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European scientific conference  
of doctoral students

# PEFnet 2017

European scientific conference PEFnet 2017 was organised by the Faculty of Business and Economics, Mendel University in Brno, as the 21<sup>st</sup> doctoral conference.

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## FOREWORD

Dear readers,

it has been a tradition that the PEFnet doctoral scientific conference is held annually at the Faculty of Business and Economics, Mendel University in Brno. The conference provides an opportunity for PhD students from around the world to present their research and interact with other PhD students and senior researchers. For some of them it is the first time their research ideas have been presented in front of a scientific community. We believe that this experience in the early stages of their scientific career helps to prepare them for future research work and contributes to their further scientific development. Another important aspect of participation in the conference is networking with other young and senior researchers dealing with similar research problems from the areas of economics and the information sciences.

The 21<sup>st</sup> PEFnet took place on the 30<sup>th</sup> November 2017 on the campus of Mendel University in Brno. The conference reacted to several topics concerning accounting and taxes, business economics, computer science and information systems, economics and finance, management, marketing and trade, and quantitative methods in economics. We were pleased to welcome more than 100 PhD students from all over the world representing universities from countries including Albania, Austria, the Czech Republic, Hungary, Latvia, Lithuania, New Zealand, Poland, Romania, Slovenia, and Turkey.

In the presented Proceedings you will find 28 papers that were recommended by conference discussants and selected on the basis of a peer-review process. We believe that the presented research outputs contribute to and extend the current state of knowledge and will stimulate further debate, not only in academia but also in other institutions in the public and private sectors. We would like to thank all the participants in the conference for their inspiring contributions. Furthermore, we are grateful to all the reviewers and the members of the scientific committee for their contribution to the organisation of this scientific conference.

Prof. Ing. Jana Stávková, CSc.  
Chair of the Scientific Conference Board  
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# DAILY PREDICTION OF FOREIGN EXCHANGE RATES BASED ON THE STOCK MARKET

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## ABSTRACT

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The stock and foreign exchange markets are the two fundamental financial markets in the world and play a crucial role in international business. This paper examines the possibility of predicting the foreign exchange market via machine learning techniques, taking the stock market into account. We compare prediction models based on algorithms from the fields of shallow and deep learning. Our models of foreign exchange markets based on information from the stock market have been shown to be able to predict the future of foreign exchange markets with an accuracy of over 60%. This can be seen as an indicator of a strong link between the two markets. Our insights offer a chance of a better understanding guiding the future of market predictions. We found the accuracy depends on the time frame of the forecast and the algorithms used, where deep learning tends to perform better for farther-reaching forecasts.

## KEY WORDS

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foreign exchange market, stock market, decision tree, neural network

## JEL CODES

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## 1 INTRODUCTION

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Over the past few years currencies have become one of the most popular products to trade. No other market can claim a 71 per cent surge in volume over a three-year time frame. According to the Triennial Central Bank Survey of the foreign exchange market conducted by the Bank for International Settlements and published in October 2007, daily trading volume hit a record of \$3.2 trillion, up from \$1.9 trillion in 2004 (Pletschke et al., 2014). With the growth of the foreign exchange market researchers' attention to this subject started to grow.

Several methods exist to predict foreign exchange markets. The most widely adopted is time-series analysis. Rehman et al. (2014) for example use the data from the markets past to predict its future with very high accuracy. It is however possible to predict the future of a time-series from the relation to other variables. Weng et al. (2017) use Wikipedia traffic and Google News counts in addition to market data to forecast stock prices.

This research uses data from another market, the stock market, to predict the future of the foreign exchange market. This paper aims to answer two fundamental questions. First, we want to know if it is possible to predict the foreign exchange market based on the stock market, and second, whether shallow learning or deep learning are better suited for this task. A prediction is said to be successful if the forecast achieves an accuracy of 50% or higher.

Furthermore, our goal is to predict rises and falls in prices in the foreign exchange market. The performance of shallow learning and deep learning is compared using the measurements of accuracy, precision, recall and F1. Decision trees were used as forecast models to represent shallow learning. Neural networks were used as a deep learning model. Both models usually promise very good results, as shown in the literature review, and are therefore a good choice for comparing shallow learning and deep learning.

## 2 LITERATURE REVIEW

This literature review covers the main articles published recently to give an overview about the current state of research regarding the forecasting of the stock and foreign exchange markets.

Weng et al. (2017) developed a system for one day ahead stock market prediction. The system was built on available data such as market data and technical indicators that reflect price variation, Google News on the stock of interest and the number of unique visits to the Wikipedia page selected. After applying feature selection algorithms, the authors implemented three different classification models based on an artificial neural network, a decision tree and a support vector machine. The performance of these models was evaluated based on parameters such as accuracy, precision, sensitivity and F-measure.

Malliaris and Malliaris (2015) used decision trees in a study of the behaviour of gold as an investment asset. The fundamental question in this article was how gold returns behaved during the recent financial crisis when inflation was very low. The authors used daily data in the period from March 1, 2004 to October 20, 2014. The data contained the values of six variables that have an influence on gold returns. The authors split the data into the periods before crisis, after crisis and during crisis. Then a C5.0 decision tree model was used for each data set. The authors managed to show that different variables have more influence on the gold return during different periods.

Liu et al. (2017) undertook research into forecasting copper prices with decision tree models. The

authors used a dataset of the historical prices of crude oil, natural gas, gold, silver, lean hogs and coffee, the Dow Jones index and copper prices as independent variables. These variables were chosen because they demonstrated a high Pearson cross-correlation. The results of this work showed that a tree-based method is capable of accurately and reliably predicting copper prices in both the short and long terms, with mean absolute percentage errors below 4%.

Nayak et al. (2016) developed prediction models for the Indian stock market. In their research, the authors used two datasets: historical stock prices obtained from YAHOO Finance and sentiment data build on news tweets corresponding to the stock of interest. Based on these datasets, two prediction models were developed – one model was designed for daily prediction and the other for monthly prediction. Those models were based on a boosted decision tree, logistic regression and a support vector machine. The results showed that the boosted decision tree performs better than other algorithms, both in short term and long term predictions.

Rehman et al. (2014) trained a special form of neural network that implements feature selection with 500 days' worth of USD data. They then tested their network with 1000 days of historical data from YEN, NZD, CAD, KRW and IDR. In the testing phase 10 days of history was used to predict the next day. They managed to achieve an accuracy of over 98% for all five currencies and an MAPE (Mean Absolute Percentage Error) as low as 1.128%.

### 3 DATA AND METHODOLOGY

This section explains the working steps concerning data and methodology. Fig. 1 shows the workflow of data collection, data preprocessing, gathering of the numerical results and the evaluation.

Data for this research was obtained from publicly available sources. Google Finance was used to get stock market data and X-RATES for foreign exchange market data. The stock market data consists of the parameters opening prices, highest prices, lowest prices, closing prices and the volume of a given day. The foreign exchange market data consists of the selling and buying price of one currency in respect to the other for a given day. In order to predict rises and falls in the prices in the foreign exchange market, the data should be transformed in such a way as to represent rises and falls leading to a binary classification.

It is set that a price is rising if the price of the current day is greater than the price of the previous day and is denoted as 1, while the price is falling if the price of current day is smaller than the price of the previous day and is thus denoted as 0. This transformation is described by equation 1.

$$R_i(c) = \begin{cases} 1, & \text{if } P_i(c) > P_{i-1}(c) \\ 0, & \text{else} \end{cases}, \quad (1)$$

where  $c$  is the selected currency,  $P$  represents the price,  $i$  is the current day and  $R$  the rise or fall in the price.

The stock market data was then transformed to represent relative changes in the selected parameter. Further, the stock markets are closed on weekends and holidays while the foreign exchange market remains open. To avoid a mismatch of data, the values of the last day when the market was open (e.g. Friday) was used. The calculated percentage change is used as shown in equation 2.

$$C_i(s) = \frac{V_i(s)}{V_{i-n}(s)} \cdot 100, \quad (2)$$

where  $s$  is the selected stock,  $V$  is the actual price of the stock,  $i$  is the current day,  $n$  is the number of days between the current day and the last day where a price was made, and  $C$  is the percentage change in the price. This calculation was made for each stock parameter.

In order for prediction models to work correctly, the dataset should not contain biases, thus the amount of rises and falls must be nearly same.

To represent shallow learning, models based on decision trees were used. Decision tree models are popular methods in data mining (Breiman et al., 1984). They are based on splitting a training data set to build a model through a recursive partitioning process. The goal of the partitioning process is to minimise entropy in nodes. There are different approaches to optimise this process. In this research the measurement of information gain was used (Kent, 1983).

Neural networks were used to represent deep learning. These are used by many authors to forecast stock markets and often provide very good results (Rehman, Khan and Mahmud, 2014; Weng, Ahmed and Megahed, 2017).

Ten different neural networks were trained. LBFGS, ADAM and SGD were used as well as different hidden layer sizes. For all the networks the rectified linear unit function was used as an activation function and alpha was set to 1e-5. Table 1 shows the different networks in detail. The hidden layers are represented so that the  $i$ -th element represents the number of neurons in the  $i$ -th hidden layer (e.g. 5, 2 means that there are two hidden layers, one hidden layer with five neurons and the other with two).

Tab. 1: Overview of neural network parameters

Solver	Hidden Layers	Learning Rate	Early Stopping	Iteration max.
LBFGS	5, 2	Constant	False	200
LBFGS	5, 2, 2, 2, 2	Constant	False	200
LBFGS	5, 5, 2	Constant	False	200
LBFGS	2, 2	Constant	False	200
ADAM	5, 2	Constant	False	200
ADAM	5, 2, 2, 2, 2	Constant	False	200
SGD	5, 2	Adaptive	False	500
SGD	10, 2, 2	Adaptive	False	200
SGD	5, 2, 2, 2, 2	Adaptive	False	200
SGD	2, 2	Adaptive	True	200

Figure 2 illustrates the final experimental setup. Stock market data ( $Y$ ) for  $n$  different stocks is fed to the learning algorithms for day 0. The algorithms are then trained to predict whether a chosen currency price pair ( $X$ ) rises or falls on a given number of days ( $m$ ) in the future.

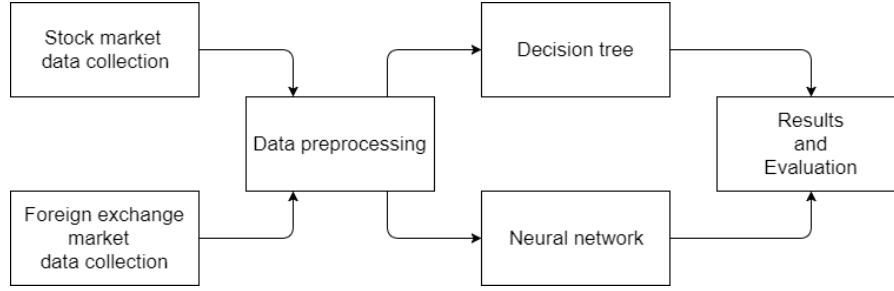


Fig. 1: Workflow to illustrate the methodology

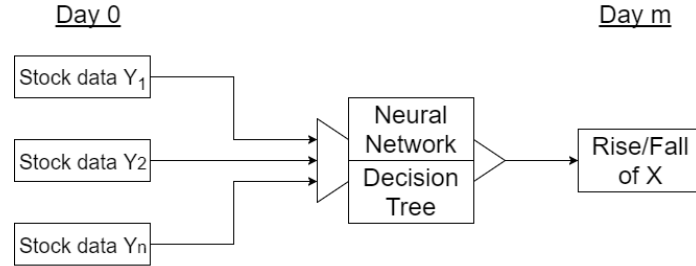


Fig. 2: Experimental setup

## 4 RESULTS

All the market data was collected for the period from January 4, 2011 to May 2, 2017 for the foreign exchange market as well as for the stock market. This leads to a total of 2162 days of market data for currencies and 1592 for the stock market. After applying the transformations to the dataset, it was split into training (80%) and testing (20%) datasets.

Tab. 2: Number of rises and falls to observe a possible bias

Currency	Rises	Falls
GBP	1187	975
INR	1177	985
AUD	1186	976
SGD	1174	988
JPY	1152	1010
CHF	1155	1007
MYR	1188	974
CAD	1157	1005
EUR	1130	1032
CNY	1196	966

Currency price pairs were gathered for the United States dollar (USD) in relation to ten other currencies. The list of currencies is the British Pound (GBP), the euro (EUR), the Indian Rupee (INR), the Australian Dollar (AUD), the Canadian Dollar (CAD), the Singapore Dollar (SGD), the Swiss Franc (CHF), the Malaysian Ringgit (MYR), the

Japanese Yen (JPY) and the Chinese Yuan Denminbi (CNY). The dataset contains the values of selling price and buying price. In order to model rises and falls in selling/buying price of the USD to other currencies, the data was transformed. Table 2 shows the distribution of rises and falls for each currency to observe a possible bias.

The observation of the amount of rises and falls for each currency showed that rises and falls are rather equally distributed.

Since the common currency in a price pair is USD, the ten highest ranked companies from the Fortune 500 (2015) as the stock market side of the model were chosen. This list ranks United States companies by their total revenues. Therefore, it is ensured that the United States stock market is represented with the highest possible significance. The selected list of companies includes Walmart, Exxon Mobil, Apple, Berkshire Hathaway, McKesson, UnitedHealth Group, CVS Health, General Motors, Ford Motor and AT&T.

Several time frames are covered in this experiment, starting from next day forecast up to seven days ahead. As stock market data, opening prices, highest prices, lowest prices, closing prices and volume of a given day are used to find a correlation to the foreign exchange market.



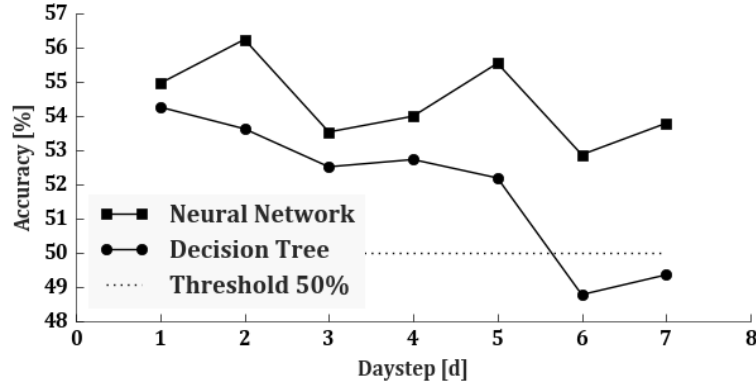


Fig. 3: Accuracy of decision trees and neural networks with respect to daystep

For the actual experiment, the variables from Figure 2 were chosen as follows. The ten chosen stocks were used as the input for each model ( $n = 10$ ). Each model was then trained with five different stock parameters ( $Y$  = opening price, highest price, lowest price, closing price and volume), with seven different daysteps ( $m = 1, 2, \dots, 7$ ) and for every currency pair ( $X$  = GBP, INR, AUD, SGD, JPY, CHF, MYR, CAD, EUR and CNY), leading to a final total of 350 different setups per model.

The performance of these setups was then measured by the metrics accuracy, recall, precision and F1. Setups with a recall of 100% were removed due to overfitting.

#### 4.1 Decision Tree

The accuracy of setups is in a range between 47.57% and 60.12%, precision – between 38.00% and 63.63%, F1 – between 18.11% and 72.36%, recall – between 20.10% and 91.47%. Because of the large number of models, we cannot include all the results, thus only results with best measurements for every currency are shown in Table 3.

Tab. 3: Results of decision trees

Currency	Daystep	Accuracy [%]	Precision [%]	Recall [%]	F1 [%]
SGD	1	60.12	61.42	87.75	72.26
AUD	2	58.00	60.06	91.00	72.36
INR	3	57.87	59.70	83.76	69.71
JPY	2	56.79	59.45	80.20	68.29
MYR	1	55.28	57.08	80.54	66.81
GBP	3	54.40	54.57	91.47	68.36
CNY	5	54.71	54.32	90.22	67.81
EUR	1	53.47	52.55	85.71	65.15
CHF	2	53.17	53.43	80.92	64.36
CAD	5	51.06	51.77	85.38	64.45

#### 4.2 Neural Network

The highest achieved accuracy was 60.2%, and the lowest 41.7%. Since a complete list of results is beyond the scope of this paper, the best results for each currency ranked by accuracy are shown in Table 4.

Tab. 4: Results of neural networks

Currency	Daystep	Accuracy [%]	Precision [%]	Recall [%]	F1 [%]
INR	5	60.24	60.50	96.98	74.52
AUD	2	59.70	61.38	88.56	72.51
SGD	1	59.40	60.54	90.95	72.69
JPY	2	58.81	60.94	80.41	69.33
CHF	2	59.61	56.65	84.18	67.73
MYR	5	57.23	56.77	95.65	71.26
CAD	2	56.12	55.45	97.80	70.78
EUR	7	56.06	57.39	40.74	47.65
GBP	2	55.52	56.29	87.03	68.37
CNY	5	54.22	53.54	99.43	69.60

#### 4.3 Comparison

Figure 3 shows the comparison between shallow learning and deep learning. The results for each currency were averaged and for neural networks only the best network was chosen for each currency. Neural networks performed reasonably across the whole timeframe, while it can be observed that the accuracy of decision trees falls with increasing forecasting time frame. Decision trees even fell below the 50% mark for a daystep of higher than 5. Surprisingly, the best average accuracy for neural networks was obtained using a daystep of 2.

## 5 DISCUSSION AND CONCLUSIONS

Since the results show that by using the proposed model an accuracy of over 50% can be achieved for each currency pair, it can be clearly stated that it is possible to predict the foreign exchange market based on the stock market.

From the results it can be concluded that while shallow learning works for this application, deep learning techniques outperform shallow learning. This difference gets more significant the longer the forecasting time frame gets. However, when looking at the highlights for specific currencies it can clearly be stated that for some currencies and time frames shallow learning outperformed deep learning, if only by a small margin.

Further, both methods show the same currencies in their top three. This leads to the conclusion that these currencies are most impacted by the stock market of the United States. These currencies come from the Asia-Pacific area.

During the experiment it was also noticed that changing stock parameter (e.g. open price, close price, etc.) has no influence on the model. This leads to the conclusion that these parameters contain the same information about the stock market. This was assumed for parameters such as opening price and close price, but it also holds true for trading volume.

Since this research shows that it is possible to make short term predictions of the currency market by using the stock market as input, it is clear that a correlation between stock and currency markets exists, and thus further research in this area is highly recommended.

Since the main goal of this research was not to optimise the accuracy but to prove that an accuracy of over 50% can be achieved, it is likely that the accuracy can be further enhanced.

## 6 ACKNOWLEDGEMENTS

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# INSIGHTS ON THE NEW TAXATION SYSTEM FOR FARMERS IN LITHUANIA

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## ABSTRACT

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From 2018, the government of the Republic of Lithuania intends to include the agricultural sector in the common Lithuanian taxation system. However, there is no scientific research on the effects of this tax reform on the viability and competitiveness of farmers. This could lead to the risks of not solving existing problems as well as creating new ones and causing stress among agricultural enterprises, farmers and other businesses. The paper aims to submit proposals for the improvement of the farmer taxation system. In order to investigate the theoretical aspect of the classification of taxation systems, applicable taxation systems on farmers in different countries and existing problems of these taxation systems, systemic analysis and synthesis of theoretical insights of foreign and local scientific literature have been applied. The results of the theoretical research will assist in identifying what structure of taxation system for farmers should be applied in Lithuania.

## KEY WORDS

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farmers, tax, taxation, taxation system

## JEL CODES

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H20, H25

## 1 INTRODUCTION

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The government of the Republic of Lithuania (2017) plans to implement a new taxation system. Applied from 2018, the new taxation system should improve the tax and social system. The main goals of the new taxation system reforms are the reduction of poverty, family support, simplicity and justice of taxation, promotion of entrepreneurship, attraction of investment, and creation of new jobs. The reform of the new taxation system provides for the inclusion of the agricultural sector into the common Lithuania taxation system during a transitional period of 2 years. Unfortunately, there is no scientific research on whether the new taxation system in Lithuania will keep the viability and competitiveness of the agricultural sector.

The United Nations Sustainable Development Goals focus on a new strategy of the common agricultural policy after 2020 (European Union, 2016). Accordingly, detailed research must be carried out on the development of a new tax reform in Lithuania, i.e. to find out what the optimal taxation system for farmers would be considering the vision of a new common agricultural policy after 2020. According to LeBlanc (2006), the government accepts that farmers need to have special instruments of taxation because normal tax rules would cause undue hardship for farmers.

*The problem of the research:* what should the new taxation system for farmers be and how should the taxation system be developed?

Tab. 1: Advantages and disadvantages of direct and indirect taxes (Phiri, 2016; George Alin, 2015)

Taxes	Direct taxes	Indirect taxes
Advantages	Better redistribution of GDP.	Tax payers feel less tax burden. Conducive climate for domestic savings and foreign investments.
Disadvantages	Distort economic growth more. Leads to lower consumption.	Have negative effects on economic growth.

*The aim of the research:* to submit insights on the improvement of the structure of the taxation system for farmers.

*Tasks to achieve the aim:*

1. To analyse the classification of the taxation system revealing its advantages and disadvantages.
2. To identify taxation systems of farmers in different countries.
3. To provide insights into the new taxation system for farmers in Lithuania.

In order to investigate theoretical aspects of the classification of the taxation system and existing taxation systems for farmers, systemic analysis and synthesis of theoretical insights from foreign and national scientific literature have been applied. Theoretical research results helped to provide insights into the new taxation system for farmers in Lithuania and to assess further research in this area.

## 2 CLASSIFICATION OF THE TAXATION SYSTEM

According to Andersen, Asheim, Mittenzwei, et al. (2002) the taxation system is partly regulated under legal sovereignty. If a country is federal, the taxation system can have a minimum of three levels (federal, state and local). If a country is unitary, the taxation system has only two levels (governmental and local). The local level of both types of country (federal and unitary) can have sub-levels, i.e. country and municipal level. Regardless of the number of tax levels in the country, all taxation systems consist of two types of tax.

According to George Alin (2015) and Rajendran, Nedelea (2016), taxes are classified into direct and indirect taxes. According to Worlu, Nkoro (2012), taxes levied directly on personal or corporate income are called direct taxes and taxes levied on the price of a good or service are called indirect taxes. It is important for the government to find a balance in choosing direct and indirect taxes since both direct and indirect taxes have their advantages and disadvantages (see Table 1). All direct and indirect taxes can have different calculation methods, which depend on the tax rate. Therefore the taxation system can be formed of different tax rates.

According to Tomkiewicz (2016), a taxation system can be progressive or regressive. As claimed by Bikas, Subaciene, Astrauskaite, et al. (2014) and Mitu (2015), there exist three different taxation systems: proportional, progressive and regressive (see

Table 2). Rajendran (2016), Rajendran, Nedelea (2016) distinguish one more taxation system, namely degressive taxation.

As we can see in Table 2 all three taxation methods have advantages and disadvantages. Proportional taxation is simple but is not the best system to deal with problems such as poverty reduction. According to Bikas, Subaciene, Astrauskaite, et al. (2014), a proportional taxation system means that the whole object is taxed with the same tax rate – so-called flat taxes. Piketty, Saez (2007) use proportional to mean a progressive taxation system claiming that a progressive taxation system refers to the idea that taxes are proportional and everyone pays the same share of taxes. However, Bikas, Subaciene, Astrauskaite, et al. (2014) disagree with this idea of proportional taxation arguing that a progressive taxation system is the system where the tax rate increases by increasing the tax object. Rajendran (2016) admits that degressive taxation refers to the case where the tax rate does not increase in the same proportion as the income of a person. According to Blum and Kalven (cited in Rothbard, 2001), degressive taxation is a form of progressive tax. There is no unanimous opinion on which taxation system is better. Therefore the government has to use a combination of these taxation systems in creating the taxation system and seeking the implementation of policy goals.

