků přes počítačové sítě (E_AEBUY) – 30 % v České republice a EU 27. Nejméně používanými službami jsou přijímání objednávek podniky přes počítačové sítě (E-AESELL) a podniky, prodávající alespoň 1 % svého obratu pomocí počítačových sítí (E-ESELL) v Polsku, na Slovensku a v Maďarsku, kde se tyto služby nepoužívaly v roce 2010 prakticky vůbec.

Obr. 1: Datové ukazatele e-commerce v zemích V4 a EU27 rok 2010

Zdroj: data (Eurostat, 2017), obrázek autoři

Obr. 2: Datové ukazatele e-commerce v zemích V4 a EU27 rok 2014

V roce 2014 v České republice výrazně vzrostl ukazatel nákup podniků přes počítačové sítě (E_AEBUY) na úroveň 64 % podniků (obr.2). Došlo k rozvoji služby nákupu podniků přesahující 1 % z obratu (E-EBUY) v Polsku o 10 procentních bodů, naopak ve stejném ukazateli nastal v České republice pokles o 13 %. V České republice se pak navýšil přibližně o 10 % jak ukazatel přijímání objednávek podniky přes počítačové sítě (E-AESELL), tak i ukazatel podniky prodávající alespoň 1 % svého obratu pomocí počítačových sítí (E-ESELL). Služby přijímání objednávek podniky přes počítačové sítě (E-AESELL) a podniky, prodávající alespoň 1 % svého obratu pomocí počítačových sítí (E-ESELL) nejsou ani v roce 2014 prakticky využívány Polsku, na Slovensku a v Maďarsku. Postavení České republiky mezi ostatními zeměmi V4 může být ovlivněno i rozvojem automobilového průmyslu v ČR, kde je elektronická komunikace vyžadována v rámci celého dodavatelského řetězce.

3.1.2 E-business

V oblasti E-businessu je tradiční nadvláda skandinávských zemí prolomena, byť na prvních dvou místech jsou země Finsko a Dánsko (druhý cluster). Mezi ně se vklínily země s úzkou vzájemnou ekonomickou vazbou a těmi jsou Belgie, Rakousko a Německo. Zajímavé je osmé místo Slovenska (čtvrtý cluster), které naznačuje široké zapojení této země do mezinárodní integrace a integraci ICT do ekonomických procesů organizací (Tab. 2).

Tab. 2: Datové služby – E- business

| Pořadí v roce 2014 (2010)	Země	výsledné relativní hodnocení		Cluster	
		2014	**2010**	**2014**	**2010**
8 (8)	Slovensko	0,47598	0,43630	4	5
17 (20)	**EU27**	**0,32950**	**0,31897**	**6**	**6**
23 (22)	**Česká republika**	**0,28476**	**0,28465**	**6**	**6**
29 (30)	Polsko	0,20893	0,19109	7	7
31 (31)	Maďarsko	0,12844	0,02053	8	8
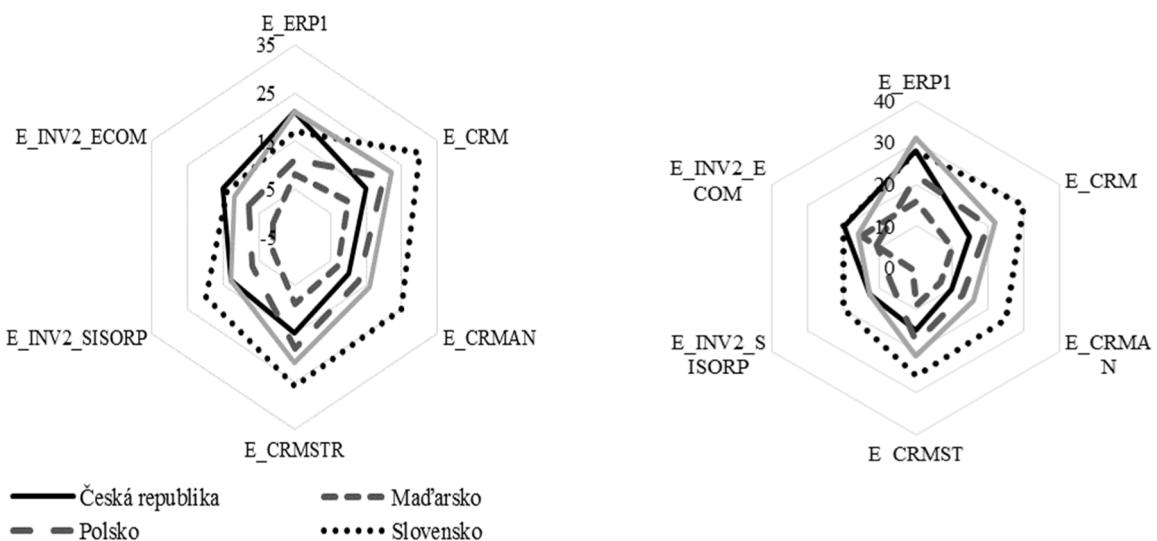
V této části je interpretace výsledků nejednoznačná. Svoji roli zde hraje způsob uzavírání kontraktů a práce se zákazníkem, která je hodně závislá na kulturním prostředí. V zemích, kde je zavedeno ústní uzavírání dohod a preferován osobní kontakt obchodníka se zákazníkem, je obecně rozsah využívání e-business řešení nižší.

V oblasti e-business je nejrozšířenější používání služeb na Slovensku, které si svoje postavení udržuje již od roku 2010 a je na osmém místě mezi Evropskými zeměmi. Naproti tomu v ostatních zemích V4 nejsou tyto služby příliš využívány. Česká republika na 23. místě (šestý cluster) je pod průměrem EU27 a Polsko a Maďarsko uzavírají pomyslný peloton evropských zemí – Polsko je 29. a patří do sedmého clusteru a Maďarsko je dokonce jedinou zemí, která patří do osmého clusteru. V roce 2010 byly služby e-business nejvíce rozšířeny na Slovensku. Jednalo se o používání aplikací a systémů CRM pro řízení podniku (E_CRM), pro analýzu informací o zákaznících a pro potřeby marketingu (E_CRMAN), uchovávání těchto informací v podnikových informačních systémech (E_CRMSTTR) a odesílání elektronických faktur ve standardní struktuře pro automatizované zpracování a sdílení informací (E_INV2_SISORP). A prakticky na stejné úrovni bylo využívání služby zasílání a příjem elektronické faktury pomocí libovolné výpočetní techniky (E_INV2_ECOM). V České republice se naproti tomu využívalo v širší míře (přibližně ve stejné jako je průměr EU27) služby sdílení informací CRM mezi odlišnými provozními oblastmi podniku (E_ERP1). V Polsku a v Maďarsku bylo používání služeb CRM minimální.

V roce 2014 si vedoucí postavení zachovalo Slovensko (obr.3). Míra využívání jednotlivých služeb e-businessu zůstala prakticky nezměněná v České i Slovenské republice, zato došlo k nárůstu využívání služby E_ERP1 v Polsku (přibližně o 15 %) a služby E_INV2 v Maďarsku také přibližně o 15 %. Všechna zde uvedená zjištění sice vycházejí z dat, která publikuje Eurostat, ale jednotlivé naměřené hodnoty jsou silně ovlivněné kvalitou dostupných dat z jednotlivých členských zemí V4.

Obr. 3: Datové ukazatele e-business v zemích V4 a EU27 rok 2010 (vlevo) a 2014 (vpravo)

Závěr

Analýza ukazatelů penetrace ICT přes obě výše uvedené oblasti (e-commerce a e-business) do ekonomiky ukázala, že obecným trendem ve zkoumaném období 2010 – 2014 v evropských zemích je rostoucí penetrace ICT, a dále že více využívané služby ICT jsou z oblasti e-commerce než z oblasti e-business. V roce 2014 byla v České republice největší penetrace funkcí e-commerce (80 % uživatelů), ve Slovenské republice pak funkcionality e-business (40 % uživatelů).

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MODEL LOGISTICKEJ REGRESIE PRE LONGITUDINÁLNE ÚDAJE

LOGISTIC REGRESSION MODEL FOR LONGITUDINAL DATA

Viera Labudová, Martina Lakatová

Abstract: *The objective of this paper is to describe particularity of longitudinal data and methods which can be used to analyse them. The assumption of usual tools used for analysis is the independence of observations. In order to analyse of longitudinal data, we have to make provisions for their particularity, which is the dependence of observations. Therefore, while we analyse them, we must employ methods that are adjusted to that dependence. Several approaches have been proposed to model binary outcomes that arise from longitudinal studies. Most of the approaches can be grouped into two classes: the population-averaged and subject-specific approaches. The generalized estimating equations (GEE) method is used to estimate population averaged effects. In this paper, we investigate the Generalized Estimating Equation (GEE) capabilities of PROC GENMOD for correlated outcome data to fit models using unspecified (unstructured) correlation structure. The data from EU SILC was used to find out how material deprivation of households in the Slovak Republic (material deprivation: yes (1), no (0)) is linked to their available characteristics.*

Keywords: *Longitudinal Data Analysis, Material Deprivation, Generalized Estimating Equation Model, EU SILC.*

JEL Classification: C10, M31, O10.

Úvod

Dizajn mnohých experimentálnych výskumov je založený na meraniach, ktoré sa opakujú na výskumnej vzorke v oddelených časoch, tzv. vlnách. Takýto druh merania má názov longitudinálny výskum. V rámci longitudinálnej štúdie sa zbierajú dáta aspoň v dvoch rozdielnych časových obdobiach. Predmetom skúmania môžu byť jednotlivci alebo skupiny, v rámci jednotlivých cyklov to môžu byť tí istí jednotlivci alebo aspoň im podobní. Cieľom takejto štúdie je zachytenie a skúmanie zmeny v čase a porovnanie medzi jednotlivými cyklami (Basl, 2007). Aplikácia časovej dimenzie je faktorom, ktorý longitudinálny výskum stavia do opozície k prierezovému výskumu (Babbie, 2010).

Modelovanie longitudinálnych dát si vyžaduje použitie iných prístupov ako pri analýze prierezových údajov. Hlavným cieľom tohto príspevku je ukázať možnosti modelovania hodnôt binárnej závislej premennej na základe údajov, ktoré boli získané longitudinálnym prieskumom.

Longitudinálne (panelové) údaje začali používať v akademickom výskume P. F. Lazarsfeld a M. Fiske (Lazarsfeld a Fiske, 1938; Lazarsfeld, 1940) v 40. rokoch minulého storočia a to v oblasti výskumu verejnej mienky. Potreba analyzovať longitudinálne údaje viedla k vývoju modelovacích techník, ktoré zohľadňujú ich špecifický charakter. Pri modelovaní binárnej závislej premennej sa používa zovšeobecnený lineárny model, ktorý bol prvý krát predstavený v práci Neldera a Wedderburna (1972). Možnosti použitia tohto modelu pri skorelovaných dátach jeho

rozšírením o tzv. pracovnú korelačnú maticu, ktorá kvantifikuje závislosti medzi pozorovaniami, opísali ako prví Liang a Zeger (1986) a Zeger a Liang (1986). Do modelovania závislej premennej zaviedli prístup, ktorý sa uvádza pod skratkou GEE – *generalized estimating equations*, alebo sa používa pomenovanie marginálny model, resp. populačne-spriemerovaný model. Ďalšie podrobnosti nielen o triede populačne-spriemerovaných modelov, ale aj o objektovo-špecifických modeloch prinášajú Zeger et al. (1988) a Neuhaus et al. (1991). Opis logistického modelu s náhodnými efektmi, ktorý sa používa pri odhade vplyvu hlavných efektov v objektovo-špecifických modeloch možno nájsť v prácach autorov Stiratelli et al. (1984), Wong a Mason (1985), Lee a Nelder (1996) a Hu et al. (1998). Autori Snijders a Bosker (1999) a Mason (2001) poukázali, v súvislosti s analýzou longitudinálnych údajov, na dôležitosť použitia takých modelovacích techník, ktoré zohľadňujú závislosť meraní. Svojím výskumom potvrdili, že nerešpektovanie podmienky nezávislosti pri aplikácii analytických nástrojov vedie k neefektívnym a často aj ku skresleným odhadom parametrov modelu. Rôzne prístupy k analýze panelových dát v štatistickom programe SAS uvádza vo svojej práci Paul Allison (1999), ktorý praktickými ukážkami ilustruje hlavné rozdiely medzi marginálnymi modelmi, modelmi s fixovanými efektmi a modelmi s robustnými štandardnými chybami.

1 Formulácia problematiky

1.1 Dizajn longitudinálneho výskumu

Longitudinálny výskum má tri druhy dizajnov: opakovaný prierezový výskum, panelový výskum a kohortný výskum.

Opakovaný prierezový výskum (repeated cross-sectional analysis), resp. výskum trendu sa uskutočňuje v rôznych časových obdobiach a to vždy na inej vzorke. Vzhľadom na to, že jeho zameraním je porovnanie výsledkov získaných v rôznych časových obdobiach, viaže sa k jednej téme, má teda to isté zameranie (Ruspini, 2002; Šubrt, 2013).

Kohortný výskum (cohort analysis) je analýza udalostí, ktoré nastali v tej istej kohorte alebo generácii.

Panelový výskum (panel analysis) je špeciálny dizajn longitudinálneho výskumu. Jeho špecifickým znakom je to, že sa pri ňom opakovane zbierajú informácie na tej istej výberovej vzorke v rôznych časových obdobiach. Longitudinálne údaje získané z panelových štúdií možno použiť na analýzu krátkodobej dynamiky zmien, napr. pohybov do a von z trhu práce, prechodov do a von z chudoby alebo na sledovanie procesu demografických zmien. Možno ich použiť aj na skúmanie dlhodobých účinkov, napr. vplyvu vzdelávania na trh práce, závislosti študijných výsledkov detí v škole a neskôr v ich samostatnom živote v závislosti od rodinného zázemia, sledovanie vzťahu medzi zdravotným stavom človeka a jeho spôsobom života (Laurie, 2013).

Okrem týchto troch dizajnov longitudinálneho výskumu možno uskutočniť aj hybridný výskum, ktorý je kombináciou panelového výskumu a opakovaného prierezového zisťovania (Kalvas, 2003; Lechnerová, 2009).

1.2 Longitudinálne dáta, panelové dáta

V praxi sa často používa ako ekvivalent longitudinálneho prieskumu jeho dizajnová podoba panelový prieskum. Toto nahradenie všeobecného tvaru jednou z jeho

špecifických podôb spôsobuje množstvo nedorozumení a nejasností. Na druhej strane sa akceptuje použitie pojmu longitudinálne dáta ako ekvivalentu k pojmu panelové dáta. V ďalšej časti budeme používať pojem longitudinálne, resp. panelové dáta ako výsledok panelového zisťovania.

Longitudinálne, niekedy nazývané panelové dáta, sú údaje, ktoré boli získané na tom istom výberovom súbore v rôznych časových obdobiach. Jednotkami súboru môžu byť jednotlivci, domácnosti, podniky, atď.

Na longitudinálne dáta možno nazerať tiež ako na zhluky dát, resp. špeciálny prípad zhlukovo skorelovaných dát (cluster-correlated data). Zhluky môžu byť výsledkom prirodzenej hierarchickej štruktúry populácie, alebo sú výsledkom dizajnu štúdie, prípadne sa pri vytváraní zhlukov v dátach aplikujú obidva aspekty.

Longitudinálne údaje majú v porovnaní s prierezovými údajmi, alebo s údajmi časových radov niekoľko výhod. Umožňujú presnejšie odhady parametrov modelu a to z dôvodu väčšieho počtu pozorovaní. Modely využívajúce panelové dáta umožňujú kontrolovať vplyv vynechaných, resp. nepozorovaných premenných, ktoré sa nemenia ani v čase ani v rámci prierezových dát (Hsiao, 2005).

Za hlavné nevýhody modelov, ktoré sú založené na longitudinálnych údajoch, možno považovať predovšetkým problémy, ktoré sú spojené so zberom údajov. Tie sú dané samotnou charakteristikou panelu zisťovania a hlavne podmienkou, aby sa počas celého obdobia zisťovania nemenil súbor štatistických jednotiek. Ďalším dôležitým predpokladom longitudinálneho výskumu je aj vytvorenie stabilného výskumného tímu, ktorý musí ostať zachovaný počas celej doby výskumu (Bijleveld, 1998).

2 Metódy

2.1 Metódy analýzy longitudinálních údajov

Pre analýzu longitudinálnych údajov (údajov so zhlukovou štruktúrou) existuje niekoľko rôznych analytických metód. Opakované merania možno analyzovať pomocou analýzy rozptylu. Jej použitie však naráža na množstvo obmedzujúcich podmienok (Ballinger, 2004).

Pri modelovaní hodnôt závislej premennej na základe longitudinálnych údajov treba brať do úvahy skutočnosť, že výsledky opakovaných meraní na tom istom objekte majú tendenciu byť skorelované (Zeger, Liang, Albert, 1988).

Pri modelovaní sa využívajú dva rozdielne prístupy: objektovo-špecifický (subject-specific) a populačne spriemerovaný prístup (population-averaged) (Zeger, Liang, Albert, 1988). Objektovo-špecifický prístup používa model s náhodnými efektami a modely zmiešaných efektov (mixed-effect models) (Crowder, 1995). Model zmiešaných efektov zachytáva závislosti medzi pozorovaniami, ktoré boli získané na tej istej jednotke. Populačne spriemerovaný prístup využíva GEE metóda (The generalized estimating equation) (Crowder, 1995). GEE metóda poskytuje priemerné hodnoty odhadov parametrov pre celú populáciu (Crowder, 1995, Zorn, 2001).

GEE metóda (GEE prístup) bola vyvinutá a opísaná autormi Liang a Zeger (Liang, Zeger, 1986), (Zeger, Liang, 1986). Jej využitie súviselo s testovaním vplyvu faktorov (nezávislých premenných) na premenné s rozdelením pravdepodobnosti patriacim do množiny rozdelení exponenciálneho typu (Ballinger, 2004). GEE modelovanie je rozšírením zovšeobecneného lineárneho modelu (Nelder, Wedderburn, 1972) a to o

zahrnutie korelácií medzi hodnotami závislej premennej. Na základe tohto prístupu bol vyvinutý marginálny model, resp. model populačného priemeru.

V článku najskôr veľmi zjednodušene predstavíme model logistickej regresie pre dáta, v ktorých predpokladáme nezávislosť pozorovaní. V ďalšej časti zavedieme jeho tvar pre prípad longitudinálnych údajov.

2.1.1   Zovšeobecnený lineárny model GLZ (Generalized Linear Model)

Model logistickej regresie je špeciálnym prípadom zovšeobecneného lineárneho modelu (Generalized Linear Model). Ten možno použiť v prípade, ak má vysvetľovaná premenná aj iné ako normálne rozdelenie pravdepodobnosti, napr. binomické, Poissonovo, exponenciálne, gama rozdelenie.

Zovšeobecnený lineárny model sa skladá z troch častí: z náhodnej zložky, identifikujúcej rozdelenie pravdepodobnosti závislej premennej, zo systematickej zložky, ktorá špecifikuje lineárnu funkciu vysvetľujúcich premenných a z väzbovej funkcie, ktorá opisuje funkčný vzťah medzi náhodnou zložkou a systematickou zložkou.

Náhodná zložka zovšeobecneného lineárneho modelu je tvorená vektorom nezávislých náhodných premenných $\mathbf{Y} = (Y_1, Y_2, \ldots Y_n)$. Každá nezávislá premenná Y_i, $i = 1, 2, \ldots n$, má rozdelenie pravdepodobnosti zo skupiny rozdelení exponenciálneho typu.

Systematickou zložkou je vektor $\boldsymbol{\eta} = (\eta_1, \eta_2, \ldots \eta_n)^T$, ktorý môžeme vyjadriť takto:

$$\boldsymbol{\eta} = \mathbf{X}\boldsymbol{\beta} \tag{1}$$

kde $\mathbf{X}$ je matica typu $n \times (p+1)$ obsahujúca pozorované hodnoty vysvetľujúcich premenných X_1, $X_2, \ldots X_p$ na objektoch $O_1, O_2, \ldots O_n$, pričom prvý stĺpec matice obsahuje iba jednotky a $\boldsymbol{\beta}$ je $(p+1)$-prvkový vektor neznámych parametrov modelu $\boldsymbol{\beta} = (\beta_0, \beta_1, \ldots \beta_k)^T$. Vektor $\boldsymbol{\eta}$ sa nazýva lineárny prediktor.

Väzbová, resp. spojovacia funkcia, spájajúca náhodnú a systematickú zložku modelu, je poslednou časťou GLZ. Väzbovou funkciou je funkcia g podmienenej strednej hodnoty vysvetľovanej náhodnej premennej $E(y_i) = \mu_i = E(Y|\mathbf{x}_i)$, ktorá vyhovuje nasledujúcej požiadavke

$$g(E(y_i)) = g(\mu_i) = \boldsymbol{\eta}_i = \mathbf{x}_i \boldsymbol{\beta}, \, i = 1, 2, \ldots n \tag{2}$$

kde $\mathbf{x}_i$ je vektor hodnôt vysvetľujúcich premenných zodpovedajúcich objektu O_i. Použitím väzbovej funkcie logit dostávame model logistickej regresie

$$g(\mu_i) = \ln \frac{\mu_i}{1 - \mu_i} = \mathbf{x}_i \boldsymbol{\beta} \tag{3}$$

2.1.2   Rozšírenie zovšeobecneného lineárneho modelu pre longitudinálne dáta

V ďalšom budeme predpokladať, že merania hodnôt nezávislých premenných X_1, $X_2, \ldots X_p$ [1] a hodnôt závislej premennej Y boli opakované t_i krát, $1 \le t_i \le t$.

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[1] Vstupné premenné môžu byť časovo nezávislé (napr. pohlavie), alebo ich hodnoty sa môžu meniť s časom (napr. príjem, počet členov domácnosti).

Výsledkom sú pozorovania $\left(y_{ij}, \mathbf{x}_{ij} \right)$ pre objekty $i = 1, 2, ... n$ a obdobia t_{ij}, $j = 1, 2, ... t_i$ [2], kde y_{ij} je hodnota závislej premennej meraná na i-tom objekte v čase j a $\mathbf{x}_{ij} = \left(\mathbf{x}_{ij1}, \mathbf{x}_{ij2} ... \mathbf{x}_{ijp} \right)^T$ je $(p \times 1)$- rozmerný vektor hodnôt vysvetľujúcich premenných pre objekt i v čase j. Na každom objekte O_i je teda uskutočnených t_i meraní. Nech $\mathbf{y}_i$ je $(t_i \times 1)$-rozmerný vektor $\left(y_{i1}, y_{i2}, ... y_{it_i} \right)^T$ a $\mathbf{x}_i$ je $(t_i \times p)$-rozmerná matica $\mathbf{x} = \left(\mathbf{x}_{i1}, \mathbf{x}_{i2} ... \mathbf{x}_{it_i} \right)^T$, opisujúca hodnoty nezávislých premenných pre i-ty objekt.

Nech je i-ty objekt opísaný vektorom hodnôt závislej premennej $\mathbf{y_i} = \left(y_{i1}, y_{i2}, ... y_{it_i} \right)^T$ a prislúchajúcim vektorom stredných hodnôt $\boldsymbol{\mu_i} = \left(\mu_{i1}, \mu_{i2}, ... \mu_{it_i} \right)^T$, kde μ_{ij} je stredná hodnota závislej premennej Y_i v čase j. Premenné Y_i sú nezávislé medzi jednotlivými prípadmi a skorelované medzi jednotlivými obdobiami (vnútri objektu). GLM model pre longitudinálne dáta sa líši od modelu pre merania, medzi ktorými nie je korelácia len tým, že sa musí navyše odhadovať kovariančná (resp. korelačná) štruktúra skorelovaných meraní. Marginálny model špecifikujúci vzťah medzi funkciou strednej hodnoty μ_{ij} a vektorom hodnôt vysvetľujúcich premenných $\mathbf{x}_{ij}$ má tvar (Allison, 2009; 2012)

$$g\left(\mu_{ij} \right) = \mathbf{x}_{ij}^T \boldsymbol{\beta} \tag{4}$$

kde g je známa väzbová funkcia (v prípade alternatívnej závislej premennej je to funkcia logit) a $\boldsymbol{\beta}$ je $(p \times 1)$- rozmerný vektor hodnôt neznámych parametrov modelu.

3 Rozbor problému

Na Slovensku, podobne ako v ďalších krajinách Európskej únie, sa vykonáva každý rok štatistické zisťovanie EU SILC, ktoré je zamerané na príjmy a životné podmienky domácností. Zisťovanie v sebe zahŕňa okrem prierezovej zložky aj longitudinálnu zložku. V praktickej časti článku je využitá práve longitudinálna zložka tohto zisťovania na identifikáciu faktorov, ktoré štatisticky významne vplývajú na výskyt materiálnej deprivácie v domácnostiach Slovenska.

Za materiálne deprivovanú domácnosť sa v Európskej únii považuje domácnosť, ktorá čelí vynútenému nedostatku aspoň v troch z deviatich nasledovných deprivačných položiek, ktoré si nemôže finančne dovoliť: čeliť neočakávaným výdavkom, ísť raz za rok na 1 týždeň dovolenky mimo domov, uhrádzať nedoplatky spojené s hypotékou alebo nájomným, úhradou za energie alebo splácaním nákupov na splátky a iných pôžičiek, jesť jedlo s mäsom, kurčaťom alebo rybou každý druhý deň, udržiavať primerané teplo v byte, alebo si nemôže finančne dovoliť, aj keby chcela (ide o tzv. vynútený nedostatok): práčku, farebný televízor, telefón alebo automobil.

Pri analýze sme použili databázu individuálnych údajov zisťovania EU SILC (UDB verzia 23/09/2016), ktorú nám pre potreby výskumných analýz poskytol Štatistický úrad Slovenskej republiky. Z longitudinálnej zložky tejto databázy sme použili údaje

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[2] Ak je počet meraní pre všetky objekty rovnaký a vzdialenosti medzi jednotlivými časovými obdobiami sú rovnaké, potom t je celkový počet období, v ktorých bolo uskutočnené meranie.

o domácnostiach, ktoré boli opakovane sledované a opytované v rokoch 2012, 2013, 2014 a 2015.

EU SILC sa v rámci Slovenska realizuje ako integrovaná („rotačná") forma zisťovania so štyrmi čiastkovými súbormi (Obr. 1). Na začiatku (rok 2012) bola vybraná reprezentatívna vzorka domácností a tá sa rozdelila na štyri podsúbory (replikácie 1, 2, 3, 4). Každý z nich reprezentuje celý základný súbor a to tak, že štruktúra každého z týchto podsúborov je podobná štruktúre základného súboru. V nasledujúcich rokoch zisťovania (roky 2013, 2014 a 2015) sa vždy jeden z podsúborov nahradil novým podsúborom. Na obrázku (Obr. 1) sú nové podsúbory zobrazené ako svetlo vyfarbené bunky. Čísla v jednotlivých bunkách určujú, koľký krát je daný podsúbor súčasťou výberovej vzorky. Podsúbor (replikácia 4), na ktorom bolo robené zisťovanie vo všetkých štyroch rokoch je označený na obrázku oválnym obdĺžnikom.

Obr. 1: Rotačný dizajn EU SILC

Replikácia vzorky	2012	2013	2014	2015
1	1			
2	1	2		
3	1	2	3	
4	1	2	3	4
5		1	2	3
6			1	2
7				1

Zdroj:EU statistics on income and living conditions (EU-SILC) methodology – sampling, Gerbery (2011), upravené autormi

Dátový súbor, ktorý sme následne analyzovali, obsahoval 1 234 domácností, čo predstavuje 4 936 pozorov aní za štyri sledované roky.

Na identifikáciu faktorov ovplyvňujúcich stav materiálnej deprivácie domácností sme využili model logistickej regresie. Ako vstupné premenné boli v tomto modeli použité hlavne premenné, ktoré opisujú vlastnosti domácnosti[3]: pod hranicou rizika chudoby[4] (CHUDOBA – ARPT60i), stupeň urbanizácie[5] (URBAN – DB100), región (REGION – DB040)[6], typ domácnosti (TYP_DOM – HT) a vlastnícky status (VLASTN – HH021)[7]. K osobe stojacej na čele domácnosti sa vzťahovala iba jedna vstupná premenná pohlavie[8] (POHLAVIE – RB090). Pôvodné hodnoty premenných región, typ domácnosti a vlastnícky status boli pred samotnou analýzou upravené zlúčením a prekódovaním kategórií. Upravené hodnoty premennej typ domácnosti sú v Tab. 1.

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[3] V zátvorke sú uvedené pracovné skratky premenných, ktoré boli využité pri práci so softvérom a za pomlčkou je označenie premenných prebraté z použitej databázy.

[4] U binárnej premennej pod hranicou rizika chudoby označovala hodnota 1 stav, keď je domácnosť ohrozená rizikom finančnej chudoby.

[5] Premenná stupeň urbanizácie nadobúdala hodnotu 1,ak domácnosť žila na území s hustým osídlením, hodnotu 2 pre územia s mierne hustým osídlením a hodnotu 3 pre územia s riedkym osídlením.

[6] Pri premennej región bolo použité takéto kódovanie: Východné Slovensko (1) , Stredné Slovensko (2) a Bratislavský kraj a Západné Slovensko (3).

[7] Premenná vlastnícky status má v tejto analýze takéto kategórie: ubytovanie poskytované bezplatne (1), nájomník/ podnájomník platiaci bežné nájomné alebo nájomné za trhovú cenu a ubytovanie prenajímané za zníženú cenu (2), majiteľ a vlastník platiaci hypotéku (3).

[8] Binárna premenná *pohlavie* nadobúda hodnotu 1, ak stojí na čele domácnosti muž a hodnotu 0, ak je na čele domácnosti žena.

Tab. 1: Kódovanie zlúčených kategórií premennej typ domácností

Typ domácnosti	kódovanie
domácnosť 2 dospelých bez závislých detí - obaja vo veku pod 65 rokov, domácnosť 2 dospelých bez závislých detí - aspoň jeden dospelý vo veku 65 rokov a viac	1
ostatné domácnosti bez závislých detí, ostatné domácnosti so závislými deťmi	2
domácnosť s 1 rodičom a s 1 alebo viac závislými deťmi, domácnosť 2 dospelých s 3 alebo viac závislými deťmi	3
domácnosť 2 dospelých s 1 závislým dieťaťom, domácnosť 2 dospelých s 2 závislými deťmi	4
jednočlenná domácnosť	5

Zdroj: EU SILC – verzia 26/09/2016,vlastné spracovanie

Do analýz boli zahrnuté aj premenné obdobie (OBDOBIE – RB010) a identifikačné číslo domácnosti (ID – RB0303). Modelovanou premennou bola premenná materiálna deprivácia (MD), ktorá nadobúdala dve obmeny: MD = 1, ak bola domácnosť materiálne deprivovaná, MD = 0, ak domácnosť nebola materiálne deprivovaná.

Odhady hodnôt parametrov modelu logistickej regresie sme uskutočnili v programe SAS Base pomocou procedúry GENMOD. Uvedená procedúra vyžaduje definovanie pracovnej korelačnej matice obsahujúcej hodnoty koeficientov korelácie medzi hodnotami premennej *materiálna deprivácia*, ktoré boli zistené v rôznych rokoch. GEE metódou boli odhadnuté dva modely. V jednom bola použitá autoregresná a v druhom neštruktúrovaná korelačná pracovná matica. Prvky týchto matíc vyjadrujú silu vzťahu medzi hodnotami premennej materiálna deprivácia v jednotlivých rokoch zisťovania (Tab. 2).

Tab. 2: Výstup procedúry GENMOD – neštruktúrovaná pracovná korelačná matica (UN), autoregresná pracovná korelačná matica (AR)

Working Correlation Matrix (UN)					Working Correlation Matrix (AR)				
obdobie	2012	2013	2014	2015	obdobie	2012	2013	2014	2015
2012	1	0,5697	0,5533	0,4479	2012	1	0,6189	0,3831	0,2371
2013	0,5697	1	0,6446	0,5429	2013	0,6189	1	0,6189	0,3831
2014	0,5529	0,6446	1	0,6707	2014	0,3831	0,6189	1	0,6189
2015	0,4479	0,5433	0,6707	1	2015	0,2371	0,3831	0,6189	1

Zdroj: EU SILC – verzia 26/09/2016, SAS Base,vlastné spracovanie

Hodnoty odhadnutých parametrov modelu obsahuje Tab. 3.