Tab. 2: Proportional, progressive and regressive taxation systems advantages and disadvantages (Bardhi, 2017; Vlad, Brezeanu, 2015; Paulus, Peichl, 2008 and others)

Taxation system	Proportional	Progressive	Regressive
Advantages	A simple taxation system.	Increase the tax morale.	Helps to maintain a large public sector more easily.
	Decreases tax evasion.	Encourages low-income people.	
	Decreases the cost of administration.	Promotes consumption.	
	Favourable business environment.	More revenue to the government budget.	
	Enhances labour supply incentives.	Helps small businesses to progress.	
Disadvantages	Less revenue to the government budget.	Discourages people with high income.	Collects the greater part of the poor income.
	Investment suffers.	Complex taxation system.	
	Scares off small companies.	Tax avoidance.	
		It is harder fiscal burden for big companies and migrates to other countries.	

### 3 TAXATION SYSTEMS FOR FARMERS

The taxation system for farmers depends on different levels of government such as national, regional and local (Khan, 2001). Therefore, to assess these differences taxation systems for the farmers of the seven most developed countries (Country classification, 2014) were analysed. The United States and Canada are federal countries, therefore, there are a minimum of three levels of taxation: the federal (national), the state (regional) and the municipal (local) level. In unitary countries (Japan, France, Germany, Italy and the United Kingdom) there are only two main levels (Andersen, Asheim, Mittenzwei et al. 2002).

The main difference between the United States and Canada is that farmers in Canada do not pay environmental and social taxes (Andersen, Asheim, Mittenzwei et al. 2002). The existing three levels of taxation makes it difficult to assess the taxation systems for farmers in the United States and Canada because each state uses different rules and rates for the taxation of farmers. Therefore, federal countries stand out from unitary countries by having many different taxation systems for farmers, which depend on the farmers' location. Thus it is difficult for scientists to carry out a detailed taxation analysis in these countries and so this research concentrates on unitary countries.

One of the most important direct taxes is income tax. All five most developed unitary countries use

a progressive taxation system for the calculation of income tax. The tax rate depends on income size and different countries use various limits for income. The countries have different limits varying from 3 to 4 limits for income tax calculation and tax rates from zero to 45%. Italy is distinguished from all the aforementioned countries as the minimum tax rate is 23%. The greatest numbers of limits are introduced in Germany (Taxes in Europe Database v3). Germany has a moderately supportive system (Veen, Meulen, Bommel et al. 2007).

Another direct tax, which usually depends on the farmer's income, is social insurance tax. The countries use alternative payments from minimum wages or other criteria to calculate the social insurance tax. The social insurance tax rate in Germany (18.575%) and the United Kingdom (9%) is lower because farmers who are self-employed sometimes do not pay for all security elements such as unemployment, work-related illnesses and accidents (Taxes in Europe Database v3). The United Kingdom taxation system for farmers regards farmers as being self-employed as there is no specific taxation of farmers (Andersen, Asheim, Mittenzwei et al. 2002). The social insurance tax rate in France (34.91%) and Italy (23.55%) is high in comparison with the aforementioned countries (Taxes in Europe Database v3).



Property tax is direct tax, too. Property tax revenue is calculated based on the value of land and buildings which belong to farmers. The decision on the rate of these taxes is adopted at the local level, not by the government. The most favourable situation for farmers is in Italy and the United Kingdom because farmers are exempt from land tax because of the neat landscape. Italy does not have a real estate tax (Taxes in Europe Database v3).

Agricultural policy these days and after 2020 is orientated toward sustainable development (European Union, 2016). The main problem of the world is climate change. Climate change is characterised by rising temperatures, carbon dioxide and volatility. Therefore, farmers face new challenges to find new plants which would be more resistant and to find out ways of keeping the viability of the farm (Hatfield, Boote, Kimball, et al. 2011). Public policy makers are looking for effective ways to slow down dangerous

climate change. One of the ways of dealing with climate change is environmental taxes (Nordhaus, 2007). Environmental taxation stands out in the United Kingdom where climate change tax is applied (Taxes in Europe Database v3). In other countries traditional taxes are applied, however, there are no specific taxes for the agricultural sector.

Value added tax is one of the indirect taxes. Japan's farmers are registered as small and medium-sized and therefore they are exempt from registering as value added tax payers. These farmers could return value added tax on equipment purchases and are exempt from value added tax on petroleum products (Cnossen, 2017). The United Kingdom has not reduced value added tax on agricultural supplies, but other countries such as France, Germany and Italy have a special tax rate for some agricultural supplies.

## 4 THE TAXATION SYSTEM FOR FARMERS IN LITHUANIA

The main problem in Lithuania is the same as in other countries, i.e. complex taxation and tax administration that causes stress to farmers in terms of correct tax calculation and payment (Colesnic, 2016); the taxation system for farmers does not correspond to the efficiency of Paret (Proskura, 2014) and the principle of social integrity (Hajduga, 2014; Proskura, 2014).

Farmers have a different status than enterprises which means different business risks. Including farmers into the common taxation system leads to the assumption that they will be taxed like other self-employed persons. This shows that agricultural enterprises and farmers will still have different taxation although business and business risk is the same; unfortunately, the responsibility of the owners is different. According to Lamb (1994), although taxes must guarantee revenue for the government, the agricultural business is unique and must be completely excluded from the economy as the result of their business being the production of food.

Lithuania is a unitary country and the taxation system has only two levels: governmental and local. The Lithuanian taxation system consists of two types of tax: direct and indirect taxes. According to the Taxes in Europe Database v3, the main direct taxes

are income tax and property taxes (land and real estate tax) whereas indirect taxes are environmental taxes (pollution from mobile sources and packaging waste taxes) and value added tax in Lithuania. Social insurance taxes in this database are not sorted as direct or indirect taxes.

However, as the insights of Damulienė and Vengrauskas (2001) show, social security taxes are direct taxes. It is necessary to admit that the taxation burden is low in Lithuania because the income tax rate is low (Mickienė and Girdziute, 2016). It is necessary to change income taxation in Lithuania, to prevent farm division into small farms so as to avoid value added tax payer status (Slavickienė and Savickienė, 2012).

The existing income taxation is proportional. Table 3 shows that social insurance contributions paid by farmers depend on the farm size and farmer status as value added tax payer. The disproportion between small and large-scale farmers shows that the taxation system is regressive (Mickienė and Girdziute, 2016). Today we are in a situation where older farmers are forced to work on the farm to survive, thus not transferring farm management to their children. This situation contradicts the common agricultural policy of the European Union, which

Tab. 3: Insights into the new taxation system for farmers in Lithuania (income and social insurance taxes)

Taxation	Applicable	Insights
Income tax	Standard income tax rate is 15%. Income tax exempt tax rate is 5% and 0%. Income tax rate depends on value added tax payer status of farmers. (Law on Personal Income Tax, 2002). This situation shows that the taxation system in Lithuania gives some privileges (Mickiene, Girdziute, 2016).	In order to achieve the main goals of the Lithuanian government (reduction of poverty, family support), the best way is to introduce a progressive income tax. The conducted analysis of the experience of other countries has shown that we need to have no less than 3 limits for income tax depending on the amount of income, with tax rate varying from 5 percent to 45 percent.
Social insurance tax	The shadow economy has greatly decreased in Lithuania, this leading to increasing social security contributions (Giray, 2017). Social insurance tax rates depend on the economic size of a farm (State Social Insurance Fund).	It is necessary to assess what social security system could be implemented in Lithuania to ensure the social security of old-age farmers: a pension from the national budget or private foundations.

Tab. 4: Insights into the new taxation system for farmers in Lithuania (property taxes)

Taxation	Applicable	Insights
Property tax	According to Real Estate Tax Law (2006), persons (farmers are persons who are self-employed) are exempt from real estate tax if they have farms, greenhouses, farm buildings and auxiliary farm buildings, the value of which is lower than 220 thousand Euros.	It is necessary to assess the inclusion of farm buildings in the real estate taxation system.

promotes the integration of young people into the agricultural sector.

The land and real property tax revenue is allocated to the municipal budget in Lithuania (Aleknavicius, 2011). The existing property taxation (see Table 4) shows that real estate tax is paid by enterprises and just a few people who have real estate of large value. It should be noted that farmers do not fall into the tax criteria and do not pay this tax for farm buildings.

Farmers have exemption from environmental taxes (see Table 5). This situation reveals that Lithuania has no ecological tax, and therefore the Lithuanian government has to carry out ecological tax reform. In order to maintain the tax burden, it should be redis-

tributed by reducing other taxes and contributions (Ciuleviciene, 2014).

Today the value added tax rate for agricultural supplies is standard (see Table 5). In Lithuania, a reduced value added tax rate for some agriculture supplies was applied until 2009. Unfortunately, the decision of the government to reject this tax rate and use the standard value added tax rate for agricultural products has negative effects. Low agricultural and food prices in the neighbouring countries such as Poland have encouraged Lithuanians to go shopping to these countries for their own needs or for the purpose of buying goods there and reselling them in bazaars. In this market there exists cash settlement. Therefore official statistics do not provide any infor-

Tab. 5: Insights into the new taxation system for farmers in Lithuania (environmental and value added taxes)

Taxation	Applicable	Insights
Environmental tax	The agricultural sector is exempt from environmental tax for pollution from mobile sources and packaging waste if consumption packages do not exceed 0.5 tons per year. Tax exemptions are valid for haylage packaging (Tax Law on Pollution, 1999).	The Lithuanian government has to carry out ecological tax reform. Even though currently the agricultural sector is considered one of the main polluters, it does not pay any environmental taxes.
Value added tax	The standard value added tax rate is 21%, there is no exemption for agriculture supplies.	The application of reduced value added tax rate for agricultural products must be considered following the experience of the analysed countries.

mation on the effect of this situation on Lithuanian farmers' production (Gapsys and Eicaite, 2010).

An analysis of the scientific literature allowed the identification of the guidelines for improving the taxation system for farmers in Lithuania. It is necessary to carry out our research and calculation of the mentioned taxes so that the new taxes could be improved. This article shows that the Lithuanian taxation system has imperfections. Therefore it would

not be correct to include farmers into the common taxation system. Such scenario of the Lithuanian government would not solve the existing problems, thereby only worsening the existing problems. It is necessary to evaluate whether tax reform is in line with common agricultural policy goals. The guidelines for tax reform must be transparent and the future effects on income, society, and farmers must be estimated.

## 5 CONCLUSIONS

The taxation system depends on the country as it can have different levels and sub-levels. These taxation systems consist of direct and indirect taxes which have different calculation methods. The main difference between calculation methods is the tax rate and its structure. Tax rate methods show the type of taxation system: proportional, progressive, regressive or degressive.

Analysis of the most developed countries discloses that countries use progressive income taxation systems which depend on different income limits and different tax rates. The social security system varies greatly between the analysed countries as in some countries tax rate is high and in others low; and there exist private social security funds. The property tax situation is different in the analysed countries as some countries provide exemption for farmers' land

and buildings, whereas in some countries there is no real estate tax. All countries apply environmental taxes, but there are no specific taxes for farmers. The majority of countries have reduced value added tax rate for agricultural supplies.

In Lithuania, income taxation is proportional, and therefore the government of Lithuania has to consider progressive taxation for the sake of poverty reduction. The social insurance system has some problems which have to be dealt with to ensure social stability for old-age farmers, thus promoting the integration of young people into the agricultural sector. Property tax exemptions for farmers must be reviewed. Lithuania has to discuss the reform of ecological taxes and make some decisions for reduced value added tax on some agriculture products.

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# SUCCESS FACTORS OF VIRTUAL SYSTEM SUPPLIERS IN THE AUTOMOTIVE INDUSTRY

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## ABSTRACT

The automotive industry is one of the most important pillars of the global economy. However the industry has changed significantly. Complexity in production is increasing, product and technology life cycles are shortening and the number of variants is increasing. The entire automotive industry is dominated by a few very large system suppliers. Small and medium-sized suppliers are under pressure to change. Basic strategy changes and new organisational models are required. One possibility is the network-like collaboration of various companies as a virtual system supplier. Which factors make such a company successful? Theories and theoretical approaches are used and literature research has been carried out to identify possible success factors. Transferable success factors from similar organisational forms are considered. The factors are summarised in terms of content and the strategic success factors are determined.

The results will be used in a first case study examining four possible success factors and their possible impact on the success of the company considered. The findings are the essential basis for a later empirical survey.

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## KEY WORDS

success factor, virtual system supplier, system supplier, automotive industry, organisational model

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## 1 INTRODUCTION

### 1.1 The Need for Change and Flexibility

The global automobile industry is the key sector of the economy for every major country in the world (Organisation Internationale des Constructeurs d'Automobiles (OICA), 2017).

While there has been a reduction in the life cycles of both products and technologies, the complexity

inherent in the manufacture of automobiles has grown. Global corporate networks have emerged, linked as customers and suppliers (Bredow, 2014: 1).

Warnecke (1993: Vorwort/Prolog) argues that in that past mass production was successful primarily due to the automation of mass production, utilising assembly lines and reducing the complexity and scope of each worker's task.

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<sup>1</sup>Micro-, small- and medium-sized enterprises (SMEs) are defined in the EU recommendation 2003/361. (European Union, 2003) The main factors determining whether an enterprise is an SME are: (1) staff headcount and (2) either turnover or balance sheet total.



Matt and Ohlhausen (2011: 1) add that the micro-, small-, and medium-sized enterprises (SMEs)<sup>1</sup> upon which the European economy heavily relies are also significant determiners of success.

In Germany alone, of the country's roughly 3.63 million companies, 99% are small- and medium-sized enterprises (SMEs), employing 60% of the workforce (Bundesministerium für Arbeit und Soziales, 2016: 83).

As competitive pressures intensify and the requirements of the market persist in a state of flux, both the companies' ability to adapt as well as their bottom lines are under increasing strain. The response to this situation must go beyond holding down costs for planning, investment and production. The company must also set a significant level of versatility as a goal unto itself. Only those companies which are able to develop process-oriented structures can appropriately respond to the market.

Flexibility must stand at the heart of the organisation. Due to the complexity generated by market dynamics, it is no longer possible for real companies to make the necessary investments in new product segments or processes. Years ago within certain industries the virtualisation of companies began to be seen as the antidote to such rigidity.

Schuh et al. (1998: 19) have identified two trends within the various attempts made at increasing organisational flexibility in companies. The first involves large companies and their segmentation and dissolution. The second begins with independent units, as well as small and mid-sized companies, which are drawn together into cross-organisational, cooperative constructs. The structures created are referred to as network organisations or Virtual Corporations.

Meant for a popular audience, this definition was featured on the cover of *Business Week*: *"Big, complex companies usually can't react fast enough. Small, nimble ones may not have the muscle. What's the answer? A new model that uses technology to link people, assets, and ideas in a temporary organization. After the business is done, it disbands. It's called the virtual corporation."* (Morrison, 1993: Front cover of the *Business Week*)

## 1.2 The Automotive Industry and its Suppliers

Regarding the automobile industry, a large number of definitions are to be found in the literature, which are to be specified subsequently for the purpose of a clear conceptual understanding. Terporten (1999: 86) defines the term as follows:

*"The term automotive industry refers to the manufacturers of motor vehicles and their engines, road tractors, superstructures, trailers, motor vehicle parts and accessories."* [translated by the author from the German]

According to Schlösser (2005: 94), this broad definition should be differentiated into the automotive manufacturing industry and the automotive supply industry.

In terms of the automotive value chain, the original equipment manufacturer (OEM) is of primary importance. With final responsibility for the overall product, it also has sole access to the end customer. "OEM" and "vehicle manufacturer" are synonymous (Schonert, 2008: 14). Although the OEMs are the largest and most dominant companies in this industry, the automotive supply industry is also of crucial economic importance, as these companies contribute approximately 82% (level of 2015) to the added value of a vehicle (statista, 2017).

The WFO – Wirtschaftsförderung Osnabrück (2016: 12–15) describes the automotive supplier industry in one part of Germany as follows: The value chain within the automotive industry is highly stratified, dominated by the OEMs as final manufacturers. Beneath them are suppliers, identified according to three tiers. Tier 1 suppliers produce modules and systems delivered directly to the final manufacturer. Tier 2 suppliers provide components for such systems. Finally Tier 3 suppliers produce the parts themselves. Medium-sized suppliers find themselves in a fluid environment in terms of technology, socio-cultural influences and politics. The companies themselves must adapt to cope with these pressures.

Modular procurement has altered the supplier structure of the (automotive) industry. Increasingly under this system, the module supplier (Tier 1) works directly with the OEM. However, sub-suppliers of components (Tier 2) and parts (Tier 3), as well as suppliers of raw materials, find themselves working within a multi-stage supply chain with only indirect contact with the OEM.

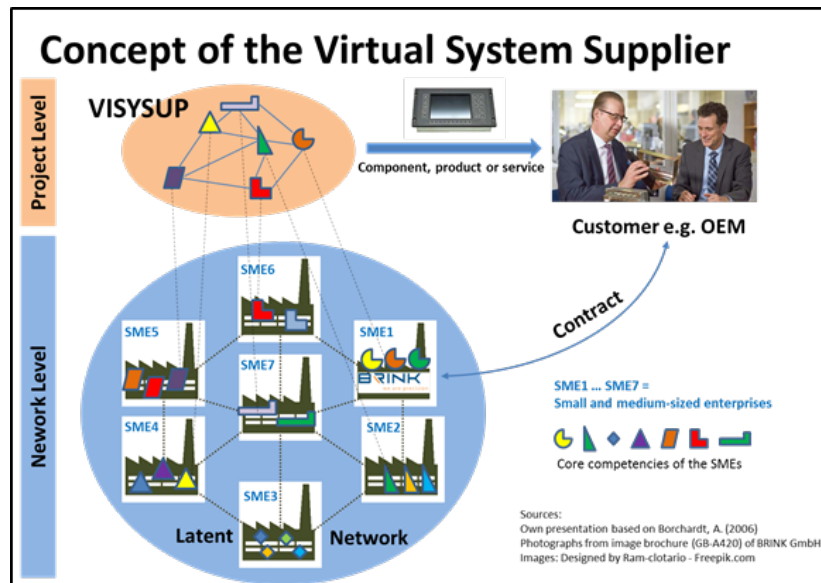


Fig. 1: Concept of the Virtual System Supplier based on Borchardt (2006: 20), photographs from Brink (2016: 8, 16)

### 1.3 From Virtual Corporation to VISYSUP – The Virtual System Supplier

In Figure 1, the VISYSUP<sup>2</sup>, or activated network, is distinguished from the latent network. As defined by Borchardt (2006: 19) the virtual company draws on dynamic basic components contained within both the latent and activated networks, i.e. the project-specific project network (see Schuh et al., 1998: 63). This allows for the network and project levels of a virtual company to be distinguished from one another.

The latent network of the VISYSUP is unlike networks found in distribution, production or sales. By pooling both homo- and heterogeneous core competencies through loosely formed links, it is able

to interact with cooperative partners as a unified whole. The activated network represents only a portion of the total latent network, which itself bears similarities to a strategic network. However, unlike a strategic network comprised of large companies, the latent network remains invisible to the market (Borchardt, 2006: 20).

Virtual companies or system suppliers exhibit various phases of life, as do nearly all organisational forms. For the purposes of this paper, four ideal phases in the development of such virtual organisations have been drawn from the literature: selection of cooperation partners, foundation, execution, and evaluation/liquidation of the cooperation. Prior to these phases, however, the organisational form itself must be chosen (Tjaden, 2003: 56).

## 2 METHODOLOGY AND DATA

As a research method, a structure-discovering (explorative) approach has initially been selected for this study, as the research area studied has remained underdeveloped thus far. In particular, no established hypotheses regarding possible success factors of this form of cooperation can be identified. But that would be the function of a confirmatory work.

According to Augsburg University (2017: 6) exploratory examinations are primarily conducted with

the aim of developing new hypotheses in a relatively unexplored field of investigation or of creating theoretical or conceptual prerequisites in order to be able to formulate initial hypotheses. They are relatively un-standardised and leave much room for the investigator's imagination and ingenuity. At this early stage of the research process, therefore, an explorative research method is essential. First, the theoretical basis for the research project must be

<sup>2</sup>Virtual System Supplier – This term is, according to investigations by the author in science and business, so far nonexistent. The author has therefore coined this term, including the abbreviation "VISYSUP".

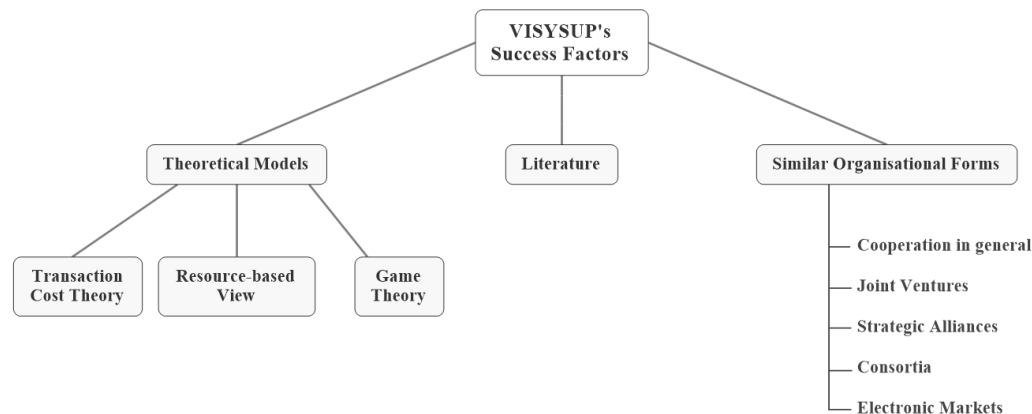


Fig. 2: Identification of possible success factors in theoretical models, the literature and similar organisational forms

laid. For this, success factors must be determined. To do this, theories and theoretical approaches are used and literature reviews are carried out to identify possible success factors. Transferable success factors from similar forms of organisation are considered (see Figure 2).

The procedure is essentially based on a hermeneutic method. According to Erdélyi (2012: 9) hermeneutics provides the methodological basis for the analysis of any kind of source. It is also used in empirical studies, since at the beginning it is necessary to show the current state of research.

The identified literary sources are analysed, evaluated and assigned to the life phases of the VISYSUP. In another scientific work the author will develop the model “VISYSUP’s House of Success”. However, this is not yet part of this work.

In order to describe the phenomenon of the VISYSUP and its success factors in a real environment and to obtain insights for further empirical investigations, a company – BRINK GmbH – is examined more closely in the course of a case study.

According to Göthlich (2003: 7) case studies aim to interpret a phenomenon in its context. Thus case studies are among the interpretive methods. Case studies use and combine different types of data. Quantitative analysis methods are not excluded. Case studies therefore are only a short distance removed from quantitative methods. Also in the continuum between deduction and induction, case studies occupy a central position, because it is an empirical method which proceeds on a theory-guided basis.

According to Yin (2003: 13–14), the case study is an empirical study that examines a contemporary phenomenon in its real context, especially when the boundaries between phenomenon and context are not clear.

The authors of this case study have focused at this stage on a comparative study, which, apart from induction and deduction, is one of the basic research methods. Comparative research consists of analysing the characteristics of the subjects to determine similarities and differences. For the purpose of the correctness of such tests, the comparability of research objects is due to their essence. As a result of comparisons, the so-called partial identity is gained, which is a means of knowing that the essential components of phenomena are similar to one another.

This method is not in itself a sufficient tool to solve scientific problems, but it is a reference for further scientific research in a given field. Thus the author will focus his attention on further and more detailed research in subsequent publications.

Initially, four factors were selected for this case study. The criteria for the selection were, on the one hand, the intuition of the author, who is also the owner of BRINK GmbH and can be regarded as an expert in this field. On the other hand, long-term participants (network partners) of the VISYSUP’s were surveyed as to which factors were decisive, in their opinion, contributing to the success of this form of virtual enterprise.

On this basis, the following success factors were selected for this preliminary case study, which should above all serve to gain insights:

1. "Size and image of the partners"
2. "Building trust (both personal and procedural/impersonal)"
3. "Geographically congruently positioned partners"
4. "Low cultural distance"

Based on these factors, 321 companies from different industries such as production, research & development and engineering were examined. The choice of variables was made on the basis of indicators significant for enterprises which are participants in virtual system suppliers.

### 3 SUCCESS FACTORS

#### 3.1 The Basics

Entrepreneurial action always has the goal of success. Business leaders make their decisions based on examining the causes of success or failure.

The origin of success factor research is the PIMS program (Profit Impact of Marketing Strategies). In addition, the 7S model described for the first time by the authors Peters and Waterman in 1982 gave an important impetus to this field of research. Peters and Waterman (2004: 10) break down success factors into seven clusters.

Tjaden (2003: 59) notes that in co-operation besides the goals of co-operation as a whole, the individual interests of the partners also exist. In addition to the objective success of cooperation as a whole (macro level), there is still the subjective success of cooperation participation for each of the partners participating in the cooperation (micro level).

In the development of success factors for forms of cooperation different authors, such as Müller (2000), Helm and Peter (1999: 28) or Tjaden (2003: 68), have categorised the success factors according to the different phases in chronological order. As a result, a classification was made, which offers the advantage of being able to assign success factors to life stages. Subsequently, recommendations for action can be derived for each individual phase.

In order to systematise the success factors a phase classification is also used in this paper. For factors that occur in several phases of life the group of "phase-indifferent success factors" was additionally formed.

The choice of variables was made on the basis of the analysis of data relevant for the non-minor survey in 2006-2017, and on this basis the variables in the global perspective were analysed in relation to the above-mentioned factors.

The universal application of the model to the evaluation of the factors proposed here is decisively one of the methods for assessing the effectiveness of Virtual System Success Factors. In retrospect it can support the implementation of further business factors – strategically oriented to the survival, development and maximisation of profit.

#### 3.2 Success Factors of Virtual System Suppliers from Theoretical Models

In accordance with the underlying concept of theory-based research, theories and theoretical approaches are considered in this section in order to identify possible success factors for virtual enterprises or virtual system suppliers.

The author of this paper refers in particular to the comprehensive work of Tjaden (2003: 84–99). He gives an all-encompassing overview of the theories used so far in the research field concerned. These are theories used to explain the three areas "success or success factors", "networks" and "virtual corporations".

Following the structure of Sydow (2005: X–XI), Tjaden (2003: 86) has systematised the theories used in the literature in economic theories and inter-organisational theories.

The following sections discuss three of the most frequently used theories in these areas to derive potential success factors for virtual enterprises. Specifically, these are transaction cost theory, the resource-based view and game theory.

##### 3.2.1 Transaction Cost Theory

Transaction cost theory is an organisational theory which is associated with the New Institutional Economics and in which the contract as an organisational form is at the centre of research interest. Transaction cost theory explains why certain transactions are handled and organised more or less efficiently in certain organisational forms of the exchange deal

(Ebers and Gotsch, 1995: 225). It assumes that all action is connected in a market economy with costs.

According to Picot (1982: 270) and Picot et al. (2003: 50), any transaction costs incurred can be divided into five groups: start-up costs, agreement costs, handling costs, control costs and adjustment costs.

With transaction cost theory, clear requirements can be derived for advantageous and therefore more successful virtual system suppliers. According to this theory, the transaction and production costs must be minimised so that the resulting total cost function is well below the other cost functions. Looking first at the components of transaction costs that have already been mentioned it is possible to reduce start-up costs by knowing potential partners and their capabilities and by building a stable network. The agreement costs can be minimised by shorter negotiations due to the waiving of contractual arrangements. Handling costs can be reduced through the use of information and communication technology and the lowest possible interface losses. Control costs can be reduced to ensure compliance with deadlines, quality, quantity and confidentiality agreements by stable trust, possibly building on personal relationships. Furthermore, lower adaptation costs within the cooperation can be achieved through open communication and timely information. A clear definition of requirements and goals can reduce transaction costs even in the start-up phase, as can a fundamental waiving of contractual arrangements.

A possible success factor can also be derived from the fixed transaction costs: The advantage of the intermediate form of coordination of virtual enterprises in comparison with a hierarchy or a traditional company lies in the reduction of the fixed costs, e.g. arising from the bureaucratic apparatus.

Transaction cost theory represents one of the most frequently used theoretical approaches – also in the research into virtual enterprises. It is consistently granted a high degree of empirical probation (Ebers and Gotsch, 1995: 234f; Sydow, 2005: 145). The theory provides some potential success factors of virtual system suppliers in terms of pure cost level.

### 3.2.2 Resource-based View

The resource-based view (RBV) is based on studies by Penrose (1959). As early as 1959 she attributed her success to the quality of internal resources in “The Theory of the Growth of the Firm”. It belongs

to the inter-organisational theories (Blecker, 1999: 191ff).

Since the end of the 1970s it has been a theory advocated by various scientists for the alternative explanation of competitive advantages for companies in which the concept of the resource is placed at the centre (see Pfeffer and Salancik, 1978).

The RBV combines two approaches: firstly, the strategic advantages of companies are attributed to the fact that companies have other more strategically valuable resources; secondly, that they can use their resources better than their competitors. Differences in the company’s success are seen here in the resource equipment and on the resource markets.

The core competence approach of Prahalad and Hamel (1990), anchored in the RBV, reduces the range of potentially competition-relevant resources of a company to specific competences of the company. These should be designed so that they can be used in the production of a variety of goods and services and thereby bring the customer the highest possible use growth. Furthermore, the company should as far as possible have this core competency on its own. As a strategic corporate goal this requires the development of a Unique Selling Proposition (USP).

From a resource-oriented perspective the main advantage of networks is the sharing of resources (Hungenberg, 1999: 18). An additional benefit for the partners may be the bringing together of complementary core competencies (allying), but only if their respective assignments within the partnership are known. At the same time, pooling of equal skills or linking of systems and processes can be used to promote further development in order to jointly develop new competition-relevant resources more quickly (Blecker, 1999: 207). It also helps to boost success if the partners already bring competition-relevant resources into the alliance. Due to the fact that resources wear down and other skills become relevant to competition, the flexibility of the network in terms of admitting/changing partners is crucial to success. This requires the economic independence of the partners, as otherwise an exchange would be difficult or impossible.

Already the ability of the partners to cooperate is an ability which is difficult to imitate. At the same time it is also a prerequisite for making the resources of the partners accessible to one another, provided that there is a basic willingness to cooperate and learn (Blecker, 1999: 208–209). As a result these



skills, as well as direct access to technologies and low-level collaboration are factors in the success of Virtual Enterprises. Appropriate knowledge management for reproducing intangible resources in particular is crucial to success. Likewise, the minimisation of interface losses is necessary for successful joint action.

### 3.2.3 Game Theory

Game theory, like the transaction cost approach, is one of the economic theories. A milestone in the development of this theory is the publication "Theory of Games and Economic Behavior" of Neumann and Morgenstern (2007) from 1944. The term game theory dates back to its beginnings, in which actions in the context of parlour games in particular were analysed.

Game theory provides different approaches to favour success which basically only occurs in a cooperative style of play. The benefits of non-cooperative behaviour may be diminished, conflicts that lead to non-cooperative behaviour between fellow players can be prevented or resolved and mutual trust in the functioning of cooperation increased.

### 3.2.4 Summary of the Conclusions from the Theoretical Models

In summary, according to the three theoretical approaches considered here, there are a large number of potential success factors that influence the success of a virtual system supplier. Each of the theories focuses on one facet of cooperation: Transaction cost theory emphasises production and transaction costs, the resource-based view focuses on internal capabilities, and game theory considers partner interaction within the collaboration.

## 3.3 Success Factors of Virtual System Suppliers from the Literature

With the exception of Tjaden (2003), the success factors of virtual companies or virtual system suppliers have not been sufficiently analysed (Blecker, 1999: 4). The investigations are almost always confined to individual facets regarded as success factors by the respective author, which are neither empirically substantiated nor developed in theory. These are therefore amateur theories, which are also described imperatively. This also applies to the larger study of Krystek and Reppegather (1999), entitled "Success factors of cross-company virtual

organisational structures". In a very theoretical way, the authors integrate inter organisational virtuality as a factor of success into normative management (Krystek and Reppegather, 1999: 410ff). However, Krystek and Reppegather (1999) do not provide a justification for the selection, empirical assignment or implementation-oriented concretisation of the success factors derived.

The only empirical work known to the author is the study of Konradt (1999). For this work, five short anonymised case studies were developed on the basis of interviews. Konradt (1999: 104) derived factors of success in terms of strategy, partner, process and culture from the direct mentions of positive and problematic aspects of the interviewees, as well as the must and can criteria of virtual enterprises:

- Strategy: (a) Recognise the benefit of long-term business relationships; (b) Trust in the partners; (c) Unconditional reliability; (d) Clear responsibilities.
- Requirements for the partners: (a) Economic independence; (b) Entrepreneurial and professional competence.
- Process: (a) Clear communication structures for quick communication; (b) Continuous and fast data exchange; (c) Transparent competencies and resources of the partners.
- Culture: (a) Building and maintaining social relationships between the partners; (b) Mutual technical and motivational support/activation; (c) Commitment of the employees.

Another detailed attempt to identify success factors in connection with virtual enterprises can be found in the publication by Blecker (1999: 120ff). However, the author only develops the impact of the properties of Virtual Enterprises on the strategic success factors of companies in general (cost, quality, flexibility, time, product variety and service), that is, the positive/negative effects on the success factors for companies, but not the success factors of the "virtual enterprise" form of cooperation per se.

Tjaden (2003: 102–103) in his work concerning the success factors along the life phases of virtual enterprises has compiled the publications known to him in tabular form. Tjaden (2003: 102) states that in none of the studies has the effect of the success factors been presented quantitatively and/or has a statement been made about the strength of the influence of the success factors introduced.



Tab. 1: Potential success factors in the phase “selection of cooperation partners”

Potential success factors	TM <sup>a</sup>	LI <sup>b</sup>	SO <sup>c</sup>
Definition of goals of the Virtual Company and requirements for participating partners.	×		
Compatible strategic goals.	×	×	×
Compatibility of experiences, values, principles and hopes for the future.	×	×	×
Redundant competences of the partners.	×	×	×
Complementary core competences.	×		×
Same product or service quality.	×		×
Organisational similarity of the partners.	×		
Similar professionalism of the partners.	×		×
Low cultural distance.	×		×
Geographically congruently positioned partners.	×		×
Principal cooperation and learning willingness.	×	×	×
Size and image of the partners.	×		×
Absolute reliability.	×	×	
Cooperation experience of the partners.	×		
Good relationship between the management of the partners.	×		×

Notes: Representation of the author including the evaluation of Tjaden (2003: 114).

<sup>a</sup>) Potential success factors from theoretical models (TM).

<sup>b</sup>) Success factors of virtual system suppliers from the literature (LI).

<sup>c</sup>) Transferable success factors from similar organizational forms (SO).

### 3.4 Transferable Success Factors from Similar Organisational Forms

All in all, a great deal has already been written on the success factors of organisational forms, partly from the academic side, partly from the practical side – in particular by consultants. Helm and Peter (1999: 28) alone counted more than 50 joint venture projects. According to Tjaden (2003: 103) joint ventures, strategic alliances, consortia and electronic markets are very close to the form of cooperation of virtual enterprises. Therefore, in addition to the success factors of cooperation's in general, these four organisational forms are taken into account, especially in the selection of possible success factors of virtual enterprises.

For reasons of space, however, a precise explanation at this point must be omitted. In order to find transferable knowledge the author of this paper has dealt in detail with the following literature:

- Success factors for cooperation in general: Bronder (1993), Herowitsch (1997), Kanter (1995), Nadler and Tushman (1980), Tjaden (2003) and Zentes and Swoboda (1999).

- Success factors in joint ventures: Eisele (1995), Helm and Peter (1999), Schrader (1993) and Tjaden (2003).
- Success factors of strategic alliances: Barrantes et al. (2000), Bronder and Pritzl (1991), Devlin and Bleackley (1988), Müller (2000) and Tjaden (2003).
- Success factors of consortia: Büschgen (1989), Stiefel (1989) and Tjaden (2003).
- Success factors of electronic markets: Fischer et al. (2001), Rütter and Szegunis (2000) and Tjaden (2003).

### 3.5 Results – Summary of Potential Success Factors of Virtual System Suppliers

On the basis of the evaluations of the author's investigations and following the investigations of Tjaden (2003: 57–114), the following potential success factors of the virtual system supplier could be determined. Their presentation is based on the life phases of virtual companies/virtual system suppliers and their sources.

Tab. 2: Potential success factors in the phase “foundation of the cooperation”

Potential success factors	TM	LI	SO
Permanent win-win situation for all partners.		×	×
No dominance pursuit of a partner.	×		×
Meaning about equal for all partners.	×		×
Common target agreement.	×	×	×
Clear definition of cooperation modes (decision-making, conflict management, new partners, withdrawal rules and ownership of rights).	×		×
Determining the value of the various working modules.	×		
Waiver of contractual arrangements.	×		

Note: Representation of the author including the evaluation of Tjaden (2003: 114).

Tab. 3: Potential success factors in the phase “execution of the cooperation”

Potential success factors	TM	LI	SO
Communication style: Respectful treatment of the partners.	×		×
Building a corporate identity for the virtual company.	×	×	
Unambiguousness of responsibility.		×	×
Delegation of responsibility.		×	×
Cooperation of the partners directly at the “lower” hierarchical level.	×		×
Direct access to partner technologies.	×	×	
Low or no interface losses between the partners.	×	×	
Quality of employees and management.		×	×

Note: Representation of the author including the evaluation of Tjaden (2003: 114).

Tab. 4: Potential success factors in the phase “evaluation and liquidation”

Potential success factors	TM	LI	SO
Joint performance measurement and quality control.	×	×	×
External auditor as an objective entity for evaluation and profit distribution.	×	×	
Stable and permanent network as the basis for new virtual enterprises.	×	×	

Note: Representation of the author including the evaluation of Tjaden (2003: 114).

Tab. 5: Potential “phase-indifferent” success factors

Potential success factors	TM	LI	SO
Clearly defined goal.	×		
Economic independence of the partners.	×	×	
Transparency through structured processes as well as open and regulated communication.	×	×	
Information and communication technology.		×	×
Knowledge Management.	×	×	×
Building trust (both personal and procedural/impersonal).	×	×	×
Building social relations between the partners.	×	×	
Excellent (core) competencies of the partners.	×	×	
Abandonment of core competencies covered by other partners.	×	×	
Familiarity with core competencies and resources of the partners.	×	×	
Existence of a system leader.	×	×	
Existence of a coordinator.	×	×	
Flexibility of the network with regard to incorporation or change of partners.	×	×	

Note: Representation of the author including the evaluation of Tjaden (2003: 114).

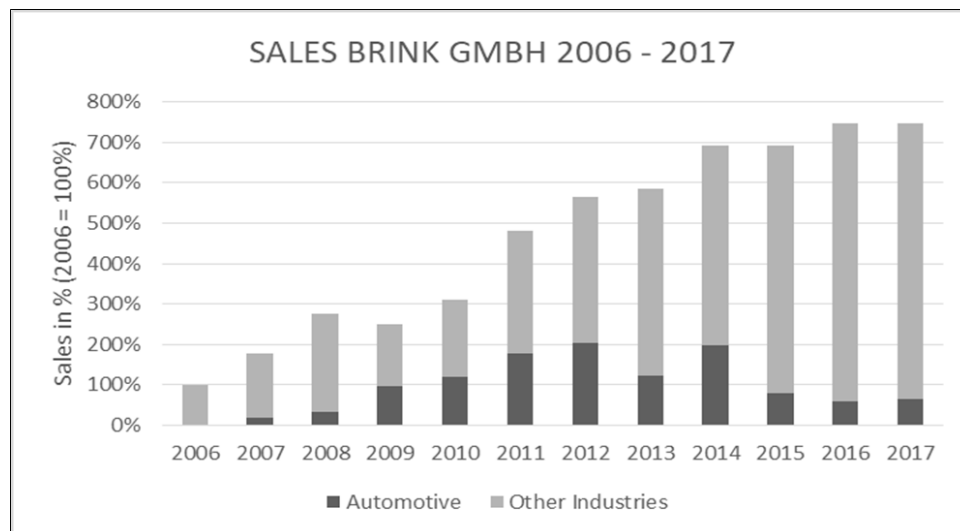


Fig. 3: Sales development of BRINK GmbH 2006–2017 in % (year 2006 = 100%) from company data of BRINK GmbH

## 4 CASE STUDY OF BRINK GMBH

### 4.1 The Company

BRINK GmbH was founded in 2004 by two shareholders as a sales and consulting company. The majority shareholder has also been the company's CEO since that time and is also the author of this paper. Very quickly the business focused on the production and sale of both metal and plastic technical components as well as mechanical assemblies and systems. It never engaged in the production of the parts itself, but left that to European production partners.

This includes every area of the business, from quote generation and the provision of expert advice in the development stage of the customer project through the creation of prototypes to the timely delivery to the customers of flawless serial products.

This made the company more successful year by year (see Figure 3). The customer profits as well in that the BRINK GmbH is able to offer the best service and extremely competitive conditions to its customers.

Whether the customer is looking for a simple lathed component or a complex welded assembly, BRINK GmbH always follows its own motto: "We are precision!"

BRINK GmbH is not just an automotive supplier but also supplies other industries such as electrical engineering and electronics, furniture, mechanical engineering, medical and rehabilitation technology, metal and plastic processing, sports and wellness

equipment, technical building equipment and other industries.

The system supplier BRINK GmbH is a focal company (central company in a strategic network) in a company network consisting of independent companies. BRINK GmbH plays a coordinating and leading role in a joint (project) business. In doing so, the company is in direct contact with the customer and thus gives the virtual company a "face". The organisational and scheduling coordination between the different participants of the VISYSUP is also the responsibility of the BRINK GmbH.

Sales development of BRINK GmbH was analysed between 2006 and 2017 (Figure 3). Over the years a clear upward trend could be observed. In 2009, the global economic crisis also reached BRINK GmbH. Customers cancelled orders already placed. Sales declined noticeably. Thus, in the years 2009-2010, a slight decrease in sales development was observed, but the years 2011-2012 indicate an upward trend compared to the crisis years of 2009 and 2010. In the subsequent years 2014-2017 this increase was even greater (compared to 2010-2011).

The share of the automotive business appears extremely unstable. In the years 2009 to 2012, 35 to 40 per cent of annual sales could still be achieved, but in 2013 automotive sales declined significantly (measured both in terms of absolute and relative values). In 2014 automotive sales once again increased significantly. The absolute values of 2014 could be achieved again, but not the relative

values, since in the same period the turnover with other industries increased significantly. From 2010, automotive sales remained at around 10 per cent of the respective annual sales.

Tab. 6: Range of Services on the basis of Brink (2016: 7)

Range of Services	Core Competencies	
	BRINK GmbH	Network Partners
Research & Development	×	×
Engineering	×	×
Material / Purchasing Management	×	
Production: Machining		
Lathing		×
Milling		×
Grinding		×
Cutting Gears		×
Production: Casting Technology		
Die Casting		×
Gravity Die Casting		×
Investment Casting		×
Sand Casting		×
Production: Sheet Metal Working		
Punching and Bending		×
Laser Machining		×
Lathing		×
Nibbling		×
Welding		×
Deep Drawing		×
Production: Forming		
Cold Extrusion		×
Forging		×
Production: Plastic Injection Moulding		×
Production: Mounted and Welded Assemblies	×	×
Production: System Technology	×	×
Marketing & Sales	×	
Quality Management	×	×

Currently, 30 per cent of customers (across all sectors served) are OEM's, 52 per cent are Module Suppliers and 13 per cent are Component Suppliers. All the insights gained from this work can, in the author's opinion, also be transferred to other industries. The automotive sector already represents the "premier class" of the possible branches of industry, as the requirements of automotive customers with

regard to product and delivery quality, as well as the flexibility expected, are often significantly higher in comparison to customers in other industries.

The Range of Services shows the "Range of Service" which the VISYSUP is willing to render under the direction of BRINK GmbH. The core competencies of the individual network participants complement each other ideally. According to Brink (2016: 6) they range from the production (with the help of external partners) of lathed and milled parts, the casting of iron and non-iron metals, the creation of cold extruded and forged components, through plastic injection moulding, to sheet metal working. BRINK GmbH not only supplies individual parts but also assembles everything into finished units and systems and is able to carry out development projects alone or with the support of network partners.

## 4.2 BRINK GmbH and its suppliers

The list of suppliers in 2017 was divided according to the size of the enterprise (eurostat, 2016)<sup>3</sup>. Companies were divided into four types: micro (12 companies); small (101 companies); medium (31 companies) and large (three companies). BRINK GmbH is also a small company. With very large companies, there are very few business relationships.

The results of chapter 3.5 have been used to assess the success factors of virtual systems suppliers such as, in this case, the duration of cooperation.

As Table 7 shows, BRINK GmbH cooperated with 147 partner companies in 2017. Of these, 19 companies were completely new partners. But there were also 20 companies which had worked together with BRINK GmbH for 10 years and more. 174 companies no longer work with BRINK GmbH. They had started to cooperate within the last 14 years, but this cooperation came to an end within this period.

When the collaboration has ended, then it has done so in more than 80% of cases within the first three years of collaboration.

Based on these results, it is reasonable to suppose that long-term cooperation is an indication of trust between the partners.

Figure 4 presents the numbers and percentages for partner companies and where they come from. The volume is shown in relation to the countries of origin

<sup>3</sup>(a) Micro enterprises: fewer than 10 persons employed; (b) Small enterprises: 10 to 49 persons; (c) Medium-sized enterprises: 50 to 249 persons; (d) Large enterprises: 250 or more persons employed.

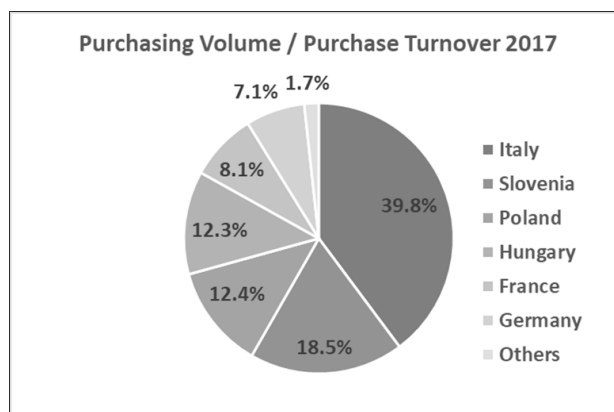


Fig. 4: Number and purchasing volume of the current partners from Company data of BRINK GmbH

of the cooperation partners. As can be seen from the table, active partners operate only within Europe.

The largest number of partners is found in Germany, Italy and Poland. The highest purchasing turnover is obtained thanks to cooperation with partners in Italy, Slovenia and Poland. BRINK GmbH achieves smaller turnovers within other countries, but these are also significant for overall cooperation and company results.

Tab. 7: Duration of cooperation of BRINK GmbH with the virtual suppliers (from company data of BRINK GmbH)

Duration of cooperation	On-going	Cancelled
up to 1 year	19	88
greater than 1 and less than 2 years	14	36
greater than 2 and less than 3 years	25	21
greater than 3 and less than 4 years	14	7
greater than 4 and less than 5 years	12	8
greater than 5 and less than 6 years	13	6
greater than 6 and less than 7 years	9	5
greater than 7 and less than 8 years	11	1
greater than 8 and less than 9 years	3	0
greater than 9 and less than 10 years	7	2
greater than 10 and less than 11 years	6	0
greater than 11 and less than 12 years	5	0
greater than 12 and less than 13 years	2	0
greater than 13 and less than 14 years	7	0
Total in 2017	147	174

### 4.3 Results of the Case Study

BRINK GmbH has been successful with the VISYSUP business model.