Tab. 3: Výstup procedúry GENMOD pre dva typy pracovnej matice (TYPE = UN), (TYPE = AR)

Parameter		Neštruktúrovaná matica (TYPE = UN)					Autoregresná matica (TYPE = AR)				
		Est	Standard Error	Z	Pr > |Z|	OR	Est	Standard Error	Z	Pr > |Z|	OR
Intercept		-0,3116	0,1981	-1,57	0,1158	0,73	-0,1834	0,1991	-0,92	0,3568	0,83
REGION	1	0,2734	0,1313	2,08	0,0373	1,31	0,2626	0,1319	1,99	0,0465	1,30
REGION	2	0,4052	0,1317	3,08	0,0021	1,50	0,3921	0,1326	2,96	0,0031	1,48
REGION	3	0,0000	0,0000	.	.	1,00	0,0000	0,0000	.	.	1,00
TYP_DOM	1	-0,5949	0,1415	-4,20	0,0001	0,55	-0,5744	0,1459	-3,94	0,0001	0,56
TYP_DOM	2	-1,0001	0,1428	-7,01	0,0001	0,38	-1,0393	0,1446	-7,19	0,0001	0,35
TYP_DOM	3	-0,5475	0,1887	-2,90	0,0037	0,58	-0,5692	0,1926	-2,96	0,0031	0,57
TYP_DOM	4	-1,1732	0,1627	-7,21	0,0001	0,31	-1,2187	0,1665	-7,32	0,0001	0,30
TYP_DOM	5	0,0000	0,0000	.	.	1,00	0,0000	0,0000	.	.	1,00
VLASTN	1	0,4527	0,1755	2,58	0,0099	1,57	0,4641	0,1788	2,59	0,0095	1,59
VLASTN	2	0,2647	0,2662	0,99	0,3199	1,30	0,3292	0,2925	1,13	0,2604	1,39
VLASTN	3	0,0000	0,0000	.	.	1,00	0,0000	0,0000	.	.	1,00
CHUDOBA	0	-0,6095	0,1250	-4,88	0,0001	0,54	-0,7264	0,1244	-5,84	0,0001	0,48
CHUDOBA	1	0,0000	0,0000	.	.	1,00	0,0000	0,0000	.	.	1,00
POHLAVIE	0	0,8306	0,1192	6,97	0,0001	2,29	0,8140	0,1201	6,78	0,0001	2,26
POHLAVIE	1	0,0000	0,0000	.	.	1,00	0,0000	0,0000	.	.	1,00
URBAN	1	-0,5190	0,1588	-3,27	0,0011	0,60	-0,5119	0,1605	-3,19	0,0014	0,60
URBAN	2	-0,1726	0,1212	-1,42	0,1543	0,84	-0,1682	0,1205	-1,40	0,1626	0,85
URBAN	3	0,0000	0,0000	.	.	1,00	0,0000	0,0000	.	.	1,00
OBDOBIE	1	0,3890	0,0699	5,56	0,0001	1,48	0,3862	0,0705	5,47	0,0001	1,47
OBDOBIE	2	0,2853	0,0629	4,53	0,0001	1,33	0,2815	0,0634	4,44	0,0001	1,33
OBDOBIE	3	0,2052	0,0537	3,83	0,0001	1,23	0,2036	0,0541	3,76	0,0002	1,23
OBDOBIE	4	0,0000	0,0000	.	.	1,00	0,0000	0,0000	.	.	1,00

Zdroj: EU SILC – verzia 26/09/2016, SAS Base, vlastné spracovanie

V tabuľke (Tab. 3) sú okrem hodnôt bodových odhadov (Est), hodnoty štandardných chýb odhadu týchto parametrov (Standard Error), hodnota testovacej štatistiky (Z) a p-hodnota (Pr > |Z|) testu štatistickej významnosti parametrov.

Pri interpretácii hodnôt odhadnutých parametrov sa v prípade modelu logistickej regresie využívajú pomery šancí (Odds Ratio). Tie vyjadrujú aký je pomer šance domácnosti byť deprivovanou, ak je zaradená podľa niektorej sledovanej vlastnosti (napríklad typ domácnosti) do príslušnej kategórie v porovnaní so šancou byť deprivovanou, ak by bola na základe tejto vlastnosti zaradená do tzv. referenčnej kategórie tejto premennej[9]. Ak zoberieme do úvahy výsledky modelu, ktorý bol vytvorený použitím autoregresnej pracovnej korelačnej matice, potom môžeme konštatovať, že najväčšie rozdiely sú medzi kategóriou jednočlenných domácností (referenčná kategória) a ostatnými kategóriami, do ktorých boli jednotlivé domácnosti zaradené na základe ich zloženia (Tab.1). Šanca domácností dvoch dospelých s jedným alebo dvoma závislými deťmi je 3,33-krát vyššia (1/0,30) a v skupine

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[9] Referenčnou kategóriou bola kategória, ktorej číselné kódovanie malo najvyššiu hodnotu. Predpokladáme pritom, že hodnoty ostatných premenných sú u porovnávaných skupín domácností rovnaké.

domácností dvoch dospelých bez závislých detí je 1,79-krát vyššia (1/0,56) ako šanca materiálnej deprivácie u jednočlenných domácností. Ostatné domácnosti bez ohľadu na to, či v nich žijú nezaopatrené deti majú šancu byť materiálne deprivovanými, ktorá je na úrovni 0,35 takejto šance vyčíslenej pre jednočlenné domácnosti.

Pozornosť si zaslúži porovnanie šancí materiálnej deprivácie domácností, ktorých rôzny sociálny status sa prejavuje aj cez ich podmienky alebo možnosti bývania. Domácnosti, ktorým je ubytovanie poskytované bezplatne majú šancu byť materiálne deprivovanými 1,59-krát vyššiu ako domácnosti, ktoré vlastnia nehnuteľnosť určenú na bývanie (referenčná kategória). Skupina domácností, ktoré žijú v podnájme zahŕňa aj nájomníkov žijúcich v sociálnych bytoch, ktorým je poskytované bývanie za znížený nájom. Šanca domácností žijúcich v podnájme, že budú materiálne deprivované, je 1,39-krát vyššia ako u vlastníkov bývania.

Miery materiálnej deprivácie by mali byť komplementárne ku mieram chudoby. Príjmová chudoba a materiálna deprivácia sú totiž dva koncepty, ktorých spojením možno analyzovať životné podmienky domácností z rôznych aspektov. Ak totiž vnímame chudobu ako stav deprivácie, potom meranie chudoby možno považovať za meranie deprivácie. Vzťah medzi obidvoma fenoménmi možno identifikovať aj na základe parametra, ktorý kvantifikuje rozdiely medzi rodinami, ktoré sú ohrozené rizikom príjmovej chudoby a tými, ktoré ohrozenými nie sú vzhľadom na ich stav materiálnej deprivácie. Domácnosti, ktoré sú ohrozené rizikom chudoby majú približne 2-krát (1/0,48) vyššiu šancu, že budú materiálne deprivované, ako domácnosti, ktoré nie sú rizikom chudoby ohrozené.

Štatisticky významný je aj rozdiel medzi šancou domácností, na čele ktorých stojí žena a šancou domácností, na čele ktorých stojí muž. Šanca byť materiálne deprivovanou je u domácností, na čele ktorých stojí žena 2,26-krát vyššia ako u domácností na čele s mužom. Do skupiny domácností, ktoré uvádzajú, že ich prednostom je žena, patria totiž jednočlenné domácnosti a domácnosti osamelo žijúcich matiek s deťmi, ktoré patria z hľadiska výskytu materiálnej deprivácie k najviac ohrozeným.

Vplyv oblasti, v ktorej žijú domácnosti sme sledovali prostredníctvom premenných región a urbanizácia. Až 1,48-krát vyššiu šancu, že budú materiálne deprivované, majú domácnosti Stredného Slovenska a 1,3-krát vyššiu šancu domácnosti Východného Slovenska v porovnaní s domácnosťami žijúcimi v Bratislavskom kraji alebo v regióne Západného Slovenska.

Šanca materiálnej deprivácie u domácností, ktoré žijú v oblastiach s hustým osídlením je približne 1,67-krát vyššia (1/0,60) ako u domácností žijúcich v oblastiach s riedkym osídlením.

Získané výsledky podporujú naše hypotézy o skupinách domácností, najviac ohrozených materiálnou depriváciou, ktoré sme získali predchádzajúcimi analýzami.

4 Diskusia

Výsledky modelu logistickej regresie vytvoreného na longitudinálnych údajoch, ak odhliadneme od možnosti rôzneho kódovania hodnôt vstupných premenných, závisia od spôsobu odhadu parametrov. V našom prípade boli tieto možnosti limitované aj typmi procedúr, ktoré možno použiť na odhad hodnôt parametrov v programe SAS. Ďalšie rozdiely môžu byť spôsobené typom použitej pracovnej korelačnej matice.

V príspevku sú zverejnené výsledky odhadu pre model s využitím neštruktúrovanej matice a model, vytvorený použitím autoregresnej matice. Okrem týchto pracovných korelačných matíc, ktorých definovanie podmieňuje GEE metóda odhadu, možno použiť nezávislú, konvertibilnú alebo Toeplitzova maticu (podrobnosti napr. v Liang, Zeger, 1986). Rozdiely vo výsledkoch odhadov závisia aj od použitej procedúry štatistického programu. V práci bola použitá procedúrou GENMOD programu SAS Base. Okrem nej možno v SASe použiť aj procedúry LOGISTIC a SURVEYLOGISTIC. Pri interpretácii výsledkov modelu sme uprednostnili model, pri odhade ktorého bola použitá autoregresná korelačná štruktúra.

Hodnotenie kvality modelov odhadnutých GEE metódou je založené na iných kritériách ako sú tie, ktoré sa štandardne používajú pri modeloch logistickej regresie, odhadnutých na prierezových údajoch. Pri GEE metóde sa nepoužíva vierohodnostná funkcia, preto nemôžeme na posúdenie kvality modelu použiť Akaikeho informačné kritérium alebo Bayesovské informačné kritérium. Alternatívou k týmto mieram je QIC kritérium (Quasilikelihood under the Independence model Criterion), alebo QICu kritérium. Podrobnosti o spôsobe ich výpočtu a odporúčaniach pre ich použitie uvádzajú napr. Hardin a Hilb (2003). Lepší je model s nižšou hodnotou QIC. Vzhľadom na hodnoty tohto kritéria pre model s autoregresnou korelačnou štruktúrou (QIC = 5 276,65) a model s neštruktúrovanou korelačnou maticou (QIC = 5 295,95) bol ako lepší model, ktorého parametre boli následne interpretované, vybraný model s autoregresnou korelačnou štruktúrou.

Záver

Metodika odhadu parametrov lineárneho regresného modelu, v prípade číselnej spojitej premennej, alebo modelu logistickej regresie, ak je závislá premenná binárna, sa štandardne používa pri práci s prierezovými zložkami databáz. Problémy vznikajú vtedy, ak sa tie isté metódy odhadu používajú aj pri práci s longitudinálnymi údajmi. Ignorovanie toho, že výsledky opakovaných meraní na tom istom objekte majú tendenciu byť skorelované a nezačlenenie tejto skutočnosti do modelu môže viesť k odhadom parametrov, ktoré nie sú, hlavne pri silných závislostiach, dostatočne výdatné. Ambíciou tohto článku bolo poukázať na špecifiká odhadu parametrov modelu logistickej regresie, vytvoreného na základe longitudinálnych údajov.

V článku sme sa venovali technikám, ktoré sa používajú na modelovanie binárnej premennej s využitím longitudinálnych údajov. V praxi sa pri takýchto analýzach používajú dva rozdielne prístupy: objektovo-špecifický, alebo populačne-spriemerovaný prístup. Populačne- spriemerovaný prístup využíva GEE metóda, ktorá poskytuje priemerné hodnoty odhadov parametrov modelu pre celú populáciu. Túto metódu sme použili na testovanie vplyvu faktorov (charakteristík slovenských domácností a osôb stojacich na čele týchto domácností) na premennú materiálna deprivácia. Údaje pochádzali z longitudinálnej zložky databázy EU SILC pre roky 2012 až 2015. Analýza bola urobená v štatistickom programe SAS Base.

Hoci sa zisťovanie EU SILC realizuje na Slovensku už od roku 2005, nie sú k dispozícii analytické štúdie, ktoré by využívali pri modelovaní longitudinálnu zložku tejto databázy. Analýzu tejto databázy poskytuje len práca *Pretrvávajúca chudoba – analýza longitudinálnej databázy EU SILC* (Gerbery, 2011). Tá však využíva len nástroje opisnej štatistiky. Za hlavný prínos tohto článku preto považujeme tak teoretický výklad problematiky, ktorá je v našich podmienkach ešte stále na okraji

záujmu analytikov, ako aj prezentáciu výsledkov získaných praktickou aplikáciou opísaných metód. Model, ktoré sme získali špeciálnou metódou odhadu parametrov modelu logistickej regresie, zohľadňujúc osobitný charakter longitudinálnych údajov, poskytuje zaujímavé výsledky, ktoré umožňujú vytvoriť profil slovenských domácností vzhľadom na pretrvávajúci stav materiálnej deprivácie v rokoch 2012 až 2015.

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IDENTIFIKACE DETERMINANTŮ PŘÍMÝCH ZAHRANIČNÍCH INVESTIC V ČESKÉ REPUBLICE

THE IDENTIFICATION OF FOREIGN DIRECT INVESTMENT´S DETERMINANTS IN THE CZECH REPUBLIC.

Veronika Linhartová, Daniela Vávrová

Abstract: *The issue of foreign direct investment is becoming an increasingly discussed topic in terms of possibilities of influencing their volume and their benefits for the national economy as well. Foreign direct investment can have a numerous impact on the host economy. It can influence the labor market, increase competitiveness, bring new management practices, know-how, innovation or interconnection of national economies. Investments can also have negative impacts on the national economy such as crowding out domestic businesses or inequality of investment inflows into different industries. The aim of the paper is based on empirical studies define the possible factors influencing the inflow of foreign direct investment into the country and identify the specific factors influencing the inflow of foreign direct investment into the Czech Republic. Using multiple regression analysis, the Expenditure on science and research, Gross domestic product, Corporation tax, and the Corruption perception index were identified as significant factors influencing foreign direct investment in the Czech Republic.*

Keywords: *Foreign Direct Investment (FDI), Inflows of FDI, Determinants of FDI, Regression Analysis, Czech Republic.*

JEL Classification: *D73, E2, F21.*

Úvod

Problematika přímých zahraničních investic se stává stále diskutovanějším tématem z hlediska možností ovlivňování jejich objemu i jejich přínosů pro národní ekonomiku.

Přímé zahraniční investice lze definovat jako „*investice do jiné země, které slouží za účelem získání podílu na kmenových akciích a rozhodovacích pravomocích alespoň ve výši 10 %, či podílu, který dává zahraničnímu investorovi rozhodovací pravomoci*" (Liebscher, 2007). Hostitelské země mají o zahraniční investice zájem především kvůli jejich pozitivním dopadům. Odborná literatura uvádí, že nové investice mohou ovlivňovat pracovní trh, zvyšovat konkurenceschopnosti a doplňovat nedostatek domácího kapitálu. Přímé zahraniční investice také mohou přinášet nové manažerské postupy, know-how, inovace či propojení národních ekonomik (Benáček, Víšek, 2000; Liebscher, 2007; Blonigen, Piger, 2014). Investice mohou mít také negativní dopady, mezi které patří vytěsnění domácích podniků nebo nerovnost přílivu investic do různých odvětví (Biswas, 2002; Bevan, Estrin, 2004; Carstensen, Toubal, 2004). Proto je nutné, aby hostitelská země zvážila možné důsledky přílivu přímých zahraničních investic.

Každá země disponuje určitými faktory, které jsou důležitými pro rozhodování investorů. Řadu těchto faktorů může hostitelská ekonomika ovlivnit a podpořit tak zájem ze strany zahraničních investorů. Některé faktory, jako například polohu státu,

naopak hostitelská ekonomika ovlivnit nemůže (Benáček, Víšek, 2000; Valach, 1996). Investoři obecně preferují země, které jsou pro ně z nějakého důvodu atraktivní. Jednotné vymezení faktorů, které jsou pro investory rozhodující, je velmi obtížné. Země, které chtějí podpořit příliv zahraničních investic, mohou používat nástroje pro přilákání investorů, mezi něž patří propagace hostitelské země, investiční pobídky či služby aftercare (Dvořáček, 2005; Viturka, 2000).

V České republice byl zlomový rok 1995, kdy vznikl nový devizový zákon č.219/1995 umožňující směnitelnost české měny a s tím spojený volný pohyb kapitálu. Dalším důležitým milníkem bylo vládní usnesení č. 298 v roce 1998, čímž byla zahájena podpora investování pomocí investičních pobídek. V této době se také změnil přístup vlády, která si kladla za cíl zdokonalit a zpřehlednit legislativní prostředí, zlepšit podporu malých a středních podniků a podpořit výzkum a vývoj. Tyto změny způsobily zvýšení počtu zahraničních partnerů v České republice a významně ovlivnily současný stav v oblasti přímých zahraničních investic.

Cílem příspěvku je na základě dostupné literatury obecně vymezit možné faktory ovlivňující příliv přímých zahraničních investic do země a s využitím statistických metod identifikovat konkrétní faktory mající vliv na příliv přímých zahraničních investic do České republiky.

1 Teoretická východiska řešené problematiky

Odborná literatura věnující se problematice přímých zahraničních investic (dále již jen PZI) vymezuje několik faktorů, podle kterých se zahraniční investoři zpravidla rozhodují.

Faktory na makroekonomické úrovni zahrnují všeobecné faktory, obchodní faktory, národní a lokální faktory, infrastrukturní faktory, pracovní faktory, nákladové faktory, kulturní či environmentální faktory. Mezi všeobecné faktory patří například politická stabilita, kvalita legislativních předpisů, intenzita ekonomického růstu, úroveň úrokových sazeb, otevřenost ekonomiky, daňové zatížení či rizika týkající se inflace, pohybu kurzů, hospodářských cyklů a úrokových měr. Obchodní faktory představují blízkost k zákazníkům, dostupnost zdrojů surovin či přítomnost firem stejného podnikatelského zaměření (Benáček, Víšek, 2000; Valach, 1996; Viturka 2000). Faktory na regionální úrovni a lokální úrovni jsou považovány za velmi důležité pro získávání PZI. Patří mezi ně kvalitní nabídka rozvojových ploch, komerčně využitelných stavebních objektů a atraktivita regionu, města či obce. Regionální marketing poskytuje informace konečným příjemcům o nabídkách lokalit vhodných na podporu ekonomických aktivit či na podporu realizace rozvojových záměrů spolufinancovaných z veřejných prostředků. Důležitý předpoklad pro úspěšné realizace marketingové činnosti je správná marketingová strategie, která vychází ze strategie národního rozvoje. Do regionálních a lokálních faktorů patří rovněž vybavenost oblasti technickou infrastrukturou, kvalita dopravního napojení regionu, velikost sídelního centra či technické a uživatelské charakteristiky budov (Dvořáček, 2005; Viturka, 2000)

Faktory ovlivňujícími zahraniční přílivy kapitálu se zabývala rovněž řada empirických studií. Autoři Bénassy-Quéré, Coupet, Mayer (2007) analyzovali vliv faktorů na PZI v zemích OECD v letech 1985-2000. Zkoumali existenci vlivu různých faktorů na PZI, ale také zda tyto faktory ovlivňují PZI pozitivně či negativně. Jejich

výsledky prokázaly, že mezi faktory, které mají pozitivní vliv na příliv investic v těchto zemích jsou společný jazyk, HDP, produktivita práce, produktivita spotřebitelů či legislativa týkající se právní ochrany investorů. Zajímavé bylo zjištění a vlivu korupce. Prokázali, že země s vysokou mírou korupce mají až 7,9krát větší příliv PZI. Jako negativní faktory, které mají zásadní vliv na odrazování investorů, označili autoři ochranu zaměstnanosti a slabou koncentraci kapitálu. Pod pojmem ochrana zaměstnanosti autoři rozumí pracovně-právní předpisy upravující pracovní dobu a podmínky odměňování pracovníků.

Na výše zmíněné autory navázali Blonigen, Piger (2014), kteří za významný faktor označili společný jazyk a otevřenost obchodu. Jejich výsledky prokázaly, že jazyková spřízněnost ovlivní příliv PZI až v 85 % zkoumaných zemí. Otevřenost obchodu, tedy existence celní unie a dohod o volném obchodu, ovlivňuje PZI až v 90 % případů.

S již zmiňovanou studií autorů Bénassy-Quéré, Coupet a Mayer nesouhlasí autoři Demekas et al. (2007), kteří ve své práci tvrdí, že korupce a daňové prázdniny nemají na PZI žádný vliv. Jejich práce obsahuje data z let 1995-2003 z jednotlivých vybraných zemí včetně České republiky. Předchozí studie obohatili o poznatek, že pokud se zvyšuje úroveň příjmů země, významnost vlivu ostatních faktorů PZI klesá a na důležitosti nabývají činitelé jako domácí trh a podnikatelské prostředí. Na rozdíl od ostatních studií zkoumali i faktor týkající se ochrany životního prostředí, u kterého bylo prokázáno, že příliv PZI také ovlivňuje.

Holland, Pain (1998) věnovali pozornost přílivu PZI do transformujících se ekonomik. Předpokládali, že právě PZI jsou pro tyto státy nezbytné pro „nastartování" jejich ekonomiky. Do studie zahrnuli 8 států včetně České republiky. Výsledky studie prokázaly, že možnost realizace privatizace, blízkost k západním a rozvinutějším státům a rozvíjející se obchodní vazby mezi státy mají na růst ekonomik významný vliv. Dalším zjištěním byla nezávislost investic na mzdových nákladech a schopnostech pracovníků. Autoři tvrdí, že mají jen okrajovou roli při konečném rozhodování investora. Za nejvíce důležité faktory byly označeny geografická blízkost, obchodní dohody a zahájení jednání o vstup do Evropské unie.

Carstensen, Toubal (2004) zkoumali determinanty PZI v zemích střední a východní Evropy. V posledních letech došlo právě na tomto území k velkému nárůstu investic především v zemích střední Evropy (Česká republika, Maďarsko, Polsko, Slovenská republika), zatímco východoevropské země (Bulharsko, Rumunsko) zaostávaly. Klasické faktory, které jsou zmíněné v předchozích studiích, doplnili o tržní potenciál, firemní náklady, podnikatelské prostředí, investiční pobídky, daňové sazby z příjmů právnických osob. V rámci své analýzy autoři studie rozdělili časové řady na krátkodobé a dlouhodobé. Výsledkem studie je, že pokud se tržní potenciál hostitelské země zvýší průměrně o 1 %, lze v prvním roce očekávat zvýšení PZI o 166 milionů dolarů. V dlouhodobém horizontu se pak jedná až o 246 milionů dolarů. Dalším faktorem, kterým se autoři zabývali, byly mzdové náklady. Pokles těchto nákladů zvýší příliv PZI v prvním roce o 25 milionů dolarů a v dlouhodobém horizontu až o 37 milionů dolarů. Mezi významné faktory mající vliv na PZI dále označili tržní prostředí, nízké mzdové náklady, daně z příjmů PO a příslušné dotace. Rovněž tak kvalifikovaná pracovní síla má dle autorů zásadní význam pro zavádění inovativních výrobních technologií. Za další determinant PZI je považována daň z příjmu právnických osob, přičemž její snížení o 1 % vyvolá v prvním roce průměrně příliv 2,5

milionů dolarů. Tento faktor podle zmiňovaných autorů tudíž nepatří mezi nejvýznamnější faktory, stejně jako kvalita pracovní síly a inovace technologií.

Autoři Bevan, Estrin (2004) zkoumali determinanty přílivu PZI v letech 1994-2000 ve vybraných hostitelských zemích, opět včetně České republiky. V empirické studii použili jako proměnné HDP, inflaci, kurzová rizika, ukazatele institucionálního rozvoje a rizikovost země pro potenciálního investora hodnocenou bonitou či ratingem. Autoři studie považují za významný faktor pro příliv PZI především HDP hostitelské země. Rovněž potvrdili negativní vztah mezi PZI a mzdovými náklady, příliv investic jde tudíž do oblastí s nižšími náklady na jednotku pracovní síly. Tržní riziko bylo poměrně překvapujícím výsledkem provedené analýzy, jelikož bylo prokázáno, že PZI toky nejsou tímto faktorem ovlivněny. Studie se rovněž zabývala vlivem vstupu do Evropské unie na PZI, přičemž autoři došli k závěru, že příliv investic zvýší i pouhé oznámení Evropské unie o přistoupení určité země.

Biswas (2002) označil za jeden z nejdůležitějších faktorů dodržování vlastnických práv v zemi. To je pro investory velmi důležité, jelikož raději investují v prostředí, které zaručuje větší jistotu, že jejich kapitál zůstane zachován. Za důležitý faktor označuje rovněž demokracií, která zmíněná individuální vlastnická práva chrání. Umožňuje rovněž efektivní přenos informací o vládní politice, což investoři vítají.

V oblasti identifikace determinantů přílivu PZI do hostitelské ekonomiky jsou v hodnocení zmiňovaných autorů patrné rozdíly, které mohou být způsobeny značnou diferencí zkoumaného vzorku zemí, rozdílnou metodikou zkoumání i zkoumaným časovým obdobím.

2   Metody

Pro naplnění cíle příspěvku je využita metoda vícenásobné regresní analýzy, díky které je možné posoudit vliv vybraných determinantů na příliv PZI do České republiky. Lze rovněž určit vzájemnou závislost či nezávislost zvolených faktorů.

V rámci analýzy jsou využity odhady parametrů metody nejmenších čtverců (OLS). Vícenásobná regresní analýza hledá hodnoty závislé proměnné z lineární kombinace hodnot dvou a více nezávislých proměnných. Vzorec lze vyjádřit následujícím způsobem:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \tag{1}$$

kde jsou:

Y – závislá proměnná,

β_0 – konstanta,

β_1, β_2, β_3 – regresní koeficienty,

X_1, X_2, X_3 – hodnoty nezávislé proměnné.

Pomocí vícenásobné regresní analýzy lze vysvětlit rozptyl závislé proměnné Y, zjistit vliv každé nezávislé proměnné X na závislou proměnnou Y a predikovat hodnoty pro jednotlivé případy (Hebák et al., 2005)

Aby bylo možné vícenásobnou regresní analýzu interpretovat, musí data splňovat řadu předpokladů, které zajistí nezkreslené výsledky regresní analýzy. Mezi tyto předpoklady patří normální rozdělení proměnných, výskyt homoskedasticity, nepřítomnost multikolinearity, proměnné musí být metrické a data nesmějí být odlehlé

hodnoty (Víšek, 1998). Veškeré předpoklady vícenásobné regrese byly pro potřeby provedení analýzy ověřeny.

Veškeré modelování a testování proměnných je uskutečněno pomocí softwaru Gretl, testování bylo prováděno s 5% hladinou významnosti.

3 Analýza determinantů přílivu přímých zahraničních investic do ČR

Konkrétní lokalizační faktory byly pro potřeby regresní analýzy zvoleny na základě odborné literatury a zahraničních empirických studií zmiňovaných ve druhé kapitole příspěvku. Soubor testovaných proměnných je dostupný v časové řadě let 1998 – 2015. Toto období bylo vybráno z důvodu jiné metodiky evidence přímých zahraničních investic před rokem 1998, což by mohlo vést ke zkresleným výsledkům.

Za konkrétní lokalizační faktory byly zvoleny následující proměnné:

Příliv PZI = f (obecná míra nezaměstnanosti, HDP, HDP na obyvatele, minimální mzda, Index vnímání korupce, sazba daně z příjmů právnických osob, rating, nominální kurz CZE/EUR, výdaje na vědu a výzkum, Index ekonomické svobody, investiční pobídky).

Vícenásobný regresní model pro identifikaci determinantů PZI v České republice lze tak podle vzorce (1) vyjádřit ve tvaru:

$$Příliv\ PZI_t = \beta_0 + \beta_1 OMZ_{t-1} + \beta_2 HDP_{t-1} + \beta_3 HDP/o_{t-1} + \beta_4 MZ_{t-1} + \beta_5 CPI_{t-1} + \beta_6 TAXPO_{t-1} + \beta_7 RG_{t-1} + \beta_8 NK_{t-1} + \beta_9 VAV_{t-1} + \beta_{10} IES_{t-1} + \beta_{11} IP_{t-1},$$ (2)

kde jsou:

t	příslušný rok v rozmezí 1 … t,
OMZ	obecná míra nezaměstnanosti,
HDP	hrubý domácí produkt,
HDP/o	hrubý domácí produkt na obyvatele,
MZ	minimální mzda,
CPI	Index vnímání korupce,
TAXPO	daň z příjmů právnických osob,
RG	rating,
NK	nominální kurz CZE/EUR,
VAV	výdaje na vědu a výzkum,
IES	index ekonomické svobody,
IP	investiční pobídky.

U nezávislých proměnných je bráno v úvahu časové zpoždění jednoho roku. Důvodem tohoto zpoždění jsou úvahy řady autorů (Blonigen, Piger, 2014; Carstensen, Toubal, 2004; CzechInvest, 2015; Holland, Pain, 1998) zabývajících se problematikou PZI. Podle těchto autorů reagují investoři na měnící se situaci v hostitelské ekonomice se zpožděním, jelikož čekají na potvrzení nových informací i v dalším období. Jako další důvod jsou označovány rovněž zdlouhavé registrace začínajících podnikatelů.

Před použitím vícenásobné regresní analýzy je nutné ověřit multikolinearitu. Ta vzniká v důsledku vzájemného ovlivňování nezávislých proměnných. Z Tabulky 1 je zřejmé, že tato situace nastává hned u několika proměnných. Z tohoto důvodu bylo nutné některé nezávislé proměnné z vícenásobné regresní analýzy vyloučit. Z testovacího vzorku byly vyloučeny dva faktory na základě největšího počtu multikolinearity s nezávislými faktory. Nejvíce závislostí bylo prokázáno u HDP na osobu, u kterého byla prokázána existence multikolinearity s 6 nezávislými faktory. Další proměnnou, která bude pro následující analýzu vyřazena, je kurz CZE/EUR, jelikož byla prokázána závislost s 5 indikátory.

Tab. 1: Test multikolinearity

OMZ	HDP/o	HDP	MZ	VAV	IP	CPI	TAXPO	NK	IES	RG	
1	-0,28	-0,27	-0,12	-0,24	-0,25	-0,69	0,17	0,20	-0,30	0,23	**OMZ**
	1	*0,99*	*0,96*	*0,92*	*0,99*	0,67	*-0,97*	*-0,93*	0,45	-0,81	**HDP/o**
		1	*0,97*	*0,91*	*0,99*	0,66	*-0,97*	*-0,93*	0,42	-0,80	**HDP**
			1	0,84	*0,96*	0,49	*-0,95*	*-0,93*	0,25	-0,68	**MZ**
				1	*0,93*	0,66	-0,88	-0,77	0,66	*-0,94*	**VAV**
					1	0,63	*-0,98*	*-0,93*	0,47	-0,83	**IP**
						1	-0,55	-0,47	0,45	-0,57	**CPI**
							1	*0,94*	-0,42	0,78	**TAXPO**
								1	-0,24	0,70	**NK**
									1	-0,74	**IES**
										1	**RG**

Zdroj: Vlastní zpracování dat ČNB, ČSÚ, CzechInvest, TI

Po vyloučení zmíněných faktorů, lze regresní model zapsat podle vzorce (1):

Příliv PZIt = β0 + β1OMZt-1 + β2HDPt-1 + β3MZt-1 + β4CPIt-1 + β5TAXPOt-1 + β6RGt-1 + β7VAVt-1 + β8IESt-1+ β9IPt-1 (3)

Dalším krokem je modelování determinantů, které mají vliv na příliv PZI do České republiky pomocí již zmiňované regresní analýzy. Cílem je nalézt takové řešení, které se bude jevit jako nejvhodnější výběr modelu pomocí adjustovaného koeficientu determinace (R_{2adj}), který je považován za srovnávací proměnnou kvalit.

Lepší model je možné rozpoznat podle hodnoty informačních kritérií, přičemž platí, že čím nižší hodnota informačních kritérií, tím lepší model. Pro testování nejlepšího vybraného modelu regresní analýzy byla využita informační kritéria, mezi která patří Schwarzovo informační kritérium (BIC), Akaikovo informační kritérium (AIC) a Hannan-Quinnovo informační kritérium (HIC) (Bill, Němec, Pospiš, 2009).