Turnover has risen to 7.5 times its value in 12 years (see Figure 3). The company has existed for 14 years now and has mostly made decent profits. The order backlog is always good.

Which of the numerous factors have ultimately contributed to this cannot be conclusively stated. This requires further investigation and (statistical) evaluation.

First, the size of the network partners was investigated. Almost 70% of the partner companies belong to the group of “small enterprises”, i.e. companies that employ 10 to 49 people. Only three companies (2 per cent) are large enterprises (250 or more employees). This seems to be a clear indication that similar company sizes are having a positive effect on the success of the VISYSUP.

The “trust” of the network partners in each other also seems to have a positive influence on the success of the network. As an indicator, we have used the “Duration of cooperation of BRINK GmbH with the virtual suppliers” (see Table 7). It is noticeable that cooperation with many new partner companies has already ended within the first three years. And on the other hand it can be stated that the very long-standing partner companies have the largest share of the sales realised in the VISYSUP. There is a great deal of trust between BRINK GmbH and these companies. The author therefore hypothesises that trust between business partners has a positive impact on the success of the VISYSUP.

Two other potential success factors considered are “Geographically congruently positioned partners” and “Low cultural distance”. It is very clear that BRINK GmbH only buys 7 per cent of its purchasing volume from German partner companies and that, for example, it purchases almost 40 per cent of the purchasing volume from Italy. Even without further data collection it can be assumed that the influence of these factors, at least for BRINK GmbH, is rather low.

## 5 CONCLUSIONS

The research presented based on a case study has made it possible to recognise and obtain a broad, though not exhaustive, description of the success factors for virtual system suppliers. The stages of assessing four of the many factors of the virtual success of the organisation were shown and discussed in detail. The research method applied allowed additional conclusions to be drawn and set the direction for further research.

The formulated goals for this work have been implemented in the form of:

- application of the comparison method for one VISYSUP with 321 participants;
- the area of the surveyed companies: Europe;
- companies surveyed belonging to different industries such as production, research & development and engineering;
- the ordering of success factors for virtual systems suppliers in theoretical terms;
- application of four of the many success factors for virtual system suppliers: (1) Size and image of the partners; (2) Building trust; (3) Geographically congruently positioned partners; (4) Low cultural distance;
- identification of the success factors for VISYSUP's for the enterprises surveyed.

In summary, the most important conclusions from this research should be highlighted. In the research the comparative method was used. It indicated significant relationships between the factors studied from 2006-2017, especially in the area of geographically congruently positioned partners, building trust and the size and image of the partners. This shows how important the selection of variables is for subsequent measurements in a given segment. Thus, on the basis of the factors determined, a negative impact on turnover in the area of geographically congruently positioned partners in the analysed years was found. A positive effect of building trust (both personal and procedural/impersonal) could be found.

In the work, the research results presented indicate the areas of activity for enterprises in which the success factors of virtual system suppliers provide arguments for the appropriateness of selecting these areas. In addition, attention should be paid to the fact that BRINK GmbH is constantly working on the development of cooperation with virtual suppliers,

with particular emphasis on Europe. For this reason it was necessary to investigate the issue and carry out further analyses to indicate the important factors contributing to the success of virtual system suppliers.

Therefore retrospective identification of the possible success factors of virtual system suppliers was carried out and the results were analysed and systematised.

Theoretically, it would also be possible to apply and analyse all factors, but here we have limited the research to the above-mentioned factors. The holistic theoretical and practical analysis contained in this study is the assessment of the ex-ante condition in relation to the current state giving it a measurable, pictorial and neutral dimension.

The following pragmatic conclusions arise from the theoretical and practical analyses carried out in the work:

- a small number of studies on the success factors of virtual system suppliers point to the clear need for further research in this segment;
- the model of graphic development should be continuous improvement;
- the small number of studies in the literature on the subject, which would cover far-reaching internal issues regarding success factors for virtual systems suppliers, creates the possibility of filling a certain gap;
- on the basis of a case study, it is possible to see how virtual success factors are determined and how this goal is achieved;
- despite the strong rivalry between virtual enterprises in many industries, BRINK GmbH has managed to strengthen its market share, which is undoubtedly an important element in improving its competitive position.

This work brings an original contribution to the field of theoretical and practical issues in the area of success factors for virtual system suppliers. Above all, it presents a novel approach to the development, implementation and assessment of success factors of virtual system suppliers.

From this point of view these are very important factors for the author to undertake further research in this interesting direction.



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# THE DEVELOPMENT OF THE IMPORTANCE OF INTERNAL VALUES OF GEN Y'S EMPLOYEES

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## ABSTRACT

The article deals with the study of motivations and perspectives of employees with regards to generation mix. It is based on research combining quantitative and qualitative methods and identifies mindsets and values of Generation Y's employees of a selected company. Based on these findings, there were defined recommendations to contribute to a better understanding and approach to this segment. The recommendations then serve as a basis for further exploration of multi-generational workplaces and its' social and economic impacts, that affect both employees and employers. The paper will also discuss the possibilities and directions for further research.

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## KEY WORDS

Generation Y, motivation, leadership

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## 1 INTRODUCTION

The generation mix in the workplace is not any new phenomenon. Cooperation on a workplace of workers of different age groups is a topic that has been discussed in the academic and business environment for a long time (Mannheim, 1952). On the other hand, due to demographic trends, there is a situation that will result in the collaboration of more diverse age groups in the workplace. Of course, this effect is accompanied by technological development and the quality of available healthcare, which prolong lives of humans (Rašticová, 2012, s. 36). It is also associated with pressure, both voluntary and forced, to extend the economically active part of lives.

The reasons for the more extended period of occupation and the resulting income are mainly

of economic and social character. Financial independence and self-sufficiency of the population are related to the economic ones. It also lowers amount of public budget expenditures and one-way transfer payments to endangered age groups. The social dimension, which of course is reflected in economic indicators, has an impact on the socialization of people in society – health, wellbeing and so-called happy life (Diener and Seligman 2004).

Apart from mentioned above, we have been living in times, when it is increasingly difficult for companies to maintain their advantage in a highly competitive environment. It is something that happens in the markets of goods and services, for example, customers who are more and more

informed, more demanding and less loyal to brands (Kusek, 2016). However, a similar shift can also be observed in the resource markets, for example in the relationship between the employee and the employer. Companies need to develop strategies that are better able to respond to changes in the social and economic demands of employees – to keep up with changing behaviours, expectations, and requirements of employees (Yuan, Woodman, 2010).

The survey that was carried out in 2014 among world directors found out that up to 36% of respondents were experiencing a lack of talents in the labour market. Deloitte's research (531 HR executives from 468 companies were surveyed) has concluded that for 87% of HR directors, getting the best talent is their top priority (Ashton, Morton, 2015). One possible way to face this situation can be to emphasize the creation and development of so-called employer branding. The definition of employer branding was formed in the 1990s, but the broader consciousness came from 2004 to 2008, precisely in connection with the substantial shortage of talented workers in the labour market. It is intended to identify employees with the values and vision of the company (similarly as in the consumer-product relationship regarding product branding) and aims to contribute to increasing the attractiveness of an organization on the labour market (Mosley, 2015).

Motivations of workers in choosing an employer are different. Based on the research conducted by LinkedIn's Professional Social Network, it was found out that the critical factor in deciding for an employer is not just financial valuation. It is also the role that would the employee play in the company (69%), and the vision (direction) of the organization (64%) (Talent Solutions, 2016). In association with the above-mentioned technological advances, there can

also be seen growing awareness of internal corporate culture (working climate) and the work environment of organizations. Current and former employees significantly affect the attractiveness of the employer in the eyes of future job seekers. For up to 50% of workers, information spread by Word of Mouth is significant and has a notable impact on the interest of employer's organization. This is another reason why it is essential for companies to work on perceptions of the employer's brand in the labour market (Mosley, 2016).

Nowadays, the generation mix in the workplace is made up of four different generations – Silent Generation, Baby Boomers, Generation X, and Generation Y. In a short time, the youngest generation, Generation Z, will also be represented on the labour market (Knight, 2014). Each of these groups is not characterized only by the age but also by several similar features in values, work habits, attitude to the employer and expectations of life as such. The emergence of each generation is always defined by critical social events that affect its future direction. For example, in the context of the European Generation Y, the fall of the Berlin Wall or the end of the Cold War can be considered as a significant driving force of this change (Kruntorádová, 2013).

The article aims to examine motivations and strategies of the selected generation segment, to provide a basis for further future research of the topic of workplace distribution with regards to the age. The results of the work will help to identify possible differences from previous generations and suggest recommendations for future study on this issue – not only at the level of a specific organization but also at the level of the social impact of employing selected age groups of workers on a labour market.

## 2 METHODOLOGY AND DATA

The article presents results of author's Diploma Thesis carried out in 2015. The research had been done by using a combination of quantitative and qualitative methods of exploration. The subject of the study was a Czech technological company, which at the time of the research employed 63 employees (57 respondents). All employees were able to be included in Generation Y.

The method of research was first an in-depth interview with the director of the selected company – focused on a global view of motivations and employee's attitude to the employer. Outputs from the in-depth interviews then led to creating a structure of the questionnaire addressed to employees of the company. The questionnaire consisted of 33 questions (Černý, 2016).

Based on the obtained data, it was possible to compile meta-profiles of the company. Meta-profile consists of 32 meta-programs and provides a comprehensive view of the thinking styles, motivation, and values of individuals or groups. It makes it possible to define strengths, weaknesses, and opportunities for further development both of individuals and groups (Hollander, 2011).

The results were fit into the methodology of MindSonar tool that measures thinking styles, mind-sets, representational styles and cognitive filters of individuals. It results in a profile that consists of 13 groups of “programs” which are in mutual opposition (i.e., in the context of perception of time it is past, present and future). There are 10 points to be distributed within each group of programs (Hollander, 2011). Each group thus provides information about internal processes that affect the inner state and is expressed as external behaviour. All programs together compose individual profile, which can be transformed into teams’ profile (by standard deviation).

This article focuses and comments mostly one group of programs – internal frame of reference and external frame of reference.

### 3 RESULTS

Based on the in-depth interview with the CEO of the selected company there were created two meta-profiles. The first one stating for a company consisted of the same age group as today but ten years ago. The second one was stating for the current organization according to CEO’s perspective. Then, according to the questionnaire survey carried out with contemporary employees, there was created the third meta-profile.

The Figure 1 demonstrates the transformation of the requirements that young employees have from their employers. Much of what has been spelled out in this questionnaire survey is due to the change of meta-programs from the external frame of reference to the internal frame of reference and also from the external locus of control to the internal locus of control. It is a shift of attention to the individual’s level and leads to a higher awareness of one’s values and beliefs, which can be perceived in extreme form as selfishness, indifference or irresponsibility.

The decision-making process of an internally referenced person is influenced by what the person thinks is important to them. The source of motivation is therefore based on their reference structure (value frame). This internal arrangement affects the behaviour and perception of the external world. Feedback or advice from someone else may seem worthless to this person. It is complicated for a person with this thinking style to take different views of the situations (Alder, 1997).

The decision-making process of an externally referenced person is influenced by what the person thinks that might be important for their surroundings. It means that the thinking style is characterized by the motivation that comes from outside (external environment). A person with this thinking style is thus easily influenced by outer value frames and criteria. To keep the person in focus on the goal, it requires external feedback, and it is easy for them to follow the opinions and direction of others. It is therefore difficult for them to make their decisions based on their individual values and beliefs (Alder, 1997).

A significant threat could be recognized in of the level of fulfilment of the assigned task. In 77% of cases, the respondents indicated that they were completing their assignments according to what they meant to them. There may be a conflict of expectations between the assigning and assigned persons. It could cause that a critically important task might produce a feeling of meaningless activity to the assigned person. Aforementioned, of course, would have influenced the level of engagement and the quality of the result. The high internal frame of reference, therefore, stresses significant demand for communication within the working group.

The Figure 2 summarizes findings of a questionnaire carried out in the company. It answers four research questions and provides recommendations how to respond to the recognized results.

It was found that the employer-employee status is more likely to be at one level. It means that the traditional dominance of the employer over the employee is being changed. On the contrary, employers

META-PROGRAM	ZNAČKA	HODNOTA
PROACTIVE	PA	4
REACTIVE	RA	6
TOWARDS	TW	8
AWAY FROM	AW	2
INTERNALLY REFERENCED	IT	4
EXTERNALLY REFERENCED	EX	6
OPTIONS	OP	4
PROCEDURES	PC	6
MATCHING	MA	7
MISMATCHING	MI	3
INTERNAL LOCUS OF CONTROL	ILC	7
EXTERNAL LOCUS OF CONTROL	ELC	3
GENERAL/GLOBAL	GL	6
SPECIFIC	SP	5
MAINTENANCE	MN	4
DEVELOPMENT	DV	3
CHANGE	CH	3
PEOPLE	PP	4
ACTIVITY	AC	2
INFORMATION	IF	4
CONCEPT	CO	4
STRUCTURE	ST	3
USE	US	3
TOGETHER	TG	5
PROXIMITY	PX	3
SOLO	SO	2
PAST	PT	4
PRESENT	PR	2
FUTURE	FU	4

META-PROGRAM	ZNAČKA	HODNOTA
PROACTIVE	PA	7
REACTIVE	RA	3
TOWARDS	TW	8
AWAY FROM	AW	2
INTERNALLY REFERENCED	IT	7
EXTERNALLY REFERENCED	EX	3
OPTIONS	OP	7
PROCEDURES	PC	3
MATCHING	MA	7
MISMATCHING	MI	3
INTERNAL LOCUS OF CONTROL	ILC	7
EXTERNAL LOCUS OF CONTROL	ELC	3
GENERAL/GLOBAL	GL	8
SPECIFIC	SP	2
MAINTENANCE	MN	2
DEVELOPMENT	DV	4
CHANGE	CH	4
PEOPLE	PP	4
ACTIVITY	AC	4
INFORMATION	IF	2
CONCEPT	CO	2
STRUCTURE	ST	4
USE	US	4
TOGETHER	TG	3
PROXIMITY	PX	4
SOLO	SO	3
PAST	PT	2
PRESENT	PR	4
FUTURE	FU	4

META-PROGRAM	ZNAČKA	HODNOTA
PROACTIVE	PA	8
REACTIVE	RA	2
TOWARDS	TW	8
AWAY FROM	AW	2
INTERNALLY REFERENCED	IT	7
EXTERNALLY REFERENCED	EX	3
OPTIONS	OP	7
PROCEDURES	PC	3
MATCHING	MA	8
MISMATCHING	MI	2
INTERNAL LOCUS OF CONTROL	ILC	7
EXTERNAL LOCUS OF CONTROL	ELC	3
GENERAL/GLOBAL	GL	6
SPECIFIC	SP	4
MAINTENANCE	MN	1
DEVELOPMENT	DV	4
CHANGE	CH	5
PEOPLE	PP	5
ACTIVITY	AC	4
INFORMATION	IF	1
CONCEPT	CO	2
STRUCTURE	ST	4
USE	US	4
TOGETHER	TG	3
PROXIMITY	PX	5
SOLO	SO	2
PAST	PT	2
PRESENT	PR	4
FUTURE	FU	4

Fig. 1: Meta-profiles of the former company, actual company according to the interview and actual company according to the questionnaire (Černý, 2016)

ISSUE	FINDINGS	RECOMMENDATIONS
<b>How does Generation Y perceive and fulfill their job responsibilities?</b>	The level of accomplishment of the assigned task depends on the subjective perception of the importance of the task by the individual. For individuals, valuation of a correctly completed assignment from the external environment is critical, so as awareness of the impact of their activities on the functioning of the whole company.	<ul style="list-style-type: none"> <li>to assign work tasks according to the capabilities and personal goals of the worker</li> <li>to provide sufficient projection of the consequences of assignments on the customer's output value (even repeatedly)</li> <li>to give feedback and appreciation of well-done tasks</li> </ul>
<b>How does Generation Y choose their employer?</b>	Great emphasis is focused on the working climate and personal qualities of executives - even before joining the company. If employee's expectations are met, they are very loyal to their employer concerning the amount of work done and length of the contract. On the other hand, there is a low aversion to a job change, and workers are continually in contact with the labour market.	<ul style="list-style-type: none"> <li>openness and transparency in company's functioning</li> <li>sharing (communication) of corporate values both internally and externally</li> <li>emphasis on public opinion through selected communication channels (WOM, social media)</li> <li>sufficient attention to the employee's actual needs</li> </ul>
<b>How does Generation Y perceive their employer?</b>	The working climate (atmosphere, colleagues, etc.) is essential for the individuals. There is also demand for a certain degree of freedom and flexibility regarding work hours. A determining factor is a workload, development of knowledge that influences the development of the company, sufficient internal communication within the organization and adequate feedback from the supervisor.	<ul style="list-style-type: none"> <li>to put great emphasis on the functioning of the collective</li> <li>freedom in work tasks solving</li> <li>individualization and identification of workload of each</li> <li>to combine leisure time activities with work</li> <li>to empower strengths and provide further development</li> </ul>
<b>How is Generation Y motivated in a working context?</b>	Individual's purpose is to find work-life balance, and the primary motivation is not financial reward. Again, a great deal of emphasis is put on the working climate and personality profiles of co-workers. A satisfied customer is perceived as the driving force of the company. Employees want precisely defined expectations of their role and to accept full responsibility for their performance. Trust, freedom and professional leadership motivate them to achieve above-standard performance.	<ul style="list-style-type: none"> <li>the understandability and simplicity of the company's direction</li> <li>to chunk down company's visions</li> <li>to provide a detailed description of the role and expectations from the worker</li> <li>to address responsibility for the assigned tasks</li> <li>professional guidance in the style of coaching and mentoring</li> <li>to enhance mutual respect and collaboration between departments and individuals</li> </ul>

Fig. 2: Questionnaire findings. (Černý, 2016)

are forced to a higher degree of transparency and openness not only within the company's functioning (internal) but also due to its surroundings (external). Potential employees are changing their behaviour from passive recipients of job offers to individuals actively looking for opportunities that seem meaningful to them. It results in the situation when employers are chosen as equal partners of employees.

In this context, findings of the research have shown a low aversion to the change of employer. Even satisfied workers are actively maintaining contact with the job market. It, of course, escalates pressure

on employers to pay sufficient attention to build employer brand and be able to respond to the changes in individual's motivations and needs of employees.

There was also identified the shift in perceiving values and needs by individuals. For this reason, employers are forced to respond to this change by adjusting their internal processes and staffing as a whole. Being able to meet new needs such as free working time, support for self-realization (courses and education) or support for leisure time activities (sports subscription). With linkage to freedom and free time activities, it was found out that the



boundary, between the working and private lives of Generation Y's workers, has disappeared. Factors causing this influence are both demands of corporate culture (i.e., the people employees are surrounded by) and requirements for free time (i.e., requests for leisure time activities during the working day). Workers want to be entertained while working and work with people they like. For this reason, they tend to spend time together even after working hours. The right leadership of these people, who are willing to devote more time and attention to their jobs, which they do not perceive as much as a job (more like fun, challenge and chance to succeed), can have a positive effect on the company's performance.

The most significant shift was observed in the tremendous growth of self-confidence and active behaviour of employees. Another substantial change, essentially typical for this age group, was the change in the frame of reference – from the choice of values

from the external environment to the internal (own). It means that the driving engine of an employee's motivation is their internal frame of reference. On its' basis, they evaluate whether the specific assignment (task) has any meaning to them and whether it is worth the effort and time spent.

Findings resulting from the research can be summarized in following points (Černý, 2016):

- sufficient emphasis and attention to the inner motives of individuals (internal frame of reference)
- enough space to express internal purposes and values
- unambiguous (comprehensible, measurable, long-term and repeated) communication of requirements, objectives, and expectations
- alignment with common values (higher goals, meaningfulness)
- regular feedback and future orientation (vision)

## 4 DISCUSSION AND CONCLUSIONS

In general, Generation Y's employees are looking for meaningfulness, the ability to enjoy (have fun), care and attention to themselves and their needs, direction, success, and freedom in their lives. This finding is in agreement with the outcome of research that confirms the growth of individuals' preferences (Abramuszkinová, 2017). The study calls for awareness of potential threats that might be caused if the process of growth of internal values exceeds a specific level. It opens up a new perspective of further research in the context of employees' motivation within a workplace.

If above mentioned demands are fulfilled, they are able and willing to deliver high-quality performance with maximum deployment. They are very interested in finding new ways of solving and developing particular industries. The challenge faced by employers is their high proactivity, so it is necessary to guide them through proper (professional, competent) leadership and vision. It is useful to direct their focus more often than to other generations, to keep them engaged and on the track. Another challenge is freedom (autonomy) in solving assigned obligations, which may be an obstacle in specific areas. However, attention is essential in all aspects. First of all, the attention that is paid to individuals and their values (and over time changes of values). Secondly, it is

also the attraction of their concentration, to become significant movers in the development of the society. It is clear from the results that increased emphasis should be placed on communication and perception of the human factor also regarding motivations and internal needs.

It is important to consider that the research was held in only one company, which means that the output cannot apply to all business sectors, nor the whole society. Another limitation of the study is that the findings do not consider the employer's side of the employer-employee relationship (i.e., organization's vision, strategy, business cycle, etc.) – the degree of balance of each party's requirements.

The findings mentioned above confirm the specificity of chosen workforce segment considered from a generation perspective. Therefore, it is desirable to dedicate attention to the further research of interests, motivations, and behaviour of employees concerning age to create a suitable working environment. It is also necessary to consider not only the economic dimension of the employee-employer relation but also to take into account the social aspect of age diversity in the workplace to achieve a broader effect of the influence of employment on the functioning of the whole society.

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# AN ECONOMETRIC MODEL OF REAL ESTATE PRICES IN SLOVAKIA

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## ABSTRACT

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The characteristics related to real estate prices can be divided into two basic groups – the first group contains characteristics that determine average real estate prices in the municipality and the second group contains other characteristics that determine the price of specific real estate in the municipality. Based on the database of 959 plots of building land in Slovakia using an econometric model based on the OLS, the goal of this paper is to quantify the relationship between selected characteristics and average real estate prices in municipalities in the Slovakia. The results indicate that real estate prices in the Bratislava region are statistically significantly higher than in other regions of Slovakia, there is a statistically significant negative relationship between distance from the municipality and the nearest big regional city and the average real estate price of the municipality, and there is a statistically significant negative relationship between average real estate price of a municipality and the rate of unemployment in this municipality.

## KEY WORDS

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econometric model, building land, real estate prices, unemployment, population

## JEL CODES

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C10, C31, R31

## 1 INTRODUCTION

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An indispensable part of the market economy of each country is the real estate market that represents the area where the supply and demand of various economic subjects, including businesses, meets the real estate in the form of land and buildings used as a real space for everyday existence but also for business activities. Real estate as a real asset is, in addition to its primary purpose, an interesting alternative to supplement the investment portfolio of investors in terms of diversification of the total portfolio of selected assets (Davis, 2008). An inseparable part of the real estate market is the interaction between demand and supply that creates the market price. Based on this market price land or buildings are subsequently exchanged between the participants

in that market. Knowing the market price of real estate, the determinants of these prices and their development over the time allows acceleration of the buyer's decision-making process in selecting the property, and at the same time, from the viewpoint of the seller, it makes it possible to optimise the sales process in order to determine the initial price at which it is willing to sell the property (McMillan, 2016). However, the results of real estate price studies also find their use among top-level institutions at the level of the state, where they serve as a basis for decisions on tax policy or other policies (Dillard, 2013; Hill, 2013; Ling, 2008).

The need for more extensive research on the real estate prices in Slovakia (especially land prices)

can be justified in two roles. Within the first, which characterises the importance of research of this nature, there is an absence of analyses and similar research in the field of land prices in Slovakia (Dluhos, 2015). The National Bank of Slovakia, as part of the conducted and published analyses, provides an overview of real estate prices, but only of prices for residential real estate – house and apartment prices. On the other side, we can justify the importance of the present research in view of the government’s intention to tax real estate in Slovakia

on the basis of its market price, which represents a fairer taxation system than the current table-based system that to a large extent does not reflect the real estate price.

A real estate taxation system based on market price requires a valuation model that estimates the market price by knowing the key determinants of real estate prices. This research includes econometric models that estimate the price of building land in Slovakia, making it possible to create a new real estate tax model based on the results of this research.

## 2 LITERATURE REVIEW

When we are looking for information on valuation models in the foreign literature (not only in real estate), we often encounter the term “Hedonic pricing method” (Sheppard, 1999; Sirmans, 2005). The “Hedonic pricing method” (HPM) is a method that results in a model that identifies the basic factors (attributes) of the commodity price (commodity and asset will be considered synonyms for the purposes of this work), provided that the price of the asset is determined by intrinsic characteristics (properties) that this asset has on sale, and is also determined by external characteristics that affect this asset and hence its price (Herath and Maier, 2010). The goal of the “hedonic model” is to identify the determinants (internal and external to the asset) of asset prices. Van der Kruk (2005) states that the basic feature of the HPM can be used to estimate total demand for commodities.

Court (1939) was the first who used the HPM method to create a car price model. Colwell and Dillmore (1999) argue that Haas (1922), who analysed the actor’s land price in Minnesota (considering the year of sale, the access road to the land, the size of the city, the distance to the city centre), carried out this study for another fifteen years before Court, but did not use the term “hedonic”. The HPM method is used to examine the price indices (Goodman, 1978), the rate of taxation (Bednarz, 1975) and also the valuation of computers (Berndt, 1995) and cars (Cowling, 1972). Herath and Maier (2010) report that a possible use of hedonic models within the meaning of the above definition is the real estate market. House prices are then determined by the internal characteristics of the house (area, condition ...) as well as external factors from the

neighbourhood (accessibility to schools, shops, environmental factors – pollution rate, prices of other homes ...). Research on HPM’s external factors (in particular the impact of environmental pollution – air, water) is relatively widespread, while research on the impact of racial segregation and crime on property prices is inadequate (Herath and Maier 2010).

Answers to previous questions can provide a regression analysis that identifies and quantifies the correlation for each of the characteristics examined in relation to the market price. Property pricing models can be used for developers, real estate investment companies and owners, as they can provide information about statistically significant characteristics that may affect the resulting transaction price (the transaction price is the price at which the real estate would be sold in the market and, in this sense, is understood as the potential market price) (Monson, 2009). To fulfil the goal of this paper, we can find various methodologies in the literature – multiple linear regression analysis and OLS (Bonetti, 2016; Corgel, 2015), and conditional and unconditional quantile regression (Koenker, 1978; Kim, 2015; Rudkin, 2017, Firpo, 2009).

Herath and Maier (2010) conducted a comprehensive survey of particular studies from hedonic pricing method. They chose the 471 most searched articles with hedonic pricing method in the Web of Knowledge database and looked at what was the specific focus of these studies. They came to the conclusion that there were 13 studies dealing with the historical development of pricing models, 134 theoretical and methodological studies, 311 empirical studies, and 13 studies exploring the survey and summary from

hedonic pricing studies. Only a small part of the studies focused on the internal characteristics of the property (16 papers), income elasticity (7 pieces of research) and population income (two pieces of research). Thus, we can say that the primary part of research focusing on valuation models is geared to investigating specific real estate price determinants, with external characteristics prevailing. Out of these external characteristics the most frequent were environmental factors (air pollution or the presence of forests or wetlands) – up to 56 studies were examined. Other characteristics as number of service enterprises, parks, number of primary schools and number of farms were examined in 33 papers.

A territorial analysis of these studies shows that most, up to almost 54%, of the research was conducted in the US, followed by Canada with almost 11%, France with eleven studies and the Netherlands with ten studies. A high percentage of US and Canadian research into hedonic pricing models may be the origin of this term in the US, while research into real estate price determinants in Europe and other countries may not use the hedonic pricing models. This knowledge needs to be applied when searching for further real estate research without a conceptual concept. We can observe a rising trend of real estate valuation research, especially after 2010. The rise in interest in real estate property research after 2010 may also be due to the US mortgage crisis in 2007 and 2008, as until the period of the mortgage crisis, the amount of research in this area did not

increase significantly over the years. This trend is observed through the number of papers from the CCC database which focus on hedonic pricing models of real estate prices during the period 1998–2016.

This paper examines the relationship between population of the municipality, unemployment in the municipality, structure of the population from the point of view of economic activity and distance of the municipality from the district and regional town to the dependent variable of the real estate price in Slovakia. The relationship between housing values and the urban environment was examined by Ong (2016) in Singapore during the years 1989–2000 and by Zoppi (2015) in Sardinia. Thanos (2016) concludes there is a statistically significant positive relationship between the number of inhabitants and the real estate prices of the municipality. Thanos (2016) examined the relationship between unemployment and the price of real estate on a sample of 3887 single-family homes in Austria during the years 1998–2009. Helbich (2014) found a negative significant relationship as well. Carrillo (2013), through US real estate research, concludes that the relationship between unemployment and the price of real estate has come out as a statistically insignificant negative relationship. Chadourne (2013) examined the relationship between distance to a park and the price of real estate, while Hui (2016) examined the relationship between the distance of the property from the city centre and its price.

### 3 DATA

The object of interest of this paper is the price of building land intended for housing in the Slovak Republic, which also enters the econometric model as an explanatory variable. Due to the absence of a database of already realised prices of building land, advertised prices of building land were used, which in the case of respecting the existence of price premiums, provided the same results in the estimates of the log-lin regression econometric model. The average price level of the building plots of towns/villages throughout the whole of Slovakia was modelled. The aim of the article is to determine the concrete impact of the individual characteristics of the municipality and the land on the average price per square metre of land. As part of the

modelling, land from 96 cities and 96 municipalities was examined, with five randomly selected areas of municipal land being observed in each municipality. The database of these prices is from the year 2015 and the prices are those advertised from the portal [www.reality.sme.sk](http://www.reality.sme.sk).

In the Table 1, the basic descriptive statistics for the prices of these examined building plots within the regions and Slovakia are given.

In examining the specific impact on land prices, we decided to examine several characteristics, because in addition to quantifying the impact of a specific explanatory variable on the land price, it was also a goal to create a model that, given its assumptions, would serve to estimate the average price level of



plots at a sufficient qualitative level. When examining the price of land, we focus on characteristics such as the impact of the region on the average price of the land in the town/city, which has emerged as a binomial variable, and the characteristics of unemployment, the population, the distance of the municipality from the nearest district/regional city and the structure of the population.

Tab. 1: Prices in Eur per square metre of building land in the regions of Slovakia

	Mean	Median	Minimum	Maximum	Std. Dev.
TN	33.84	28.00	1.00	259.33	26.27
PO	37.35	33.00	4.04	95.85	20.43
BB	39.85	36.13	2.00	133.06	26.42
BA	158.63	99.24	1.00	1610.70	164.39
KE	51.81	39.61	2.06	250.00	43.97
NT	33.76	25.00	3.73	165.00	27.86
TT	41.00	35.00	3.20	304.00	29.58
ZA	40.19	32.00	2.38	408.33	31.43
Slovakia	74.88	44.00	1.00	1610.70	107.58

Notes: TN – Trnava region, PO – Prešov region, BB – Banská Bystrica region, BA – Bratislava region, KE – Košice region, NT – Nitra region, TT – Trnava region, ZA – Žilina region, Slovakia – whole country

The following variables were used for econometric modelling:

- PricePs – Price per square metre of building land
- BA – Binary variable of the location of the land, 1 – Bratislava region, 0 – no
- TT – Binary variable of the location of the land, 1 – Trnava region, 0 – no
- TN – Binary variable of the location of the land, 1 – Trenčín region, 0 – no
- NT – Binary variable of the location of the land, 1 – Nitra region, 0 – no
- ZA – Binary variable of the location of the land, 1 – Žilina region, 0 – no
- BB – Binary variable of the location of the land, 1 – Banská B. region, 0 – no PO Binary variable of the location of the land, 1 – Prešov region, 0 – no
- KE – Binary variable of the location of the land, 1 – Košice region, 0 – no ActivToPop The ratio of economically active population to total population
- BuiltUpArea – Ratio of built-up area of the municipality/(built-up area + garden)
- Pop – Population of the municipality over 62 years of age
- Unemploy – Ratio: Unemployed/unemployed + workers
- DisToTown – The sum of the distance from the nearest district and county town in kilometres

## 4 METHODOLOGY

We assume a general linear regression model:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + u, \quad (1)$$

where  $y$  is a dependent variable,  $x_1, x_2, \dots, x_k$  represent independent variables and  $u$  is a random component.

Since we often have more than one observation, we have  $n$  observations, where  $n$  is a natural number, so for  $i = 1, 2, 3, \dots, n$  we apply as follows:

$$\begin{aligned} y_i &= \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_k x_{ik} + u_i = \\ &= \beta_0 + \sum_{j=1}^k \beta_j x_{ij} + u_i. \end{aligned} \quad (2)$$

Another version of (2) is then a matrix version of a linear regression model (Hayes, 2007; Weisberg, 2005; Ye, 2015):

$$y = X\beta + u, \quad (3)$$

where

$$X = \begin{pmatrix} 1 & x_{11} & x_{12} & \dots & x_{1k} \\ 1 & x_{21} & x_{22} & \dots & x_{2k} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 1 & x_{n1} & x_{n2} & \dots & x_{nk} \end{pmatrix}, \quad \beta = \begin{pmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \\ \vdots \\ \beta_k \end{pmatrix}, \quad u = \begin{pmatrix} u_1 \\ u_2 \\ u_3 \\ \vdots \\ u_n \end{pmatrix}, \quad y = \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ \vdots \\ y_n \end{pmatrix} \quad (4)$$

considering the matrix  $X$  and the three vectors  $\beta, u, y$ .

The real values of the parameters  $\beta_0, \beta_1, \beta_2, \dots, \beta_k$  are unknown to us, but we are able to take



different approaches on the basis of these parameters (estimators), we mark the estimators same as the real parameters, but with a roof. Then, for vector variables of dependent variables,  $\hat{y}$  is valid:

$$\hat{y} = X\hat{\beta}, \quad (5)$$

where  $X$  is the matrix of independent variables and  $\hat{\beta}$  represents the vector of estimated parameters. The residues then represent the difference between the actual value and the estimated value of the dependent

variable, where the residual vector  $e$  holds:

$$e = y - \hat{y} = y - X\hat{\beta}. \quad (6)$$

To estimate the linear regression model parameters (1), the most common least squares (OLS – Ordinary least squares) method is used to minimise the sum of the squares of the residues  $S$ :

$$S = \sum_{i=1}^n e_i^2. \quad (7)$$

## 5 RESULTS

We modelled the prices of real estate with two models (lin-lin model and log-lin model) due to the use of the advertised price and the various effects of the price premium (the difference in the advertised and realised price) on the estimates of the parameters of these two models (Dluhoš, 2017). The first model represents the model where we used the lin-lin econometric model; the second model was considered a log-econometric model with respect to the research by Dluhoš (2017), which examines the impact of different levels of price premium on the estimation of regression model parameters.

By using the variables PricePs, TT, TN, NT, ZA, BB, PO, KE, ActiveToPop, BuiltUpArea, Pop, Unemploy, DisToTown, we have succeeded in creating the following model, which has the form:

$$\begin{aligned} \text{PricePs} = & \beta_0 + \beta_1 \cdot \text{TT} + \beta_2 \cdot \text{TN} + \beta_3 \cdot \text{NT} + \\ & + \beta_4 \cdot \text{ZA} + \beta_5 \cdot \text{BB} + \beta_6 \cdot \text{PO} + \\ & + \beta_7 \cdot \text{KE} + \beta_8 \cdot \text{ActiveToPop} + \\ & + \beta_9 \cdot \text{BuiltUpArea} + \beta_{10} \cdot \text{Pop} + \\ & + \beta_{11} \cdot \text{Unemploy} + \\ & + \beta_{12} \cdot \text{DisToTown} + \epsilon. \end{aligned}$$

Variance Inflation Factors were used to test for multicollinearity, and it was found that multicollinearity is not present among the variables. When testing the model specification using Ramsey's RESET test, we found that we cannot reject the hypothesis that the variable and the model are correctly specified. White's test and the Breusch-Pagan test confirmed that heteroscedasticity was present in the model, and therefore heteroscedasticity-robust standard errors (HC1 variant) were used. The model results are in Table 2.

The results of Model 1 show that all the variables examined are statistically significant at a 5% significance level. Average prices of building plots in the Bratislava region are statistically significantly higher than in other regions of the Slovak Republic. As the number of inhabitants aged over 62 in the given municipality grows, the average price of a building plot increases. A negative relation to the average price of a building plot can be observed for the variables: ActiveToPop, BuiltUpArea, Unemploy. The Figure 1 shows the actual and predicted prices from this Model 1. We can notice that the prices marked and highlighted in the picture are higher than the prices for others – the cities of Košice and Bratislava.

Due to the research of Dluhoš (2017), which dealt with the impact on the estimation of regression model parameters in the case of the use of different price premiums (the difference between the advertised and the selling price of the property), the logarithmic transformation of the dependent variable was used and here is the log-lin model:

$$\begin{aligned} \log(\text{PricePs}) = & \beta_0 + \beta_1 \cdot \text{TT} + \beta_2 \cdot \text{TN} + \\ & + \beta_3 \cdot \text{NT} + \beta_4 \cdot \text{ZA} + \beta_5 \cdot \text{BB} + \\ & + \beta_6 \cdot \text{PO} + \beta_7 \cdot \text{KE} + \\ & + \beta_8 \cdot \text{ActiveToPop} + \\ & + \beta_9 \cdot \text{BuiltUpArea} + \beta_{10} \cdot \text{Pop} + \\ & + \beta_{11} \cdot \text{Unemploy} + \\ & + \beta_{12} \cdot \text{DisToTown} + \epsilon. \end{aligned}$$

For the multicollinearity test, Variance Inflation Factors were used again, where it was found that multicollinearity is not present among the variables. When testing the model specification using Ramsey's

Tab. 2: Model 1: lin-lin model

*Model 1: OLS, using observations 1–969, dependent variable: PricePs*

	Coefficient	Std. Error	t-ratio	p-value	
const	161.775	17.663	9.1590	< 0.00001	***
TT	−16.349	3.29141	−4.9672	< 0.00001	***
TN	−28.0942	2.87094	−9.7857	< 0.00001	***
NT	−25.5725	3.08535	−8.2884	< 0.00001	***
ZA	−23.002	2.90062	−7.9300	< 0.00001	***
BB	−24.53	3.01186	−8.1445	< 0.00001	***
PO	−19.7209	3.06691	−6.4302	< 0.00001	***
KE	−19.4456	3.18055	−6.1139	< 0.00001	***
ActiveToPop	130.452	27.5239	−4.7396	< 0.00001	***
BuiltUpArea	−12.4466	2.11531	−5.8840	< 0.00001	***
Pop	0.00189029	0.000184083	10.2687	< 0.00001	***
Unemploy	−64.6839	9.84371	−6.5711	< 0.00001	***
DisToTown	−0.0712371	0.022058	−3.2295	0.00128	***
Mean dependent var.	36.63730	S.D. dependent var.		26.86419	
Sum squared resid.	320193.8	S.E. of regression		18.30111	
R-squared	0.541658	Adjusted R-squared		0.535904	
F(12, 956)	34.03694	P-value(F)		7.47e-66	
Log-likelihood	−4185.254	Akaike criterion		8396.507	
Schwarz criterion	8459.898	Hannan-Quinn		8420.637	

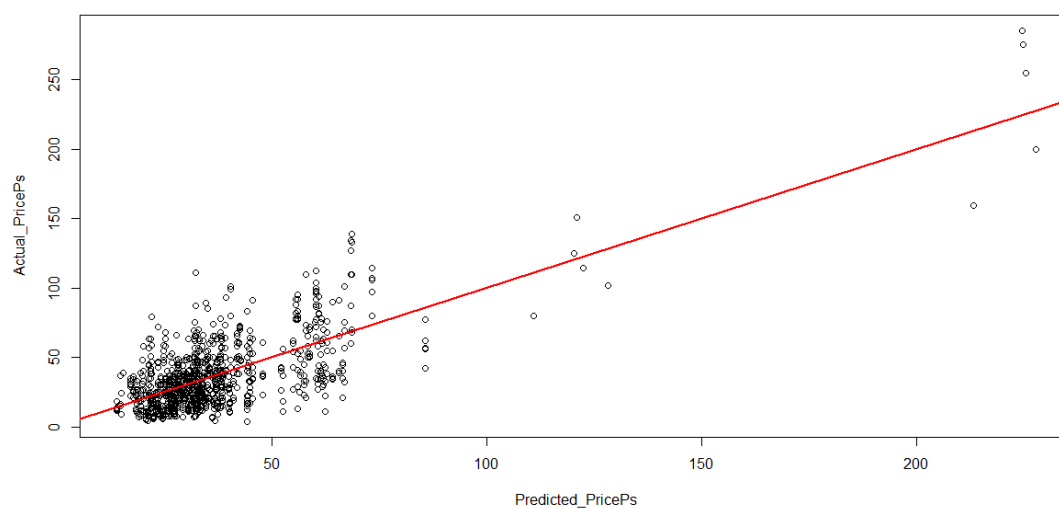


Fig. 1: Actual – fitted price – Model 1

RESET test, we found that we cannot reject the hypothesis that the variable and the model are correctly specified. White's test and the Breusch-Pagan test confirmed that heteroscedasticity was present in the model. Heteroscedasticity-robust standard errors (HC1 variant) were also used. The results of Model 2 are given in Table 3.

By comparing Model 1 and Model 2, we can notice that  $R^2$  of Model 2 is 0.325684, while  $R^2$  in Model 1 is 0.541658, indicating that Model 1 explains a greater degree of variability than Model 2. Despite this, in the case of the existence of a percentage price premium, it is preferable to use the log-lin model if we want to interpret our results at market prices of building

Tab. 3: Model 2: log-lin model

*Model 2: OLS, using observations 1–969, dependent variable:  $\log(\text{PricePs})$* 

	Coefficient	Std. Error	t-ratio	p-value	
const	5.9748	0.507091	11.7825	< 0.00001	***
TT	−0.275936	0.0726656	−3.7973	0.00016	***
TN	−0.623004	0.0697989	−8.9257	< 0.00001	***
NT	−0.529651	0.0734591	−7.2101	< 0.00001	***
ZA	−0.416453	0.0629583	−6.6147	< 0.00001	***
BB	−0.553523	0.0683242	−8.1014	< 0.00001	***
PO	−0.347856	0.0791896	−4.3927	0.00001	***
KE	−0.322453	0.081339	−3.9643	0.00008	***
ActiveToPop	−2.18385	0.819323	−2.6654	0.00782	***
BuiltUpArea	−0.243017	0.0612482	−3.9677	0.00008	***
Pop	2.02417e-05	2.14977e-06	9.4157	< 0.00001	***
Unemploy	−2.4382	0.339562	−7.1804	< 0.00001	***
DisToTown	−0.00282721	0.000633746	−4.4611	< 0.00001	***
Mean dependent var.	3.394300	S.D. dependent var.		0.645662	
Sum squared resid.	272.1124	S.E. of regression		0.533513	
R-squared	0.325684	Adjusted R-squared		0.317220	
F(12, 956)	46.57538	P-value(F)		4.06e-87	
Log-likelihood	−759.6126	Akaike criterion		1545.225	
Schwarz criterion	1608.617	Hannan-Quinn		1569.355	

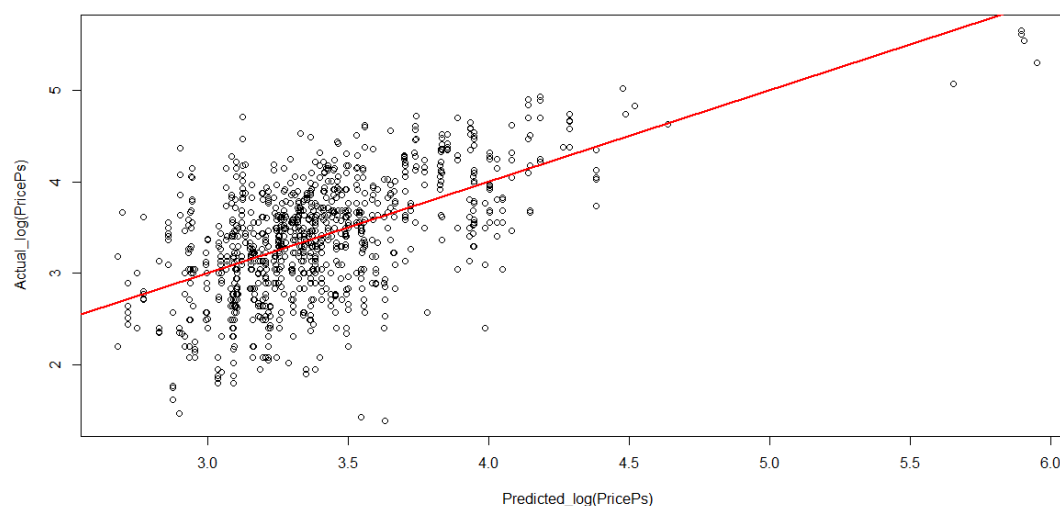


Fig. 2: Actual – fitted price – Model 2

plots, since in this case we receive the same parameter estimates as when using market prices. Figure 2 shows the actual and fitted prices of Model 2.

This Model 2 presents the percentage change – how many per cent the price will change if the independent variable changes by one unit. We also looked at the predictive power of this Model 2 in

view of the actual prices and predicted prices after the using inverse function of a logarithmic function. This actual and predicted prices from Model 2 (in euro per square metre) are shown in Figure 3.

To compare the quality of fit criterion of both models, it is necessary to calculate Quasi  $R^2$  for Model 2, which expresses the degree of explained

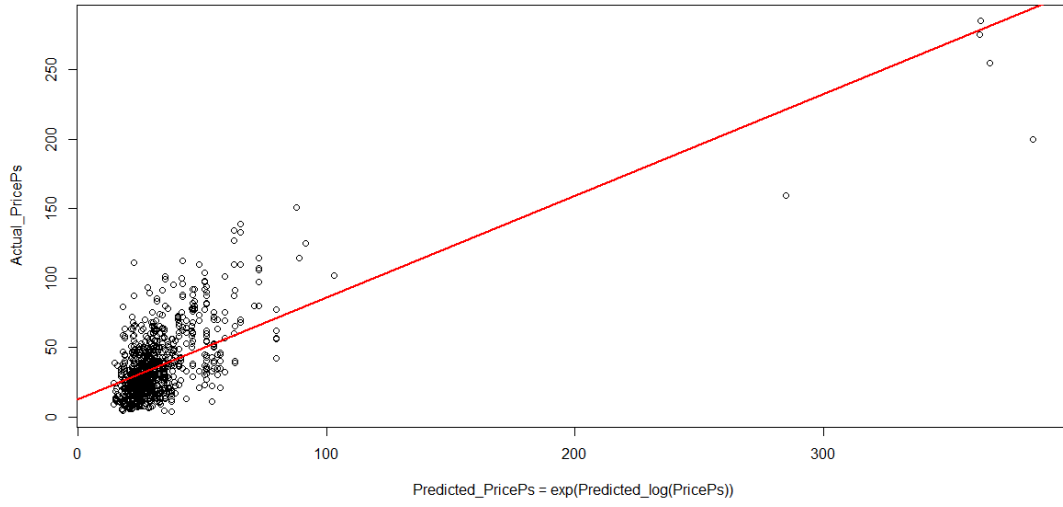


Fig. 3: Actual – fitted price in eur per square metre – Model 2

variability by the model at the same units of euro per square metre:

$$\text{Quasi } R^2 = Q - \frac{\sum_{i=1}^n \left( Y_i - \exp(\log Y_i) \right)^2}{\sum_{i=1}^n (Y_i - \bar{Y})^2}, \quad (8)$$

where  $Y_i$  is the actual price of the  $i$ -th building land,  $\exp(\log Y_i)$  is the predicted price of the  $i$ -th building land in eur per square metre,  $\bar{Y}$  is the average actual

price of all building land,  $n$  is the number of plots of examined building land.