Pro vícenásobnou regresní analýzu platí následující hypotézy:

H_0: parametry jsou nevýznamné,

H_1: parametry jsou významné.

K zamítnutí nulové hypotézy dojde v případě, že p-hodnota je nižší než alfa (tedy 0,05). Z tohoto důvodu jsou výsledky původního modelu uvedené v Tabulce 2

neuspokojivé a bylo využito přemodelování, které odstranilo faktory s nejvyšší p-hodnotou. V tomto případě byl vyloučen faktor IES, RG, IP, MZ a OMZ.

Výsledný model po úpravách zahrnuje pouze významné proměnné splňující předpoklady pro zamítnutí nulové hypotézy.

Tab. 2: Vícenásobná regresní analýza

	Původní model		Výsledný model	
	Koeficient ß	**p-hodnota**	**Koeficient ß**	**p-hodnota**
Const	906,8620	0,6400	1800,2500	0,0396**
OMZ	-32,5781	0,2525		
HDP	0,6516	0,2512	0,4315	0,0096***
MZ	-0,0652	0,5759		
CPI	-20,7404	0,2214	-15,0402	0,0507*
TAXPO	-30,3660	0,1510	-40,5311	0,0123**
RG	20,1198	0,8210		
VAV	10,6922	0,2110	12,0960	$8,90e^{-5}$***
IES	-1,7700	0,9150		
IP	0,0009	0,8007		
R²	0,9934		0,9947	
R²adj.	0,9902		0,9925	
p-hodnota (F)	0,0008		0,00001	
AIC	213,8221		208,1861	
BIC	222,7258		213,5283	
HIC	215,0498		208,9227	

Zdroj: Vlastní zpracování

Z Tabulky 2 lze sestrojit výslednou funkční formu regresního modelu podle vzorce (1):

Příliv PZI = 1800, 25 + 0, 4315*HDP – 15, 0402*CPI – 40, 5311*TAXPO + 12, 0960*VAV (4)

Jako nejvýznamnější faktor ovlivňující příliv PZI do České republiky byly provedenou vícenásobnou regresní analýzou prokázány výdaje na vědu a výzkum. Analýza prokázala, že pokud výdaje na VaV vzrostou o 1 miliardu Kč, příliv PZI vzroste o 12 miliard Kč.

Další významnou determinantou PZI je v prostředí České republiky HDP. Provedená analýza prokázala, že při zvýšení HDP o 1 miliardu Kč dojde v České republice k přílivu investic v hodnotě 0,4 miliard Kč.

Naopak negativní vliv na příliv PZI má daň z příjmů právnických osob. Zvýšení daně z příjmu PO o 1 % vedlo ve sledovaném období ke snížení přílivu PZI o 40 miliard Kč.

Posledním faktorem, který se jeví jako významný, je Index vnímání korupce. Provedenou analýzou bylo prokázáno, že pokud se Index zvýší o jeden bod (tedy sníží se míra korupce v ČR), bude příliv PZI snížený o 15 miliard Kč. Je nutné zdůraznit, že tento indikátor se z vybraných jeví jako nejméně důležitý.

4 Diskuze

Výsledky o vlivu lokalizačních faktorů na příliv zahraničních investic do České republiky se v řadě závěrů shodují se závěry řady empirických studií zabývajících se touto problematikou.

Jako nevýznamné se ve výsledném regresním modelu jeví obecná míra nezaměstnanosti, minimální mzda, rating, index ekonomické svobody a investiční pobídky. Tyto proměnné byly vyřazeny pro nevýznamnost. Je však nutné brát v úvahu, že tyto výsledky jsou testované jen pro Českou republiku bez srovnání s jinými zeměmi. Vyřazení obecné míry nezaměstnanosti a minimálních mezd může být způsobeno odklonem preferencí investorů, kteří v současné době dávají přednost kvalifikované pracovní síle, čím dál více žádané a oceňované. S nevýznamností mezd ve své práci souhlasí autoři Holland, Pain (1998), kteří tvrdí, že minimální mzda není pro investorské rozhodování vůbec rozhodující. Výsledky nevýznamnosti týkající se ratingu potvrzují závěry studie autorů Bevan, Estrin (2004), kteří zjistili, že investoři preferují podnikatelské prostředí před schopností vlády splácet své dluhy.

Dalším zamítnutým faktorem je index ekonomické svobody. Důvodem pro zamítnutí významnosti této proměnné může být skutečnost, že přibližné 90 % zahraničních investic do České republiky přichází právě z EU, jež se v posledních letech snaží tuto oblast zharmonizovat. Z toho lze vyvodit, že index ekonomické svobody je v členských státech srovnatelný, a proto nepatří mezi významné faktory pro příliv PZI. Z toho lze vyvodit, že právě index ekonomické svobody je v členských státech srovnatelný, a proto nepatří mezi významné pro příliv PZI. Posledním faktorem, který se jeví jako nevýznamný, jsou investiční pobídky. Potvrzují to výsledky studie Demekase et al. (2007) či studie autorů Blonigen, Piger (2014). Výsledek týkající se investičních pobídek v České republice však může být zkreslený z důvodu vysoké multikolinearity na HDP, výdajů na VaV a minimální mzdy.

Jako významné proměnné lze označit faktory HDP, výdaje na VaV, korupce a daň z příjmu PO. Z těchto faktorů se jako nejvýznamnější projevily výdaje na vědu a výzkum. Důvodem tohoto vztahu mezi PZI a výdaji na VaV může být odklon od levné pracovní síly k síle kvalifikované. Pro investory mohou být právě výdaje na VaV důležitou informací při rozhodování o lokalizaci jejich investic. Z výše těchto výdajů mohou investoři předpokládat, že se Česká republika snaží podpořit výzkum moderních výrobních zařízení a technologii. Rovněž Benáček, Víšek (2000) ve své publikaci tvrdí, že pokud chce hostitelská země podpořit příliv PZI, musí podporovat vědu a výzkum, aby svými „objevy" měla konkurenční výhodu před jinými zeměmi. Podle autorů Blonigen, Piger (2014) inovace technologií ovlivňují příliv PZI, ale nepatří k nejpodstatnějším faktorům.

Druhým nejvýznamnějším faktorem se jeví proměnná HDP, což je v souladu se závěry autorů Bevan, Estrin (2004). Provedená analýza prokázala, že při zvýšení HDP o 1 miliardu Kč dle specifikace modelu dojde v prostředí České republiky k přílivu investic v hodnotě 0,4 miliard Kč. Důvodem závislosti a menší částky může být úzká provázanost investic a HDP. Ukazatel HDP obsahuje složku hrubého fixního kapitálu (dále HFK). Právě v této složce jsou zohledněny i investice. HFK znázorňuje, jak domácí i zahraniční firmy rozšiřují své kapacity a tím i růstový potenciál celého hostitelského hospodářství. Vztah mezi HDP a HFK v letech 1998–2007 byl v České republice téměř totožný. Obě veličiny reagují v čase t shodně, v případě HDP s malým zpožděním. Zjištění a výsledky této práce to potvrzují.

Dalším faktorem, u kterého byla prokázána závislost, je daň z příjmů PO. Na rozdíl od předchozích proměnných má tento ukazatel na příliv investic negativní vliv. Provedená regresní analýza prokázala, že pokud se v České republice daň z příjmu PO

zvýší o 1 %, výsledkem bude snížení přílivu PZI o 40 miliard Kč, což je v souladu se závěry studie autorů Carstensen, Toubal (2004).

Posledním faktorem, který se jeví jako významný, je Index vnímání korupce. Tento závěr se shoduje se závěry autorů Bénassy-Quéré, Coupet, Mayer (2007), jejichž výsledky potvrzují, že země s vysokou mírou korupce mají až 7,9krát větší přílivy investic.

5 Závěr

Přímé zahraniční investice, které jsou nedílnou součástí ekonomik naprosté většiny zemí, přináší celou řadu pozitivních dopadů pro hostitelskou ekonomiku. Ne vždy jsou však spojeny jen s pozitivními důsledky pro hostitelskou ekonomiku. Jedním z hlavních negativ přímých zahraničních investic je zejména vytěsňování domácích podniků. Proto je nutné každou investici individuálně zvážit v konkrétních časových i místních podmínkách dané ekonomiky.

Jednotlivé země mají o pozitivní důsledky, které plynou z přílivu investic, prokazatelný zájem. Pro „přilákání" investorů využívají nejrůznější nástroje a lokalizační faktory, kterými přirozeně disponují, jsou jim vlastní. Každá země je díky nim specifická a jedinečná.

V České republice lze za lokalizační faktory, kterými se může působit na potenciální investory, označit příznivou geografickou polohu, členství v EU, NATO, vzdělané obyvatelstvo, nižší náklady na pracovní sílu, atraktivní investiční pobídky a stabilní růst ekonomiky.

Příspěvek si kladl za cíl vymezit determinanty působící na příliv PZI do České republiky. Z výsledků regresního modelu vyplynuly jako významné faktory výdaje na vědu a výzkum, HDP, daň z příjmu právnických osob a Index vnímání korupce. Zatímco výdaje na vědu a výzkum či HDP se jeví jako faktory mající pozitivní vliv na PZI. Daň z příjmu PO a Index vnímání korupce se ve výsledcích jeví jako negativně vymezené.

Zjištěné výsledky neprokázaly vliv investičních pobídek na přiliv PZI do České republiky. To může být způsobeno tím, že investiční pobídky v evropských zemích jsou si velmi podobné. Z tohoto důvodu lze doporučit odklon od financování investičních pobídek k větší podpoře vědy a výzkumu. Naopak se nedoporučuje zavedení progresivní daně či zvýšení současné daně z příjmu PO, které by mohlo vést ke snížení přílivu PZI do České republiky.

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KOMPARACE ZÁJMU O PODNIKOVÉ SOCIÁLNÍ SÍTĚ V LETECH 2014 A 2017

COMPARISON OF INTEREST IN THE ENTERPRISE SOCIAL NETWORKS IN 2014 AND 2017

Jana Moravcová

Abstract: The process of rapid IT development affects the world of business and management. In recent years, businesses have applied new technologies to their management. One of the modern technologies is Enterprise Social Network. The primary aim of the paper is to identify the use of Enterprise Social Network at present and to compare the data with the results of 2014. Secondary research is to find out how many businesses use information systems in internal communication, and then determine if these systems are sufficient. The methodology of the paper is based on a controlled interview with representatives of companies at the University of Pardubice meeting, called Contact. The paper publishes summary information of entrepreneurs about the interest and experience with Enterprise Social Networks, and about the tools used for internal communication. The discussion of the paper addresses the current concerns and wishes of entrepreneurs. The paper seeks to highlight the rapid development of information technologies and the adaptability of entrepreneurs to gain greater competitiveness.

Keywords: Business, Enterprise Social Network, Information Technology, Internal Communication.

JEL Classification: M00, M15, M12.

Úvod

Proces rychlého vývoje informačních technologií ovlivňuje svět podnikání a managementu. Konkurenceschopný podnik by měl v současném turbulentním a globalizujícím prostředí věnovat informačním technologiím a informačním systémům v řízení lidských zdrojů mimořádnou pozornost (Pitra, 2007). Ekonomické subjekty se setkávají s výzvy Průmyslu 4.0 a hledají tak klíčové faktory konkurenceschopnosti a dlouhodobé prosperity. Především střední a velké organizace mají problém se sdílením informací a efektivním využíváním znalostí svých zaměstnanců. Pokud podnik s velkým počtem zaměstnanců využívá ke sdělování informací email, telefon nebo pouze osobní přístup, může se začít celý proces interní komunikace komplikovat. V posledních letech se podnikatelé začínají zajímat o moderní informační software zvaný podniková sociální síť. Pro podnik to může být užitečný nástroj, pokud se nepodcení plán implementace na základě rozvahy, co je jejím cílem. Na současném trhu existuje několik specializovaných technických dodavatelů této sítě. Příspěvek je proto zaměřen na získání reálných zkušeností podnikatelů s podnikovými sociálními sítěmi, jejich znalostmi a dále o využívaných nástrojích interní komunikace.

1   Podnikové sociální sítě

Současné ekonomické a globální podmínky přiměly velké množství podniků ke změně informačních systémů na systémy založené na digitalizaci. Cílem podniků je zvýšení efektivity, snížení nákladů na provoz a schopnost pracovat v reálném čase na různých platformách. Neefektivně řízený podnik nemá v současných složitých a konkurenceschopných světových obchodních skupinách místo (Akrani, 2010). Většina současných výzkumů a studií týkajících se podnikových sociálních sítí se zaměřuje na to, jak mohou podniky zlepšit obchodní výsledky, snížit náklady, zlepšit komunikaci a zvýšit kvalitu produktů (Weber & Monge, 2011). Proto mnoho podniků reorganizuje své hlavní obchodní procesy investováním do následujících klíčových technologií (Oprescu & Eleodor, 2014):

- cloud computing;

- business intelligence;

- sociální média.
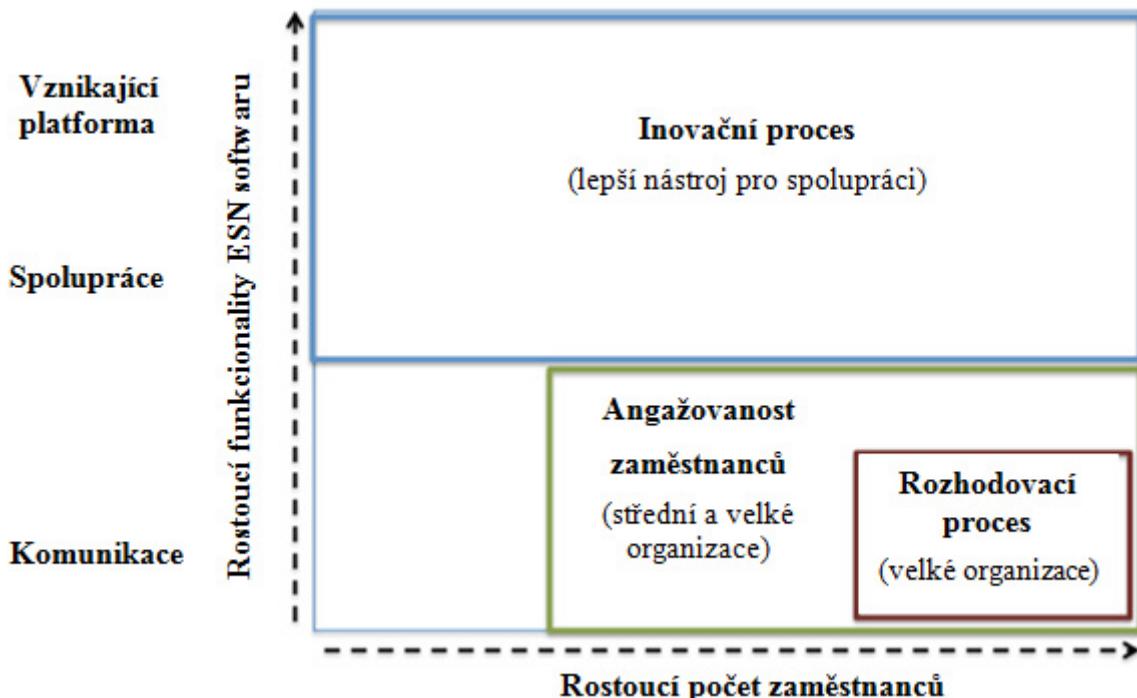
Informační technologie a používané informační systémy se každým rokem zvyšují. Předpokládá se nárůst používaných informačních technologií na 50 miliard v roce 2020 (Duhăneanu & Marin, 2014). Rozvoj technologií a schopnost organizací rozpoznávat trendy, nové obchodní příležitosti, se stávají rozhodujícím faktorem konkurenceschopnosti (Hynek, 2015). Jednou z možných informačních technologií jsou podnikové sociální sítě (Enterprise Social Networks), na základě tohoto systému se uživatelé mohou rychle připojit kdekoli na světě (Kozel, Mynarova & Svobodova, 2011). Nejdříve je třeba vymezit rozdíl mezi online sociální sítí a interní podnikovou sociální sítí. Online sociální síť je webová služba umožňující vytvářet sociální vazby mezi svými registrovanými uživateli (jednotlivci i organizace). Uživatelé mají možnost zakládat veřejné nebo poloveřejné profily v uzavřeném systému, komunikovat spolu, sdílet digitální obsah a další aktivity. Mezi nejznámější online sociální sítě můžeme zařadit Facebook, Twitter, LinkedIn aj. Online sociální sítě jsou využívány především pro marketingové účely. (Assimakopoulos et al., 2017; Copuš & Čarnogurský, 2017; Janouch, 2010; Boyd & Ellison, 2007) Oproti tomu podniková sociální síť je interní sociální software sloužící pouze pro registrované uživatele v daném podniku. Využití podnikové sociální sítě v podniku slouží především pro interní komunikaci a spolupráci mezi zaměstnanci napříč organizační strukturou. (Tomlinson et al., 2010; Kreijns et al., 2007, Roschelle, 2013) Scott a kol. (2016) definují podnikovou sociální síť jako platformu pro pečlivou integraci více typů nástrojů Web 2.0 do jedné soukromé / poloprivátní sítě pro podniky a organizace. Černý definuje podnikovou sociální síť jako součást vnitropodnikové komunikace s cílem spolupráce, sdílení informací, získávání zpětné vazby nebo vzájemné komunikace mezi jednotlivými osobami ve společnosti (Černý, 2016). Podniková sociální síť představuje interní podnikový software a nabízí škálu výhod pro moderní podnikové řízení (Leonardi, Huysman & Steinfield, 2013). Společným rysem tohoto pojmu je v řadě definicí využívání služeb ze standardních externích sociálních sítí, k vytvoření "viditelnosti" a spolupráce v rámci podniku. Autorka tohoto příspěvku definuje podnikové sociální sítě následovně: Podnikové sociální sítě používají interní sociální software, který nabízí další sociální média a platformy pro spolupráci, diskusi, sdílení know-how, znalostí a podnikových dokumentů. Podporuje budování vnitrofiremní kolektivní inteligence a prohlubování sociálních vztahů a soudržnosti

v organizaci. Profily interních sociálních sítí mohou obsahovat pole, která popisují aktuální projekt, technické dovednosti, znalosti a kontaktní informace (Ellison, Gibbs & Weber 2014).

Christidis, Mentzas and Apostolou (2012) na základě svého výzkumu prezentují výhody plynoucí z využívání podnikových sociálních sítí z hlediska podniků i zaměstnanců. Mezi zmíněné výhody patří zvýšená spolupráce mezi zaměstnanci, přenos znalostí a zvýšená viditelnost mezi svými spolupracovníky i směrem k vedení a managementu firmy. Návaznost případové studie Riemer and Scifleet (2012) zkoumá rozvíjející znalosti pracovních postupů na podnikové sociální síti Yammer. Z výsledků plyne, že zmíněná podniková sociální síť, mimo jiné poskytuje prostor pro inovativní nápady a konverzační médium pro budování vztahů. Recker et al. (2016) publikují podobný závěr užitečnosti podnikové sociální sítě na inovační proces. Velké nadnárodní organizace stále častěji využívají aplikace podnikových sociálních sítí, například Yammer, Jive, IBM Connection a další typy podnikových sociálních sítí. Nástroje podnikových sociálních médií, jako jsou tyto, mohou těžit z organizačních procesů, protože poskytují přístup k novým lidem a odborným znalostem (Steinfield, DiMicco, Ellison, & Lampe, 2009) a zvyšují povědomí a kontakt mezi virtuálními zaměstnanci (DiMicco & Millen, 2007). Důraz sociálních médií na konektivitu a sdílení zkušeností, znalostí a osobní identity jsou dokázány také v oboru výuky (Rambe & Nel, 2014).

Podnikové sociální sítě jsou vhodnější pro podniky s vyšším počtem zaměstnanců. Z Obr. 1 je patrné, že s růstem velikosti podniku rostou výhody plynoucí z využívání tohoto softwaru. Podniková sociální síť může sloužit jako nástroj pro efektivnější inovační proces, efektivnější komunikační nástroj a nástroj pro snadnější rozhodování.

Obr. 1: Přínos podnikové sociální sítě pro podniky

Zdroj:Vlastní zpracování, (Srinivasan, 2011)

Manažeři si mohou vybrat z celé řady podnikových sociálních sítí, příkladem Chatter, IBM Connections, Socialcast, Tibbr, Yammer. Odborníci společnosti PCMag

přezkoumali řadu aplikací v rámci podnikových sociálních sítí, vymezili jejich silné a slabé stránky a identifikovali, které podnikové sociální sítě jsou nejlepší pro podnikání, tzv. Business Software Index (pcmag.com, 2017) Je třeba zmínit, že výběr podnikové sociální sítě by měl být podpořen požadavky na jednotlivé funkcionality ze strany managementu a zaměstnanců.

2 Metodika

Primárním cílem příspěvku je komparovat zájem o podnikové sociální sítě z let 2014 a 2017. Sekundárním cílem příspěvku je zjistit používané softwarové systémy a spokojenost s těmito systémy v rámci interní komunikace v podnicích. Metodologie příspěvku je na základě řízeného rozhovoru se zástupci podniků na akci pořádané pod záštitou Univerzity Pardubice zvané Kontakt.

Zkoumaným vzorkem byly podniky zúčastněné na veletrhu Kontakt 2014 a Kontakt 2017 v Pardubicích. Metodika příspěvku je založena na řízeném rozhovoru se zástupci zúčastněných podniků. Poté byla provedena kvalitativní a kvantitativní komparace výsledků z roku 2014 a 2017. V roce 2014 byl uskutečněn řízený rozhovor s 30 zástupci podniků, v roce 2017 s 20 zástupci zúčastněných podniků. Dělní podniků podle právní formy podnikání je v roce 2014 následující: 16 společností s ručením omezeným, 12 akciových společností, 1 veřejná obchodní společnost a 1 státní podnik. Dělení podniků podle právní formy podnikání je v roce 2017 následující: 7 akciových společností a 13 společností s ručením omezeným. Tab. 1 zobrazuje rozdělení zkoumaných podniků podle velikosti, v závislosti na počtu zaměstnanců.

Tab. 1: Dělení zkoumaných podniků podle velikosti, v závislosti na počtu zaměstnanců

Velikost podniku	Zkoumané podniky v roce 2014	Zkoumané podniky v roce 2017
Malý podnik (10-50 zaměstnanců)	0	2
Střední podnik (51-250 zaměstnanců)	5	3
Velký podnik (nad 250 zaměstnanců)	25	15
Celkem zkoumaných podniků	30	20

Zdroj: Vlastní zpracování

Pro ověření zájmu a reálného využívání podnikové sociální sítě byly stanoveny následující výzkumné otázky:

1. výzkumná otázka: Dokáží zástupci podniků správně charakterizovat rozdíl mezi podnikovou sociální sítí a online sociální sítí?

2. výzkumná otázka: Využívají zástupci podniků ve své práci podnikovou sociální síť a mají zájem o další informace k tomuto informačnímu softwaru?

Výsledky z roku 2014 jsou uvedeny v publikovaném časopise European Scientific Journal February 2015 (Školudová, 2015). Z odpovědí respondentů na první výzkumnou otázku vyplývá, že 57 % respondentů nezná rozdíl mezi online sociální sítí a podnikovou sociální sítí. Z výsledků týkající se druhé výzkumné otázky vyplývá, že 30 % respondentů využívá ve své firmě podnikovou sociální síť, 13 % respondentů pouze prvky podnikové sociální sítě a zbývajících 57 % respondentů nevyužívá žádnou podnikovou sociální síť. Mezi zmíněné produkty podnikových sociálních sítí
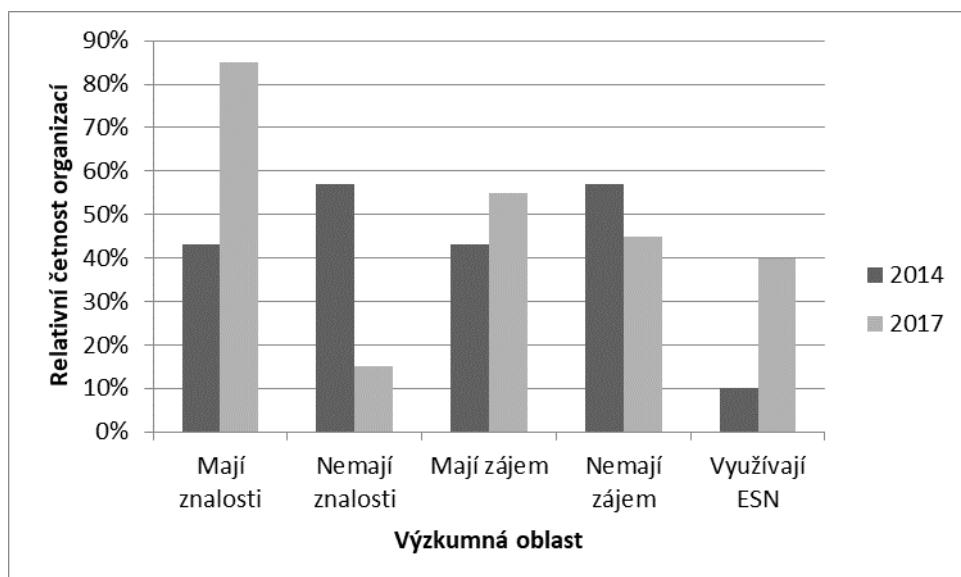
patří Yammer, Chatter, Sharepoint a vlastní ESN. Dále 43 % respondentů vyjadřuje zájem o další informace k podnikovým sociálním sítím.

3 Výsledky primárního a sekundárního výzkumu

Primárním výzkumem bylo zjistit a komparovat zájem o podnikové sociální sítě z let 2014 a 2017. Na základě řízeného rozhovoru se zástupci podniků byly zjištěny informace pro zodpovězení výzkumných otázek. Z odpovědí na první výzkumnou otázku vyplývá, že 85 % respondentů zná rozdíl mezi online a podnikovou sociální sítí. Po zpracování získaných informací týkající se druhé výzkumné oblasti vyplývá, že 40 % respondentů využívá ve svém podniku podnikovou sociální síť. Mezi zmíněné produkty podnikových sociálních sítí patří Yammer, IBM Connection, Jive Software a vlastní systém podnikové sociální sítě. 55 % respondentů vyjadřuje zájem o další informace k podnikovým sociálním sítím.

Obr. 2 znázorňuje komparaci odpovědí z let 2014 a 2017. Z výsledků vyplývá, že během tří let nastal 42% pozitivní rozdíl ve znalostech o rozdílu mezi online sociální sítí a podnikovou sociální sítí. V roce 2014 respondenti neznali rozdíl mezi online sociální sítí a podnikovou sociální sítí z 57 %. V současné době zástupci podniků znají rozdíl mezi online sociální sítí a podnikovou sociální sítí a jsou schopni sdělit další bližší informace. Vzrostl také zájem o další informace k podnikovým sociálním sítím. Respondenti by uvítali školení manažerů i zaměstnanců. Podstatným rozdílem oproti roku 2014 je také nárůst ve využívání podnikových sociální sítí. Nejvyužívanějším produktem podnikové sociální sítě byl software Yammer, vlastněný firmou Microsoft.
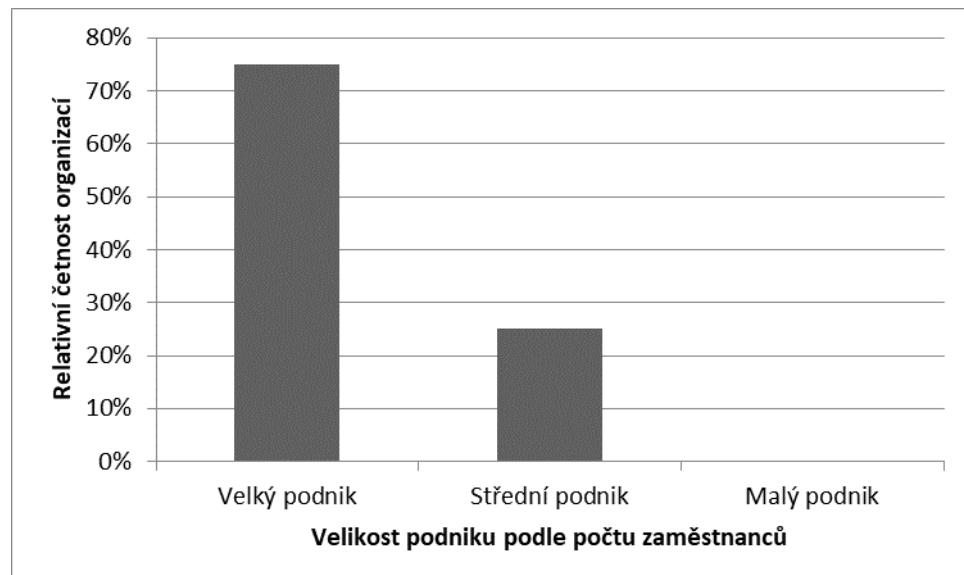
Obr. 2: Komparace odpovědí z let 2014 a 2017

Zdroj: Vlastní zpracování

Obr. 3 zobrazuje rozdíl ve využívání podnikových sociálních sítí podle velikosti podniků z hlediska počtu zaměstnanců. Je patrné, že převážně velké podniky využívají podnikovou sociální síť. Podniky s malým počtem zaměstnanců (do 50 zaměstnanců) tuto podnikovou sociální síť nevyužívá.
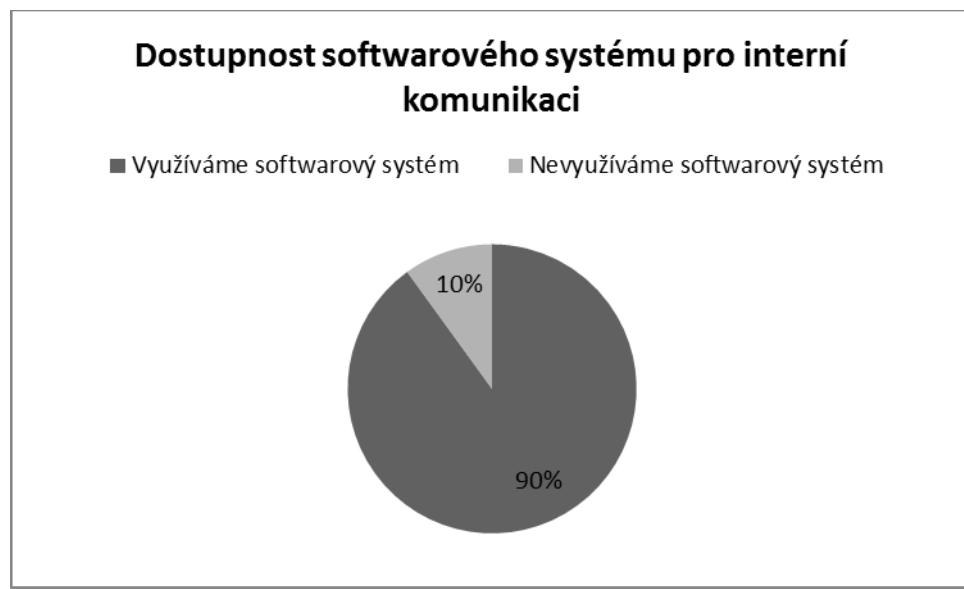
Obr. 3: Podniky využívající podnikovou sociální síť

Sekundárním výzkumem byla problematika interní komunikace. Respondenti odpověděli, že v rámci interní komunikace v organizacích používají jeden či více softwarových systémů. Obr. 4 znázorňuje, že 90 % podniků využívá softwarový systém. Mezi 10 % patřily malé a střední podniky do 60 zaměstnanců.

Obr. 4: Softwarové systémy interní komunikace

Zjišťovány byly problémy, se kterými se podniky v rámci interní komunikace a HR systémů setkávají. Zástupci podniků spatřují ve využívaných softwarových systémech následující nedostatky:

- vyhledávání kontaktní osoby;

- přesycenost rozdílných podnikových systémů;

- potřeba větší spolupráce mezi zaměstnanci;

- potřeba snadnější správy podnikových dokumentů;

- chybí integrace podnikových informací do intranetu;

- potřeba systému ke školení zaměstnanců;

- potřeba systému reportů;

- potřeba postupů pracovních činností;

- chybí rezervace aut přes sofistikovaný systém;

- potřeba „uživatelsky přátelské" podnikové systémy;

- grafických design podnikových systémů;

- nechuť zaměstnanců učit se novým systémům;

- potřeba integrovaného řešení do jednoho systému.