Quasi  $R^2$  for Model 2 has a value of 0.4143, which in terms of price prediction means that Model 1 (lin-lin model) is a better model from the point of view of prediction ability and quality of fit criterion ( $R^2$  for Model 1 is 0.5417).

We see from this Figure 4 that the problem is the city of Bratislava (points with the highest values) – because this model overestimates most of the land below the average price and underestimates much land above the average price.

## 6 CONCLUSION

The research results show that the average price of building land in the Bratislava region is statistically significantly higher (at a 5% level of significance) than the average price of building land in other regions of Slovakia. The lowest average level of land prices is in the Trenčín region, where this average price is on average about 28 EUR per square metre lower than in the Bratislava region. The smallest difference in the price level compared to the Bratislava region is in the Trnava region, where the price is lower in this region by approximately 16 EUR per square metre. Statistically significant variables related to the average price level of a given municipality are the

population of the municipality which has a positive impact on the average property price. A statistically significant negative impact on the average price of real estate comes from unemployment of the municipality, the distance of the municipality from the nearest regional and district town and also the structure and composition of the population in terms of the active economically active population. In further research, it would be interesting to remove the building land prices of Bratislava and Košice and to make econometric models without building land in these cities.

## 7 ACKNOWLEDGEMENTS

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# AWARENESS AND UTILISATION OF EXPORT PROMOTION ORGANISATIONS: EVIDENCE FROM A DEVELOPING ECONOMY

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## ABSTRACT

The aim of this study was to identify the awareness and utilisation of Export Promotion Organisations (EPOs) in Ghana. To achieve this, a quantitative method was employed. Structured and semi-structured questionnaires were administered to MSMEs in the Greater Accra region of Ghana. The study identified that even though the level of awareness of EPOs is high among the study's MSMEs, utilisation is not. Factors such as a low level of education and bureaucracies were identified as the possible reasons for this. I also identified that much of Ghana's export promotion support activities are more geared towards the agricultural sector, with less focus on the manufacturing and handicraft sectors. Hence the reason for the low utilisation in the aforementioned sectors. The study calls for a more comprehensive empirical study of the awareness and utilisation of EPOs in all the sectors of the Ghanaian economy if these conclusions are to be generalised.

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## KEY WORDS

awareness, utilisation, export promotion organisation, MSMEs, internationalisation

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## JEL CODES

F12, F13, F23

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## 1 INTRODUCTION

The liberalisation of the world economy has enabled firms, whether large or small, to operate across borders with fewer complications than several decades ago. This phenomenon has presented enormous opportunities as well as challenges for Micro, Small and Medium Sized Enterprises (MSMEs) in developing countries. In Ghana, micro businesses are firms that employ a maximum of 5, Small enterprises employ up to 9, whilst medium enterprises employ more than 10 but not more than 99. This definition was proposed by the World Bank and has been adopted by researchers such as (Abor & Quartey, 2010). Most of these firms, as a result of competition from

well-established companies overseas, are left with no option but to find markets for their goods and services or fold. However, this is a herculean task as these firms are often characterised by a lack of resources and access to quality information to aid internationalisation. As a result, most governments have resolved to run export intervention programs to assist local businesses. In fact, ever since the establishment of the earliest EPO in 1919 in Finland, the number of these organisations has skyrocketed in the last decades, indicating the significant role they play (Lederman, et al., 2010). In most developing African economies like Ghana, some of these institutions have

existed since 1969 and are very active in promoting Ghanaian exports. They include the Ghana Export Promotion Authority (GEPA), the Export Development and Agricultural Investment Fund (EDAIF), the Export and Import bank (EXIM) bank as well as other foreign development partners such as USAID. These organisations have promoted exports in Ghana with the GEPA specifically tasked with stimulating exports in the Non-Traditional (NTE) Export sector. The NTE sector of Ghana comprises of the export of goods and services other than Ghana's known traditional exports, namely, cocoa, gold and timber. These include manufacturing, handicrafts and the services sector. The contribution of this sector to the Ghanaian economy has been increasing with an overall contribution of \$2.4 billion to the Ghanaian economy in 2016 (Ntumu, 2017).

On the other hand, the study of SME internationalisation has received a lot of attention, perhaps due to the significant roles SMEs themselves play in the economic development of nations, such as employment creation. In most economies, for example Ghana, SMEs are considered the engine of economic growth and hence their growth has become a top priority for government, leading to the institution of Export Promotion Organisations (EPOs) to aid the export pursuits of firms. In line with the above there have been a number of studies focussing on the activities and impact of such EPOs (Shamsuddoha, et al., 2009; Freixanet, 2011; Gencturk & Kotabe, 2001; Francis & Collins, 2004; Francis & Collins, 2004; Lederman, et al., 2010; Lederman, et al., 2010). Nevertheless, whereas the greater numbers of studies focus on the developed economies, there is a limited amount of literature on African business studies (Habiyakare, 2009; Steenkamp, 2006). Unfortunately, most studies conducted in developed economies are often used to generalise the internationalisation of SMEs in developing economies without proper contextualisation. Such practice appears too simplistic. Particularly studies on EPOs (Freixanet, 2011; Shamsuddoha, et al., 2009; Freixanet, 2011), have argued that the increase number of these programmes across the globe have not received enough attention from academia. Interestingly, reviewing existing studies on EPOs, only a few studies (Marandu, 1995; Matenge, 2011; Tesfom & Lutz, 2008) focus on Africa. For Ghana to benefit from the several free trade agreements including those with the European Union, the

activities of these export support institutions must be monitored, strengthened, and utilised.

The current study is exploratory in nature and aims to identify the level of awareness and utilisation of Export Promotion Organisations (EPOs) in Ghana, utilising a quantitative methodology. The main research question of the study is, what is the level of awareness and utilisation of EPOs in in the NTE sector of Ghana? It must be noted that even though the emphasis of this study is on EPOs, Export promotion programmes (EPPs) are used interchangeably as the export programmes are the works of the mandated organisations. In the subsequent paragraphs, the literature on EPOs is presented followed by the identification of key EPOs in Ghana and the strategic importance of EPOs to MSMEs. The methodology adopted in the study, the key findings and conclusions are presented later.

## 1.1 Export Promotion Organisations

Export promotion organisations (EPOs) are institutions that stimulate the pursuit of exports by firms in a specific country. The structures of these organisations can differ from country to country, such as, mainly public structures as in Canada or privately controlled as in Austria or a combination of both as exists in Finland (Jordana, et al., 2010). The first such organisation can be traced back to 1919 in Finland, where the Finnish Export Association existed to promote Finnish exports, and has since dominated many governments' strategic agenda of dealing with current account deficits. (Jordana, et al., 2010) have proposed three fundamental premises for analysing EPOs: the structure of the EPOs, the relationship of the EPOs to other actors, and the internal organisational factors of the EPO. I adopt this analytical perspective in this study as it provides a comprehensive approach to understanding EPOs in a country.

Firstly, in a multi structure model as suggested by (Jordana, et al., 2010), EPOs exist in four categories, namely hierarchical, public structures, decentralised public structures, pluralistic structures and private structures. Whereas in the hierarchical structure a single organisation controls and delegates responsibilities to third party agencies in the export promotion agenda, several independent public organisations exist in decentralised public

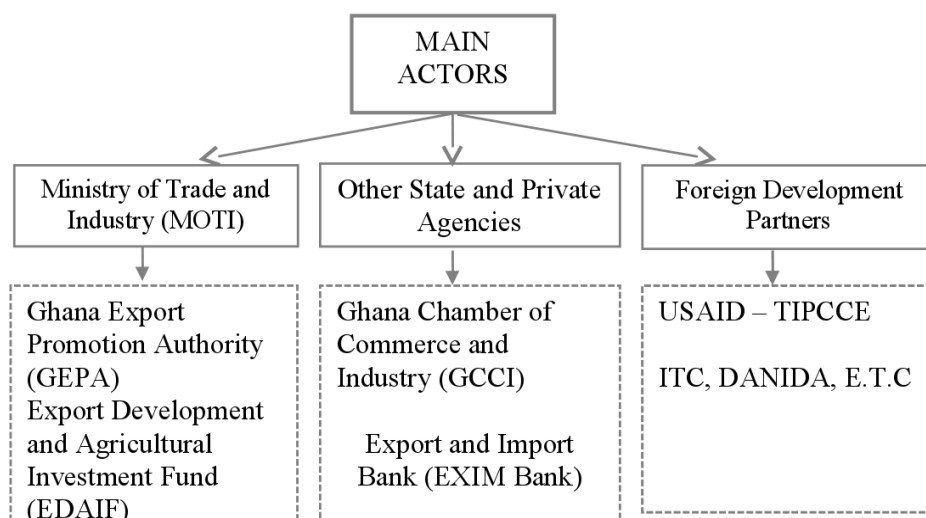


Fig. 1: Actors in Ghana's export promotion agenda

structures. The pluralistic model denotes a situation where both private and public organisations exist, whilst a private model represents exclusively private organisations leading the export promotion effort. Secondly, the relationship of EPOs with other actors identifies three primary settings of the organisation: the source of strategic directions, the source of funding and the target beneficiaries. Finally, the internal organisational perspective looks at factors such as the status of the organisation, their presence in the country, their financial and human resources, and the kind of promotion service they provide. It must be noted that these factors as mentioned above can have a profound impact on the awareness and utilisation of an EPO. For example, in a hierarchical model a change in the government's economic policy can influence the strategic direction of the EPO, and hence the level of awareness and utilisation will not be universal.

### 1.1.1 Ghana's Export Promotion Agenda

In this section, an overview of Ghana's export promotion framework is provided to identify key actors in the export promotion agenda. Figure 1 below identifies key players such as the Ministry of Trade and Industry (MOTI), the GEPA and the Export and Import Bank (EXIM). It also identifies other state institutions as well as some foreign development partners such as USAID and other organisations that promote exports in Ghana. Due to limitations of space only few of the actors indicated in Figure 1 will be discussed.

#### *The Ministry of Trade and Industry (MOTI)*

The MOTI in Ghana is the principal body responsible for formulating and directing the trade policies of Ghana. As part of its mandate, the ministry promotes and facilitates the export trade of Ghana's MSMEs. In respect of this, the ministry has an export trade development division responsible for providing assistance to the export sector of Ghana as well as the development of new value added products for export purposes. In addition, the ministry as identified in Figure 1 above has other agencies and institutions that work directly under it, including the GEPA, the Export Development and Agricultural Investment Fund as well as the Ghana Free Zone Board. All these agencies have been identified as providing direct support to the export community in Ghana.

#### *Ghana Export Promotion Authority (GEPA)*

The GEPA is an example of a decentralised model and operates as an autonomous agency under the MOTI with a specific role. It was established in 1969 by law to ensure the promotion of exports in the non-traditional export (NTE) sector of Ghana. The NTE export sector consist of the export of goods and services other than Ghana's main export commodities – specifically cocoa, gold and timber. The strategic role played by GEPA can be categorised into four areas, namely 1) promotion of goods made in Ghana overseas, 2) the provision of training and export information services, 3) export planning and export market development and 4) facilitating networks of

Ghanaian SMEs. The organisation performs these roles through a number of programmes and initiatives such the institution of an export training school and match-making of exporters to fulfil huge overseas orders. Through a joint assistance programme by the international trade organisation, UNCTAD and the WTO, the Ghana Export Information Centre (GEIC) was established to provide export information services to exporters. Well equipped with state of the art facilities, the centre boasts of assisting on average 453 MSMEs monthly with export trade information, (Adjei-Sam, 2017). Apart from this, the authority organises regular trade shows and conferences in Ghana and the West African sub region. It also has a presence in four out of the 10 regions in Ghana and has a total of over 4000 members (Ntumy, 2017). With all these in place, it is expected that there will be high awareness and utilisation of this organisation in Ghana. The presence of this organisation and their initiatives is rendered useless if the target exporters have little or no knowledge of its existence, or know but fail to utilise it. As a state-owned agency, the sources of funds, appointment of key personnel and the strategic direction of the organisation are all determined by the state. A change in government could potentially affect the operational focus and strategic direction of the organisation.

### ***EDAIF/EXIM Bank***

The Export Development and Agricultural Investment Fund (EDAIF) was an agency under the MOTI founded in 2000 to provide financial assistance to exporters. In 2016, the agency was consolidated into the new EXIM bank with the aim of developing and promoting exports in Ghana. The EXIM bank was established by law to provide reliable and flexible financial credit facilities to Ghanaian exporters. This is expected to reduce the oft-cited reason for lack of finance by MSMEs in their internationalisation. It currently has about 13 different financial products for exporters and importers in Ghana. Apart from the EDAIF, other companies which were previously providing financial assistance to MSMEs were also consolidated into the EXIM bank. They included the Exim Guaranty Company Limited and the Export Finance Company Limited. The amalgamation of these private and public entities is an excellent example of a pluralist model as identified by (Jordana, et al., 2010).

The key role identified as an export promotion effort by the Ghana Chamber of Commerce and Industry is their role in issuing certificates of origin to exporters who wish to take advantage of several trade agreements Ghana has signed. This certificate is required in many jurisdictions such as the EU and the USA from exporters in Ghana. They also encourage members in need to consider exporting as a means of becoming competitive and profitable.

### ***Foreign Development Partners***

Among the key actors in Ghana's export promotion framework as identified in Figure 1 are some development partners such as USAID. These development partners are foreign donor organisations owned by foreign governments that are committed to Ghana's development. As a result, they have specific target beneficiaries in their support agenda. USAID for example had a programme called Trade and Investment Program for Competitive Export Economy (TIPCEE), which was intended to improve the export competitiveness of Ghanaian exporters on the international market. The initiative aimed at improving the supply chain of Ghanaian producers as well as collaborating with key stakeholders on ways to improve the overall business climate in Ghana. In most cases, they provided up to 100% of travel expenses to business owners to attend trade shows and conferences (Eastering, et al., 2008). They also provide training and awareness programmes on sanitary and phytosanitary requirements to exporters in the agricultural sector. In fact, in the interim EPA signed between Ghana and the EU, the EU has agreed to set aside funds and institute programmes to assist Ghanaian exporters in taking advantage of the EU-Ghana free trade agreement.

From the above, it could be concluded that Ghana's export promotion framework embodies a typical pluralistic model identified by (Jordana, et al., 2010). This means that whereas the government may want to promote exports within some specific industry, foreign development partners who have their own agenda may also want to promote exports in a different sector. In the end a lot of options are created for SMEs to utilise.

#### **1.1.2 Why Export Promotion Organisations?**

Extant studies on EPOs and their programmes have asserted claims and counter claims regarding the

influence of EPOs. For example, (Lages & Montgomery, 2005) identified that the overall contribution of such programmes is insignificant against the annual export performance of firms in the United State of America (USA). In addition, Coughlin and Cartwright in the 1980s identified that EPOs activities directly influence the growth of American based exporters. However, this was questioned by (Gencturk & Kotabe, 2001), who claim that only a limited number of firms in USA practically utilise the services of EPOs, hence it would be wrong to conclude that export growth is influenced by EPOs. It is arguable that perhaps the utilisation of EPOs and their programmes in developed economies could differ from how EPOs are utilised in developing economies. Apparently, SMEs in advanced economies may less often utilise EPOs due to the advancement in infrastructure and information technologies that facilitate access to information on foreign market potential. In addition, most SMEs in advanced economies are well-resourced compared to SMEs in developing markets. This reduces the mental barriers of the owners and as a result are able to engage in international business without assistance. For example, a recent study by (Matenge, 2001, p. 105) identified that SMEs in Botswana largely needed the intervention of their home government before they could embark on any meaningful exports.

In using the stage models (Freixanet, 2011) found that utilisation of programmes is contingent on the stage of the firm's internationalisation. Therefore an initial exporter may fully utilise EPOs as compared to regular exporters with overseas experience. (Zafar, et al., 2002), however, identified that large firms are often much more aware of these programmes than smaller firms with less international experience. In some of the studies that focus on the effectiveness of export promotion (Marandu, 1995), awareness and utilisation are often the criteria used to determine the effectiveness of the promotion efforts. In his article (Coudounaris, 2012) identified a positive relationship between awareness and usage of export promotion in some cases. However, as indicated earlier, these

studies are conducted in a different context and may not depict the situation in other contexts. As said previously, (Freixanet, 2011) in using Johanson & Valhne's stage model, made an effort to identify the influence of export promotion on each stage of the export involvement of the firm. It reveals that programmes such as trade shows and conferences are mostly utilised by passive exporters and these have a profound impact on future internationalisation plans (Freixanet, 2011, p. 1075). For regular exporters with little structure it was identified that promotion programmes related to information dissemination and networking influence SMEs to export. Moreover, exporters with a well organised structure were identified to have a higher number of export markets when programmes such as information dissemination and other investment programmes are geared towards them. Finally, regular exporters that have overseas subsidiaries do not benefit from promotion programmes. Nonetheless these findings indicate the significance of EPOs.

For example, EPOs can be an active agent in providing knowledge and expertise required by MSMEs in their internationalisation (Gencturk & Kotabe, 2001). In most of the internationalisation literature it has been identified that the international exposure of management and employees in a firm can be a catalyst for internationalisation. In this way, an SME with limited or no international exposure by either their management or employees can rely on export promotion programmes to gain exposure and an interest in internationalising (Marandu, 1995). Financially, the initial investment required in embarking on internationalisation can be huge. In this situation, the existence of EPOs through some programmes and initiatives can leverage such initial investment, thereby assisting the SME in concentrating its limited resources on building and maintaining their in-house expertise. In other words, EPOs, can assist SMEs in reducing their cost of operation and increasing their profits in the long run (Gencturk & Kotabe, 2001).

## 2 METHODOLOGY AND DATA COLLECTION

The study is exploratory in nature and seeks to identify the level of awareness and utilisation of EPOs by MSMEs in Ghana. To achieve this, a quantitative

method within a pragmatic paradigm is employed. Apart from offering a middle ground between 'philosophical dogmatism', pragmatism "places high regard



for the reality of and influence of the inner word of human experience” (Johnson & Onwuegbuzie, 2004 p. 18). This enables the researcher to ascribe meaning and subjectively interpret some observations. Primary data sources were obtained by administering structured and semi-structured questionnaires to MSMEs in the manufacturing and handicrafts sector in the greater Accra region of Ghana. In all, a total of 195 questionnaires were administered via mail to MSMEs in the Greater Accra region of Ghana. The first data collection exercise took place in the summer of 2014 and because of the low response rate, a follow-up was made personally to some of the MSMEs at their premises in February 2015. The companies were randomly selected from the directory of GEPA and

hence all the participating companies were exporters or at least had engaged in exports in the last five years. All the respondents agreed to the interviews voluntarily and therefore the reliability and validity of the data is assured. Questions asked included: How many times have you used this agency in the last five years? How familiar they are with these agencies? and What programmes of these agencies have they accessed in the last five years? Respondents were also asked to express their opinion on for example, why they used one agency or the other. Secondary sources of information were also obtained from the internet to ascertain the nature and activities of existing EPOs in Ghana.

### 3 RESULTS

Out of the total of 195 questionnaires distributed including the face-to-face interviews, only 69 MSMEs voluntarily responded, representing a conversion rate of 25.4%. Of these respondents, some 37% were micro businesses, 45% small enterprises and 18% medium enterprises. All of the companies were in the manufacturing and handicrafts sectors with manufacturing constituting 42% and the handicrafts sector 58%. As indicated in Figure 2, the GEPA has an awareness rate of 79% followed by the GEIC, which is technically under the GEPA, at 77%, the GCCI at 67%, the EXIM/EDAIF at 62% and other development partner agencies 13%.

Despite the high level of awareness, the utilisation of the services of these agencies, especially the GEPA, is not encouraging. The service that was most accessed was export-related information provided by the GEIC. 47% of companies accessed the service by this agency, followed by GEPA at 43%. The EXIM/EDAIF was utilised by 9% and foreign development partners represent 4% utilisation. It must be noted that the EDIAF has existed since 2000 and the EXIM bank that consolidated the EDAIF was only established in 2016, therefore the

9% utilisation may represent the utilisation of the EDAIF whereas the 62% most likely represents the new EXIM bank which generated a lot of interest in the business community in the last year.

As indicated in the figure 4 below, the utilisation of these agencies differs significantly among the business categories. Utilisation of the GEPA by the various business enterprises were as follow: micro 47%, small 46%, and medium 21%. Also, whereas the utilisation of the GCCI was 21% for micro, 47% for small and 15% for medium-sized enterprises, the utilisation of the GEIC was 37% for micro, 42% for small and 30% for medium-sized enterprises. Regarding the utilisation of the EXIM/EDAIF, 11%, 28% and 49% were respectively recorded by micro, small and medium-sized enterprises. Lastly the usage of other agencies such the USAID and TIPCEE was 31% for micro, 32% for small with no utilisation by medium-sized enterprises. Popular services utilised among all the SMEs were trade shows and missions, information acquisition, export training and credit facilities as well as the acquisition of certificates of origin from the GCCI.