Pro implementaci efektivního podnikového systému, který přispěje ke zlepšení interní komunikace a zlepšení komunikace s HR oddělením, bude třeba zvážit požadavky podniků lišící se podle odvětví. Požadavky budou jistě rozdílné pro podniky poskytující IT služby a například pro podniky v oboru zemědělské výroby.

4 Diskuze

Technický pokrok umožňuje v této digitální době každý měsíc veřejnosti i podnikům představovat nové technologie. Podniky se snaží reflektovat tento nárůst informačních technologií a přizpůsobovat se těmto změnám. V současné době podniky řeší digitální technologie v rámci Průmyslu 4.0. Pokud chce podnik zůstat na trhu a být konkurenceschopný, měl by investovat do vhodně zvolených informačních a digitálních technologií.

Z výsledků vyplývá, že během 3 let se zvýšilo povědomí o podnikových sociálních sítí a podnikatelé dokáží vysvětlit rozdíl mezi online sociálními sítěmi (Facebook, Twitter, aj.) a podnikovými sociálními sítěmi (Yammer, Jive, aj.). Řada podniků si již uvědomuje výhody plynoucí z úspěšné implementace podnikové sociální sítě. Podnikům může tento software nabídnout lepší komunikaci a spolupráci mezi zaměstnanci, rychlejší sdílení podnikových dat a informací, efektivnější využití znalostní báze zaměstnanců. Je třeba ale také zmínit, že i podnikové sociální sítě mají své nedostatky, které plynou převážně z nesprávné implementace. Již v roce 2012 Ward (2012) uveřejnil následující hrozby plynoucí při nesprávné implementaci podnikové sociální sítě:

- nedostatečné přijetí ze strany managementu;

- nedostatečné přijetí ze strany zaměstnanců;

- nedostatečná IT podpora;

- opatrnostní obavy ze ztráty výkonnosti zaměstnanců.

Podle názorů respondentů jsou tyto hrozby stále aktuální., proto je navrhováno následující doporučení:

- tvorba detailního plánu implementace podnikové sociální sítě ještě před realizací v podniku;

- školení managementu a zaměstnanců k účelnosti a funkčnosti tohoto systému;

- následné monitorování efektivity využívání podnikové sociální sítě a míry angažovanosti zaměstnanců (tzv. Engagement Rate).

S nástupem generace Y nastávají změny v řízení lidí. Je třeba, aby tyto zaměstnance manažeři správně motivovali a znali jejich specifické potřeby v rámci pracovního prostředí. V budoucnu bude pro manažery důležité, aby porozuměli těmto novým zaměstnancům (D'Netto & Ahmed, 2012). Je zřejmé, že by manažeři měli reagovat na tyto změny a přizpůsobit své strategie a hledat vhodné způsoby náboru, rozvoje, odměňování atd. Je třeba tyto "digitální zaměstnance" integrovat a sociálně adaptovat s předchozími generacemi zaměstnanců (Strohmeier & Stefan, 2014). Existuje předpoklad, že generace Y snadněji a rychleji přijme nové informační technologie do pracovního procesu. Nastupující mladší generace bude vyžadovat možnost využívat moderní sociální informační technologie a aplikace.

Závěr

Management je uznáván jako samostatný proces, v němž manažeři plánují, organizují, vedou, motivují a řídí lidské úsilí, aby dosáhli dobře definovaných cílů. Přežití organizace v současném konkurenčním světě je možné pouze prostřednictvím efektivního a kompetentního řízení. Růst národních a nadnárodních podnikových operací, rychle se měnící technologie, zvyšování složitosti rozhodování, dynamické společenské a ekonomické prostředí, globalizace podnikatelských a projektových organizací významně ovlivňují budoucí manažerské úkoly v podnikovém řízení.

Příspěvek se věnuje informačním technologiím a aktuálním manažerským trendům v souvislosti s vlivem na interní komunikaci. Primárním výzkumem byla zjištěna využívanost podnikových sociálních sítí v současné době a byla provedena komparace zjištěných údajů s výsledky z roku 2014. Sekundárním výzkumem bylo zjištěno, jaké informační systémy podniky využívají v rámci interní komunikace. Následně byly získány názory respondentů, zda využívané informační systémy jsou dostačující nebo spatřují jisté nedostatky. Aplikace firemních sociálních sítí se v organizacích používají k tomu, aby zaměstnancům a dalším zúčastněným stranám umožnila virtuální komunitu, kde si mohou vyměňovat informace, vytvářet a podporovat iniciativy a provádět řadu dalších úkolů a činností. Jsou to v podstatě sociální média pro podnikatelský svět, které umožňují využívat všechny výhody interakce a připojení obvykle spojované se sociálními sítěmi.

Na základě řízených rozhovorů a zjištěných výsledků vyplývá začínající trend ve využívání podnikových sociálních sítí. Je nutné překonat averzi vůči změnám, neochotu učit se novým metodám a přijmout moderní sofistikované nástroje pro zefektivnění celopodnikového systému řízení. Příspěvek poukazuje na rychlý vývoj informačních technologií a přizpůsobivosti podnikatelů pro získání větší konkurenceschopnosti. Podnikové sociální sítě mohou manažerům nabídnout sofistikovaný podnikový software k podpoře interní komunikace a spolupráce mezi zaměstnanci. Je otázkou, zda podnikové sociální sítě budou mít v České republice stále stoupající trend, což bude třeba ověřit na velkém vzorku respondentů. Další výzkumná

oblastí může být věnována vnitrofiremní komunikaci v kontextu s trendem konceptu Průmyslu 4.0.

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STRATEGIC MANAGEMENT AND PERFORMANCE OF ENTERPRISES EVALUATED USING CHAID DECISION TREE ANALYSIS

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Abstract: *The proposed paper deals with the relation of strategic planning and economic performance of Czech and Slovak industrial enterprises based on questionnaire research results processed by CHAID decision tree model. The relations between the selected parameters were focused and statistically tested on a sample of 254 industrial enterprises active in the Czech and Slovak Republic in the years 2009-2011. The hypothesis was formulated and evaluated with the goal of clarifying the mutual relation between the strategic planning and performance of the examined enterprises. The chi-square analysis was used as the primary statistical method. The findings show that the "successful branch" of the decision tree based on the parameter "annual turnover" leads through "written strategic document". We can also find the implementation of ISO 9001 quality management system on the "successful branch". The results can be interpreted as empiric ex-post confirmation of reasonability of thorough strategic planning and continuous improvement. These management branches are crucially underestimated especially in micro and SMEs. The findings confirm our previous research publications on this topic as well as other studies.*

Keywords: *Strategic Management, Business Performance, Enterprises, Chi-square, Decision Tree.*

JEL Classification: D22, L2

Introduction

This paper presents mainly the interconnection between a strategic document form and turnover as the parameter of economic performance and some related phenomena. The primary motivation is to emphasise the necessity of managerial education and application of this knowledge in enterprises (micro and SMEs) to increase competitiveness. The specific goal of the paper is to prove the correlation of strategic planning and economic performance by CHAID decision tree method. The paper is organized as follows: First literature review emphasizing the influence of strategic planning and strategic document on overall business performance is presented. Then the methodology used, including data collection and analyses, and formulation of hypothesis are introduced. The results and discussion include graphical decision tree scheme and its interpretation, derived data tables and the most important conclusions are deduced and discussed.

1 Literature review and theory

The theoretical review focuses on scientific literature concerning strategy, formulated strategic document, and related management tools and their influence on business performance. Later, the concepts of different levels of strategic document are explained.

1.1 Strategic planning and enterprises performance

This chapter deals with the analysis of the scientific literature related to strategic planning and strategic document and their impact on business performance. The most important synthetic information is provided in Tab. 1. The focus is put on strategic management, strategic documents, and tools related to strategical analyses (SMART, PESTLE, five forces according to Porter, SWOT, and BCG matrix).

Tab. 1: Literature sources – strategy, strategic document (SD), and performance of enterprises

#	Author, year	Finding, causality
1	Analoui, 2003	SD increases the readiness of an enterprise for market conditions.
2	Andersen, 2000	SD is an important tool for the performance of an enterprise.
3	Anthony, p. 36, 2012	Reengineering of core capabilities → mastering of strategic innovation.
4	Brkic et el. 2011	Clear strategy, long-term planning → best quality management practice.
5	Drucker, 2008	SD is an absolute necessity and primary success condition of any business.
6	Dyer et al. 2011	Long-time strategic work → success in significant or disruptive innovation.
7	Ettlie et al. 2005	Strategy → predictor of adoption performance.
8	Frost, 2003	Approach to strategic management differs according to enterprise size. Bigger enterprises have often better and more elaborate written SD.
9	Hartz, 1998	Long term goals, management tools and frequent updating → core of SD. Bigger enterprises have a written SD more often.
10	Hussey, 1997	Small enterprise usually utilizes max. 2-3 strategic management techniques.
11	Johnson, 2006	Strategic document (SD) → specific competitive advantages.
12	Laforet 2008	Bigger enterprises → resources and infrastructure, Smaller enterprises → individuality and flexibility.
13	Lichtenthaler 2008	Strategic technology planning → firm performance in a knowledge-based economy.
14	Rudd, 2008	SD has to be actualized frequently to bring positive impact on enterprise performance.
15	Rumelt, p. 77, 2011	SD = diagnosis, guiding policy and actions.
16	Song, 2011	SD leads to better performance of enterprises, but planning process has to be sophisticated.
17	Stonehouse, 2002	Big enterprises → focus on strategic management tools. SD of a small firm is usually only an operational plan. SWOT analysis is the strategic tool with dominant occurrence.
18	Tapinos, 2005	SD → engine driving the enterprise towards its visions.
19	Temtime, 2003	Size → resources, investments, knowledge → strategic planning.

Source: own processing by authors.

Analoui and Karami describe some benefits of the implementation of strategic management in SMEs in the following points (Analoui, 2003): It helps to understand the current situation in which the business is located. It provides a clear insight into the vision and mission of the enterprise. It determines strengths and weaknesses, with emphasis on those strategically important for business activity. It contributes to identifying the right business objectives.

Andersen's study provides empirical evidence that strategic planning (where the emphasis is on conventional elements of the strategic management) is associated with higher performance in all the studied industrial environments. The resulting effect on the performance of strategic planning between the different sectors of activity did not

differ significantly. Therefore, strategic planning is an important performance tool in all areas of economic activity, which increases both economic performance and innovation and business development (Andersen, 2001). Existing enterprises that want to master strategic innovation have to carefully borrow some core capabilities, thoughtfully forget others and systematically learn some completely new skills – Vijay Govindarajan (Anthony, p. 36, 2012).

It can be inferred that the best quality management (integrating continuous improvement philosophy) practice is found in enterprises having clearly defined analysing strategy relying upon cost-based leadership with smaller-scale (continuous) innovations and good analytical capabilities, where managers are proactive, plan long-term and motivate employees, who are also proactive, having good personal relations, spirit of fellowship, and cooperation (Brkic et el. 2011). The current environment where enterprises of various sizes and sectors operate together is often described in literature as more dynamic, turbulent, and unpredictable. Especially in these defined terms, the existence of basic long-term development goals and guidelines appears to be an absolute necessity, a condition for the success of any business. We are talking about a strategic document, strategic planning, and strategic tools. Without the acceptance of this requirement, the enterprise is only responding to the incentives, instead of actively creating (Drucker 2008). Success in significant or disruptive innovation requires long-time strategic work and outlook in deep vision. Innovation advantage can translate into a premium in your enterprise's stock price – an innovation premium – that is possible only by building the code for innovation right into your organization's people, processes, and guiding philosophies (Dyer et al. 2011).

In many industries, external technology commercialization is critical for gaining and sustaining a competitive advantage. Opening up strategic technology planning therefore contributes to firm performance in a knowledge-based economy (Lichtenthaler 2008). While large enterprises have realized the importance of formal writing formulated, long-term planning, smaller enterprises do not necessarily point intentions and activities to the same depth and put the same emphasis on understanding and applying strategic management (Frost, 2003; Zakrzewska-Bielawska, 2005).

The key aspects of the strategic document are the long-term organizational goals, strategic use of management tools, and frequent updates. As Hartz and Kanji emphasize, smaller enterprises have the flexibility regarding the implementation of a new management philosophy and approach and this process does not take so much time. This leads to the fact that there is a direct relationship between enterprise size and existence of a strategic document in writing. Smaller enterprises are placing greater emphasis on operational planning, intuitive or informal planning activities, and short-term goals. They also pay little or no attention to improving the environment (Hartz, 1998). The number of strategic management methods, tools, and systems used by management in small businesses is very low. Hussey has identified nearly sixty different management strategic tools, methods, and techniques. The empirical data show that small enterprises use only two or three strategic managerial techniques in practice (Hussey, 1997).

While larger firms have the advantage of the availability of resources and systems, small businesses have the advantage of individuality. Also, decision-making processes are easier in smaller enterprises than in larger (Laforet 2008, Kraus, 2006). To place a positive impact on business performance, a certain flexibility in deciding changes in

strategic matters, such as products and services and their production and financial issues - capital and fixed assets (equipment), is needed (Rudd, 2008). For this reason, frequent updates of the strategic document are important. According to R. P. Rumelt, one of the most influential thinkers on strategy and management, the core of a strategy contains three elements (Rumelt, p. 77, 2011):

- A diagnosis that defines or explains the nature of the challenge. A good diagnosis simplifies the often overwhelming complexity of reality by identifying certain aspects of the situation as critical.

- A guiding policy for dealing with the challenge. This is an overall approach chosen to cope with or overcome the obstacles identified in the diagnosis.

- A set of coherent actions that are designed to carry out guiding policy. These are steps that coordinated with one another to work together in accomplishing the guiding policy.

Song's empirical research shows that more strategic planning and more new product development lead to better business performance. That is why strategic planning is a way of predicting turbulent business environment, a logical sequential process that is often described in the literature as really affecting the performance of the business (Song, 2011). Academics have a huge amount of models, methods, tools, techniques, and approaches that are available to support the processes of strategic management. However, almost all of these theoretical approaches focus only on large enterprises. Scientific publications severely lack focus on strategic tools customized for the management of medium and small or micro-enterprises (Stonehouse, 2002).

The most widely used management tool among small firms is SWOT analysis. Next are the evaluative tools of financial analysis and budgeting. SWOT analysis is a tool used by most enterprises of any size. (Stonehouse, 2002; Vaněk, 2014). Strategic planning can be defined as a process that is performed by an organization in order to develop strategies that contribute to performance and drive the organization toward its vision for future (Tapinos, 2005 Volberda, 2010). These conclusions based on the literature reflect an important fact - the lack of strategic thinking among top managers of small businesses. All cited results agree that the effort devoted to strategic planning process is critically low in small enterprises. Temtime explains this phenomenon rationally; increasing the size of the business means an increase in resources, investment, and expertise, which have a direct impact on strategic planning and management of enterprises (Temtime, 2003). Lazar et al (2012) introduce the importance of careful costing in strategy creation as well as its realization.

1.2   The form of the strategic document

In terms of business strategy development, we can divide enterprises (including both SMEs and large enterprises) into three categories:

1. Enterprises that have a well-planned and detailed written primary strategic document. This document deals with important areas of enterprise organization such as human resources, market analyses and marketing goals, product development and innovation, technologies of production and services, logistics, quality and environment, budgeting, financing and payback, time schedule, risk evaluation, etc. Detailed strategic document should use modern management methods and techniques such as PEST,

Porter's five forces, marketing mix, SWOT, and others. The strategic document covers the future period of at least three years and is often compared with real situation and updated (at least once a year).

2. Enterprises that have a strategic document drawn up in some written but concise form, with insufficient details in all the important chapters. Many enterprises briefly address just their mission and vision and some partial strategic issues, such as production, marketing, or finances; however, other important chapters stay unelaborated. Such document often serves as a business plan for obtaining subsidies or loans, but hardly satisfies the internal strategic function.

3. Enterprises that have no written strategic document. It is never clear if the strategy is kept in the mind of top management (e.g. alone self-employed entrepreneurs), is partially a subject of the enterprise culture or does not exist at all.

2 Research materials and methods

This section describes the original questionnaire research that provided data and the research process. A hypothesis is introduced, and the methodology of analyses based mostly on CHAID decision tree is described. The method of questionnaire survey was formerly used, for example, by Zimmermannova (2015) for the purposes of the analysis of decision making of Czech electricity and heat producers within the EU ETS. The results show that the EU ETS had no impact on environmental investments planning in Czech enterprises in the period 2013-2014.

2.1 Data

The research project called "Adaptability of entrepreneurship", which created the data background for the presented article was realized during the spring semester 2012. A total number of 722 enterprises active in the Czech Republic (89%, including 64% from Moravia-Silesian region) and Slovak Republic (11 %) between 2009 and 2011 were interviewed. The interview protocol included a controlled dialogue between a questioner and an enterprise owner, an executive manager, or a top manager, so the collected data have the character of an experts' guess opinion. The initial sample of 722 enterprises was filtered and reduced to 677 credible subjects. Further filtration was realized in order to obtain a data group in which the subjects could be considered as industrial enterprises. The filtration included exclusion of micro enterprises with gross annual turnover less than CZK 10 million, exclusion of enterprises with less than 10 employees and exclusion of self-employed entrepreneurs – natural persons. For the filtration, industrial enterprises were specified (with compliance with ČSO) as those with NACE 05 to 33, which resulted in a data group of 254 valid items. NACE 05 to 33 covers these economical activities: B – Mining and quarrying (5 to 9) and C – Manufacturing (10 to 33). Based on the findings of the theoretical research, we carried out the following research:

2.2 The research processes

The research process comprised the following components: (A) Defining the need for the research and the solved problem. (B) Formulation of the research objectives and the plan. (C) Theoretical research – analysis of literature and available information. (D) Questionnaire-based survey - primary data collection. (E) Data processing and analysis.

(F) Interpretation of the results. (G) Conference publishing activities – expert feedback. (H) Further data analysis and interpretation. (I) Advanced publishing - indexed journals, monographs.

2.3 Hypothesis

The following hypothesis was formulated: H1: Strategic planning corelates to business performance of the enterprises examined based on CHAID decision tree analysis. H0: non H1

2.4 Methodology of analyses

A decision tree consists of a set of hierarchical decision rules. Like a real tree, we say that the decision tree grows, has branches and is pruned. A decision tree consists of a root, which represents the entire subject, and through the gradual progress of branching to other nodes, the tree grows. The nodes that are not further divided are referred to as terminal nodes or leaves. Trees are binary or non-binary, depending on whether they branch into two or more branches. Among one of the most famous and widely used algorithms of binary trees belongs CART. In the presented case of analytical procedure, our team used the method CHAID (Chi-squared Automatic Interaction Detector).

This method was developed in 1980 by G. V. Kass. CHAID tree is often used in commercial spheres, especially in marketing (for example, the selection of target customers). CHAID tree is non-binary type; nodes can therefore be divided into a larger number of nodes than two branches. As the name suggests, the statistical criterion for branching is the chi-square test. Chi-square test is used to determine the independence of the PivotTable, that is, a combination of categories of a dependent variable and a predictor. If X and Y independently have the test statistics of Pearson's Chi-square distribution with $\upsilon = (r-1)(s-1)$ degrees of freedom, where r is the number of rows and s the number of columns in the pivot table, independence in the pivot table means that both variables affect each other. The hypothesis of independence phenomena here is the null hypothesis H0. Pearson's Chi-square test is often referred to as a test of goodness of fit (Kass, 1980).

The CART algorithm only creates binary trees, meaning that only two branches are from one node. Binary trees are usually more accurate than non-binary. The Gini index is used as the branching criterion. Strengths: The CART has a good use in the case of many input fields. It can quickly estimate the classification model. It also offers a booster method to increase classification accuracy. In addition to other algorithms it can work with both discrete and continuous outputs. The CHAID test uses the $\chi2$ test to select the most appropriate branch attribute, which implies that the input variable must be only categorical. Strengths: CHAID can create non-binary trees, it means that nodes can have more than two branches when splitting. Trees therefore grow more in width than in binary trees (QUEST and CART). CHAID is better for larger data files.

The branching of decision tree occurs via the calculation of CHAID adjusted p values. Chi-square test selects a predictor with the smallest adjusted p value for each of the merged class predictors using the Bonferroni correction. This predictor of optimally merged categories is used to split the node. If a significant predictor cannot be found, the node has been further subdivided. A further division may not occur as a result of the small number of observed cases that have not been distributed.

When analysing our sample, the following rules has been determined due to file size and clarity of output:

- Maximum/Maximum Tree Depth: 3 levels of branching.
- Parent Node (it branches out further nodes) must contain at least 20 observations.
- Child Node (it is already more node than branch) must contain at least 10 observations.

Since the aim was to explain the success of enterprises that we measured using variable sales development during the last three years and their three categories (decline, stagnation, and growth), the development of the turnover variable has been chosen as the dependent variable. To evaluate the dependent variable, we used the method of decision tree branch with other (independent) categorical variables, which included a questionnaire. Executing the Decision Tree with the original 254 observations gradually branched out with the help of six variables summarized in the inputs and outputs described in Tab. 2.

Tab. 2: Categories of data for cluster analysis

Inputs – Independent Variable	Outputs – Dependant Variable
Form of strategic document	Turnover (sales) from products/services
Implementation of ISO 9001	Total costs
Change in production	Profit

Source: own processing by authors.

The data ware analysed and processed using Microsoft Excel and IMB SPSS statistic 11.5 software.

3 Results

The following chapter presents the most important results regarding the application of a decision tree based on chi square on the introduced data sample of Czech and Slovak industrial enterprises. The original data are illustrated by the decision chart, CHAID tables, comments, and discussion.

3.1 Basic characteristics of the data group

More than ¾ of the examined enterprises fall into group C – Manufacturing and other (incl. agricultural engineering) and B – Mining and quarrying active firms. In terms of size, roughly 30-40% are small enterprises, 20-30% are medium-sized enterprises and 15-30% are large enterprises. According to the turnover criterion, the rest are micro-enterprises (~15%). The criterion of number of employees does not match very well with the criterion of annual turnover in our data group, which indicates a relatively low turnover per capita in the regions of interest.

3.2 Construction of the decision tree and the results

The graphical representation in Fig. 1 confirms the expected findings of whether the success of enterprises (sales performance over the last three years) is related to the form of strategic document. The adjusted p value assumes a value of 0.005, which is significantly less than the threshold value of 0.05. The branching out shows that

enterprises that have a strategic document elaborated in details reach an almost 20% higher turnover growth (growth rate 58.8%) than in the case of enterprises that have a brief or less formalized written strategic document (growth rate 37.9%).

The next level of branching shows that profit growth in all enterprises correlates with an increase in turnover, which is quite understandable. More interesting is the fact that was revealed by the third level of tree branching. Enterprises that have a written and detailed strategic document achieve a growth of profit and sales more often if they implemented QMS ISO 9000 series in their activities.

3.3 Successful tree branch results

The above mentioned conclusions are supported, with relatively high accuracy, by the CHAID model that works with the change in turnover with error estimate less than 20%, accuracy of the model is more than 80% on the level of statistical deviation of 0.025.

The following tables 3 to 8 show the basic statistical parameters such as frequency, valid percent, cumulative percent, and chi square value in nodes 0 to 12 and 16 to 17 of the "successful branch of the decision tree". The changes in turnover and profit were chosen as the measure of success.

Tab. 3: Change in turnover – node 0

		Frequency	Valid Percent	Cumulative Percent	Chi Square
Valid	Fall	82	32.3	32.3	
	Stagnation	59	23.2	55.5	
	Growth	**113**	**44.5**	**100.0**	**9.187**
	Total	254	100.0		

Source: own processing by authors.

Tab. 3 characterizes the situation of change in turnover in the researched enterprises. Nearly half of the respondent enterprises (44.5%) achieved a growth in sales over the last three years. Stagnating sales were recorded by 23.2% of the respondent enterprises and a fall in turnover by 32.3%. Roughly one-eighth of the respondent enterprises (12.2%) recorded a growth greater than 30%
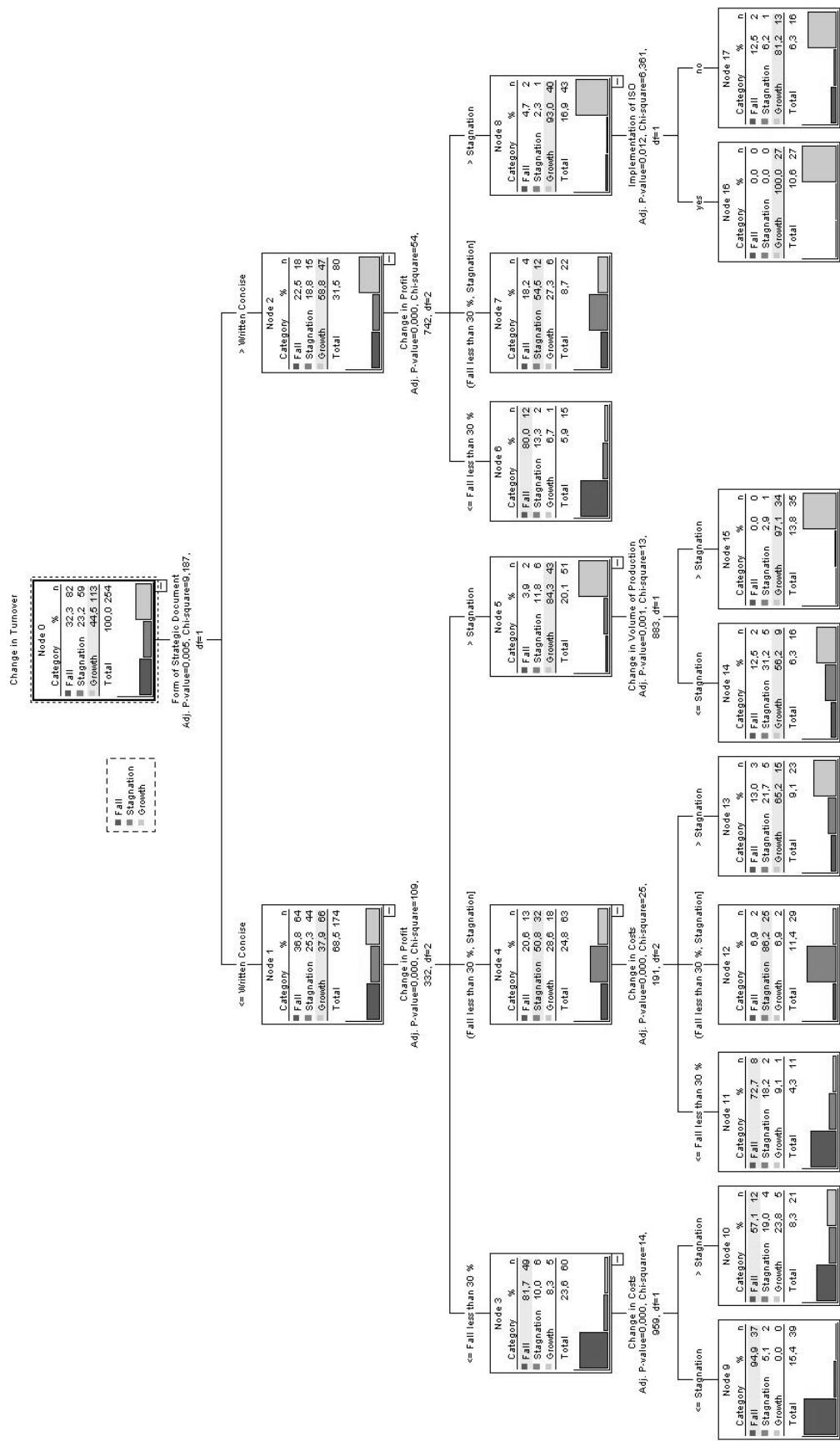
Tab. 4: Form of strategic document – nodes 1, 2

		Frequency	Valid Percent	Cumulative Percent	Chi Square
Valid	Not written	52	20.5	20.5	
	Written Concise	122	48.0	68.5	109.332
	Written Detailed	**80**	**31.5**	**100.0**	**54.742**
	Total	254	100.0		

Source: own processing by authors.

The impact of the form of the strategic document is apparent in Tab. 4. Almost half of the respondent enterprises (48%) work with strategic documents in written form, but only in brief, concise manner. Almost one-third of respondents/enterprises (31.5%) use a written, detailed strategic document. Chi square value suggests that written detailed form of strategic document leads more closely to enterprise success than other forms.

Fig. 1: Decision tree, growing method: CHAID, dependable variable: change in turnover

Source: own processing by authors.

Tab. 5: Change in profit – nodes 3 to 8

		Frequency	Valid Percent	Cumulative Percent	Chi Square
Valid	Fall >30%	18	7.1	7.1	
	Fall less than 30%	57	22.4	29.5	14.959
	Stagnation	85	33.5	63.0	25.191
	Growth <30%	**65**	**25.6**	**88.6**	**13.883**
	Growth >30%	29	11.4	100.0	
	Total	254	100.0		

Source: own processing by authors

Tab. 5 confirms the expected relation between turnover and profit, where roughly ¼ of the researched respondent enterprises achieved growth up to 30%. Chi square value suggests that growth in turnover relates most to growth in profit up to 30%.

Tab. 6: Implementation of ISO 9001 – nodes 16, 17

		Frequency	Valid Percent	Cumulative Percent	Chi Square
Valid	No	106	41.7	41.7	
	Yes	**148**	**58.3**	**100.0**	**6.361**
	Total	254	100.0		

Source: own processing by authors.

Tab. 6 presents the results concerning implementation of ISO 9001. The number of enterprises that implement the management standards ISO 9001 is slightly larger (58.3%) than the number of enterprises that are not administrated by ISO 9001 standards (41.7%). Chi square value suggests that ISO 9000 series implementation leads more closely to enterprise success than omitting it. The collected data show similar results as in the case of annual turnover and profit as well as in the case of trends of costs – see the following Tab. 7.

Tab. 7: Change in costs – nodes 9 to 12

		Frequency	Valid Percent	Cumulative Percent
Valid	Fall >30%	5	2.0	2.0
	Fall less than 30%	59	23.2	25.2
	Stagnation	72	28.3	53.5
	Growth <30%	**88**	**34.6**	**88.2**
	Growth >30%	30	11.8	100.0
	Total	254	100.0	

Source: own processing by authors.

4 Discussion

Discussions in theoretical literature of different geographical and economical origin show that proper strategic planning with the application of modern management tools clearly leads to better business performance in various forms. Our methodological approach allowed us to conduct ex-post research and analyses in Czech and Slovak enterprises. Our practical empirical research and analyses confirm the theoretical findings also in our native surrounding.

Conclusion

To sum up, the objective of the study was to analyse and make more transparent the performance factors of business enterprises mostly in connection with strategic document from and turnover as the parameter of economic performance. The aim of the paper was to prove, by CHAID decision tree method, the connection between strategic planning and economic performance. The questionnaire contained many questions with categorical variable, and therefore it was decided that each pivot-table will be replaced in the output of the decision tree as a set of contingency tables converted into a graphical format output of decision tree analysis.

The hypothesis H1 was approved: strategic planning (specially structured and detailed) correlates to business performance of enterprises examined based on CHAID decision tree analysis as seen in Fig. 1 and Tab. 4. Nevertheless, there is no clear causality if strategic document influences enterprise performance or vice versa enterprise performance supports strategic planning. Even that their correlation is high, the causality is not proved by chosen method. The implementation of ISO 9001 supports better performance by reinforcing strategic planning. The main conclusion of the paper is that strategical planning as well as continuous improvement are very important factors close to business performance, however, the knowledge and utilisation of these methods still do not guarantee high performance, especially in SMEs. The novelty of the paper lies in the confirmation and specification of theoretical findings by the original data obtained in Czech and Slovak enterprises.

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PRINCIPLE OF USING SYSTEMIC APPROACH TO MANAGEMENT AUDIT IMPLEMENTATION BY SMALL AND MEDIUM-SIZED ENTERPRISES

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Abstract: *In connection with their earlier contributions, addressing the issue of systemic approach to implementing management audit with regard to small and medium-sized enterprises, the authors intend to further pursue their effort and interest in this specific area of research with the following paper. Its main objectives are to introduce own comprehensive concept, which involves the use of a systemic approach and is expressed in the form of a specific model of "Systemic approach to management audit", and to propose both standardized and purposeful procedures related to such audit. In order to develop the concept, a questionnaire survey was conducted among a number of managers of small and medium-sized enterprises in the Czech Republic, along with structured interviews with auditors carrying out management audits in their professional practice as well. Based on their research, the authors found that the examined enterprises tend to perform management audits only on rare occasions and without using any systemic approach or particular procedures. This is mainly due to an absence of time schedules or lists of individual activities that are required in the audits according to a precisely and previously specified order, as suggested in this paper.*

Keywords: *Small and Medium-sized Enterprises (SME), Management Audit, Systemic Approach, Objective of Management Audit, Implementation of Management Audit, Proposals and Measures, Feedback.*

JEL Classification: *M21, M14.*

Introduction

Enterprises wanting to succeed in strong competition must draw particular attention to their internal stability and continuously analyse their internal environment. In order to do so, management audit implementation is instrumental for them. As Truneček (2004) and Nicholas (2014) remark, there are no clearly defined rules for such implementation, with the main dependence being on a manager´s/an auditor´s creativity and a manner the audit will be treated. However, to fulfil the main essence of an effective management audit and its implementation, a certain systemic approach must be followed.