### 4 DISCUSSIONS AND CONCLUSIONS

The aim of this study was to identify the level of awareness and utilisation of EPOs in the internationalisation of MSMEs in Ghana. The findings show high

awareness but low utilisation of export promotion services among MSMEs in the studied industries. Firstly, there is limited empirical evidence contextu-



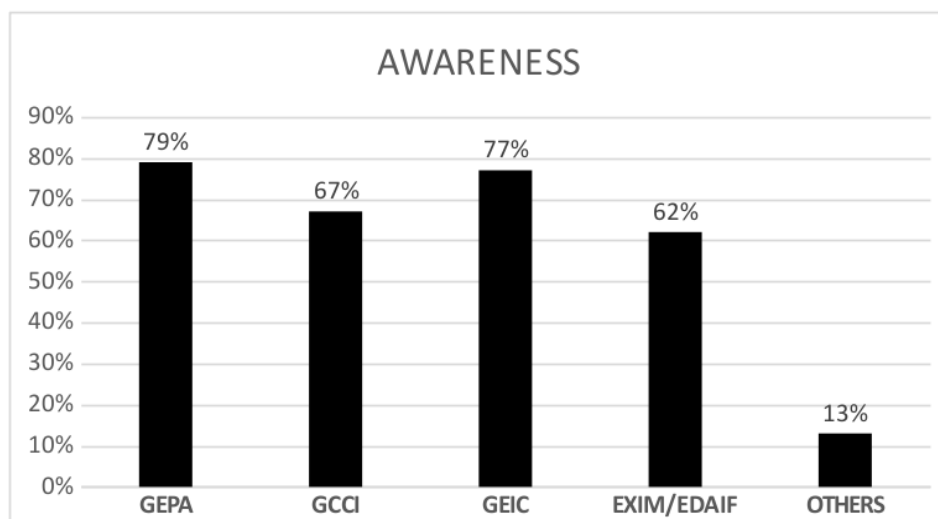


Fig. 2: Awareness of Export Promotion in Ghana

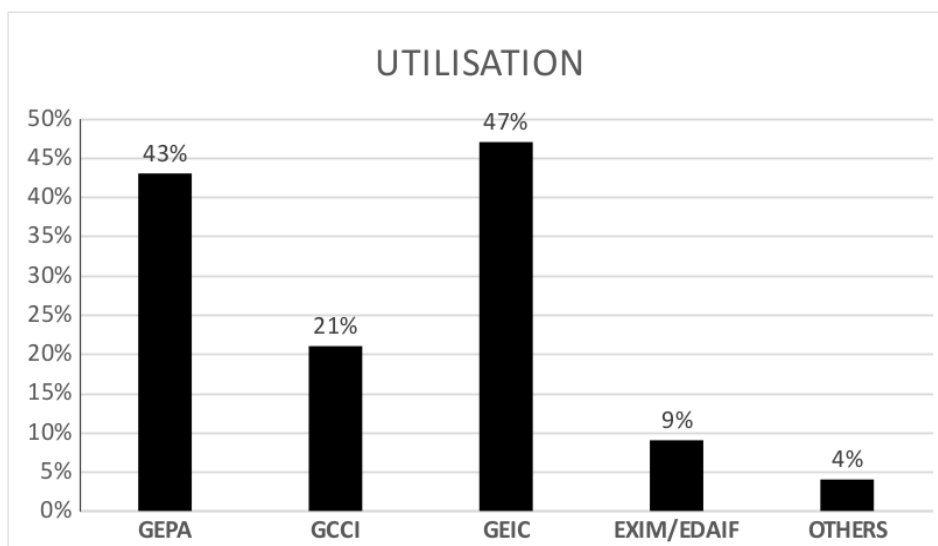


Fig. 3: Utilisation of EPOs in Ghana

ally to compare the findings. However, (Coudounaris, 2012) found a positive relationship between awareness and usage of EPOs. Even though this study did not statistically measure the relationship between the two variables, the expectation was that high awareness would translate into high utilisation, but nonetheless this was not the conclusion. Previous studies (Gencturk & Kotabe 2001), had earlier hinted at the low usage of export programmes in the USA. However, (Matenge, 2011) concluded that firms in Botswana largely required some government assistance before they could embark on any meaningful exports. These two contrasting findings cannot be confirmed or refuted in this study as the scope is narrow. As indicated, Ghana's export

promotion framework depicts a pluralistic model with governments, foreign development partners and private agencies providing support in many forms as proposed by (Lederman et al., 2010). This implies that MSMEs that do not utilise the service of GEPA might consider other non-state sponsored agencies for assistance.

From the review of activities of EPOs in Ghana, I found that the emphasis seems to be more on the agricultural sector, which might explain the low utilisation among the studied MSMEs. Although it is prudent to pay more attention to the agricultural sector since it is one of the major sectors of the Ghanaian economy, consideration should be given to the manufacturing and the handicrafts sector as well.

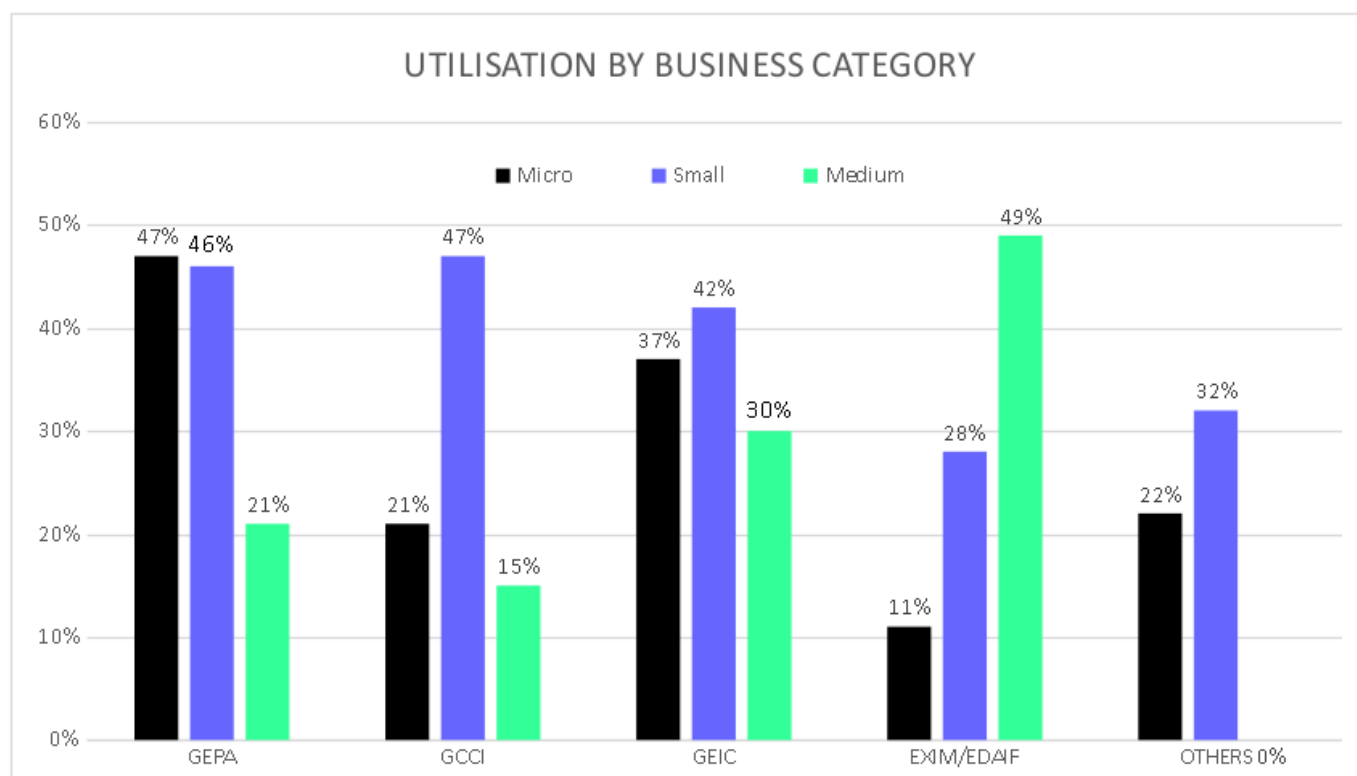


Fig. 4: Utilisation of EPOs by business categories

This is because these sectors present huge growth potential and provide alternatives for economic diversification. Another explanation for the high awareness and low utilisation could be attributed to the involvement of politicians who often tout their ambitions to industrialise and transform the country into an export driven economy. This results in a lot of promises that generate attention and interest among the business community although less is achieved in the end. For example, the EDAIF has existed since 2000, but due to ineffectiveness and low patronage it had to be consolidated into the new EXIM bank which was apparently an initiative of

a different government. Other reasons such as low level of education and the bureaucracy involved in acquiring financial assistance and other initiatives discourage potential beneficiaries. This was mostly evident among micro businesses. However, as indicated, the study focused on MSMEs in the capital region of Ghana and did not include all sectors of the Ghanaian economy therefore, the generalisation of these findings is limited. A more comprehensive study is recommended in the future to ascertain the reasons for the low utilisation. Such studies should also incorporate other sectors such as agriculture if the findings are to be generalised.

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# VALUATION OF CORPORATE BONDS ON THE INTERNATIONAL MARKET

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## ABSTRACT

The paper focuses on the valuation of corporate bonds, especially in times with low inflation and low interest rates. We apply International Arbitrage Pricing Theory. The basis of the theory is asset return decomposition to non-currency and currency returns. Currency movements affect asset factor loadings and associated risk premiums. The aim of paper is to define the factors influencing bond prices. Tests are performed using corporate bond returns are provided in the period 2000–2016. Our results confirm the relationship between the movements of bond prices and movements in exchange rates.

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## KEY WORDS

bonds, exchange rate, asset pricing, risk premium

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## JEL CODES

G12, G15, G11

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## 1 INTRODUCTION

In times of financial crisis when interest rates and inflation decline to their lower limit, bond prices increase. Which further factors influence bond prices in times of low inflation and low interest rates? Currency movements are significant component of the market factor loadings.

The aim of my research is the valuation of corporate bonds in countries with low inflation and low interest rates. This study identifies factors influencing bond prices. Nominal bond yields have been constrained by the interest rate lower limit in different countries. Exchange rates are important factor that affect prices of bonds. The exchange rate affects the bond prices more when inflation and interest rates are low.

I apply the universal return decomposition of Solnik's International Arbitrage Pricing Theory for

corporate bonds. First I show the effect of factors on bond prices of countries on each continent and then, the effect of factors on prices of countries in emerging and developing markets.

I use corporate bonds data to test the theory between 2000 and 2016. My data source is the internal databases of company Thomson Reuters for bond prices. Further data sources are the International Money Fund, World Bank, Yahoo Finance and the Eurozone. The interest rate is represented by the policy rate. Inflation is defined as the producer price index. The exchange rate is determined as the value of the national currency per SDR. We use a monthly panel analysis. I have a unique dataset of 60 countries.

Results tend to confirm that the role of exchange rate risk is negative for bond prices. The influence of

exchange rate risk is higher in periods of low inflation or low interest rates. The interest rate has a negative effect to bond price and it is significant for European and African countries. Inflation is not significant for most countries. The exchange rate risk is important for the valuation of bonds in emerging markets.

The rest of the article is structured as follows: Section 2 discusses the data and methodology used to measure factors affecting bond prices. Section 3 displays the results and Section 4 is the conclusion.

## 1.1 Literature Review

Interest rates and inflation influence bond prices and bond yields (Huang and Kong, 2002; Elton, 2004). The bond yields gradually decreased from 2009 to 2012.

The Capital Asset Pricing Model (CAPM) is attractive and simple domestic model that perform a covariance of asset returns with state variables. Viceira (2011) realised CAPM for bond markets. The Capital Asset Pricing Model identifies a market portfolio. The International Capital Asset Pricing Model (ICAPM) was applied by Solnik (1974) and Sercu (1980), as exchange rate risk has traditionally been specified as a separate factor affecting the prices of capital assets. The market portfolio does not exist in the international framework. The Arbitrage Pricing Theory (APT) provides a fruitful alternative to these utility based models. APT risk factors should explain variation of returns (Brennan,

1998). The International Arbitrage Pricing Theory (IAPT) formulated by Solnik (1983) is a multi-consumption real Capital Asset Pricing Model. The form of the International Arbitrage Pricing Theory model is unchanged by investors with different home currencies.

The International Asset Pricing Theory decomposes asset returns into portions due to currency returns and non-currency returns. Armstrong (2011) defined changes in underlying asset values (non-currency) and random currency movements (i.e. exchange rate risk). Non-currency returns are earned by all investors regardless of their home currency. The exchange risk is associated with random changes in currency values and change the asset returns of investors with different home currencies. Currency movements affect risk factors and addition residual exchange risk. The main assumptions of the International Asset Pricing Theory are purchasing power parity, efficient markets and the possibility of arbitrage.

During the financial crisis of 2008 and the following years, many central banks reduced their target interest rates as the traditional tool of monetary policy. Interest rates were at their lower limit. Monetary policies have helped to reduce long-term interest rate (Christensen and Rudebusch, 2012; Sirm et al., 2011) and deflationary pressures. The central bank may keep policy rates low for a longer time. Central banks may be able to affect bond yields by changing the risk premiums (Rezende, 2017).

## 2 METHODOLOGY AND DATA

Our panel, which is a part of the European companies issuing corporate bonds, includes monthly data for 4 813 bonds in Europe between January 2000 and November 2016 (provided by the Morningstar database). We are mostly focused on factors affecting the bond price for a period with low inflation or a low interest rate. The bond price is influenced by the risk premium. The impact of exchange rate risk to bond price is higher in the time with a low inflation or interest rate. The literature survey shows that exchange rate depreciation of the local currency causes significant losses for foreign investors.

We consider several bond specific variables which describe an asset quality (returns, coupon currency and issue currency). We merge the bond prices with

a macroeconomic dataset (inflation, interest rate, exchange rate and risk-free return). The definitions of the variables are given in Table 1. The descriptive statistics of the variables are given in Table 2. All the variables are indexed before difference transformation. The correlations between variables are displayed in Table 3. All the variables are indexed after difference transformation. The dataset in monthly periods for 4 813 bonds in 20 European countries are available for the estimations.

Using this panel dataset, we focused on the impact of factors the bond price of company  $i$  in time  $t$ . We use the model of the International Arbitrage Pricing Theory. The baseline estimation is specified as

Tab. 1: Definition of Analysed Variables

Variable	Description	Source
Prices of government bonds	Prices of government bonds with ten years maturity	Thomson Reuters
Return of corporate bonds	Return of corporate bonds	Morningstar
Currency of issue	Currency of issue corporate bond	Morningstar
Payment currency	Coupon payment is paid in the payment currency	Morningstar
Interest rate	Interest rate is the policy rate in the country	International Monetary Fund, Eurostat
Inflation	Producer price index	International Monetary Fund
Exchange rate	National currency per SDR index (basket of currencies – U.S. dollar, Euro, Chinese renminbi, Japanese yen and pound sterling)	International Monetary Fund

Tab. 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Return	170 552	0.470	5.329	−97.000	561.450
Inflation	8 248 296	1.681	1.274	−6.562	18.600
Interest rate	8 161 857	3.427	1.550	−0.250	13.850
Exchange rate – domicile	5 454 002	37.047	45.580	0.754	210.563
Government bond	8 116 534	103.626	8.316	42.310	144.312
Exchange rate – issuer	8 659 571	44.893	79.801	0.000	4 566.610
Exchange rate – coupon	3 007 648	3.182	16.404	0.000	1 032.990

$$\text{returns}_{it} = \alpha_{it} + \sum_{b=1}^B \beta_b \text{bv}_{it} + \sum_{m=1}^M \beta_m \text{mv}_{it} + \mu_{it} + \epsilon_{it}, \quad (1)$$

where  $\text{returns}_{it}$  is the returns of a corporate bond  $i$  in time  $t$ , and  $\alpha_{it}$  is a constant. The second set of variables denoted the variables of corporate bonds, represented coupon currency and issue currency. The next set of variables denoted macroeconomic variables, including inflation, interest rate, risk-free return and exchange rate.

Then we used threshold analysis for the impact of factors on bond price in times with low inflation.

The threshold model can identify nonlinearities in the time series through the constant. The following model for threshold analysis is:

$$\text{returns}_{it} = \alpha_{it} + \beta_b \text{bv}_{it} I(f_{it} \leq \gamma) + \beta_m \text{mv}_{it} I(f_{it} > \gamma) + \epsilon_{it}, \quad (2)$$

where inflation is defined by a function  $I$ . The function contains the threshold constant  $f_{it}$ , which reaches a level lower or the same as the threshold value  $\gamma$  and consequently a higher level than the threshold value  $\gamma$ . The threshold  $f_{it}$  is represented by the value for the bond  $i$  in time  $t$ .

Tab. 3: Correlation matrix

	Return	Inflation	Interest rate	Government bond	Exchange rate – domicile	Exchange rate – coupon	Exchange rate – issuer
Return	1.000						
Inflation	−0.067	1.000					
Interest rate	−0.048	0.160	1.000				
Government bond	−0.034	−0.064	−0.215	1.000			
Exchange rate – domicile	−0.087	−0.061	0.054	0.024	1.000		
Exchange rate – coupon	0.000	0.004	0.008	−0.004	0.032	1.000	
Exchange rate – issuer	0.001	0.013	0.111	−0.042	−0.038	0.813	1.000



Tab. 4: Results of models with fixed effects

Model	(1)	(2)	(3)	(4)	(5)
Inflation	−1.456*** (0.0921)	−1.675*** (0.122)	−1.457*** (0.0926)	−1.455*** (0.0922)	−1.676*** (0.122)
Interest rate	−1.248*** (0.0976)	−1.029*** (0.113)	−1.250*** (0.0979)	−1.248*** (0.0976)	−1.033*** (0.113)
Government bond	−0.0471*** (0.00333)	−0.0426*** (0.00373)	−0.0473*** (0.00333)	−0.0471*** (0.00333)	−0.0425*** (0.00373)
Exchange rate – domicile		−1.102*** (0.355)			−1.107*** (0.355)
Exchange rate – issue			0.0189 (0.0125)		0.0217 (0.0163)
Exchange rate – coupon				−0.00369 (0.00380)	0.0754 (0.0847)
Constant	−0.0706*** (0.00254)	−0.0735*** (0.00312)	−0.0705*** (0.00255)	−0.0706*** (0.00254)	−0.0733*** (0.00311)
Observations	139,275	130,072	139,018	139,089	129,853
Number of firms	4,171	4,047	4,165	4,164	4,038

Notes: Robust standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

### 3 RESULTS

This section presents the results of the impact factors on corporate bond prices. We apply regression analyses for monthly periods from 2000 to 2016. At first, we start own analysis for all times. Second, attention is paid to periods of low inflation and low interest rates.

Table 4 presents the results of the first five models with fixed effects. We start analysis with macroeconomic variables (inflation, interest rate and risk-free return) without exchange rate risk (1). The macroeconomic factors are significant. The returns on government bonds are risk-free returns. The inflation and interest rates are market risks. Inflation influences bond price more than interest rate. For next models, we include exchange rate risk for domicile of corporate bonds (2), for issue (3) and for coupon payment (4). Exchange rate risk is an additional risk effecting bond prices. The exchange rate for the currency of domicile is significant. The exchange rate for the currency of issue and the currency for coupon payment are insignificant. In the last model, we use macroeconomic variables and all exchange rate risk (5). Our results show that exchange rate risk is significant only for the currency of domicile and the macroeconomic variables are significant.

In the second step we separate the dataset by base currencies. The results are presented by Table 5. First, we use the model of issue currency, the results

are in the model from (6) to (8). Second, we use the model of main currency of payments, the results are in the model from (9) to (11). The corporate bonds in Euro and in Pound Sterling are influenced by interest rates more than by inflation. Inflation affects the bond price more in bonds in US Dollars. The exchange rate influences corporate bonds in Pounds Sterling most.

In the next step we apply threshold analysis for the level of inflation and for US Dollar currency, the results are in the models from (12) to (16). The results are in Table 6. The interest rate is positive when inflation is low. The impact of interest rate declines when inflation grows. For whole time the interest rate is significant with a negative effect. The exchange rates influence bond prices more for times with low inflation. The influence decreases with higher inflation. The exchange rate is negative for all times.

In the last step we apply threshold analysis for the level of interest rate and for Euro or Pound Sterling currency, the results are in the models from (17) to (21). The results are in the Table 7. The exchange rate for the issue currency influences the bond price more when the interest rate is lower. This effect declines when the interest rate increases. The interest rate influences the bond price most when the interest rate is low.

Tab. 5: Results of models by base currency

Model	(6)	(7)	(8)	(9)	(10)	(11)
Currency	Base Curr. Euro	Base Curr. US Dollar	Base Curr. Pound Sterling	Payment Curr. Euro	Payment Curr. US Dollar	Payment Curr. Pound Sterling
Inflation	-1.015*** (0.139)	-1.687*** (0.144)	-2.057*** (0.177)	-1.015*** (0.139)	-1.685*** (0.144)	-2.057*** (0.177)
Interest rate	-1.755*** (0.210)	-0.633*** (0.132)	-4.409*** (0.177)	-1.755*** (0.210)	-0.632*** (0.132)	-4.409*** (0.177)
Government bond	-0.0187*** (0.00575)	-0.0324*** (0.00427)	-0.0867*** (0.00759)	-0.0187*** (0.00575)	-0.0324*** (0.00427)	-0.0867*** (0.00759)
Exchange rate – domicile	-0.361*** (0.0406)	-1.367*** (0.429)	-0.843*** (0.0795)	-0.361*** (0.0406)	-1.366*** (0.429)	-0.843*** (0.0795)
Exchange rate – issue	3.277 (3.201)	4.362* (2.287)	-16.30*** (1.535)			
Exchange rate – coupon				3.277 (3.201)	4.360* (2.287)	-16.30*** (1.535)
Constant	-0.143*** (0.0105)	-0.0372*** (0.00787)	-0.146*** (0.00534)	-0.143*** (0.0105)	-0.0372*** (0.00786)	-0.146*** (0.00534)
Observations	10,481	100,398	14,487	10,481	100,433	14,487
Number of firms	458	3,012	388	458	3,015	388

Notes: Robust standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Tab. 6: Results of models with different level of inflation and the issue currency is US Dollar

Model	(12)	(13)	(14)	(15)	(16)
Percentile level of inflation	< 5	< 10	< 15	< 20	< 25
Inflation	-2.231*** (0.193)	-0.302** (0.124)	-0.230** (0.116)	-0.825*** (0.102)	-1.024*** (0.0969)
Interest rate	3.260*** (0.227)	1.291*** (0.192)	0.550*** (0.147)	0.0955 (0.118)	-0.167 (0.115)
Government bond	-0.141*** (0.00842)	-0.0845*** (0.00664)	-0.0872*** (0.00597)	-0.0731*** (0.00555)	-0.0729*** (0.00542)
Exchange rate – domicile	-2.428*** (0.127)	-0.991*** (0.0768)	-0.603*** (0.0579)	-0.648*** (0.0578)	-0.552*** (0.0517)
Exchange rate – issue	-58.97*** (4.448)	-17.23*** (2.316)	-18.79*** (2.166)	-12.07*** (1.824)	-11.22*** (1.724)
Constant	-0.550*** (0.0218)	0.0776*** (0.0104)	0.0395*** (0.0101)	-0.0407*** (0.00940)	-0.0688*** (0.00900)
Observations	15,994	33,042	41,137	49,923	54,325
Number of firms	2,356	2,592	2,763	2,872	2,905

Notes: Robust standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

## 4 CONCLUSIONS

This paper applied the International Arbitrage Pricing Theory that home currency movements affect factor loadings and risk premiums of bond prices. To do this, we used bond returns decomposed into portions or asset returns and currency returns. Asset returns are earned by all investors regardless of their home currency. Currency returns are earned by investors with different home currencies. We apply

International Arbitrage Pricing Theory for monthly returns on the corporate bonds in Europe in the period 2000–2016. For this purpose, we utilised the home-currency to currency index exchange rates (SDR). The SDR index includes the major currencies (U.S. dollar, Euro, Chinese renminbi, Japanese yen and Pound sterling). The total exchange rate risk of bonds is composed of the sum of the exchange

Tab. 7: Results of models with different levels of interest rate

Model	(17)	(18)	(19)	(20)	(21)
Percentile level of interest rate	< 5	< 10	< 15	< 20	< 25
Inflation	−1.927*** (0.157)	−1.829*** (0.137)	−1.835*** (0.133)	−1.699*** (0.130)	−1.673*** (0.124)
Interest rate	−4.328*** (0.170)	−3.619*** (0.157)	−3.375*** (0.155)	−3.263*** (0.156)	−3.423*** (0.150)
Government bond	−0.0785*** (0.00676)	−0.0764*** (0.00635)	−0.0780*** (0.00620)	−0.0790*** (0.00612)	−0.0788*** (0.00611)
Exchange rate – domicile	−0.366*** (0.0653)	−0.425*** (0.0416)	−0.412*** (0.0385)	−0.385*** (0.0390)	−0.380*** (0.0376)
Exchange rate – issue	−13.20*** (1.509)	−7.631*** (1.759)	−7.233*** (1.694)	−6.392*** (1.667)	−7.339*** (1.626)
Constant	−0.174*** (0.00596)	−0.149*** (0.00586)	−0.176*** (0.00613)	−0.175*** (0.00624)	−0.170*** (0.00536)
Observations	16,696	19,664	21,887	22,770	23,795
Number of firms	828	843	846	846	846

Notes: Robust standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

rate risk containing the currency risk for the currency of payment, the currency of issue and the currency of domicile. The home currency movements are priced into the market factor. The exchange rate risk is important factor affecting bond returns. The exchange rate influences the bond price more when inflation or interest rate is low.

Inflation has a greater impact in the case of low interest rates or low inflation, and also interest rates. The exchange rate most affects the bond price at times of low inflation. The exchange rate is more significant for the US Dollar. The exchange rate is an important factor affecting bond prices.