1 Systemic approach to management audit implementation

According to Molnár et al. (2012), the concept of a system may be generally seen as a purpose-defined complex of elements as well as a complex of links between such elements that jointly determine certain characteristics of a unit, or an integrated set of mutually active elements intended to co-operatively fulfil a predetermined function. As Whittington and Pany (2015) and Leung et al. (2015) point out, the concept of a system related to auditing, i.e. a systemic audit implementation, may be defined as a logically structured procedure of individual steps/stages/phases/activities that are

necessary to follow during management audit in their precisely and previously defined order, since they are linked together. The table below indicates that several authors recommend dividing audit implementation into three to five separate phases.

Tab. 1: Comparison of recommended phases within comprehensive audit process

Author	Number of Audit Phases	Audit Phases
Dvořáček (2005)	5	audit objective, selecting audit techniques, gathering and analysing documents/information, drawing up conclusion(s) and audit report, post-audit
Králíček, Molín (2014)	3	developing an audit plan, actual performing of audit, audit completion and composing an audit report
Truneček (2004)	4	audit objective, audit implementation, audit evaluation, follow-up check
Cangemi, Sinfleton (2003)	3	planning process, auditing process – performance, reporting process
Crumbley (2004)	4	planning, field work, reporting, follow-up
Russell (2007)	5	identify plans, make observations, evaluate, report results, follow up
Moeller (2016)	4	plan: planning and enterprise, do: acquisition and implementation, check: control objective, act: monitoring and evaluation
Hale, Whitlam (2000)	4	planning, organization, data management, reporting results

Source: Authors

Furthermore, other authors, e.g. Spencer (2010), Wheelen, Hunger (2012) and Kotler, Keller (2016), suggest that management audit should be carried out in 4 phases, as also observed by Zepeda, Ochoa (2017) and Maksymov, Nelson and Kinney (2018) in their respective works.

Overall, the phases frequently selected appear to involve planning, implementation, completion and follow-up check. As for planning, the primary goal is to determine a management audit objective, i.e. what is the purpose for management audit to be performed. The primary goal of implementation should be to collect, analyse and evaluate gathered information, i.e. to evaluate the current state of enterprise management. Regarding the completion phase, the primary goal is seen in evaluating particular conclusion(s) from the conducted audit and preparing certain proposals and measures (in case there have been deficiencies identified in enterprise management). Lastly, the primary goal of follow-up check is to assess whether the audit was processed in accordance with its defined plan and whether the proposed measures were introduced by the given enterprise.

2 Methods

The paper´s objectives are to develop a comprehensive concept on how to possibly use a systemic approach to implementing management audit, with the concept being represented by a specific model of "Systemic approach to management audit", and to suggest standardized and purposeful procedures concerning such audit. To meet the objectives, the authors decided to employ a method of experimental modelling, which is based on Molnár et al. (2012) and may also be used when creating management models. Additionally, particular data gathered from a questionnaire survey (among a number of existing Czech enterprises) and structured interviews with audit experts were also used to design the considered experimental model.

The questionnaires were created in written and electronic forms in order to ensure their potentially high level of return after approaching enterprises across the Czech Republic. To select the survey respondents, uniform stratified sampling was applied with the following principles: the basic set of 707 023 enterprises was divided into homogeneous groups according to their size and three categories were eventually generated: micro-enterprises (1-10 employees), small enterprises (11-50 employees), medium-sized enterprises (51-250 employees). Subsequently, 250 enterprises from each category were selected on the basis of simple random sampling, thus bringing the total of approached enterprises to 750. The rate of returned questionnaires amounted to 81.33 %, equalling to 610 as the total number of respondents, of which only 67 conduct management audits in their respective enterprises (specifically, 1 micro-enterprise, 33 small enterprises, 33 medium-sized enterprises). Due to the uneven division and low number of respondents in relation to the aforementioned categories, the authors continued to take account of n = 67 as the selected category of small and medium-sized enterprises.

When selecting experts for structured interviews, it was proceeded, as Hindls (2007) and Hendl (2016) recommend, to a multi-level deliberate selection consisting of three levels. The first level involved searching for experts (auditors and managers) who carry out not only financial, accounting or tax audits, but also audits in other areas. The second level was to establish certain conditions (i.e. 2 general conditions and 3 specific conditions) that the experts would have to meet in order for their views to be included in the research. The general conditions were: 6+ years of audit experience, processing audits in small and medium-sized enterprises. The specific conditions were: 8+ years of experience in management, knowledge of management methods, techniques and procedures used in enterprise management, knowledge of management and marketing analyses (e.g. SWOT analysis, IFE/EFE matrix, BCG matrix, GE matrix, STEP/EL analysis, 7S, Balanced Scorecard, etc.). In the third level, the process of selecting possible experts was subject to fulfilling both of the general conditions and one of the specific conditions. Eventually, 20 potential participants were contacted, with 16 of them promising their co-operation in the research. The conditions were met by 12 (out of 16) professionals with whom the co-operation was agreed.

Three hypotheses were constructed, all being on the grounds of an assumption that the approached managers or auditors do not use any systemic approach and standardized or purposeful procedures when conducting management audits. In view of the assumption, the hypotheses were set in the following manner – H1: When performing management audit, the use of a systemic approach by managers is

dependent on the size of enterprise. H2: When performing management audit, the use of a standardized procedure by managers is dependent on the size of enterprise. H3 – When performing management audit, the use of a purposeful procedure by managers is dependent on the size of enterprise.

3 Problem solving

To be able to possibly confirm the hypotheses, or the statements, their testing was performed in three stages. The first stage consisted in determining 1 general and 4 specific criteria and assigning them to each hypothesis statement.

A general criterion for confirming the first hypothesis statement (i.e. Using a systemic approach) regarded performing management audit in a minimum of 4 phases, including the specified audit contents. The specific criteria were laid down as follows: 1st Criterion – Phase 1: Audit Planning (Content: Defining audit objective); 2nd Criterion – Phase 2: Audit Implementation (Content: Audit processing); 3rd Criterion – Phase 3. Audit Completion (Content: Drawing up proposals and measures to improve management); 4th Criterion – Phase 4: Follow-Up Check (Content: Feedback).

A general criterion for confirming the second hypothesis statement (i.e. Using a standardized procedure) was related to determining a certain procedure for carrying out management audits, including the characteristics given in round brackets. The specific criteria were laid down as follows: 1st Criterion – Regularity of Audit (at least once a year); 2nd Criterion – Setting up a Time Schedule (for all activities that would be conducted during the audit, along with specifying their order and time span); 3rd Criterion – Compliance with the Time Schedule (observance of conducting all of the specified activities with respect to their order and time span); 4th Criterion – Setting a Time Frame (when performing the audit, the time frame must not exceed 6 months between Stage 1, i.e. Planning, and Stage 4, i.e. Follow-Up Check).

A general criterion for confirming the third hypothesis statement (i.e. Using a purposeful procedure) concerned determining a certain procedure for carrying out management audit, including the characteristics given in round brackets. The specific criteria were laid down as follows: 1st Criterion – Audit Objective (evaluating the current state of enterprise management); 2nd Criterion – Audit Program (defining the audit content and its expected fulfilment); 3rd Criterion – Establishing Audited Areas (audit must necessarily include the area of management or the area of managerial functions); 4th Criterion – Regular Auditing (at least once a year).

The second stage resided in assessing the specific criteria and assigning dependent variables (expressed in the range of 0 to 1) in order to use a data processing option in the "R" statistical program. A specific system of assigning the variables may be seen in Tab. 2.

Tab. 2: Principle of assigning variables to evaluate dependence

System of Assigning Evaluation Variables	Evaluation Variables
Fulfilling 4 specific criteria	1
Fulfilling 3 specific criteria	0,75
Fulfilling 2 specific criteria	0,5
Fulfilling 1 specific criterion	0,25
Not fulfilling any specific criteria	0

Source: Authors

For the above hypotheses to be evaluated, correlation analysis was applied to find out linear dependence between the aforementioned dependent variables and an average number of employees (i.e. the independent variables) based on defining a certain value of the Pearson correlation coefficient (r), as demonstrated in Fig. 1.

Fig. 1: Pearson correlation coefficient

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{z}(y_i - \bar{y})^2}}$$

Source: Authors

The third stage encompassed an actual evaluation of the hypotheses on the basis of data processing in the "R" the statistical program, as shown in Tab. 3. Confirming or not confirming of the hypotheses may be achieved by calculating a p-value that identifies correlation significance of the variables selected. The p-value must be compared to a significance level – α, which was set at the most commonly used level of 5%. The above hypotheses can be confirmed provided that the resulting p-value is less or possibly equal to 0,05.

Tab. 3: Evaluation of hypotheses

Hypothesis	Pearson correlation coefficient (r) interval < -1;1>	p-value α = 5 %; (p-value ≤ 0,05)
H 1	r = -0.0389101	p-value = 0.7564
H 2	r = 0.08032592	p-value = 0.5214
H 3	r = 0.04833861	p-value = 0.6999

Source: Authors

Overall, the above recorded resulting values show that using a systemic approach and standardized or purposeful procedures is not dependent on the size of enterprises. As regards the resulting values of the Pearson correlation coefficient (r) for each evaluation, they point to very week dependence between the variables. In view of dependence related to using a systemic approach by managers in the management audit implementation (given the size of enterprise), the correlation coefficient revealed **indirect dependence**. Thus, using a systemic approach by managers in that respect **decreases** with the increasing number of employees. However, when considering
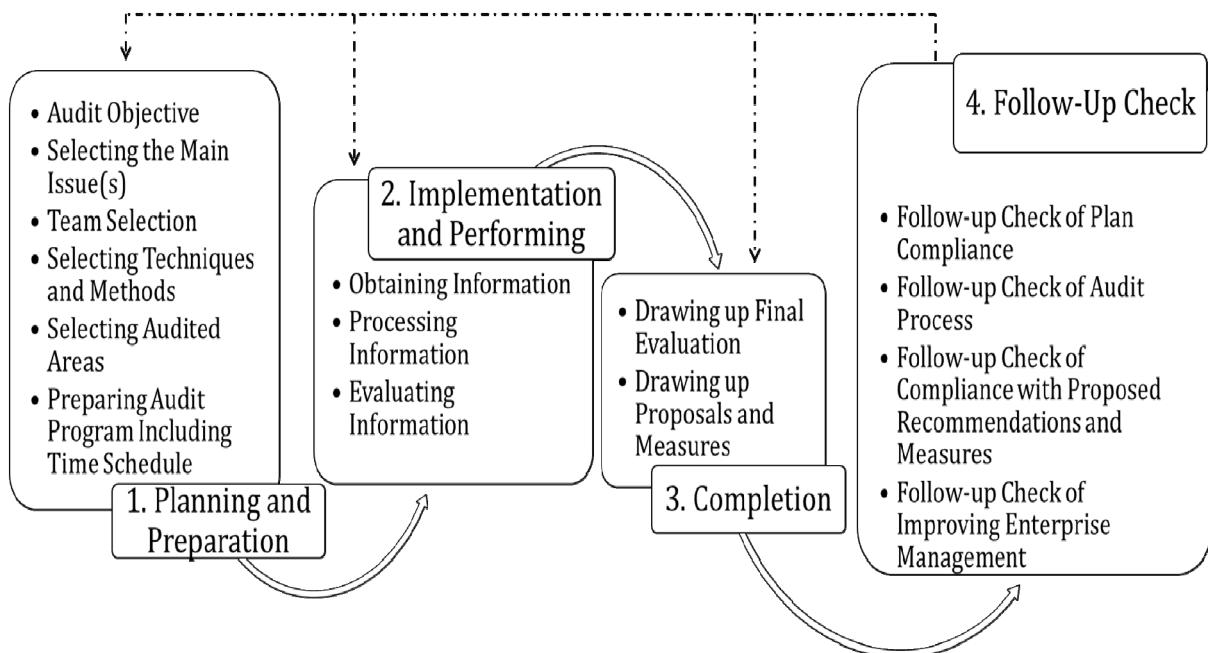
dependence related to using standardized and purposeful procedures by managers in the management audit implementation (given the size of enterprise), the correlation coefficient revealed **direct dependence**. Thus, using standardized and purposeful procedures by managers in that respect **increases** with the increasing number of employees. Then, on taking account of the resulting p-values for all 3 hypotheses, they are higher than the significance level of 0,05. As a result, it may not be claimed that the correlation of the determined variables is significant and therefore the hypotheses cannot be confirmed.

4 Research results and their discussion

The research also revealed that only **less than half** of the managers that perform management audits do so using systemic approaches and standardized or purposeful procedures. Based on this finding, the authors would like to present the managers (and the auditors concerned) with their own possible concept, which is illustrated in Fig. 2 as a specific model of "Systemic approach to management audit". It should be noted that the model was also developed according to recommendations from various experts having several years' experience in auditing.

As modified according to Štefko, Píchová, Gallo, Raušer (2016), the basis of the model is implementing management audit in 4 consecutive phases – planning, implementation, completion, follow-up check. Each phase was complemented with particular activities that are advised to be carried out during the audit.

Fig. 2: Advised activities during management audit

Source: Authors

Moreover, in terms of using the systemic approach, one "Key Activity", which such audit must essentially contain, was picked out from each of the above phases and recorded in the following table, i.e. Tab. 4, along with the corresponding specifications.

Tab. 4: Key activities of management audit phases

Phase	Key Activity	Specifications
Planning	Audit Objective	Evaluating **the current state of enterprise management system**, i.e. Evaluating **the Objective**
Implementation	Performing Audit	Achieving **the Objective** based on answering all "Managerial Questions" (see below) and referring to the (already published) "Management Model of Decision-Making" (Píchová, Raušer 2017a); (Píchová, Raušer 2017 b)
Completion	Drawing up Proposals and Measures	Drawing up 3-5 measures aimed at improving the state of enterprise management system
Follow-Up Check	Feedback	Re-evaluating **the Objective** on the basis of answering all "Managerial Questions" (see below) as well as answering the "Evaluation Questions" stated in "Evaluation of Scoring Scale" as part of the (already published) "7S Adaptation Model" (Píchová, Raušer 2017a); (Píchová, Raušer 2017 b)

<div align="right">Source: Authors</div>

In order to fulfil the main essence/content of the management "Audit Objective", i.e. evaluating the current state of enterprise management system, managers or auditors need to be aware of all aspects that are to be analysed with regard to the audit. For the purpose of doing so, selected "Managerial Questions" were formed, hence representing a vital step that should be taken in the first "Key Activity" (see Note 1 from the model of "Systemic approach to management audit"). The exact wording of "Managerial Questions" is given in Tab. 5.

Tab. 5: Managerial questions

| Examined Questions	Factors Patterned on the 7S Model
What does the enterprise want to achieve and how does it want to achieve?	Strategy
What staff and composition are needed in the enterprise?	Staff
What abilities and skills does every employee need to have?	Skills
What will be the hierarchical structure of selected employees?	Structure
Which style of managing should be used in the enterprise?	Style
What systems are necessary to be used in the enterprise?	Systems
Are all employees well aware of the enterprise events and happenings?	Shared values
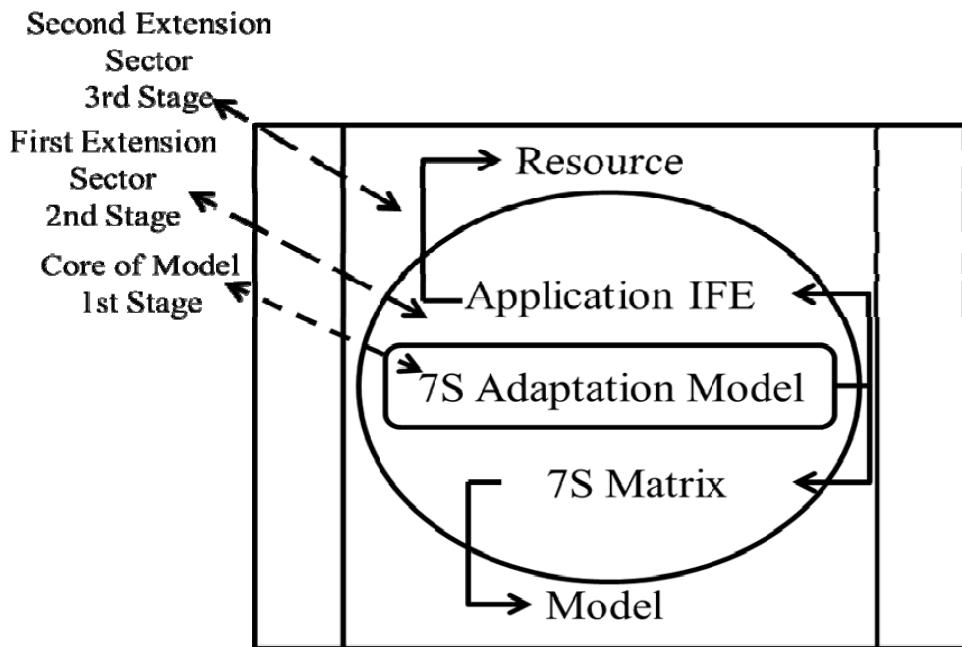
<div align="right">Source: (Píchová, Raušer 2017b)</div>

Having evaluated answers to the "Managerial Questions", one may proceed to an in-depth analysis of the above stated factors that significantly influence a success rate of enterprise management, internal stability and competitiveness. To carry out the analysis, the aforementioned "Management Model of Decision-Making" had been

designed comprising three stages. Although each of them is made up of a separately developed model, the individual stages are mutually interlinked. The first stage is formed by the "7S Adaptation Model" being the primary element/the core of the entire management model. It may be argued that managers/auditors, or even small enterprises, not requiring detailed management auditing in their immediate environment, can only use this particular core. The second stage is constituted by the (already published) "Application IFE – 7S Matrix" (see Píchová, Raušer (2017a)), which is directly connected to the "7S Adaptation Model" and may be considered as the first extension sector of the entire management model. The third (The final) stage is represented by the (already published) "Resource Model" (see Píchová, Raušer (2017b)) that may be considered as the second extension sector of the entire management model. Of the three separate models, only the "Resource Model" is divided into two parts, where a comprehensive analysis of resources is the first part and an individual analysis of resources is the second part, with both parts being equally important.

It may be added that the first and the second stage principles of the "Management Model of Decision-Making" reside in analysing and evaluating of enterprise management system. The third stage principle is to analyse and evaluate used resources (in a given enterprise) as a unique set of inputs whose effective allocation managers should focus on. The model, depicted in Fig. 3, has been introduced to several managers and auditors, see Píchová, Raušer (2017a), Píchová, Raušer (2017b), Píchová (2018).

Fig. 3: Stages of Management model of decision-making
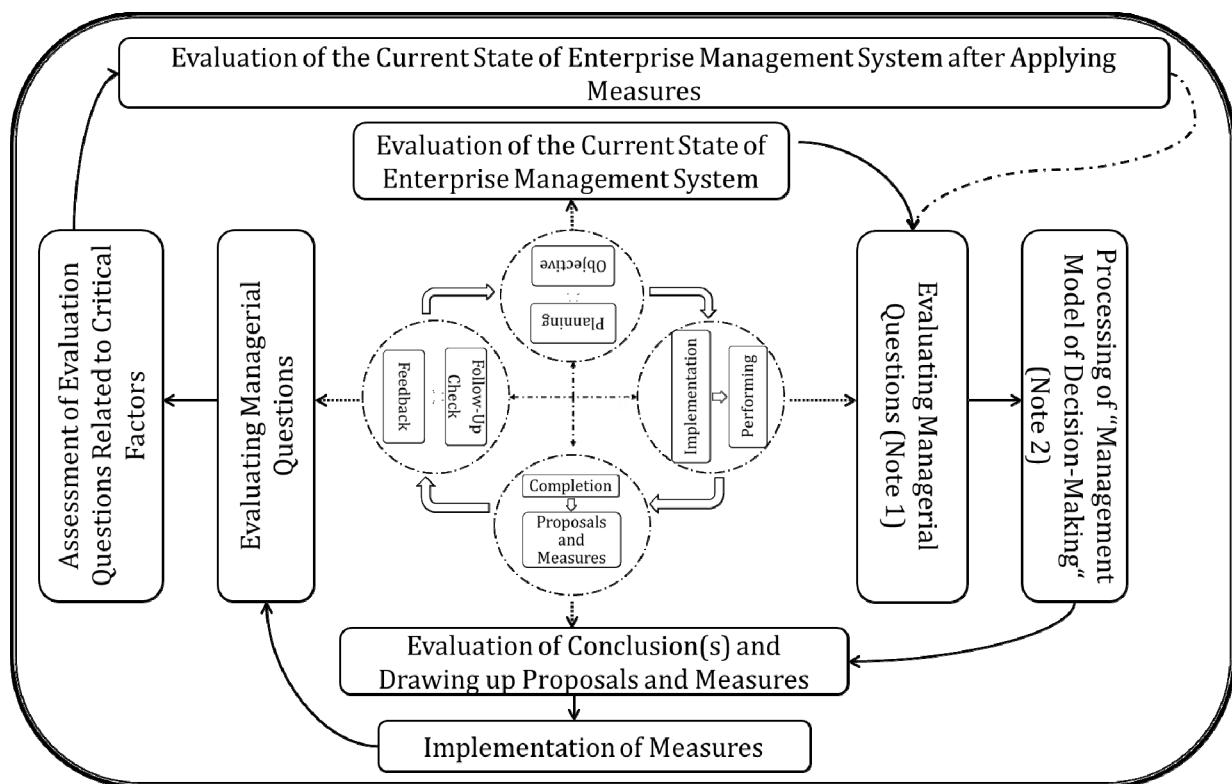
Source: Authors

Application of the "Management Model of Decision-Making" and evaluation of results from the in-depth analysis are significant steps that should be taken as part of the second "Key Activity" (see Note 2 from the "Systemic approach to management audit" model).

Based on the evaluation of the entire management model´s output, the content of the third "Key Activity", i.e. "Drawing up Proposals and Measures", is to determine whether an enterprise is managed effectively or not. If deficiencies are identified, it is necessary to suggest certain measures that, after their application, would lead to an improvement in the state of enterprise management system. There should preferably be three to five measures suggested, including a proposal to select the best possible application measure. Here, managers/auditors themselves have to be able to put forward appropriate measures, assess them and select the most suitable ones.

After a certain period of time (between 1-2 and 6 months), managers/auditors should analyse how successful/effective the introduced measures were, which is the content of "Feedback" as the fourth (the last) "Key Activity". The given enterprise management system is now being assessed in a simplified manner by evaluating answers to the "Managerial Questions" and answers to specific questions assigned to "Factors" in the aforementioned "7S Adaptation Model". However, this is only applicable to those factors where the initial evaluation was unsatisfactory. Once the answers have been evaluated, it may be determined whether the enterprise management system has improved after applying the selected measures. If no desired improvement has occurred, managers/auditors must apply other measures and yet again re-evaluate the current state of the system within 6 months. Subsequently, the authors suggest that managers/auditors should repeat the whole process from its beginning and proceed accordingly until the state sought after, i.e. effective enterprise management, has been achieved. In connection with that, the completed model of "Systemic Approach to Management Audit", illustrating a particular process to be possibly used in implementing management audit, is presented in Fig. 4.

Fig. 4: Model of Systemic approach to management audit

Finally, to be able to use standardized and purposeful procedures, it is recommended that managers and auditors follow these rules:

- Always clearly define the objective of management audit;
- Always clearly define the areas that should be analysed in management audit, with the area of management being considered as the essential area;
- Create at least a simple list of activities that are to be evaluated in management audit, preferably create a time schedule of activities, including a time frame, and always follow the time schedule;
- Compliance with the audit regularity – at least once a year;
- As for managers/auditors, audit processing should take them no longer than 6 months.

Conclusion

As stated in the introduction and also pointed out by Belás, Bartoš, Ključnikov, Kozubíková (2015), a particular basis for the competitive advantage of small and medium-sized enterprises is to create and maintain a quality business environment, especially the internal environment. This may also be achieved by its regular analysis, specifically through implementing management audit.

The research shows that the discussed management audit implementation has not been very "popular" so far among small and medium-sized enterprises in comparison with other audits, e.g. production, personnel or financial. Only 67 (out of the total of 610) respondents perform management audits in their enterprises, yet without using any systemic approach and standardized or purposeful procedures. Based on this finding, three hypotheses were established and evaluated to determine whether using of the previously mentioned approach and procedures is dependent on the size of the involved enterprises. On conducting the evaluation through correlation analysis, the hypotheses were not confirmed.

The paper´s objectives were to develop a comprehensive concept for using a systemic approach to implementing management audit, where the concept was comprehensively described and then illustrated in a model of "Systemic approach to management audit", and also to propose standardized and purposeful procedures linked to such audit. The model was formed on the basis of particular data and information obtained from both the questionnaire survey and the structured interviews. The model´s essence is to draw the attention of managers/auditors to the fact that each (management) audit should have its objective defined, and sophisticated methodology and techniques should be used during its implementation. In case there have been any weaknesses identified, adequate proposals and measures should be formulated to improve the current state/given situation regarding enterprise management, and the follow-up check phase should not be omitted.

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MODEL FOR QUALITY OF LIFE EVALUATION OF NUTS 2 REGIONS WITH RULE-BASED SYSTEMS

Martin Šanda, Jiří Křupka

Abstract: This article deals with NUTS 2 regions quality of life (QL) evaluation for the Visegrad Group in year 2015 developed by means of rules based methods. QL evaluation is a phenomenon, topical issue, dealt with by a large number of institutions and organizations. Approaches to QL evaluation however differ and there exists a whole range of indicator sets and methodologies for QL evaluation. The evaluation is based on Eurostat methodology for QL evaluation in this article. The QL evaluation works with official indicators of this methodology and uses rule-based systems methods: modification of Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) - fuzzy TOPSIS (fTOPSIS), fuzzy inference system (FIS) and Case-based Reasoning (CBR) and with using pre-defined fuzzy sets (FSs). The objective of this article is to create a model for QL evaluation based on utilization of the above-stated methods, comparing results of the individual methods and the total results of such QL evaluation. Another objective of this article is to achieve fairness supported by this model – the results from this model shall serve as recommendations for provision of subsidies for regional development including the definition for what area such subsidy should be used.

Keywords: Case-based Reasoning, fuzzy Inference System, Fuzzy Sets, Quality of Life, NUTS 2 Regions, TOPSIS.

JEL Classification: C69, D89, H89, R59.

Introduction

The concept of QL is hard to define. Various authors, organizations and/or institutions and their approaches to QL evaluation are different and even the definition of what is QL brings about a large scale of material dilemmas, as states Budowski et al. (2016), Műhlpachr (2005), Phillips (2006), Prakash et al. (2016) and Royuela et al. (2010). This article deals with the solution of practical questions in the relation of comparability to life, QL evaluation and achievement of fairness. The article verifies and confirms the suitability of using the current Eurostat methodology. QL is evaluated using selected rule-based systems methods. To solve the problem, a model is designed to output QL estimates for each region. The extension of the model is a suggestion for allowance for the development of the region. These suggestions for allowances are based on the results of the QL evaluation of individual regions and are intended for the improvement of underdeveloped or backward regions. Regional development will help reduce disparities between regions, increase the standard of living and competitiveness of the region. The aim of the paper (and proposed model) is to achieve fairness, reduce disparities between regions and support underdeveloped or backward regions.

Austrian Bundesland of Burgenland and Operational Programme Burgenland (2007) are examples of the region's backwardness solutions. This programme involved Community support for Burgenland within the framework of "Convergence Phasing-

Out" objective. The total budget of the programme was around EUR 167 million and the Community assistance through the ERDF amounted to around EUR 125 million. The overall objective of the programme was to develop further and broader the transition of Burgenland to a knowledge based economy and society through enhancements of competitive structures, promotion of attractive regions and guarantee of environmental sustainability. This was contribute to wealth and increase in QL of all inhabitants of the Bundesland and reduction of regional disparities. Balchin et al. (1999) is also addressing the issue of backwardness in the region.

For comparison, it is also possible to list the regional evaluation according to Melecký and Staníčková (2014), Aristovnik (2014) or Markowska (2017). The assessment of fairness in the proposed model itself is based on suggestion for allowance. As will be noted below, subsidies are designed to improve the development of regions in selected areas.

1 Quality of life evaluation

QL evaluation is a complex issue. There exist a lot of opinions and approaches to this issue. QL is evaluated by means of indicators. Individual indicators then form a set of indicators or they form a whole methodology for evaluating QL. As examples of such methodologies (approaches) for QL evaluation we can quote the following: Active Ageing Index (2015); Economist Intelligence Unit Limited (2015); Eurofound (2015); Better Life Index (OECD, 2015). QL evaluation was based on the Eurostat methodology (2014) and the available Eurostat official indicators (2015) for the selected year. The data matrix was then compiled from official Eurostat measurements. The aim of the paper is not the creation of a new meta-theory, so the authors proceeded from the indicators and data of this professional institution and did not create a new set of indicators. The selection of indicators from Eurostat is also supported by the fact that the model output is the suggestion for allowance to improve the development of the region. The funding of these subsidies is proposed from the sources of the operational program. Operational programs and Eurostat fall under the European Commission. These are indicators that guide the European Commission and are in line with the European Union policy.

Below there are areas A, B, …, F of indicators i_1, i_2, …, i_{30} for QL evaluation. The area is specified for field(s) by the following way: Area A (fields Economy, Labour Market): i_1 is Gross domestic product at current market prices by NUTS 2 regions; i_2 is Income of households by NUTS 2 regions, Balance of primary incomes/National income, net; i_3 is Young people neither in employment nor in education and from 15 to 24 years; i_4 is Population 65 years or older; i_5 is Population density; i_6 is Population change, Crude rate of total population change. Area B (Education, Science and Technology): i_7 is Distribution of pupils and students enrolled in general and vocational programmes, Upper secondary education - vocational; i_8 is Participation rates in selected education levels at regional level, Tertiary education; i_9 is Population aged 25-64, Tertiary education; i_{10} is Human resources in science and technology; i_{11} is Employment in high-tech sectors. Area C (Health): i_{12} is All causes of death; i_{13} is Health personnel, Nurses and midwives; i_{14} is Health personnel, Dentists; i_{15} is Fertility rates; i_{16} is Life expectancy Less than 1 year. Area D (Digital Economy and Society): i_{17} is Households with access to Internet at home; i_{18} is Individuals who have never used a computer; i_{19} is Frequency of internet access: daily; i_{20} is Internet use: Internet

banking, selling goods or services; i_{21} is Internet use: participating in social networks, creating user profile, posting messages or other contributions to Facebook, Twitter, etc.; i_{22} is Individuals who used Internet for interaction with public authorities, Internet use: interaction with public authorities in last 12 months. Area E (Transport, Tourism): i_{23} is Nights spent at tourist accommodation establishments, Nights spent; i_{24} is Number of establishments and bed-places; i_{25} is Road, rail and navigable inland waterways networks, Motorways; i_{26} is Road, rail and navigable inland waterways networks, Total railway lines; i_{27} is Victims in road accidents. Area F (Agriculture): i_{28} is Animal populations, Live bovine animals; i_{29} is Animal populations, Live swine; i_{30} is Production of cow's milk on farms. A detailed description and meaning of individual indicators, including units can be found in the Eurostat database (Eurostat, 2015).

The model that is introduced below is useable for various states or regions. However in this article the subject of attention is the Visegrad Group (V4). The reason for this is the cohesion of this regional group, small distances between these states and also the historical importance of the V4 for the Czech Republic (Visegrad Group, 2017). For the evaluation the V4 NUTS2 (Eurostat, 2011) regions were selected to support the intended extended result – recommendation for providing subsidies to NUTS2 region to develop in the selected recommended area. The actual achievement of fairness therefore consists of a suggestion for allowance for the development of regions in selected areas. NUTS2 regions as such had been created exactly for the purpose to receive subsidies from European Operational programmes (Eurostat, 2010).
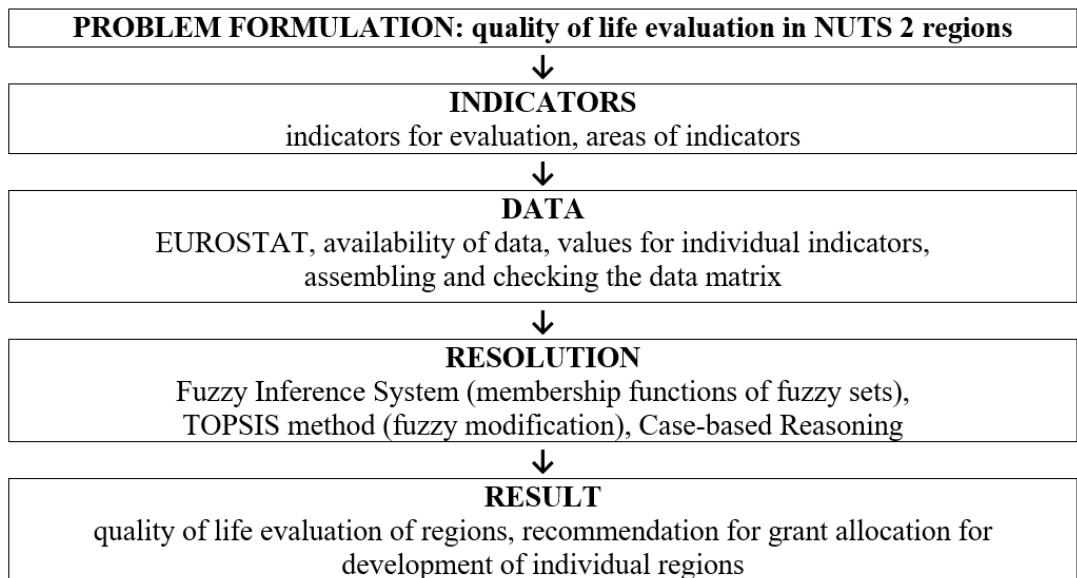
2 The model for the quality of life evaluation

As described in the text above V4 NUTS2 regions were selected for the QL evaluation. Indicators were selected for these evaluation that is based on Eurostat available data for year 2015 (for more topical evaluation even less indicators were available). The proposed model is based on Eurostat methodology, which has established methods for efficient data acquisition. From this point of view, it is desirable to rely on the already established methodology. While creating new methodologies, the availability of data can be a significant drawback. New approaches also limit the possibilities of subsequent comparison. The proposed model for QL evaluation is, compared to other models, beneficial by the use of methods that work with uncertainty. Dealing with uncertainty helps with a more appropriate description of the properties (Zadeh, 1965). Another significant benefit of the proposed model is its extension, which focuses on suggestion for allowance.

2.1 Description of the model

For the QL evaluation it has been proven that it is beneficial to use system engineering methods, for example see (Šanda, Křupka, 2016; Křupka et al., 2010; Kačmárová et al., 2013) among which there are the methods of multi-criteria decision making, rule-based systems and fuzzy logic. A combination of these methods has been used to deal with the defined problem and to create the model. In this model methods TOPSIS (its fuzzy modification respectively), FIS and CBR were used for dealing with the problem and also for QL evaluation for the individual regions. The model then worked with defined FSs. In the Fig. 1 below we can see a general schema of the model.

PROBLEM FORMULATION: quality of life evaluation in NUTS 2 regions
↓

INDICATORS
indicators for evaluation, areas of indicators

↓

DATA
EUROSTAT, availability of data, values for individual indicators, assembling and checking the data matrix

↓

RESOLUTION
Fuzzy Inference System (membership functions of fuzzy sets), TOPSIS method (fuzzy modification), Case-based Reasoning

↓

RESULT
quality of life evaluation of regions, recommendation for grant allocation for development of individual regions

Source: Authors

In the previous text the complexity of the QL evaluation was described, including data sources and selected indicators. Further there shall be described methods used for dealing with the problem – "the core" of the model. For QL evaluation were used software application MS Excel, MATLAB and myCBR in the model.

2.2 Fuzzy sets

Fuzzy logic was also used for the solution and FSs were defined for QL evaluation. Based on previous work (Šanda and Křupka, 2017) there were defined 4 FSs for area evaluation and 5 FSs for the total QL evaluation. In this article the intervals of FS were specified and there were used FS of trapezoidal shape of MF in the form [a b c d] (Chen et al., 1999). A graphical image of the defined FS is in the Fig. 2.

Fig. 2: Fuzzy sets for evaluation

Source: Authors

Defined FSs and their linguistic variables for total evaluation: very bad [0 0 0.4 0.45], bad [0.4 0.45 0.6 0.65], good [0.6 0.65 0.75 0.8], very good [0.75 0.8 0.9 0.95] and perfect [0.9 0.95 1 1]. This approach to QL evaluation and the defined FSs is based on the publication *QLIFEX - a rule-based expert system for quality of life evaluation*" (Atanasová, 2014). It is also based on the article " *A Novel Approach for*

Quality of Life Evaluation: Rule-Based Expert System" (Atanasová a Karashtranová). Atanasová (2014) also works with linguistic variables and a general assumption that the QL function is approaching the exponential shape (the better the results, the fewer subjects it achieves).

2.3 Methods Used in the Model
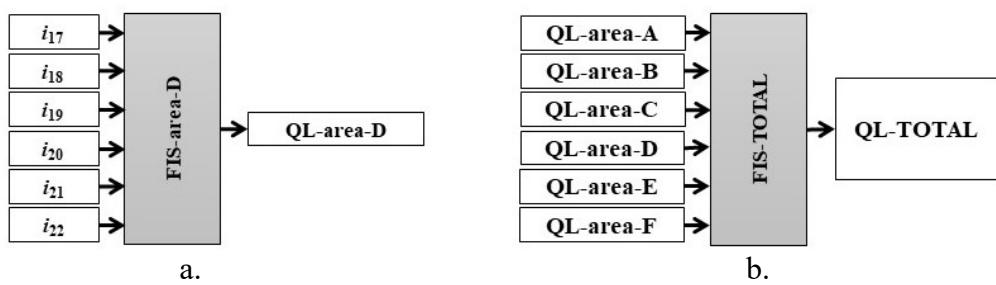
This model works with fuzzy modification TOPSIS, with FIS and CBR that shall be described in detail in the following text.

The method TOPSIS is one of Multi Attribute Decision Making algorithms, which is widely adopted. TOPSIS method is presented by Chen and Hwang (1992) and it is a multiple criteria method to recognize solutions from a limited set of alternatives. TOPSIS ranks the available networks based on their scores, with the highest being the best solution. In the created model there was used the extension of TOPSIS - fuzzy TOPSIS, where defined FSs were used. FSs were in TOPSIS method used thanks to publication (Chen, 2000). As stated by this author utilization of the fuzzy approach makes the method more realistic in the human beings decision-making environment where individuals' preferences are often ambiguous and thus they cannot be easily defined by concrete numeric values. On the contrary it is suitable to strive for verbal evaluation of alternatives and criteria. Weights of individual indicators were solved with share (1/30). Concrete description of the method's algorithm and an example of another problem being solved by the authors by means of TOPSIS method is in (Šanda, Křupka, 2016).

General structure of FIS is used for the resolution according to Zadeh (2015); Hu, et al. (2017) and Bělohlávek et al. (2002). Prior to its own QL evaluation with FIS usage, it is necessary to resolve: normalized matrix, define the rules and FSs for the QL evaluation, Mamdani type of FIS was used. Based on experimental FIS settings (Šanda, Křupka, 2017) as the optimal solution in defuzzification were selected the trapezoidal shape of membership function (MF) and the Centre of Gravity method.

Hierarchy structure of FIS for QL area and for total evaluation see in Fig. 3b.).

Fig. 3: *Hierarchy structure of FIS for QL area D (3a.) and Total evaluation (3b.)*

a.   b.

Source: Authors

The number of rules depends on the number of indicators in the relevant individual area and the number of defined FSs Examples of rules of area A: $Rule_{54}$: If (i_1 is very-bad) and (i_2 is very-bad) and (i_3 is bad) and (i_4 is very-good) and (i_5 is bad) and (i_6 is bad) then (QL-area-A is bad); $Rule_{907}$: If (i_1 is very-good) and (i_2 is good) and (i_3 is very-bad) and (i_4 is good) and (i_5 is good) and (i_6 is good) then (QL-area-A is good).

CBR is according to (Aamodt, Plaza, 1994; Watson, 1997; Lopez de Mantaras et al., 2005; Zehraoui et al., 2003) based on previous experiences that serve as the basis

for the evaluation of a given problem. CBR can be, according to described in the following steps: Retrieve (finding as much as possible similar cases to the input case), Reuse (use again the solution for the most similar case), Revise (repair of correction of the proposed solution) Retain (keeping this input problem and its solution). It is a learning process that solves problems based on the already solved problems. CBR differs from other models also by its increasing permanent learning – when there is yet another problem solved it immediately becomes available for dealing with further future problems. CRB is thus utilized for dealing with a new problem via remembering previous similar situations and re-utilization of these information and knowledge for the actual situation. CBR works on similarity basis- distance of the nearest neighbour.

2.4 Extension of the Model

One of the objectives of this article is to provide a recommendation regarding the allocation of the region development grant (for instance for a region with long-term bad result) and also the recommendation on the percentage level of the grant for any selected region. This recommendation is based on the EIU (2015), which is in the Tab. 1. In this article this approach is modified namely by the percentage (per cent amount) from the "development" operational program (which would be specially created). It is then possible to specifically define the area for the grant allocation from the partial results of the QL evaluation of the single areas.

Tab. 1: Suggestion for Allowance (in %)

QL evaluation – rating	80 – 100	70 – 80	60 – 70	50 – 60	50 or less
Suggested allowance	0	5	10	15	20

Source: (EIU, 2015)

3 Quality of Life Evaluation Results

Results achieved by the individual methods are stated in Tab. 2, 3, 4 and Tab. 5. The last column "Suggested allowance" illustrates the areas to which the grant should be directed – based on partial results in areas A – E. The result can be the recommendation for one or more areas, for more than one area, or also "alternatively area" (the area has below average results however not the worst results).

As one of the advantages of the utilization of this model can be seen the suppression of any "extreme values" both in the positive and the negative sense – where, for instance, GDP of capital cities did not play any important part.

From Tab. 2 it can be generally stated that the most problematic is the area Economy and Labour Market (based on the evaluation in the CZ in year 2015).

Tab. 2: Results of Individual Methods – CZ (in %)

Region	fTOPSIS	FIS	CBR	Suggested allowance
CZ01	41.54	68.30	51.39	area F, alternatively area A
CZ02	56.97	71.28	63.44	area C, alternatively area D
CZ03	60.97	73.38	63.61	area A, alternatively area D
CZ04	62.41	53.36	59.16	area F, area B
CZ05	61.52	69.31	64.32	area A, area B, alternatively area D
CZ06	65.54	80.38	67.56	area A, alternatively area D
CZ07	62.19	67.28	61.95	area A, area B
CZ08	61.11	56.28	60.27	area A, area F

Source: Authors

There arises the question of how shall this evaluation look like in the following years when we can see from the macroeconomic data that economy is on the rise. The NUTS2 region CZ06 has the best evaluation within the CZ. This region also belongs among the best regions under the V4 evaluation with about 70%. On the other hand CZ01 is among the worst regions due to, to a large extent, Agriculture area results.

As it is clear from Tab. 3 in PL the areas that need the most support are the following areas: Economy, Labour Market, Transport and Tourism.

Tab. 3: Results of Individual Methods - PL (in %)

Region	fTOPSIS	FIS	CBR	Suggested allowance
PL11	59.51	61.67	59.73	area A, alternatively area D
PL12	54.93	60.77	58.22	area E, alternatively area D
PL21	71.98	57.10	64.92	area A, area F
PL22	60.08	49.18	59.69	area A, area F
PL31	58.29	51.16	56.20	area A, area E
PL32	61.01	45.91	56.98	area E, area F
PL33	56.56	48.82	54.55	area A, area E
PL34	53.54	54.57	54.97	area E
PL41	64.06	66.52	62.48	partly to areas A, D and E
PL42	63.65	58.33	59.46	partly to areas A, B, D and F
PL43	58.73	42.09	55.24	area E, area F
PL51	64.91	56.00	59.94	area F
PL52	51.21	47.47	50.58	area A, area C
PL61	63.02	65.65	62.34	partly to areas A, D and E
PL62	57.37	54.57	58.26	area E
PL63	68.67	62.58	66.21	area A, alternatively area D

Source: Authors

The worst regions within PL, as well as in total, are NUTS2 regions Opolskie - PL52, Świętokrzyskie - PL33 and Lubuskie - PL43 with evaluation 50 – 53.5 %. The best NUTS 2 Polish region is Pomorskie - PL63 with value over 65%.

In HU, the following areas are the areas with the worst evaluation: Economy, Labour Market, Education, Science and Technology.

Tab. 4: Results of Individual Methods - HU (in %)

Region	fTOPSIS	FIS	CBR	Suggested allowance
HU10	59.49	61.00	56.22	area F, alternatively area A and B
HU21	59.61	59.31	59.10	area A, area B
HU22	59.84	63.97	59.51	area B, alternatively area A
HU23	58.28	57.63	58.48	area A, area B
HU31	56.96	53.18	55.14	area A, area F
HU32	56.54	54.22	56.17	area A, area B
HU33	55.43	53.88	55.29	area A

Source: Authors

NUTS 2 HU regions evaluation can be described as average (or even bellow average). The regions rank approximately in the middle of the total ranking. Neither of the regions is exceptionally good or bad.

As it can be seen in Tab. 5 Slovak regions are evaluated as from average to above-average. For SK there were generally worse results (that means potential areas for grants funding) composed from more average results. Thereby it can be recommended to distribute grants funding into more areas.

Region	fTOPSIS	FIS	CBR	Suggested allowance
SK01	57.40	67.78	51.69	partly to areas A, C and D
SK02	60.95	63.90	62.55	area F, alternatively area A
SK03	65.00	57.88	59.52	partly to areas A, B and C
SK04	66.09	60.32	62.27	partly to areas A, B, C and F

Source: Authors

When looking at the results for all regions we can see approximately 20% difference between the best and the worst regions. In average results for the entire countries there is difference smaller than 5%. This verifies the hypothesis that V4 countries are very similar to each other, however, within V4 there are regions that are worse off. Under the concept of achieving fairness it is essential to support the development of such regions. The results of the proposed model for QL evaluation NUTS2 regions were compared with Melecký and Staníčková (2014), which provide the most comprehensive view of the comparison. The other listed comparisons only deal with the partial evaluation results. The average deviation of the overall results of Melecký and Staníčková (2014) is 3.63% (for CZ 5.2%; HU 1.13%; PL 2.57% and SK 6.3%) a median 2.56% (for CZ 6.53%; HU 2.46%; PL 1.73% and SK 5.56%) compared to the results of this model.

To determine the influence of the individual parameters in the model (the indicators), a one-at-a-time sensitivity analysis (Hamby, 1994; Degasperi and Gilmore 2008) was performed on the overall results. It was examined how the overall results change if each indicator decrease by 1%. For a total of 20 out of 30 indicators, the change (decrease) S was less than 0.05%. Based on the sensitivity analysis, the biggest influence was present for the i_2 and i_{23} indicators, where S_{i12} is 1.35% and S_{i23} is 1.34%. Results of other indicators: S_{iI3} is 0.78%; $S_{i4} \in [0.63\%; 1.19\%]$; S_{i5} is 0.92%; $S_{i10} \in [0.54\%; 0.79\%]$; S_{i12} is 0.67%; S_{i14} is 0.65%; $S_{i17} \in [0.60\%; 0.63\%]$. As an extreme value can be seen the improvement of the CZ01 by 3.2% with a 1% decrease for the indicator i_{24}. This result is probably due to the nature of the indicator and the specific region CZ01 - the Prague region is a very popular region in the area of tourism. Based on the above, the results can be classified as robust.

4   Discussion - Suggestion for Allowance

Based on the above-stated evaluation results there are compiled recommendations for amounts to be allocated for the suggested grants funding (the area for grants funding has been already stated). The highest recommendation is 16.67% for the above-mentioned Polish regions. The lowest recommendation (that means best results) is for the Czech Regions Jihozápad - CZ03 a Jihovýchod - CZ06. The CZ results overall can be seen as very good results with the exception of Praha CZ01 and Severozápad - CZ04. On general terms the CZ ranks among the better parts of the V4.

The total results - Suggestion for Allowance are as follows: I) 16.67%: PL33. PL43 and PL52; II) 15%: CZ01. HU21. HU23. HU31. HU32. HU33. PL22. PL32. PL31. PL34 and PL62; III) 13.3%: CZ04. HU10. HU22. PL11. PL12. PL42. PL51. SK01 and SK03; IV) 11.67%: CZ0; V) 10%: CZ02. CZ05. CZ07. PL21. PL41. PL61. PL63. SK02 and SK04; VI) 8.33%: CZ03; VII) 6.67%: CZ06.

As an example we can state the operation program "Rural Development Programme" implemented, in the CZ, by Ministry of Agriculture. This program allocated the amount of 2.3 billion CZK. The thematic objectives of this program are also Investment in research, development and innovations for practice, Support for SMEs, Reducing energy intensity of economy, Reducing natural hazards, floods and environmental burden, Protection of the environment and use of natural resources, Increasing employment and high-quality workforce, Functioning social system and combating poverty, Improving the educational system. For instance for region Střední Čechy - CZ02, Severovýchod - CZ05 any recommendation for providing grants funding in the amount of 10% would represent 230 million CZK. In case of region CZ05 any recommendation for grants funding would go into the following areas: Economy, Labour Market, Education, Science and Technology (EU funds, 2012).

The whole process can then be described in more detail in several basic steps: the government or the ministry has set up a framework for the Operational Program (such as the Rural Development Program 2014-2020) approved by the European Commission; for the achievement of fairness between NUTS 2 regions, this model will be used; the outcome of the model will be suggestion for allowance (including areas such as infrastructure); under the principle of subsidiarity, the Regional Council of the Cohesion Region decides to grant a subsidy or contribution to the region's development. The model will ensure greater efficiency of redistribution of subsidies provided that all levels of public administration work properly. Of course, there are risks that can not affect the model and which can make the entire process "skewed" (for example, corruption). The suggestion for allowance will thus serve as a support for decision-making in public administration (Regional Council of the Cohesion Region, government). Thanks to a fairer redistribution (based on this model of QL evaluation), underdeveloped or backward regions will be continuously developed (similarly with Austrian Bundesland of Burgenland). As a result, disparities between regions will be reduced and the overall QL will increase.

Conclusion

Any QL evaluation is a fairly complex issue and its practical implementation is usually challenging. However, tools like rule-based systems, expert systems, multi-criteria decision-making systems, systems engineering methods may simplify this process. Despite this drawback, the concept of the QL has one big advantage. This concept looks on QL from many facets. Thus, this concept allows a complex QL evaluation. The created model for QL evaluation can be thus adopted to meet the number of available criteria, to meet extension by more (available) years and to allow for application on further regions, states or group of states. The model for QL evaluation can be used for QL evaluation for EU countries, evaluation development, trend description and similar and thus support the strive for fairness (justness) where the attention is given to the fact that under the same conditions there are, in various cases, achieved different results.

The authors are aware of the handicap in relation to the meta-theory, but they do not have this ambition. It is an empirical research with a pragmatic and purposeful goal. The article deals with the solution of practical issues in the relation of comparability to life. The article verifies and confirms the suitability of using and

retrieving existing data. The article also confirms the suitability of QL evaluation based on these data using selected methods. If new methodologies and theories were defined all the time, it would hurt the possibility of comparison. It would not be possible to compare the QL and its development over time, and it would not be possible to compare the individual states or regions that measure their QL "on their own". Therefore, the authors proceeded on the basis of Eurostat's official methodology, indicators and data, and did not create a new set of indicators or even new indicators. The benefits of this model and the whole approach can be found in the use of uncertainty methods for evaluating a complex variable, i.e. the QL. As Zadeh (1965) states, working with uncertainty is more appropriate for describing reality. The contribution of the model was confirmed in this paper by comparison (average deviation of 3.63% and median 2.56%) and one-at-a-time sensitivity analysis, from which the results can be classified as robust.

Recommendations for further work and development of the model include the use of multiple methods of system engineering, their synthesis and analysis; using more criteria; the inclusion of indicators for weights and areas; availability of data (current disadvantage).

Acknowledgement

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INTERFUNKČNÍ KOORDINACE V ŠIRŠÍM POJETÍ A NABÍDKA SLUŽEB

INTERFUNCTIONAL COORDINATION IN EXTENDED CONCEPTION AND OFFERING OF SERVICES

Eva Tomášková, Lucie Kaňovská

Abstract: The paper aims to investigate the relationship between interfunctional coordination (IFC) and offering of services. IFC is a crucial component of market orientation. Market orientation is one of the approaches, which is used for improving the business performance of companies and also for increasing their competitiveness. The conception of IFC was extended in this paper. IFC includes the following elements: Cooperative Arrangements, Company Culture, Expertise, Communications, Leadership Style, Ethic and Goodwill, Organizational Structure, Coordination (Fundamental Information Acquisition, Information Coordination and Coordination Activities) and Control. Current companies try to increase their service offering because of its positive influence on customers and company as well. The research was held in 60 electronic components manufactures and electric equipment manufacturers in the Czech Republic. The Spearman's rank-order correlation test was performed to verify the relationship between IFC and service offering. The main finding shows that the relationship between IFC and service offering is independent. Positive relationship between IFC and service offering is detected especially at emphasis on innovation and emphasis on the next education of workers.

Keywords: Interfunctional Coordination, Service Offering, Innovation, Education of Workers, Electronic Components Manufactures, Electric Equipment Manufacturers, the Czech Republic.

JEL Classification: M10, M31.

Úvod

Podniky se stále snaží nalézt takový způsob řízení, při kterém maximálně využijí trhem nabízené možnosti a optimálně všechny zdroje, které mají k dispozici. Pro efektivní rozhodování podniků je nutné vědět, které oblasti podniku, aktivit a procesů spolu souvisejí a vzájemně se ovlivňují a která jednání jsou na sobě spíše nezávislá. Tyto informace je pak nutné v průběhu času opět prověřovat, zda nedošlo k nějakým skutečnostem, které by znamenaly změnu.

Jedním z takových přístupů, kde se kloubí současný zájem teoretiků a praktiků, je interfunkční koordinace (IFC). IFC je předmětem zájmu v řadě vědních disciplín – marketingu, managementu, logistice, informatice, ale i řízení lidských zdrojů. IFC je nezbytnou součástí tržní orientace, která umožňuje manažerům zaměřit svou pozornost na externí a interní prvky a činnosti, jež ovlivňují činnost organizace, směřující ke zvýšení výkonu této organizace. Cílem IFC je snaha sladit všechny procesy a činnosti podniku tak, aby byl umožněný efektivní tok informací uvnitř podniku, ale rovněž mezi podnikem a externím prostředím.

V současné době je stále větší důraz kladen na služby, jak na samotný význam terciárního sektoru, tak i na služby, které výrobní podniky nabízejí k nabídce svých

hmotných produktů. Proto jedním z důležitých trendů, které ovlivňují rozvoj prodejní strategie a řízení fungování prodeje v mnoha společnostech, jejichž portfolio nabídky se dříve hlavně nebo výhradně soustřeďovalo na výrobky, je vzrůstající důležitost služeb (LaForge a kol., 2009). Doprovodný servis k rozšíření úplné nabídky výrobku pomocí služeb je možný způsob, jak snížit pokles marže a ztrátu strategického odlišení opírajícího se o inovace výrobku a technologickou převahu (Fischer a kol., 2012). Služby nemusí mít formu složité nabídky. Ve skutečnosti mají služby přidané do portfolia nabídky výrobních podniků daleko jednodušší charakter. Jedná se například o kontrolu, údržbu a případné jednotlivé opravy nainstalovaných produktů u zákazníků (Gebauer a kol., 2010; Kowalkowski a kol., 2013). Nabídka služeb není nyní pouze četnější, ale je často také pokročilejší. Z tohoto hlediska dělá odborná literatura rozdíl mezi základními službami typu jednotlivých nahodilých oprav a dodávek náhradních dílů, a naopak charakteru pokročilejší nabídky jako jsou smlouvy na zajištění úplných služeb a servisní smlouvy o činnosti (Stremersch a kol., 2001). Perfektní úroveň služeb je důležitá pro komunikaci přes Internet (Kozel a kol., 2017).

Analýza možných vztahů mezi IFC a službami je stále žádoucí. Jednak IFC i služby patří k atraktivním vědním oblastem a jednak zjištěné výsledky jsou vysoce prakticky využitelné. Cílem příspěvku je tedy zjistit, zda existuje závislost mezi širším pojetím IFC a nabídkou služeb. Pro zpracování tohoto příspěvku byly použity metoda deskripce, analýzy a syntézy. Závislost mezi IFC a nabídkou služeb byla verifikována pomocí Spearmanova korelačního koeficientu.

1 Teoretická východiska

Pojem IFC se používá již 40 let. První informace o IFC byly použity společně s termínem interfiremní kooperace ve smyslu supply chain managementu na počátku sedmdesátých let 20. století. První informaci o IFC z hlediska marketingu prezentovali Lawrence a Lorch v roce 1967. Tito autoři definovali IFC jako integraci kvality prodeje a spolupráci mezi jednotlivými odděleními a částmi podniku s cílem vytvořit takovou poptávku, která by byla v daném prostředí úspěšná. Autorem další důležité definice je Porter (1985). Dle něj vytváří IFC hodnotu pro zvolené zákazníky podniku a pomáhá v rychlé odezvě na potřeby a přání zákazníků. Další definici IFC vytvořil Shapiro v roce 1987. Shapiro se zabýval cross-functional coordination (CFC). Cross-functional coordination uspořádává a harmonizuje všechny interní funkce a procesy v podniku. Cross-functional coordination je příčinou toho, že bariéry bránící rozvinutí interních funkcí ztrácí na významu. IFC získala nový význam na počátku devadesátých let ve spojitosti s tržní orientací. Narver a Slater (1990) oprášili pojem tržní orientace a IFC získala novou dimenzi. Na konci devadesátých let Caruana a Calleya (1998) uvedli, že IFC je nejdůležitější kritérium interního marketingu. Na počátku první dekády 21. století je IFC vnímána zejména jako komunikace. Zahra a George (2002) poznamenali, že IFC integruje formální a neformální mechanismy sociální adaptace. Baker a Sinkula (2009) uvedl, že IFC pomáhá podnikům přetvářet se na učící se organizace. Podle nich, IFC presentuje kanál pro komunikaci mezi zákazníky a podnikem. Prostřední část první dekády 21. století ukazuje zejména výhody IFC. Woodside (2005) rozšířil pochopení o IFC na demonstraci snahy komunikovat se zaměstnanci, myšlení a kooperaci s vidinou dosáhnout cíle, dosáhnout efektivitu, udržet konkurenční výhodu a zvyšovat podnikový výkon. Druhá polovina první dekády 21. století definici IFC dále rozšiřuje. V této době se zde utváří dva základní přístupy k vnímání IFC. První

přístup je založený na tom, že někteří autoři vnímají IFC pouze jako nástroj pro sdílení informací, kooperaci mezi odděleními a koordinaci aktivit podniku, např. Tay a Tay (2007). Druhý širší přístup obsahuje nejen sdílení informací a koordinaci aktivit, ale rovněž i sdílení zdrojů pro vytváření koordinovaných aktivit (např. Bouranta a kol., 2005 či Peng a George, 2011). Na počátku druhé dekády 21. století jsou dále rozvíjena témata, která byla navozena v předchozí dekádě. Nadále zůstává zájem o IFC jako důležité kritérium interního marketingu (Kaurav a kol., 2015) a rozvíjení vztahu k zaměstnancům (Mohsen a Eng, 2013).

Na základě analýzy výše uvedených poznatků a za přispění našeho výzkumu jsme dospěly k závěru, že IFC je možné rozdělit do dvou úrovní. První úroveň, tedy užší jádro se přímo týká samotné koordinace – jak by se koordinace měla v podniku projevovat, tedy koordinace v rámci získávání základních informací, koordinace v rámci sdílení informací a koordinace aktivit a procesů v daném podniku. Širší pojetí koordinace se vztahuje k činnostem a procesům, které s užším pojetím souvisí a dále jej rozšiřují (IFC by se v nich měla projevovat). K těmto oblastem patří: Strategie podniku (kontrola), Styl vedení, Podniková kultura, uspořádání podniku, organizační struktura, volba zaměstnanců a nároků na ně kladených, úroveň komunikace (nejen sdělovat, ale i naslouchat) a etika.

Podle Varga a Lusche (2004) žijeme v době služeb, což znamená, že tradiční podniky orientované na hmotné produkty začleňují služby do své nabídky zákazníkům. Navíc výrobní podniky začaly také služby více přidávat do jejich celkové nabídky, jako součást jejich strategie odlišení (Oliva a Kallenberg, 2003; Neu a Brown, 2005; Gebauer a kol., 2010). Podle Olivy a Kallenberga (2003) může dokonce strategie orientovaná na odlišení podniku v oblasti služeb vést k přechodu z tradičního poskytovatele produktu k podniku orientovaného na služby. Společnosti s větší důvěrou ve služby dosahují lepší rentability tržeb a zlepšují svoji hodnotu (Fang a kol., 2008). Společnosti využívají nejlepší praktické zkušenosti nebo odbornou přípravu, které přispívají k lepšímu podnikovému výkonu s využitím kvality služeb, produktivity, ziskovosti a míry inovace. Nicméně efektivní rozdělení zdrojů klade důraz na inovační strategii podniku (Revilla a kol., 2016).

Výrobní společnosti se nyní zaměřují na strategii růstu založenou na službách k zajištění jejich pozice a k expanzi na konkurenční trhy (Reinartz a Ulaga, 2008; Ostrom a kol., 2010). Místo orientace jen na inovaci produktu se dnešní podniky zaměřují na odlišení služeb. Následně se místo vnímání služeb jako doplněk k produktu stávají služby středem celkové nabídky, kde je produkt doplňkem služby (Gebauer a kol., 2011). Využitím strategie odlišení v oblasti služeb v průmyslu získávají podniky strategické, finanční a marketing příležitosti. Skutečnost, že jsou služby méně viditelné a více závislé na pracovní síle, je nutí ke strategické příležitosti a udržitelnému zdroji konkurenční výhody (Heskett a kol., 1997). Služby vedou k vytvoření hodnoty založené na schopnostech podniku a zákazníka (Mathyssens a kol., 2006; Vargo and Lusch, 2008), tyto jsou unikátní a těžce napodobitelné konkurencí (Wernerfelt, 1984). Finanční příležitosti zahrnují dodatečné příjmy ze služeb v průběhu celého životního cyklu (Wise a Baumgartner, 1999). Marketingové příležitosti zahrnují použití služeb na rozšíření nabídky produktu a zvýšení kvality interakce se zákazníkem (Mathieu, 2001). Podobně i Davies a kol. (2007) ukázali, že služby poskytují stabilnější příjem, vyšší marži a vyžadují menší alokaci aktiv než výroba.

Navzdory všeobecné shodě týkající se přínosů strategie růstu služeb pro podniky převážně orientované na výrobky, manažeři neustále informují o problémech, které jsou spojeny s přechodem na služby. Například Stanley a Wojcik (2005) uvedli, že jen polovina ze všech řešení zajistila nízkou ziskovost a 25 % z nich ztratili peníze ve službách s přidanou hodnotou a nabídce řešení. Podobně i Neely (2008) potvrzuje, že ačkoliv průmysloví výrobci nabízející služby se radují z vyšších příjmů než tradiční výrobní podniky, stále generují nižší zisk. Výrobci se nepochybně o služby zajímají, ale když do této oblasti vstoupí, čelí značnému riziku a výzvám spojených s přechodem na obchodní model zaměřený na služby (Ulaga a Loveland, 2014).

Zatímco někteří autoři poukazují na skutečnost, že začlenění služeb by mělo být tahounem (Davies, 2003; Gebauer, 2007; Windahl, 2007), všeobecný názor je, že podniky musí zahájit posun uvnitř podniku vedoucí k proaktivní, čisté a silné strategii služeb s cílem uspět na trhu služeb (Gebauer a kol., 2005; Mathieu, 2001; Oliva a Kallenberg, 2003).

Služby na B2B trhu, které podporují výrobek, se podle Kotlera a Kellera (2013, str. 413) stávají hlavním prvkem boje o konkurenční výhodu. Právě z důvodu menšího počtu zákazníků a jejich důležitosti a síly větších zákazníků na průmyslovém trhu se očekává větší přizpůsobení potřebám jednotlivých zákazníků (Kotler a Keller, 2013, str. 222). Pro upevňování vazeb se zákazníky je nutné nabízet komplexní řešení jejich potřeb a přizpůsobit se jejich požadavkům ve všech možných ohledech. Proto je potřeba mít v zákaznickém servisu kompetentní lidi s proaktivním přístupem, kteří umí vycházet vstříc zákazníkům a mít také dobře nastavené komunikační kanály (Hazdra a kol., 2013, str. 40). Samozřejmě tento přístup by neměli mít jen zaměstnanci v zákaznickém servisu, ale měl by být prostoupen celou organizací.

2 Metody

2.1 Zaměření výzkumu

Služby jsou z hlediska IFC zajímavé z toho důvodu, že jsou důležitou součástí orientace na zákazníka, která, stejně jako IFC, je kruciální částí tržní orientace. O služby je v rámci analýzy tržní orientace významný zájem. Tento je daný jednak tím, že služby hrají stále významnější roli v nabídce podniků, jednak také tím, že Cano, Carrillat a Jaramillo (2004) prokázali, že vyšší korelace mezi tržní orientací a podnikovým výkonem byla zjištěna u neziskových podniků a podniků nabízejících služby. Podniky zaměřené na generování zisku a výrobní podniky pak měly míru korelace mezi tržní orientací a podnikovým výkonem nižší. O rok později naopak Kirca, Jayachandran a Bearden (2005) uveřejnili výsledky svého výzkumu, kde korelace mezi tržní orientací a podnikovým výkonem byla vyšší u výrobních podniků než u podniků poskytujících služby. Webb a kol. (2000) formulovali, že jejich výzkum prokázal pozitivní vliv mezi tržní orientací a kvalitou služby. Jako předpoklad úspěchu nabídky nových služeb bylo Ordaninim a Magliem (2009) zjištěno, že je nutné realizovat proaktivní tržní orientaci. Rovněž vztah mezi tržní orientací a inovacemi byl významnější u podniků nabízejících služby než u výrobních podniků, viz Grinstein (2008). Frösén a kol. (2016) zjistili, že nejvýznamnější korelace mezi tržní orientací a podnikovým výkonem byla u podniků poskytujících služby v rámci B2B.

Je tedy zřejmé, že mnohé vědecké práce zkoumají vztah tržní orientace a služeb u výrobních podniků, případně tržní orientace a podnikového výkonu u podniků

poskytujících služby. Oblasti IFC a služeb byla však věnována zatím jen minimální pozornost. Tomášková a Kaňovská (2016) analyzovaly vztah mezi užším pojetím IFC a nabídkou služeb. Zjistily, že nelze prokázat, zda mezi těmito dvěma veličinami existuje pozitivní vztah, neboť pozitivní vztah existoval pouze u poloviny zkoumaných položek. Z detailnějšího zkoumání vyplynulo, že existuje pozitivní vztah mezi užším pojetím IFC a vývojem nových produktů a služeb dle požadavků zákazníků a dále existuje pozitivní vztah mezi kvalitou produktů a služeb a koordinací všech aktivit a procesů v daném podniku. Mezi koordinací vztahující se ke sdílení informací a kvalitou produktů a služeb nebyl detekovaný žádný vztah. Totéž platí i pro IFC v užším pojetí a speciální nabídku služeb pro VIP zákazníky. Díky těmto skutečnostem bylo naším záměrem rozšířit získané poznatky a prozkoumat ještě vztah mezi IFC v širším pojetí a nabídkou služeb, tedy zda v rámci širšího pojetí IFC nevystupuje nějaká položka, která by vykazovala s nabídkou služeb pozitivní korelaci.

Na základě výše uvedených skutečností jsme stanovily hypotézu H: „Mezi širším pojetím IFC a nabídkou služeb neexistuje pozitivní vztah".

2.2 Metody výzkumu

Pro zjištění výsledků zkoumající širší pojetí IFC a nabídku služeb byl vytvořený dotazník. Dotazník založený na pětistupňové Likertově škále se skládal z položek použitých v předchozích výzkumech (Kaňovská a Tomášková, 2012, Bartošek a Tomášková, 2013) a byl rozšířen o další položky. Dotazník byl testovaný z hlediska spolehlivosti pomocí Cronbach alpha. Úroveň spolehlivosti činila 0,863 (Tomášková a Kaňovská, 2016).

Oblast vztahující se k IFC obsahuje 22 položek a je rozdělena do následujících částí: uspořádání podniku, podniková kultura, odbornost, komunikace, styl vedení, etika a dobrá pověst, organizační struktura, koordinace a kontrola. Část obsahující koordinaci se váže k užšímu pojetí IFC, zbývající části se váží k širšímu pojetí IFC. Užší pojetí IFC se dělí dále na koordinaci z hlediska aktivit, koordinaci v získávání základních informací a koordinaci informací. Pro ověření stanovené hypotézy H v oblasti nabídky služeb, byly zvoleny tři položky v dotazníku z části zaměřené na nabídku služeb.

Zvoleným objektem výzkumu byly podniky působící v elektrotechnickém průmyslu. Elektrotechnický průmysl má dlouhodobě historicky významný vliv na hospodářství České republiky. Dotazník byl určený ředitelům nebo manažerům podniků působících v elektrotechnickém průmyslu CZ-NACE 26 (konkrétně CZ-NACE 26.1, CZ-NACE 26.3, CZ-NACE 2651, CZ-NACE 266) a CZ-NACE 27 (konkrétně CZ-NACE 271, CZ-NACE 273, CZ-NACE 274, CZ-NACE 275 a CZ-NACE 279). Pro oslovení podniků byla použita placená databáze Českého statistického úřadu a databáze společnosti Kompass. Výzkum zahrnoval SME (od 10 do 250 zaměstnanců) z jihomoravského regionu. Podle Českého statistického úřadu je takovýchto podniků v jihomoravském regionu 107. Prostřednictvím telefonu a e-mailu byly osloveny všechny tyto společnosti s prosbou o spolupráci na výzkumu. Zpět bylo získáno 60 použitelných (plně vyplněných) dotazníků, což odpovídá návratnosti ve výši 56 %. Kompletní databáze byla analyzována užitím standardních statistických metod a dalších sofistikovaných technik.

3 Výsledky

Každá širší oblast IFC obsahuje dvě položky, k nabídce služeb se pojí tři položky. První položka zjišťuje, zda nové produkty včetně služeb jsou vyvíjeny a zlepšovány dle požadavků zákazníků. Druhá položka zkoumá, zda podniky vytváří speciální nabídku pro VIP zákazníky. Třetí položka zjišťuje, zda nabídka produktů a služeb se vyznačuje dobrou kvalitou.

Verifikace vztahu mezi IFC v širším pojetí a nabídkou služeb byla realizována za pomocí Spearmanova korelačního koeficientu. První číslo ukazuje hodnotu Spearmanova koeficientu pořadové korelace (Spearman rho), druhá hodnota je p – hodnota. Jestliže $p < 0{,}05$, pak zamítáme nulovou hypotézu (H0: položky jsou nezávislé), resp. přijímáme alternativní hypotézu (HA: položky jsou závislé). Hodnoty korelace jsou uvedeny v Tab. 1.

Tab. 1: Korelace položek vztahujících se k širšímu pojetí IFC a nabídce služeb

Oblast	Položka	Nabídka služeb dle přání zákazníků	Speciální nabídka pro VIP zákazníky	Dobrá kvalita nabízených služeb
uspořádání podniku	sledování činností	0,224 / 0,118	0,363 / 0,010	0,243 / 0,100
	definování činností	0,250 / 0,056	0,121 / 0,366	0,228 / 0,094
odbornost	zkušení specialisté	0,182 / 0,168	0,065 / 0,626	0,187 / 0,171
	další vzdělávání	0,271 / 0,038	0,238 / 0,072	0,316 / 0,019
komunikace	organizování setkání	0,255 / 0,052	0,155 / 0,246	0,146 / 0,288
	analýza připomínek	0,184 / 0,170	0,216 / 0,110	0,028 / 0,838
styl vedení	týmová práce a kooperace	0,229 / 0,081	0,345 / 0,008	0,078 / 0,569
	ne striktnost a formálnost	0,089 / 0,500	0,122 / 0,361	0,181 / 0,186
Etika a dobrá pověst	Etická rozhodnutí	0,092 / 0,494	0,100 / 0,458	0,099 / 0,478
	Identifikace pracovníků s podnikem	0,191 / 0,161	0,152 / 0,274	0,133 / 0,344
Podniková kultura	Preference externího prostředí	-0,284 / 0,032	-0,171 / 0,207	-0,000 / 1,000
	inovace	0,269 / 0,040	0,324 / 0,013	0,415 / 0,002
Organizační struktura	Kompetence a odpovědnost	0,222 / 0,092	0,158 / 0,235	0,184 / 0,178
	flexibilita	0,078 / 0,564	0,141 / 0,299	0,131 / 0,340
Strategie a kontrola	Dosahování dlouhodobých cílů	-0,155 / 0,259	-0,056 / 0,683	0,248 / 0,076
	Podpora hlavního cíle	0,245 / 0,063	0,200 / 0,135	0,266 / 0,052

Zdroj: autorky

Tabulka ukazuje, že většina výsledků vykazuje nezávislost, resp. pouze 17 % výsledků vykazuje závislost. Nabídka produktů a služeb dle požadavků zákazníků má pozitivní korelaci se dvěma položkami (p < 0,05), u jedné položky je pak možné sledovat negativní korelaci. U druhé položky vztahující se ke službám, tedy zjištění toho, zda podniky realizují speciální nabídku služeb pro VIP zákazníky, nalezneme pozitivní korelace ve třech případech. U poslední položky zjišťující, zda podniky nabízejí kvalitní produkty a služby, se projevuje pozitivní závislost pouze ve dvou případech. K položkám vykazující pozitivní závislost se řadí zejména důraz na inovace, které vykázalo pozitivní korelaci s nabídkou služeb ve všech třech případech (p = 0,040, p = 0,013 a p = 0,002), dále pak důraz na další vzdělávání, které vykázalo pozitivní korelaci s nabídkou služeb ve dvou případech (p = 0,038 a p = 0,019), dále pak oddělené sledování činností (p = 0,010) a týmová práce a kooperace (p = 0,008). Negativní korelaci vykazují položky preference externího prostředí a nabídka služeb dle přání zákazníků (p = 0,032). U nabídky služeb bylo možné očekávat zejména pozitivní závislost s flexibilitou, tato však ani u jedné ze tří položek nabídky služeb nebyla nalezena.

4 Diskuze

Výše uvedené výsledky tedy potvrzují hypotézu, že mezi IFC v širším pojetí a nabídkou služeb neexistuje pozitivní vztah. Pozitivní vztah je možné spatřit pouze výjimečně u některých položek IFC, zejména se v tomto případě jedná o důraz na inovace a další vzdělávání pracovníků. Přitom vzájemné porovnání obou položek, důraz na další vzdělávání a důraz na inovace, vykazuje užitím Spearmana korelačního koeficientu vzájemnou silnou pozitivní korelaci (p = 0,000). Z výše uvedeného lze tedy vyvozovat, že další vzdělávání pracovníků pomáhá vytvářet v podniku tlak na zdokonalování inovací, které se projevuje rovněž u nabídky služeb.

Ačkoliv tedy byl potvrzený pozitivní vztah mezi tržní orientací (jejíž nezbytnou komponentou je IFC) a nabídkou služeb (např. Ordanini a Maglio, 2009), vztah mezi samotnou IFC a nabídkou služeb nebyl prokázán, a to ani v užším pojetí (viz Tomášková a Kaňovská, 2016) ani v širším pojetí. Nicméně důraz na implementaci IFC u podniků, stejně tak důraz na rozšíření nabídky služeb u podniků je stále zřetelnější.

Důraz na inovace je podstatou i inteligentních služeb, které začínají podniky nabízet svým zákazníkům. Jak totiž uvedli Allmendinger a Lombreglia (2005), už brzo bude pro podnik nedostatečné nabízet služby, bude muset poskytovat inteligentní služby (v angličtině se používá výraz smart services). Jejich velkým přínosem je jednoznačně možnost monitoringu zařízení u zákazníka, které jsou důležité jak z hlediska úprav či oprav (i formou vzdálené správy) zařízení, tak i využíváním zjištěných informací a jejich vyhodnocením pro využití prediktivní údržby či následnou inovaci produktu.

Podle Kleina (2017, str. 234) patří mezi možné přínosy pro poskytovatele inteligentních služeb například zvýšení marží, snížení nákladů, generování dalších odbytů, realizace vyšších cen, shromažďování cenných informací, zvýšení spokojenosti zákazníků či odlišení se od konkurence. Naopak pro zákazníky jsou výhody z užívání inteligentních služeb podle Kleina (2017, str. 234) následující: lepší spolehlivost (např. předcházení poruchám), vyšší rychlost poskytnutí služby (např. rychlejší řešení problému), vyšší efektivita (např. optimalizace procesu), vyšší kvalita služby (např. snížená míra poruch), lepší přizpůsobení potřebám uživatele (např.

pružná konfigurace řešení), lepší kvalita informací (např. vyšší transparentnost) zaměření se na své vlastní hlavní kompetence (např. pomocí zjednodušeného outsourcingu), atd.

Mezi možná řešení inteligentních služeb, která vycházejí z výsledků případových studií Kleina (2017, str. 217), lze zařadit následující: platforma inteligentních služeb, (IT řešení propojující poskytovatele služeb, zákazníky a technické prostředky, eventuálně také partnery a třetí strany), odborná pomoc cestou dálkového připojení během uvádění do provozu, zaškolení prostřednictvím dálkového připojení (např. odborníci koučující servis u zákazníků nebo přímo zákazníky prostřednictvím připojení na dálku), datový přenos prostřednictvím dálkového připojení, uchovávání dat (např. automatické zálohování a ukládání dat), aktualizace systému prostřednictvím dálkového připojení (např. automatická aktualizace software v nainstalované bázi), dálková klasifikace podmínek a analýza nainstalované báze, prediktivní služby (např. předvídání událostí na základě dat a proaktivní iniciace servisních zásahů), porovnávání výkonnosti na základě dat (např. porovnávání provozní výkonnosti různých zákazníků pomocí nainstalované báze), poradenská činnost na základě dat (např. poskytování rad zákazníkům k optimalizaci výrobních procesů), atd.

Oblast digitálních služeb nabývá dnes na významu i u malých a středních podniků. Samozřejmě je pro ně komplikovaná počáteční investice spojená s poskytováním těchto pokročilých služeb a často je to odradí. Na druhou stranu jsou malé a střední podniky mnohem flexibilnější k novým činnostem, a pokud je vůle managementu touto cestou jít, pak může být implementace inteligentních služeb do nabídky poskytovaných produktů jednodušší. Proto jsme se rozhodly provést hloubkové rozhovory s otevřenými otázkami právě u elektrotechnických podniků, které podle informací už z uskutečněného výzkumu v roce 2014 inteligentní služby poskytují.

Oblastí výzkumu bylo právě zmapování současné situace malých a středních podniků s poskytováním těchto služeb. Z rozhovorů jednoznačně vyplynulo, že nabídka těchto služeb je pro tyto podniky téměř samozřejmostí a nedokážou si představit, že by tyto inteligentní služby zákazníkům nenabízely, protože jim jednoznačně šetří čas, peníze (např. na cestovné svých techniků) a navíc jim poskytují informace od zákazníků, které jsou pro ně a další inovace produktů velmi důležité. Tuto problematiku inteligentních služeb chceme i nadále zkoumat, jelikož se nám i podnikům jeví jako prioritní.

Závěr

IFC je možné rozdělit na IFC v užším pojetí a IFC v širším pojetí. Užší pojetí IFC se váže k samotné koordinaci, přitom širší pojetí se pak vztahuje k činnostem a procesům, které užší pojetí dále rozšiřují, kam patří oblast strategie podniku (kontrola), styl vedení, podniková kultura, uspořádání podniku, organizační struktura, volba zaměstnanců, úroveň komunikace a etika. V rámci těchto širších oblastí byla ve vztahu s nabídkou služeb zjištěna převážně nezávislost jednotlivých položek. Významná pozitivní závislost byla zjištěna zejména u položky důraz na další vzdělávání pracovníků a důraz na inovace.

Nabídka služeb dále prochází rozsáhlým vývojem, kdy v současné době se mnohé vědecké studie zaměřují zejména na nabídku inteligentních služeb. Inteligentní služby

v budoucnu určitě značně ovlivní vzdělání, zdravotnictví, maloobchod, výrobu a dopravu a společnosti, které tuto výzvu nepřijmou a nevyužijí její příležitosti, budou mít problémy přežít na trhu. Jak řekl Töytäri (2017) podniky potřebují povědomí a propojenost vytvořit hodnotné inteligentní služby.

Inteligentní produkty budou doručovat vytvořenou hodnotu pro zákazníky, kteří budou profitovat z větší kontroly užívání produktů. Pro výrobce to znamená přínos ve větší výkonnosti svých procesů, integraci s dodavatelským řetězem a onshoring inteligentní výrobní kapacity do konečného dodání high-tech produktů.

Podle Maříka a kol. (2016, str. 37) se očekávaný vývoj české ekonomiky, resp. podniků jednoznačně týká postupného propojování a prorůstání sekundární výrobní sféry s terciární sférou služeb. Oblast služeb se pak stane primární a výroba se tak stane službou materializace modelu zákaznicky poptávaného výrobku. Předvýrobní etapy, dříve velmi úzce svázané s vlastní výrobou, bude možné oddělit a pomocí zpracování virtuálních produktů již ve fázi prvních grafických návrhů, projektování či konstrukce, bude možné formou služby vytvářet variantní řešení modelů s maximální vypovídající schopností, kdy vlastní výroba může být na zcela jiném kontinentu.

Obdobná situace bude i po ukončení samostatného výrobního procesu, kdy bude formou velmi sofistikované služby zajišťován po celou dobu životnosti produktu jeho servis, příp. činností související s vylepšováním jeho užitných vlastností nebo technických parametrů. Tyto služby bude možné poskytovat, především u složitějších a technicky náročnějších celků, díky monitoringu pomocí vzdáleného přístupu k produktu nebo zařízení, jehož součástí je konkrétní produkt. Další formou zprostředkování servisních služeb bude aktivní monitoring a komunikace produktu se servisním střediskem s tím, že povýrobní údržba bude probíhat autonomně v režimu tzv. prediktivní údržby.

Problémem ale zůstává koordinace těchto inteligentních služeb, což vyvolává další otázky vztahující se k propojenosti IFC a služeb. Sledování vývoje obou oblastí bude dalším záměrem našeho výzkumu.

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STUDENT´S KEY COMPETENCIES REQUIRED FOR APPLICABILITY IN PRACTICE – STUDENTS' POINT OF VIEW

Janka Vydrová

Abstract: *The competence of university students is a key issue. Due to the situation on the labour market, it is necessary to respond already in the university education of future young professionals. The aim of each educational institution is to have high-quality graduates who are on the job market and able to adapt to the current situation. The aim of the paper is to identify a new approach in the education of young professionals based on identification of key competencies. In total, 586 questionnaires were evaluated. The research began in February 2017. The first phase was conducted through controlled interviews with 19 student groups. In total, there were 148 respondents in qualitative research. The quantitative research followed in April 2017 and ended in January 2018. The key competences identified were ranked according to their importance from the student's point of view, and in the article the author dealt with those that the respondents identified as most important for the preparation of their next vocation. These are communication skills, knowledge of foreign languages, creativity, responsibility, teamwork, flexibility, punctuality and work under stress. Three research hypotheses have been identified. Hypotheses were verified using the Two-sample t-Test statistic for equal means.*

Keywords: *Key Competencies, Universities, Education, Globalization, Young Professionals, Self-education, Self-reflection.*

JEL Classification: *J59, J89, M12, M20, M55.*

Introduction

In today's globalized and constantly evolving labour market, demands are growing for young professionals who are constantly preparing for their next vocation. These global changes are especially of an economic nature, and young experts have to respond to them quickly and flexibly. This is why new requirements for the model and quality of graduates are being created, as are the new approaches to efficiency and consequently also the competitiveness of both young professionals and those providing education. Universities must therefore flexibly respond to these changes and must therefore prepare young professionals who are able to adapt to the labour market and are ready for change, especially in the sphere of self-education. An important fact will be not only the educational process itself, but it is just as important to be education throughout life. Therefore, young professionals must be trained in modern education, i.e. to acquire knowledge but also to develop practical skills and key competencies.

In a dynamic global environment, the ability of young professionals to strategically reflect their careers and assess and develop key skills, competences and competencies, a necessary part of the prepared young practitioner. These factors will also be crucial for success in further career growth. Changes in work bring the need for modernizing knowledge, skills and competencies at the workplace. The main aim of this article is to identify a new approach in the education of young professionals based on

identification of key competencies. Recent studies suggest that a growing number of universities are embracing the notion that sustainability should and can be integrated into the university support system for entrepreneurship, or that sustainability activities should be implemented and promoted with entrepreneurial spirit (Fichter and Tiemann, 2018). Students are the future middle class members, people with higher education, the ones who will identify consumer trends, and those who will become the entrepreneurship accelerator (Głowacka-Toba, 2015). The expected results of students' core professional competences' formation in the educational practice of higher education institutions are accumulated in the complex of pedagogical conditions providing innovative update of the educational process, among which the most productive and appropriate condition for students are didactic objectives as an educational construct of core competencies' (Fan and coll., 2015) integrity in learning and professional activity (Zimnaya, 2003).

1 Statement of a problem

We moved from a human-based society to intellectual capital. Workers can no longer expect to work for the same company throughout their lives; employees need to constantly update and their skills constantly demonstrate their ability to add value to the organization (Feldman, 2010). Bejtkovský (2015) says that the aim of the philosophy of Age Management is efficient and targeted work with all age groups of employees to ensure profit, competitiveness and prosperity of institution. This is precisely the moment when we have to respond to university education and to prepare future young workers for differences. At present, experts are inclined to evaluate individual personality folk. This assessment includes both the assessment of hard skills and more and more of the assessment of soft skills. To this view, Hurrell (2015), who says that soft (e.g. interpersonal and social) skills are receiving ever more attention with employers frequently reporting that employees lack these skills.

There has been much debate in recent years, across many developed economies, concerning skills deficits. Employers report problems with filling vacancies because applicants lack the required skills (skills shortages) and/or that current workers lack proficiency in their jobs (skills gaps). These problems are, however, not confined to hard/technical skills and digital skills (Shala and Grajcevci, 2018) and deficiencies are frequently reported in 'soft' interpersonal and social skills, also called 'non-cognitive' skills (Handel, 2003). The question arises whether the gaps in soft skills that employers identify are primarily attributable to employees. The gaps in soft skills that manifest in the organization may reflect poor recruitment, selection and training practices. Another possible explanation, however, is that negative responses to quality of work can lead to impersonal individuals taking soft skills. Because soft skills are key to emotion-dependent work processes (Vincent, 2011), they may be particularly prone to leave due to negative responses to the employer. Examples of soft skills include oral communication, team working, customer handling and self-presentation (Hurrell et al., 2013). Nevertheless, despite the fact that universities are faced with increasing pressure to make use of their resources and consider sustainable development as part of their operations, many are still reluctant to revise their business models and incorporate the necessary changes (Ávila and coll, 2017). Instructional problems not only require an adequate didactic reduction of facts, but also an increase in the self-complexity of the students (Mahren and coll., 2017). Competencies have

become the leading construct in many different human resource practices, such as recruitment and selection, career development, performance management, and the management of change (Bartram, 2005; Hollenbeck, McCall, & Silzer, 2006). Competency based approach has been extended at the beginning of the 21st century in connection with discussions about problems and ways of modernization of the education. Innovative education–is not only a new way of teaching, but also a new way of thinking. This education is focuses not on the transfer of knowledge, which constantly outdates, but on mastering the core competences (Lee, 2018) that allow then to acquire knowledge on their own (Makulova, 2015). Asimov and coll. (2009) says that competence is a combination of knowledge, skills, abilities formed in the process of learning of a particular discipline, as well as the ability to perform any activity on the basis of the acquired knowledge, skills, abilities. When selecting candidates for managerial positions in SMEs operating in the Czech Republic equal emphasis is put on the general knowledge as the social maturity. When selecting candidates for managerial positions in SMEs operating in the Czech Republic does not put equal emphasis on their practical skills as on their social maturity (Taraba, 2014).

Learning from the universities' experiences of the students' key professional competencies' development shows that this process allows educational institutions to modernize training objectives and orientations from knowledge reproducing to their use and organization; to remove the dictatorship from the labour object (subject matter), but not to ignore it; to put in its base a strategy for flexibility increasing in favour of employment opportunities' and tasks' solving increasing; to put at the forefront the interdisciplinary and integrated requirements and expectations of the educational process; to integrate educational goals with situations of applicability (using) in the world of labour; to direct the activities on the endless diversity of professional and life situations (Zeer, 2000).

Summing up the experience of scientists, the model of professional competence can be defined as cognitive competences, functional competence (skills), personal competences (behavioural competences), ethical competence and meta-competences refer to the ability to cope with uncertainty, as well as with the teachings and criticism (Makulova, 2015). Competency is not the behaviour or performance itself, but the repertoire of capabilities, activities, processes and response available that enable a range of work demands to be met more effectively by some people than by others' (Kurz & Bartram, 2002). In their opinion, the cluster of characteristics that defines a competency can vary from extensive to limited depending on the competency. Besides cognitive ability there are other constructs that appear to have incremental validity in the prediction of work-related behaviours. The Big Five personality traits (Barrick and Mount, 1991) have proven to be related to work-related behaviours such as job performance (Thoresen, Bradley, Bliese, & Thoresen, 2004). The Big Five personality traits to explain variance in the competency dimensions over and above measures of verbal and abstract reasoning. In other words, in assessing competencies related to the Thinking, Feeling, and Power dimensions, it is expected psychologists not only to rely on scores of applicants on measures of verbal and abstract reasoning, but also on scores of applicants on measures of personality. Semeijn (2007) deals with the competencies in the labour market for university graduates. The main objective of the research was to identify specific and general competencies and their relationship and dependence between the educational program and the labour market. Multiple schools

and institutions, both within the business field and outside, require their students and/or employees to complete self-assessments and to develop professional development plans (Gerken, Beausaert, & Segers, 2016). In addition, some schools have dedicated courses where students create such plans through integrative tools, such as E-portfolio (Peeters & Vaidya, 2016; Vouchilas & George, 2016). Most leadership classes in Master of Business Administration programs include leadership theories, concepts of leadership and management, and to varying degrees, student learning of some managerial skills; however, many of these classes do not provide the needed focus on the development of essential skills, such as self-reflection and self-awareness (Hobson and coll., 2014). As part of efforts to respond to the changing global economy, the Australian government has undertaken two major policy-drives related to school curricula: "from knowing things to being able to do things" and "from local State curricula to a common national curriculum" (Yates and Collins 2008). In particular, most of the new curricula have focused on developing knowledge and skills outside the boundary of the subject matter, such as "essential learning," "new basics," and "capabilities." Tasmania, for example, has listed essential learning under five headings: Thinking, Communication, Personal Future, Social Responsibility, and World Future (Yates and Collins 2008). Increased workers' control of the learning process makes competence development more stimulating, is likely to simplify the work and reduces (learning-related) stress. It is therefore important that learning at work allows employees to control their learning and also allows time for the process of learning and reflection (Paulsson, 2005).

Leadership courses are important components of all business program curricula, whether emphasis is on management, finance, accounting, marketing, or another functional area. Regardless of the major, graduating business students will eventually be placed in situations where their success will be dependent on their application of leadership skills and their ability to manage people and resources effectively (Rubens and coll., 2018).

2 Methods

This article deals with the analysis and statistical evaluation of the key competencies of students that are needed during the course of study for the pursuit of another professional vocation. This research is done from the point of view of students. A sample of students was taken at two faculties of Tomas Bata and Zlin University, at the Faculty of Management and Economics and the Faculty of Humanities. The reason for choosing these two faculties was a common element, namely the teaching of Management I as a key subject in their graduate profile.

Three hypotheses have been defined:

$H1_0$: According to respondents participating in the sample, the average perception of key competencies for students is the same for men and women.

$H1_0$: $\mu1 - \mu2 = 0$

$H1_A$: According to respondents participating in the sample, the average perception of key competencies for students is different for men and women.

$H1_A$: $\mu1 - \mu2 \neq 0$

$H2_0$: According to respondents participating in the sample, the average perception of key competencies for each faculty is the same.

$H2_0$: $\mu3 - \mu4 = 0$

$H2_0$: According to respondents participating in the sample, the average perception of key competencies for individual faculties differs.

$H2_A$: $\mu3 - \mu4 \neq 0$

$H3_0$: According to respondents participating in the sample, the average perception of the key competences of students for the year of study is the same.

$H3_0$: $\mu5 - \mu6 = 0$

$H3_0$: According to respondents participating in the sample, the average perception of key competencies of students for the year of study is different.

$H3_A$: $\mu5 - \mu6 \neq 0$

For this, the Two-sample t-Test for equal means was used.

The formula for the pooled estimator of $\sigma2$ is

$$S_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2} \qquad (1)$$

Where s_1 and s_2 are the standard deviations of the two samples of respondents (men and women, Faculty of Management and Economics and Faculty of Humanities, first and third year of study) and n_1 and n_2 are the sizes of the two samples of respondents.

The formula for comparing the means of two populations using pooled variance is

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{S_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \qquad (2)$$

where equation and equation are the means of the two samples, $sp2$ is the pooled variance, and n_1 and n_2 are the sizes of the two samples. The number of degrees of freedom for the problem is

$df = n_1 + n_2 - 2$

In order to meet the main goal of the research, qualitative and quantitative marketing research was carried out. Qualitative research was conducted during February 2017 through controlled interviews with students of the first year. Their aim was to identify key skills that are essential for qualitative growth and employment in the labour market. There were 19 groups of students with a total of 148 respondents. Based on qualitative research data, a questionnaire was formulated. The questionnaires were distributed both electronically and in paper form to students of the Faculty of Management and Economics and the Faculty of Humanities in the first and third year of study. The reason for choosing is to track the author's research on progress in perceptions. The pre-test of the questionnaire was carried out on a sample of 20 respondents and was implemented in March 2017, based on the evaluation of the results, the main research was carried out in the months of April 2017 to January 2018. Scaling was done using the five-step Likert scale, where 1 was the maximum rating (importance) and 5 was the minimum rating (importance) from student´s point of view. The questions were based on the results of qualitative research, and included in

particular the key competences identified by the participants as key. The results of the questionnaires served to test the hypotheses.

The total number of respondents was 586, with 384 respondents at the Faculty of Management and Economics, 202 respondents at the Faculty of Humanities. From the questionnaires received, 12 questionnaires had to be excluded because of the incompleteness of the data. The statistical distribution of the respondents is shown in Tab. 1.

Tab. 1: Respondents statistical information

Faculty	Number of respondents	Year of Study/Gender of respondents	Number of respondents
Faculty of Management and Economics	384	First	313
		Third	273
Faculty of Humanities	202	Female	441
		Male	145

Source: (own source)

Of the total, 441 women, 145 men, were interviewed. According to the year of study, in the first year there were 313 students, in the third year there were 273 students.

3 Problem solving

The main aim of the article is to identify a new approach in the education of young professionals based on the identification of key competencies. Eight key competences identified by students as the most important for the development of their educational goals and subsequent entry into employment were identified. These eight competencies are communication skills, knowledge of foreign languages, creativity, responsibility, teamwork, flexibility, punctuality and work under stress. The author of the article will examine the dependence between these factors and gender (male, female), studied faculty (Faculty of Management and Economics and Faculty of Humanities) and year of study (first and third year). The aim is to find out which factors are dependent and which, on the contrary, are not dependent on the above variables.

As mentioned above, the determination of differences in perception of men and women was made by the Two-sample t-Test for equal means, see Tab. 2.

Tab. 2: Two-Sample t-Test for equal means

	t-test for Equality of Means						
				Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
	t	df	p-value	Mean Difference	Std. Error Difference	Lower	Upper
Knowledge of foreign languages	-,045	584	,964	-,005	,109	-,219	,209
Communication skills	1,192	584	,234	,134	,113	-,087	,355
Creativity	1,077	584	,282	,097	,090	-,080	,275
Responsibility	1,870	584	,062	,212	,113	-,011	,435
Teamwork	1,755	584	,080	,165	,094	-,020	,349
Flexibility	2,097	584	,036	,189	,090	,012	,367
Punctuality	2,961	584	,003	,295	,100	,099	,490
Work under stress	2,122	584	,034	,228	,107	,017	,439

Source: (own source)

Since p-values are higher than 0.05, we cannot reject the null hypothesis for the following statements – knowledge of foreign languages, communication skills, creativity, responsibility and teamwork. The average perception of key competencies is therefore confirmed by flexibility, punctuality, and stress work for men and women.

The second hypothesis deals with the study of statistical significance between the average value of key skills and the faculty studied. The statistical evaluation of the mean values using the t-test is shown in the following table – Tab. 3.

Tab. 3: Two-Sample t-Test for equal means

	t	df	p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Knowledge of foreign languages	-,438	584	,662	-,043	,099	-,238	,151
Communication skills	-,101	584	,920	-,010	,102	-,211	,191
Creativity	,858	584	,391	,070	,082	-,091	,232
Responsibility	-,122	584	,903	-,013	,103	-,215	,190
Teamwork	-,342	584	,733	-,029	,085	-,197	,139
Flexibility	-,861	584	,390	-,071	,082	-,232	,091
Punctuality	,312	584	,755	,028	,091	-,150	,207
Work under stress	-,455	584	,650	-,045	,098	-,237	,148

Source: (own source)

The two-Sample t-Test for equal means showed the following results. Since the p-value are higher than the significance level – 0,05 in all factors, we must reject the null hypothesis. This shows that there are no differences in the perception of key competencies between students who study at Faculty of Humanities and Faculty of Management and Economics.

The third hypothesis deals with study of statistical significance between the average value of key skills and the year of study. The statistical evaluation of the mean values using the t-test is shown in the following table – Tab. 4.

Tab. 4: Two-Sample t-Test for equal means

	t	df	p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Knowledge of foreign languages	-,852	584	,395	-,080	,094	-,265	,105
Communication skills	-1,416	584	,157	-,138	,097	-,329	,053
Creativity	-,922	584	,357	-,072	,078	-,226	,082
Responsibility	-1,398	584	,163	-,137	,098	-,330	,056
Teamwork	-2,336	584	,020	-,189	,081	-,348	-,030
Flexibility	-1,324	584	,186	-,104	,078	-,257	,050
Punctuality	,298	584	,766	,026	,087	-,145	,196
Work under stress	-1,634	584	,103	-,152	,093	-,335	,031

Source: (own source)

Since p-values are higher than 0.05, we cannot reject the null hypothesis for the following statements – knowledge of foreign languages, communication skills, creativity, responsibility, flexibility, punctuality and work under stress. The average perception of key competencies is therefore confirmed by teamwork.

4 Discussion

In the longer term it is expected to develop research methods for procedural competency as a goal and a result of education, and criteria for its evaluation, based on a holistic and multidimensional approach; integrative fundamental, practice-oriented principles, corresponding to each level of the higher education system (Makulova, 2015). This research can be supplemented by Litovchin (2015), which focuses on and engages in work, where the main principle is to think creatively and critically; to be able to see emerging problems in the professional activity and to seek ways of their rational solution, using modern technologies; to be able to generate new ideas; to work correctly with the information; to be able to organize the evidence needed to solve specific problems, to analyse them, to propose a hypothesis of problems' solving; to apply the obtained results for emerging issues' solving. Domicián and Darabos (2017) conducted research aimed at acquiring key competencies of university students, where the main result was the finding that these students were not sufficiently prepared for the future profession. Their contribution contributes to a better understanding of the development of new digital technologies that include a wide range of self-assessment methods in higher education. Students' career preferences are an important issue to various stakeholders: to university administration, career counsellors, higher education policy makers as well as to human resource managers in companies. Students, whose career preferences and goals are fulfilled, are better and more highly motivated employees (Frankowska and coll, 2015). Additionally, creativity, ability to work in a team, ability to formulate goals, ability to deal with stress and ability to make decisions revealed to be features with the greatest impact on the prediction of not only study but also career success (Dziekoński, 2016). This fact is confirmed by Máté and Darabos (2017), who emphasize the importance of self-reflection. They focus on the fact that students with better study results are more accurate in terms of self-awareness and self-esteem than other colleagues, students. Ávilaa et al. (2017) focused on examining competencies on a sample of 250 respondents in their research. As a result, these respondents consider the most important knowledge of technologies, emotional skills (conscience), evironmental environment. Among the least important, the respondents identified business partnerships, dialogue capabilities, innovation potential, integration of teaching and resistance to behavioral changes.

According to the psychologists, less verbal and abstract reasoning skills are required to be perceived competent in the Feeling and Power area. Thus, being sociable, cooperative, direct, persuasive, decisive, and responsible requires less verbal and abstract reasoning skills than, for example, analysing and planning. These results are in line with findings of Bartram (2005), who reported a stronger correlation between cognitive ability and the competency analysing/interpreting ($\rho=.40$) than between cognitive ability and the other competencies of his generic competency framework (Heinsman and coll, 2007). Most graduate students, and perhaps many working professionals, often do not allocate time for needed self-reflection and introspection on their strengths and weaknesses as managers and leaders in organizations; nor do they devote full consideration of where and how they will achieve their personal and career goals. This lack of self-reflection among students in graduate programs has been a concern, and has prompted scholars to address the way business schools are educating future leaders (Rubens, 2018). Gaps in working with

customers of young professionals are, according to Hurrell (2015), particularly in the field of teamwork, customer communication, soft skills, and oral communication. Makulova (2015) conducted a survey that included 560 graduates, where respondents noted communication, team work and mobility as highly relevant qualities that should be addressed in the higher education system. Boyatzis and coll (2017) focuses on leadership skills that are essential to a well-functioning organization. It focuses not only on young professionals but also on project managers without any age difference. Seven competencies were found to significantly differentiate outstanding leaders from average leaders. Emotional self-control, adaptability, empathy, coach/mentor, and inspirational leadership significantly or near significantly differentiated the outstanding leaders. Five additional competencies appeared as threshold competencies: achievement orientation, organizational awareness, influence, conflict management, and teamwork. In assessing the dimension Power psychologists focus mainly on personality, although they also rely on cognitive ability and performance during interview simulation exercises (Heinsman and coll., 2007). Similar research was dealt with in Hong (2012), where the main one aim is to investigate how key competencies can be incorporated into school curricula, what relevant instructional methods are needed and what institutional support is required to make school curricula based more on key competencies. The results indicate that a transformative approach, not an additive approach, is required. That is, teachers tend to restructure existing curricula to develop students' key competencies instead of considering the latter as a new teaching component (Hong, 2012). Palomino Pegalajar survey results (2018) among students (n=63) reveal a favorable rating of college students towards the development of generic competencies created in the European context; work based on cooperative learning enables a better development of personal competencies, followed by systematic and instrumental. The development of competences in the teaching and learning process is therefore positively evaluated, which promotes integral formation and lifelong learning.

We can see here that key competencies need to be addressed in the context of university education, with a holistic approach where the key element is the teacher.

Conclusion

The aim of this article, which is based on the research of key competencies of students, which took place at the two faculties of Tomas Bata University in Zlín, in the first and third year, was to identify an effective type of education based on the results of the research. This type must be applicable and it is based on literature that states that key success factors will not only innovate and update the curriculum, but also work strategically and change the concept of the subject. The aim is to bring experienced, educated students to the labour market who are on the labour market, able to adapt to the turbulent conditions of the labour market and are able to compete with young workers and from abroad. It is therefore necessary for students to be interested in foreign study stays, as well as to pass on their knowledge from the theoretical, practical and social fields. It is therefore inevitable to educate future managers with high professional skills, practical skills and social maturity. Research results point to the importance of factors identified by students as key to their further development. They are therefore communication skills, knowledge of foreign languages, creativity, responsibility, teamwork, flexibility, punctuality and work under

stress. The statistical evaluation of the research results confirmed the relationship between gender and individual factors as well as between the faculty studied and the year of study. On the basis of literary research and the study of the results of the cited authors, we can say that self-reflection, self-assessment, critical thinking, planning and decision-making are equally important key competencies. Students need to deepen their interest in studying, developing communication and motivational skills, as well as team work but especially self-reflection. This will be a key factor in their future practice. Young workers who will not be able to properly reflect on the labour market will be less demanding, and given the open labour market, they may not have the kind of job they will be happy to match with their qualifications and which can underestimate their key competence.

The author of the article will continue to address the issue. The research will continue at other faculties, the aim of the author is to obtain important data from all faculties in the Czech Republic, where the core subject is Management and prepares graduates for successful entry into the field of economic and managerial.

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KNOWLEDGE OF THE EFQM EXCELLENCE MODEL: CASE STUDY OF THE CZECH ENTERPRISES

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Abstract: *The excellence models provide a framework for understanding which levers we need to pull to achieve the results we want. EFQM business model is one of the models which deal with the assessment of the performance of an organization. The EFQM excellence model has a critical effect on the success, and competitiveness of Czech enterprises. The paper focuses on the EFQM business excellence models. The objective of this paper is to determine the level of knowledge of the EFQM excellence model by Czech enterprises. The study based on primary data collected from a recent survey of 210 Czech enterprises. The paper based on data collected in interviews with managers and founders of Czech enterprises. The enterprises included in the study are those enterprises that are incorporated in the Czech Republic. A total of 210 enterprises participated in the study, and the main primary data collection instrument was a questionnaire-interview. The findings of the statistical analysis show the influence of selected internal variables on the knowledge of the EFQM excellence model. Results of the research study confirm that level of knowledge of the EFQM excellence model in Czech enterprises is low.*

Introduction

Generally speaking, excellence means that what we are doing well today should be done even better and more wisely tomorrow, especially compared to the competition, to fully satisfy all interest groups. Business excellence frameworks can be described as an integrated set of proven business practices designed to increase business performance across a broad range of organizations (Gloet and Samson, 2017). Certainly, the concept of business excellence has, for at least three decades, been at the center stage of management theory and practices. Business Excellence is defined as a high level of maturity of a company/organization regarding management and result achievement (Zdrilić and Dulčić, 2016). Business excellence is about developing and strengthening the management systems and processes of an organization to improve performance and create value for stakeholders. Business Excellence is much more than having a quality system in place. It is about achieving excellence in everything that an organization does (including leadership, strategy, customer focus, information management, people, and processes) and most importantly achieving superior business results. Business Excellence is often described as outstanding practices in managing the organization and achieving results, all based on a set of fundamental concepts or values. The concept of business excellence has, for at least three decades, been at the center stage of management theory and practices and there is no shortage of models and frameworks that explain it. Business Excellence, accordingly to Mann et al. (2012), is about developing and strengthening the management systems and processes of an organization to improve performance and create value for stakeholders. Business

excellence is a management philosophy based on performance improvement and meeting and surpassing stakeholder needs. It is a belief in a set of core values and concepts that over time has delivered success for many organizations. Business excellence is much more than having a quality system in place; these models help organizations to assess their strengths and areas for improvement and guide them on what to do next. The EFQM (European Foundation for Quality Management) Excellence Model offers a holistic view of the enterprise, highlighting its strengths and opportunities to improve.

Various empirical studies have been done to investigate the relationship between business excellence models and enterprise performance with varied conclusions. In this research study, knowledge of the EFQM excellence model was investigated as factors influencing the success of enterprises. This paper offers several contributions to business excellence models and attempts to answer calls for studies that span across the disciplines. In particular, the paper pays attention to the key role of selected factors for the knowledge of the EFQM excellence model. Therefore we extend the studies by suggesting that the knowledge of the EFQM excellence model depends not only on their identification variables (size, age, industry) but also on performance measurement system.

The objective of this paper is to investigate awareness/knowledge of the EFQM excellence model of Czech enterprises. The ambition is to answer the central research question: "which factors affect the knowledge of the EFQM excellence model of Czech enterprises"? The study based on primary data collected from a recent survey of Czech enterprises; the data analyzed by the appropriate analytical method: categorical data analysis. The paper structured in three parts. The first part of the paper outlines selected theories dealing with the business excellence models, especially EFQM excellence model. The second section of the contribution presents and interprets results of the survey carried out among Czech enterprises. Finally, the last section provides the conclusion of the research results and offers the discussion of the most important implications. The results of the analysis discussed, and recommendations provided for managers in the last section.

1 Statement of a problem

Business excellence is about achieving excellence in everything that an organization does (including leadership, strategy, customer focus, information management, people, and processes) and most importantly achieving superior business results. Business Excellence Models, according to Mann et al. (2012) were first called Total Quality Management models. Today they are usually referred to as Business Excellence Models – this term helps to communicate the importance of "excellence" in all aspects of business, not only product and process quality. Business excellence models organizations use to understand and assess which processes need to be improved to improve results. TQM can involve all organizational levels in developing quality systems; ISO can help to define and document the processes; EFQM is strong for balanced development and learning from the best; BSC is helpful for defining control and monitoring models (Farzandi et al., 2010).

Today there exist 100 excellence models and national quality awards in 82 countries (Talwar, 2011). The most employed and recognized models at an

international level are the Deming Prize, introduced by JUSE (Union of Japanese Scientists and Engineers) in 1951, which is the first globally known excellence model. Malcolm Baldrige National Quality Award (MBNQA) in the USA established in 1987 and the European Quality Award (known as ''European Excellence Award'' since 2004), based on the European Foundation for Quality Management (EFQM) model, established in 1991 (Benavent, 2006). A recent study (Tanner, 2012) found a positive relationship between Business Excellence (EFQM Model) and Performance, and between Strategic Agility and Performance. The study also revealed that there was also evidence that Strategic Agility was related to Business Excellence. The findings suggested organizations that successfully implement Business Excellence develop the ability to respond to change, a capability that was becoming more critical as the pace of change increases. According to Bandyopadhyay and Nair (2015) this capability leads to benefits for many of the organization's stakeholders. The most widely used approaches to measuring the business excellence are the EFQM's Business Excellence Model and the Malcolm Baldridge Excellence Model established in 1987 in the USA (Lu et al., 2011). Some other awards are: Australian Business Excellence Award introduced in 1988 in Australia; European Quality Award introduced by EFQM in 1992 in Europe; CII-EXIM Bank Business Excellence Award introduced in 1994 in India, and Singapore Quality Award in 1994.

In fact, EFQM has been used as a health check tool and BSC for regular monitoring of the performances to reach the goals and objectives (Goswami and Mittal, 2013). EFQM is one of the models which deal with the assessment of the performance of an organization, using a self-assessment method for measuring nine criteria and 32 sub-criteria throughout the organization. The self-assessment procedure needs properly trained auditor from the company, and the questionnaire is developed in a manner to quantify all relevant performances. (Farzandi et al., 2010) The EFQM model measures the "Enablers" (Leadership, People, Strategy, Partnerships & Resources, and Processes, Products & Services) and the "Results" (People Results, Customer Results, Society Results and Key Results). To achieve sustained success, an organization needs strong leadership and clear strategic direction. They need to develop and improve their people, partnerships and processes to deliver value-adding products and services to their customers. If the right approaches are effectively implemented, they will achieve the results they, and their stakeholders, expect. The Model provides a framework for understanding which levers we need to pull to achieve the results we want. It helps us understand the role each part of our organization needs to play in effectively implementing our strategy; whether that is in an SME, a school or a global company. While there are numerous management tools and techniques commonly used. The model can, therefore, be used in conjunction with any number of these tools, based on the needs and function of the organization, as an overarching framework for developing sustainable excellence. Excellent organizations achieve and sustain outstanding levels of performance that meet or exceed the expectations of all their stakeholders. The EFQM Excellence Model allows people to understand the cause and effect relationships between what their organization does and the Results it achieves. All organizations strive to be successful, some fail, some achieve periods of success but ultimately fade from view, and a few achieve sustainable success, gaining deserved respect and admiration. The EFQM Foundation was formed to recognize and promote sustainable success and to guide those seeking to achieve it. This is realized

through a set of three integrated components which comprise the EFQM Excellence Model: The Fundamental Concepts of Excellence, The Model Criteria, The RADAR Logic (EFQM, 2017). A year in 1999, the EFQM Model and the CII-EXIM Model for Business Excellence, went through a major change with the introduction of RADAR (Results, Approach, Deployment, Assessment, and Review). It was introduced for measurement, and 39% change was in the areas to address bringing more emphasis on the performance and organizational excellence. The model is based on the principle factor that, "Excellent resulting concerning performance, customers, people, and society are achieved through leadership driving policy and strategy, people, partnerships and resources, and processes" (Goswami and Mittal, 2013).

2 Methods

This research study is a part of the research focused on the selected aspects of the entrepreneurial activities of Czech enterprises. The objective of the research study is to present the results of primary research focused on the knowledge of managers of Czech enterprises regarding the EFQM excellence model. The method of the oral questioning and a questionnaire as the principal instrument applied for researching the knowledge of managers of Czech enterprises regarding the EFQM excellence model. The research was carried out in the Czech Republic in the period between September 2016 and May 2017.

To fulfill the aim of this study, the following hypotheses were suggested:

Hypothesis 1: The degree of knowledge of the EFQM excellence model is affected by the inclusion of the financial area into the enterprise performance measurement system.

Hypothesis 2: The degree of knowledge of the EFQM excellence model is affected by the inclusion of the customer area into the enterprise performance measurement system.

Hypothesis 3: The degree of knowledge of the EFQM excellence model is affected by the inclusion of the internal area into the enterprise performance measurement system.

Hypothesis 4: The degree of knowledge of the EFQM excellence model is affected by the inclusion of the employee area into the enterprise performance measurement system.

Hypothesis 5: The degree of knowledge of the EFQM excellence model is affected by the foreign business activities of the enterprise.

Hypothesis 6: The degree of knowledge of the EFQM excellence model is affected by the implementation of the process management in the enterprise.

The research includes primary data collection from top managers of selected Czech enterprises. The sample consists of 210 Czech enterprises located in the Czech Republic. Selection of companies under research based on the method of non-probability purposive sampling, by occasional selection. The researched enterprises were established in the Czech Republic, and all of them are private enterprises. The instrument used in the survey, a structured questionnaire, contains three fields of varying degrees of complexity relating to the area of business management. The

questionnaire consists of closed, semi-closed and open questions. The questions were designed while based on the information gained from experts from business and universities and previous research. In some questions, particularly those related to the EFQM excellence model, simple and complex scales were used, mostly the Likert-type scale (4 = strongly agree to 1 = strongly disagree). Aso, the questionnaire also included four questions related to the enterprise background (the type of a business sector; the size of the enterprise measured by the number of employees, and the revenue; the year of establishment enterprise). The questionnaire was pre-tested for the instrument validity by ten managers. In interviews, the managers were asked to respond to the items measuring the theoretical construct. They were also requested to identify any ambiguities revealed in the questionnaire draft. Based on the feedback some minor changes of wording were made. Because of the relatively low response rate in mail surveys in the Czech Republic, and sensitivity to Czech managers' concerns about industrial espionage, a high level of personal involvement consisting of telephone calls and personal delivery and pickup of questionnaires was necessary. First, telephone calls were made with general managers or CEOs of the Czech enterprises to explain the purpose of the study and to ask for their participation. The questionnaire was hand-distributed to the general managers and CEOs after a telephone appointment. Trained research assistants helped the managers and CEOs complete the questionnaire, and explained any items that the respondents wished to have clarified. This procedure resulted in 300 matched questionnaires, out of which 90 were eliminated due to the incompleteness of responses. Thus 210 (a response rate of 70.0%) questionnaires were used in the subsequent data analysis and statistical processing. The final research sample consisted of 51.9% of companies representing manufacturing, 26.7% of service enterprises, and 21.4% of the commercial enterprises. The companies differed in their size assessed by the number of employees: 23.8% of the sample consists of micro enterprises, 38.6% of the sample consists of small enterprises, 26.2% of medium enterprises, and 11.4% of large enterprises. The Eurostat (2011) and Czech Statistical Office (2013) classify enterprises by a wide range of variables such as sales revenues and the number of employees. This research study follows the conventional idea (European idea) that the size of companies is defined according to EU norms. A company with 1 to 10 employees and 2 million euro of turnover per year referred a micro enterprise. A company, which has 11 to 50 employee and at most 10 million euro of turnover per year, is called a small enterprise. A company, which has 51 to 250 employees and at most 50 million euro of turnover per year, is known as a medium enterprise. A company, which has more than 250 employees and more than 50 million euro of turnover per year, is called a large corporation. The average age of respondents is nineteen years.

The dependent variable is the KNOWLEDGE of EFQM excellence model of managers of Czech enterprises. Respondents/managers were asked how well they know the EFQM excellence model. The level of knowledge of the EFQM excellence model was rated by the managers of each enterprise along four-point scales (1 = definitely I do not know, 2 = rather I know, 3 = rather I known, 4 = definitely known). The Cronbach alpha for the knowledge measure was 0.82, and inter-rate reliability was 0.88. The group of **independent variables** consists of the areas included in the enterprise performance measurement system: FINANCIAL area, the CUSTOMER area, the INTERNAL area, and the EMPLOYEE area. Questions on the inclusion of

these areas (financial, customer, internal, employee) in the enterprise performance measurement system were presented in the form of four-point scales (1 = we do not include it at all, 2 = we do not include it, 3 = we include it, 2 = definitely we include it) to ensure maximal respondent specificity. All multi-item measures achieved superior or adequate reliability scores in tests using Cronbach´s alpha. The alpha values range from 0.78 to 0.83. In addition to the independent variables, we also include the realization of FOREIGN business activities and implementation of PROCESS management in the enterprise. For foreign and process we used a dummy variable, which took a value of „1" if the enterprise is actively committed to foreign activities and „0" otherwise, passive attitude to foreign activities. Guided by previous literature and empirical evidence, we have included several **control variables**. Among the enterprise-level determinants of are the three widely used demographic characteristics of enterprises. Therefore, we include enterprise SIZE (natural logarithm of the number of employees) and enterprise AGE (in years). In addition to the enterprise-level determinants, we also include INDUSTRY level of the enterprise: whether the enterprise operates in the manufacturing or service sector. We included a dummy variable for industry level, as Acquaah and Yasai-Ardekani (2007), did because the distinction between manufacturing and services obviously has a considerable effect on the enterprise. The statistical classification of economic activities in the European Community NACE classified industry of the companies. Tab. 1 shows descriptive statistics for variables.

Tab. 1: Descriptive Statistics for Variables

	Minimum	Maximum	Mean	Standard Deviation	Median	Mode
Knowledge	1	4	2.00	1.014	2	1
Financial	1	4	3.61	0.801	4	4
Customer	1	4	3.51	0.790	4	4
Internal	1	4	2.82	0.883	3	3
Employee	1	4	2.94	0.884	3	3
Foreign	0	1	0.59	0.494	1	1
Process	0	1	0.55	0.499	1	1
Size	2	20 000	373.74	1816.314	34.50	3
Age	1	192	18.96	20.969	17.50	25
Industry	1	19	6.34	4.537	6	3

Source: (personal research)

The data obtained via the questionnaire research were processed by using the IBM SPSS statistical program.

3 Problem solving

The authors of the research study found that the level of knowledge of the EFQM excellence model among the respondents is relatively low. Less than a third of respondents admitted knowledge of the EFQM excellence model. Knowledge of the EFQM excellence model was proven by managers particularly in small and medium-

sized enterprises, in younger enterprises (younger than twenty years), and manufacturing enterprises with foreign business activities and with the implemented process management. Furthermore, a higher level of knowledge of the EFQM excellence model was proven, by managers from these enterprises that include the financial, internal, customer or employee area into the enterprise performance measurement.

To determine the effect of the selected variables on knowledge of the EFQM excellence model were used adequate analytical methods. The research subsumes a two-stage analytical method. The analysis began by examining the correlation between variables. All variables were screened to reveal their distribution through Pearson correlation coefficients deviations for the variables (Tab 2). It is important to realize that the correlation between the identified variables has a profound impact on the knowledge of the EFQM excellence model of the managers of Czech enterprises. The second phase of research includes the analytical method: Categorial Data Analysis.

This initial analysis of the control study variables shows that all of the variables were significantly associated with the level of the knowledge of the EFQM excellence model. A similar situation was also observed for the majority of independent variables.

Tab. 2: Correlation Coefficients

	1	2	3	4	5	6	7	8	9	10
Knowledge	1									
Size	-0.432**	1								
Age	-0.426**	0.365**	1							
Industry	0.349**	-0.035	-0.080	1						
Financial	0.102*	0.084	0.075	-0.079	1					
Internal	0.348**	0.044	0.056	-0.077	0.549**	1				
Employee	0.246**	0.005	0.041	-0.090	0.556**	0.697**	1			
Customer	0.140	0.063	0.011	0.097	0.520**	0.290**	0.473**	1		
Foreign	0.367**	0.137*	0.082	0.084	0.230**	0.266**	0.209**	0.151*	1	
Process	0.335**	0.053	0.035	0.204**	0.083	0.334**	0.332**	0.114	0.304**	1

* Correlation is significant at the 0.05 level, ** correlation is significant at the 0.01 level.

Source: (personal research)

The hypotheses 1 to 6 were tested through categorical data analysis. Tab. 3 presents the results of the analysis. The results of categorical data analysis (Tab. 3) support and complement the results of correlation analysis: enterprise age, enterprise size, and industry are significant factors influencing the level of knowledge of the EFQM excellence model. Managers of smaller and younger enterprises have a greater level of awareness of the EFQM excellence model than managers of larger and older enterprises. The strength of the relationship between enterprise size and knowledge of the EFQM excellence model is strong ($V = 0.770$). The strength of the relationship between enterprise age and knowledge of the EFQM excellence model is medium ($V = 0.510$). A similarly strong relationship ($V = 0.411$) is between industry, and knowledge of the EFQM excellence model. This finding is in harmony with the results of other research studies on the flexibility of small enterprises in the field of management.

Hypothesis 1 assumes that the knowledge of the EFQM excellence model is affected by the inclusion of the financial area into the enterprise performance measurement

system. This hypothesis is supported: the strength of this relationship is low (V = 0.180). Hypothesis 2 assumes that the knowledge of the EFQM excellence model is affected by the inclusion of the customer area into the enterprise performance measurement system This hypothesis is not supported. Hypothesis 3 assumes that the knowledge of the EFQM excellence model is affected by the inclusion of the internal area into the enterprise performance measurement system. This hypothesis has been confirmed: the strength of this relationship is low (V = 0.276). In Hypothesis 4 it was assumed that the knowledge of the EFQM excellence model is affected by the inclusion of the employee area into the enterprise performance measurement system. This hypothesis has been confirmed: the strength of this relationship is low (V = 0.213).

Tab. 3: Categorical Data Analysis

		Pearson Chi-Square Value	df	Cramer´s V Value	Asymp. Sign
Size		373.108	261	0.770	0.000
Age		163.764	111	0.510	0.001
Industry		106.571	42	0.411	0.000
Financial	H1	20.343	9	0.180	0.016
Customer	H2	12.923	9	0.143	0.166
Internal	H3	47.952	9	0.276	0.000
Employee	H4	28.496	9	0.213	0.001
International	H5	30.023	3	0.378	0.000
Process	H6	28.580	3	0.369	0.000

Source: personal research

Hypothesis 5 assumes that the knowledge of the EFQM excellence model is affected by the realization of business activities on foreign markets. This hypothesis was confirmed: the strength of this relationship is medium (V = 0.378). Hypothesis 6 presumes that the knowledge of the EFQM excellence model is affected by the implementation of the process management in the enterprise. This hypothesis was confirmed: the strength of this relationship is medium (V = 0.369).

4 Discussion

The objective of the research study is to present the results of primary research focused on the knowledge of managers of Czech enterprises regarding the EFQM excellence model. The study provided support for hypothesized relationships suggesting the importance of selected variables for the level of knowledge of the EFQM excellence model. The results summarized in Tab. 4 show that the knowledge of the financial area (H1), the internal area (H2), the employee area (H4), foreign activities (H5), and the process management (H6) are significantly associated with the knowledge of the EFQM excellence model.

Tab. 4: Summary Results of Hypothesis Testing

Hypothesis	Relationship	Finding
H1	Knowledge of the EFQM → Financial area	Supported
H2	Knowledge of the EFQM → Customer area	Not supported
H3	Knowledge of the EFQM → Internal area	Supported
H4	Knowledge of the EFQM → Employee area	Supported
H5	Knowledge of the EFQM → Foreign activities	Supported
H6	Knowledge of the EFQM → Process management	Supported

Source: (personal research)

This study shows that level of knowledge of the EFQM excellence model of Czech enterprises was proven by managers particularly in small and medium-sized enterprises, in younger enterprises (younger than twenty years), and manufacturing enterprises with foreign business activities and with the implemented process management. Furthermore, a higher level of knowledge of the EFQM excellence model was proven, by managers from these enterprises that include the financial, internal, customer or employee area into the enterprise performance measurement.

According to Samardžija and Fadic´(2009), the EFQM model gives the right direction; it helps companies to struggle through and encourages them to develop in the way they want. From a general point of view, we can see two different approaches: one based on improving the public sector, and the other on improving the private sector. Implementation of EFQM in companies makes them a desirable supplier and creates accreditation for the country, which enables development and export. Learning and competition are based on the same management framework. The model forms a good base for benchmarking and structuring processes in companies and improving them without making a restrictive framework and blocking the growth of companies and society. The fundamental thought, underlying business excellence is the idea that quality should not be focused only on products and services produced by the organization (Evans, 2008). It should be actually embedded in the practice of organization management, or, in other words, quality should be the fundamental value of the organization's management. If good management principles are designed and implemented, the consequence should be good results. This idea leads us to the term of performance excellence that can be considered a synonym for business excellence. Performance excellence is associated with the integrated approach to management of organizational performances resulting in the delivery of continuously improved values to customers and stakeholders, thus contributing to organizational sustainability, increase in the overall organizational efficiency and capacity, as well as organizational and personal learning. The results of the research are consistent with the results of the study researchers. According to Calvo-Mora et al. (2015), there is a growing interest in knowledge management as a strategic weapon. There exist two extreme approaches to change management (Castka and Belohoubek, 2001): the revolutionary one and the evolutionary one. While the former is fundamental, radical, fast, top-down oriented and socially incompatible, the latter is a continuous, long-term procedure with high social compatibility. Both approaches have their strengths and weaknesses. The results of the assessment are benchmarked against the best companies, and such a comparison

provides relevant information about the quality of process measured. Furthermore, training of all employees is necessary for the understanding of a new environment.

According to Bandyopadhyay and Nair (2015), the findings suggested organizations that successfully implement business excellence develop the ability to respond to change, a capability that was becoming more critical as the pace of change increases. This capability leads to benefits for many of the organization's stakeholders. For an organization, excellence should mean clear dedication of leaders and managers to continuous improvement of all key processes, creativity and innovation, work conditions, teamwork, motivation level and general organizational culture (Zdrilić and Dulčić, 2016).

Conclusion

This paper examines the knowledge of the EFQM excellence model by Czech enterprises. Organizations everywhere, of all types and sizes, are under constant pressure to improve their business performance. It can be used to assess and improve any aspect of an organization, including leadership, strategy and planning, people, information and knowledge and other aspects. To help in this process, many are turning to business excellence models, such as the EFQM Excellence Model. The business excellence models can be used as a business-wide framework in a holistic, focused and practical way. Business excellence models are frameworks that when applied within an organization can help to focus thought and action in a more systematic and structured way that should lead to increased performance.

This study has some contributions, including theoretical contributions and managerial implications. This study has provided some theoretical contributions as follows: It gives additional insight into the relationship between selected variables and knowledge of the EFQM excellence model. Furthermore, we also provide some implications for managers and owners of Czech enterprises. This study helps the managers to understand how the selected variables affect the knowledge of the EFQM excellence model. Managers and owners should give more attention to the business excellence models.

This study also has some limitations. First, this study has been conducted only in one small country, in the Czech Republic. Indeed, this will affect the generalizability issue. This study only examined the relationship between selected characteristics of enterprises and knowledge of the EFQM excellence model. Hence, the researcher cannot justify it as a generalization for all European countries. Due to time and cost limitations, this study employed a cross-sectional study. Thus, it only portrays the phenomena at a single point in time, and it will not be able to reflect the long-term effects of the change.

This research study suggests several recommendations for future study. The study might be extended to multiple countries in Europe. The future study might use the longitudinal study which describes phenomena in the long-term. The longitudinal study may lead practitioners and academicians to understand the causal relationship between the EFQM excellence model and performance of enterprises.

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