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# COMPARISON OF DEFERRED TAX MATERIALITY IN PHARMACEUTICALS AND CHEMISTRY

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## ABSTRACT

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The paper deals with a comparison of deferred tax materiality in pharmaceuticals and chemistry. The materiality of deferred tax is assessed on a sample of companies doing business in chemistry (NACE 20.1) and also on companies doing business in pharmaceuticals (NACE 21.1). The deferred tax materiality is assessed on a sample of companies in a time series from 2005 to 2015. The sample consists of companies listed on the Frankfurt Stock Exchange and reporting in accordance with international accounting standards IAS/IFRS. The results will be compared with the author's previous studies concerning deferred tax materiality in the chemical industry.

## KEY WORDS

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deferred tax, materiality, pharmaceuticals, chemistry

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## 1 INTRODUCTION

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Deferred tax is an accounting category purposed with booking costs into the correct period in which they arose. The creation of the deferred tax category is based on the existence of book-tax differences. The book-tax differences are differences between taxation and accounting rules. Basically there are three areas related to the deferred tax category specifically accounting for income taxes, earnings management and capital market anomalies. The issue of deferred tax materiality is dealt with especially in the environment of the USA and on a dataset of companies reporting in accordance with US GAAP. That is why this issue was chosen.

The main aim of this paper was to identify which industry the deferred tax category is the more

significant item for the decision making of external users of financial statements.

### 1.1 Theoretical Background

The main purpose of taxation is its fiscal function – to collect as much tax as possible into the state budget. On the other hand the main objective of accounting is to create a fair view of reality in a company for external users of financial statements. The correlation between accounting and taxation has been investigated by many studies (Walton, 1992; Nobes, Parker, 2010; Doupnik, Salter, 1995; Hoogendoorn, 1996; Lamb, Nobes, Roberts, 1998; Nerudová, 2009). The highest number of studies

investigate the relationship between taxation and accounting rules for income (Lamb, Nobes, Roberts 1998; Holland, 1998; Freedman, MacDonald, 2007).

The relationship between book-tax differences has been investigated by lot of studies (Jackson, 2015; Lev and Nissim, 2004; Hanlon, 2005) and provides evidence that book-tax differences can predict future earnings. This conclusion is important for understanding the relationship between book-tax differences and future earnings changes because it can help external users of financial statements to predict the effects of various types of book-tax differences. Basically the book-tax differences can be split and every single component examined to help researchers interpret the conclusions (Graham et al., 2004; Hanlon and Heitzman, 2010). Those studies were focused on the US environment and on companies preparing their financial statements in accordance with US GAAP.

There are two types of book-tax difference – permanent and temporary. The calculation of the deferred tax category is based on temporary differences. Those differences are caused by the fact that the tax and rules for financial reporting are different in the majority of countries. Permanent book-tax differences have a definitive character.

The issue of deferred tax was investigated mainly in the US environment and on a data sample that consists of companies preparing their statements in accordance with US GAAP. Ayers, McGuire and Laplante (2008) provide evidence that differences between book income and tax income should be taken into consideration in preparing credit risk analyses. Colley, Rue, Valencia and Volkan (2012) examine the theory underlying current accounting and reporting standards for deferred taxes. Laux (2013) empirically examines whether deferred taxes provide incremental information about future tax payments and explores whether the relationship is affected by whether and when the deferred tax accounts reverse. Blaylock, Shevlin and Wilson (2010) investigate why book-tax differences appear to serve as a useful signal of earnings persistence.

Weber (2009) demonstrates that abnormally high book-tax differences are underestimated by the market itself and credit rating agencies should also include this indicator in their calculations of ratings.

The temporary components of book-tax differences have been investigated by many studies Philips et al., 2003; Hanlon, 2005; Blaylock et al., 2012. The

usefulness of deferred tax expenses in detecting earnings management was also investigated. They provided evidence that deferred tax expenses can be useful for total accruals and abnormal accruals. To demonstrate this hypothesis they used Jones-type models in detecting earnings management.

Blaylock et al. (2012) investigated book-tax differences as a signal of earnings persistence. They provided evidence that there are several potential sources of book-tax differences. They also investigated the varying consequences of high positive book-tax differences and accruals persistence according to the sources of those book-tax differences. The results illustrate the significance of the source of the book-tax differences.

The first to examine the relationship between the ratio of tax-to-book income to predict earnings growth and unusual stock returns to explain the earnings-price ratio in the period before and after the implementation of the Statement of Financial Accounting Standards (SFAS) No. 109 in 1993 were Lev and Nissim, 2004. They investigated both temporary and permanent BTDs as well as tax accruals such as changes in tax assessment contributions. They also found a strong connection between tax and contemporaneous earnings-price ratios and a weak connection between tax and stock returns.

Hanlon (2014) investigated the relationship between tax enforcement and financial reporting quality. She provided evidence that higher tax enforcement by the tax authority has a positive relation to the quality of financial statements.

Nevertheless the studies mentioned above investigated the deferred tax category in the US environment and on a sample of companies preparing their financial statements in accordance with the US GAAP. There are only several studies investigating the deferred tax category in the European environment e.g. Gordon, Joos (2004), Bohušová, Svoboda (2005), Chluděk (2011), and Vučković-Milutinović, Lukić (2013), Habanec, Bohušová (2017).

Vučković-Milutinović, Lukić (2013) examined the deferred tax category on a sample of 20 of the largest non-financial companies and 20 banks in the Serbian environment. Their data sample covers the period 2009-2010 and tests the significance of DTA and DTL.

Bohušová, Svoboda (2005) examined deferred tax materiality on a sample of companies in the Czech environment. Their results show that the median of



the deferred tax/total income tax ratio is 15.21%, resp. 7.4% in the researched samples.

Habanec, Bohušová (2017) compared the materiality of deferred tax reporting in accordance with international accounting standards – the Anglo-Saxon reporting system – and reporting in accordance with Czech accounting legislation – continental accounting

system. Their results showed that deferred tax is more significant in the Anglo-Saxon reporting system. This paper is a follow-up to this study and extends the data sample of companies preparing their financial statements in accordance with IAS/IFRS international accounting standards.

## 2 METHODOLOGY AND DATA

This paper deals with the materiality of deferred tax in companies reporting in accordance with the IAS/IFRS international accounting standards. The paper is built on the conclusions of the author's previous studies (Habanec, 2016; Habanec, Bohušová, 2017; Habanec, 2017).

The materiality of deferred tax in financial reports preparation in accordance with IAS/IFRS is assessed in this paper. The dataset consists of financial reports of companies doing business in pharmaceuticals (NACE 21) and also in chemistry (NACE 20). The sample consists of companies listed on the Frankfurt Stock Exchange. The chemical and pharmaceutical industries were chosen due to a lot of obligations arising in applying IAS/IFRS accounting standards to reporting deferred income tax. Those obligations are restoring items of property, plant and equipment, the creation of provisions, revaluation on fair value, etc. The data sample covers the period from 2005 to 2015. The starting year 2005 was chosen as the first year of the obligatory application of IFRS for publicly traded companies within the EU.

The analysis used the publicly available financial statements of companies operating in the chemical (NACE 20) and pharmaceutical industries (NACE 21). The Frankfurt Stock Exchange was used for their identification. The number of 34 companies was identified in the pharmaceutical industry. Due to the unsuitable form of financial statement, eight companies were excluded, AGENNIX, ABWICKLUNGSG ROEHS, CO.DON, MEDIOS, MOLOGEN, MAG-FORCE, FORMYCON and PAON. Finally the data

sample consists of 26 companies and covers the period from 2005 to 2015. The total observations amount to 286 firm-years.

The calculation of the deferred tax materiality is based on the total amount of assets. International auditing standards were used for materiality level definition (hereinafter ISA 320). Due to fact that neither ISA 320 nor IFRS have stated any criteria for calculation of materiality level the study by McKee, Eilifsen (2000) was used. This paper stated four available approaches for calculating materiality level – single rules, variable of size rules, blend of averaging methods and formula methods.

The most suitable approach for calculating materiality level were the single rules because deferred tax was reported in particular in the balance sheet. Those are general rules based on the evaluation of quantitative factors which allow to the choice of the most suitable rule for each specific client. Some possible rules are given below:

- 5% of income before tax,
- $\frac{1}{2}\%$  of total assets,
- 1% of equity or
- $\frac{1}{2}\%$  of total revenues.

For the materiality level calculation  $\frac{1}{2}\%$  of total assets was chosen as below:

$$\text{Materiality level} = \text{total assets} \cdot 0.05. \quad (1)$$

The results were compared with the author's previous conclusions (Habanec, 2016; Habanec, Bohušová 2017; Habanec, 2017).

## 3 RESULTS

For calculation of deferred tax materiality single rules were used. The following table describes the

materiality level of deferred tax in the researched company sample.

Tab. 1: Deferred tax materiality in pharmaceuticals (%)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
AAP Implantate	Y; 9.47	Y; 7.02	Y; 4.06	Y; 3.41	Y; 3.39	Y; 3.42	Y; 3.16	Y; 3.17	Y; 2.13	Y; 2.72	Y; 1.01	Y; 3.42
4SC	N	N	N	N; 0.23	N; 0.07	N; 0.04	N	N	N	N	N	N; 0.03
BIOTEST	Y; 0.76	Y; 0.63	N; 0.39	N; 0.07	Y; 0.83	N; 0.40	Y; 0.91	N; 0.02	Y; 1.21	N; 0.20	N; 0.10	N; 0.47
CARL ZIESS	Y; 3.48	Y; 2.46	Y; 3.43	Y; 3.79	Y; 3.04	Y; 4.17	Y; 4.75	Y; 4.54	Y; 5.13	Y; 5.15	Y; 6.35	Y; 4.55
DRAGER	Y; 3.08	Y; 3.16	Y; 3.18	Y; 3.95	Y; 5.41	Y; 4.86	Y; 5.52	Y; 5.36	Y; 4.89	Y; 5.66	Y; 5.72	Y; 4.73
ECKERT	Y; 2.12	Y; 3.76	Y; 2.58	N; 0.06	Y; 6.30	Y; 8.00	Y; 5.18	Y; 4.61	Y; 4.58	Y; 3.60	Y; 2.69	Y; 4.25
EPIGENOMICS	Y; 2.80	Y; 3.27	Y; 3.40	Y; 3.10	Y; 2.39	Y; 1.35	Y; 1.10	Y; 1.54	N	N; 0.42	Y; 2.75	Y; 2.28
EVOTEC	Y; 0.83	Y; 0.53	N; 0.41	N; 0.32	N; 0.30	N; 0.19	Y; 1.55	Y; 15.39	Y; 10.48	Y; 7.19	Y; 10.58	Y; 4.29
FRESEN	Y; 0.67	Y; 0.97	Y; 0.67	N; 0.02	N; 0.04	N; 0.03	N; 0.02	Y; 1.76	Y; 1.40	Y; 1.37	Y; 1.48	Y; 1.20
GERATHERM	Y; 12.90	Y; 17.69	Y; 15.20	Y; 5.83	Y; 9.46	Y; 6.11	Y; 4.50	Y; 3.77	Y; 2.05	N; 0.46	N	Y; 6.69
STADA	Y; 1.93	Y; 2.23	Y; 2.56	Y; 2.19	Y; 1.71	Y; 1.40	Y; 1.25	Y; 1.24	Y; 2.93	Y; 3.84	Y; 3.80	Y; 2.37
SARTORIUS	Y; 3.59	Y; 3.55	Y; 3.50	Y; 3.33	Y; 2.00	Y; 1.73	N; 0.34	Y; 0.58	Y; 0.79	Y; 0.62	Y; 1.01	Y; 1.54
RHON-KLINIKUM	Y; 0.92	Y; 1.44	Y; 0.62	N; 0.44	N; 0.05	N; 0.03	N; 0.10	N; 0.10	N; 0.05	N; 0.04	N; 0.15	N; 0.29
STRATEC	Y; 0.90	Y; 3.92	Y; 2.20	Y; 1.56	Y; 1.76	Y; 1.74	Y; 0.65	Y; 0.66	N; 0.44	Y; 3.13	Y; 3.50	Y; 1.90
QIAGEN	Y; 0.78	N; 0.25	Y; 7.13	Y; 6.88	Y; 4.72	Y; 4.34	Y; 4.88	Y; 4.01	Y; 2.55	Y; 1.93	Y; 1.02	Y; 3.71
OASMA	Y; 2.04	Y; 1.38	N; 0.01	N; 0.01	N; 0.00	N	N	N	Y; 4.59	Y; 3.12	Y; 10.70	Y; 2.16
MEDICLIN	Y; 4.28	Y; 3.80	Y; 1.56	Y; 1.22	Y; 1.02	Y; 0.79	Y; 0.55	Y; 0.74	Y; 1.00	Y; 1.03	Y; 1.13	Y; 1.47
MATERNUS	Y; 1.86	Y; 1.69	N; 0.16	N; 0.35	N; 0.05	Y; 1.26	Y; 1.48	Y; 1.32	N; 0.12	Y; 0.62	Y; 0.84	Y; 0.96
GERRESHEIMER	Y; 4.09	Y; 3.74	Y; 2.86	Y; 2.35	Y; 2.57	Y; 2.45	Y; 2.47	Y; 1.94	Y; 2.42	Y; 1.53	Y; 5.72	Y; 2.99
SYGNIS	N	N	Y; 4.88	Y; 1.35	N	N	Y; 5.41	Y; 6.52	Y; 4.91	Y; 2.99	Y; 3.03	Y; 2.60
GERATHERM	Y; 1.85	Y; 18.33	Y; 14.66	Y; 26.41	Y; 22.54	Y; 6.11	Y; 4.50	Y; 3.77	Y; 2.05	N; 0.46	N; 0.18	Y; 5.79
VITA	Y; 1.23	Y; 0.69	Y; 2.43	Y; 2.14	N	Y; 2.12	Y; 1.89	N; 0.09	Y; 1.25	Y; 3.89	Y; 3.83	Y; 1.87
UMS	Y; 1.06	Y; 1.54	Y; 1.21	Y; 1.56	Y; 1.22	Y; 1.42	Y; 0.99	Y; 1.03	Y; 0.76	Y; 0.65	N; 0.47	Y; 1.10
CURASAN	Y; 35.64	Y; 2.77	Y; 2.70	Y; 1.81	N	N	N	Y; 1.53	Y; 2.20	Y; 1.65	N; 0.47	Y; 6.29
MERK	N	N	Y; 2.20	Y; 2.62	Y; 4.71	Y; 0.98	Y; 2.67	Y; 1.14	N; 0.34	Y; 0.67	Y; 4.74	Y; 2.19
MORPHOSYS	N; 0.47	Y; 1.23	Y; 1.28	N; 0.40	Y; 0.98	Y; 0.67	N; 0.49	N; 0.20	N; 0.39	N; 0.25	Y; 1.68	Y; 0.72

Tab. 2: Deferred tax materiality in chemistry (%)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
BASF	Y; 1.24	Y; 0.65	Y; 0.69	N; 0.06	Y; 0.99	N; 0.04	N; 0.01	N; 0.03	N; 0.03	Y; 2.80	Y; 1.89	Y; 0.57
BAYER	Y; 4.62	Y; 2.16	Y; 1.64	Y; 2.20	Y; 1.86	Y; 2.28	Y; 2.48	Y; 3.08	Y; 3.11	Y; 5.56	Y; 6.33	Y; 3.36
CIECH	Y; 1.57	N; 0.36	N; 0.09	Y; 2.00	Y; 2.16	Y; 2.46	Y; 2.32	Y; 1.46	N; 0.27	Y; 8.04	Y; 10.42	Y; 2.05
EVONIK	Y; 0.99	Y; 2.21	Y; 2.01	Y; 1.61	Y; 1.24	N; 0.08	N; 0.02	Y; 2.50	Y; 2.68	Y; 2.79	Y; 2.75	Y; 1.67
FUCHS	N; 0.45	N; 0.35	N; 0.14	Y; 0.61	Y; 0.76	Y; 0.65	Y; 0.77	Y; 0.97	Y; 0.84	Y; 0.84	Y; 0.85	Y; 0.71
LINDE GASS	Y; 1.43	Y; 0.96	Y; 0.69	Y; 0.96	Y; 0.99	Y; 0.87	Y; 0.90	Y; 0.72	Y; 0.86	Y; 0.81	Y; 1.43	Y; 0.97
K+S	Y; 1.97	Y; 0.97	Y; 1.33	Y; 0.63	Y; 3.66	Y; 4.74	Y; 3.42	Y; 2.17	Y; 2.56	Y; 2.36	Y; 2.52	Y; 2.52
LANXESS	Y; 0.65	Y; 0.64	Y; 0.82	Y; 2.46	Y; 2.46	Y; 1.29	Y; 0.65	Y; 1.72	Y; 3.30	Y; 4.95	Y; 4.36	Y; 2.31
SGL CARBON	Y; 7.95	Y; 6.32	Y; 4.36	Y; 2.88	Y; 2.73	Y; 2.39	Y; 2.77	Y; 4.43	Y; 2.67	Y; 2.90	Y; 3.74	Y; 3.75
STAHL METAL	Y; 3.77	Y; 3.63	Y; 3.30	Y; 2.72	Y; 2.31	Y; 1.05	N; 0.32	Y; 0.88	Y; 2.06	Y; 1.69	Y; 2.53	Y; 1.82
SYMRISE	Y; 6.43	Y; 3.26	Y; 3.58	Y; 3.12	Y; 3.12	Y; 2.16	Y; 1.47	N; 0.47	Y; 2.77	Y; 5.36	Y; 3.58	Y; 3.38
WACKER	N; 0.22	N; 0.18	Y; 0.70	N; 0.10	N; 0.10	N; 0.41	N; 0.36	Y; 2.76	Y; 2.59	Y; 4.76	Y; 4.38	Y; 1.96

From Table 1 mentioned above it is apparent that deferred tax is significant for almost all companies from the researched sample. Deferred tax is not significant only for the companies RHON-KLINIKUM, BIOTEST and 4SC. Nevertheless it can be said that deferred tax is significant for companies reporting in accordance with international accounting standards – the Anglo-Saxon reporting system – and doing business in the pharmaceutical industry. It was found that deferred tax is a highly significant item in the financial statements of companies doing business in the pharmaceutical industry.

As per Table 2 mentioned above it is apparent that deferred tax is significant for all the researched companies doing business in the chemical industry.

After calculating the deferred tax materiality for the whole sample of companies doing business in chemistry (2.09%) and for whole sample of companies doing business in pharmaceuticals (2.91%) we can say that deferred tax is more significant in pharmaceuticals. However the difference is not highly significant. The deferred tax is a highly significant item of financial statements for both of industries. This is caused by the application of international accounting standard principles from which many obligations arise – revaluation on fair value, restoring items of property, plant and equipment, creation of provisions, etc. The difference can be caused by more obligations arising from doing business in pharmaceuticals.

## 4 DISCUSSION AND CONCLUSIONS

The main object of this paper was identified deferred tax materiality for decision making by external users in the pharmaceutical and chemical industries. Data samples were investigated in chemicals – 12 companies in the period 2005 to 2015 (132 observations) – and in pharmaceuticals – 26 companies in the period 2005 to 2015 (286 observations). The analysis of the chemical industry is based on the author's previous study, Habanec, 2017.

The average deferred tax materiality in both industries was calculated. After comparison of the results we can say that the deferred tax materiality of companies doing business in the pharmaceutical industry is more significant than deferred tax materiality of companies doing business in the chemical industry. It can be caused by the obligations arising from applying IAS/IFRS principles (restoring items of

property, plant and equipment, creation of provisions and revaluation on fair value). We can also say that deferred tax is a highly significant item in financial statements in both industries and it can influence the decision-making of external users of financial statements.

The conclusions of this paper correspond with the conclusions of other studies. Lev and Nissim, 2004 and Hanlon, 2005, examined whether the tax-base is a source of information for external users of financial statements about growth in earnings and the persistence of earnings. This conclusion is supported by this paper because the deferred tax was calculated as a highly significant item in financial statements and it can affect the decision-making of external users of financial statements.

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# CHANGES IN CONSUMER BEHAVIOUR WHEN AN ARMED POLICE OFFICER IS PRESENT IN FRONT OF A TOURIST ATTRACTION IN PRAGUE

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## ABSTRACT

There are growing numbers of police officers and troops with machine guns serving in European cities. Security forces are present quite often also in front of the entrances to tourist facilities to attract the obvious attention of tourists as well as the local population. The aim of this study is to find out whether the presence of armed police officers or soldiers in the main tourist destinations is only of a security nature, or whether their presence is also reflected in the revenues from the admission, precisely whether, due to the feeling of supervision, tourists are willing to pay higher entry fees. Previous studies in behavioural economics have indicated that the factor of being watched rapidly enhances cooperation and if a human face is displayed at the money collection box, contributors pay for the product more than if flowers are depicted in the same box for the same situation.

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## KEY WORDS

behavioural economics, security, decision-making

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## 1 INTRODUCTION

Influencing people's behaviour is one of the key roles of every company's marketing strategy or state's policy. These strategies or policies are usually well-planned in advance and focused on supporting certain behaviours. Drawing on psychology and the behavioural sciences, the basic insight of behavioural economics is that our behaviour is guided not by the perfect logic of a super-computer that can analyse the cost-benefit of every action. Instead, it is led by our very human, sociable, emotional and sometimes fallible brain. Therefore it is always important to analyse the real impact or customer interpretation of a company's marketing strategy or government

policy to make sure that a new marketing strategy or government policy has a real positive impact on supporting certain behaviours. (The Behavioural Insights Team, 2010)

In the last ten years, there have been growing numbers of troops and police officers with machine guns serving on the streets of European cities. We can see them around government buildings, major transport hubs, synagogues, galleries and main tourist landmarks. These soldiers or armed police-officers are not only sitting in cars equipped with cameras, which enable concentration on and precise monitoring of the surrounding area. Rather it is completely the



Fig. 1: Wax Museum I Prague without the presence of an armed guard



Fig. 2: Wax Museum I Prague with the presence of an armed guard

opposite as the troops are quite often standing on one spot attracting the attention of the crowds. The authorities declare that the prevention of terrorist attacks and psychological support for tourists and the domestic population to be the main purpose of armed police officer's or soldier's presence in European cities. (Chrisafis, 2016; Carbonnel, Bartunek, 2017, Bohlen, 2016)

The main objective of the following study is to find out if there are side effects of presence of armed police officers in Prague and whether their presence in front of a tourist venue has an effect on Czech citizens, or more precisely whether the presence of

an armed police officer in front of the Wax Museum in Prague makes the Czech population willing to pay more for entry since there is such a supervision. The initial hypothesis of this study is based on previous experiments, which have shown that being watched increases people's willingness to cooperate and pay more into the collection box. In previous experiments people have paid nearly three times as much for their drinks when eyes were displayed on the collection box. (Batteson, Nettle, Roberts, 2006; Haley, Fessler, 2005) The presence of an armed guard could maybe have a very similar effect.

## 2 METHODOLOGY AND DATA

For the investigation of the effects of security guards, electronic questioning was used, in which 194 respondents were supposed to indicate how much they were willing to pay to enter the Wax Museum in Prague. When stating the answer one group of respondents was presented with a picture of the Wax Museum with standard marketing banners (Picture 1).

The second group of respondents was presented with a picture of the Wax Museum with standard marketing banners and an armed soldier at the front

of the Wax Museum when indicating their answer (Picture 2).

This study compares the data collected from these two groups of respondents during October and November 2017 and with the use of the T-test tries to combat the hypothesis that the presence of armed police officer changes the willingness of visitors to pay entrance fee.

The respondents did not know the purpose of the questioning and were also asked to recognise the figures in the Wax Museum in Prague. The



reason for that was the previous finding that people sometimes behave differently than they indicate when asked directly. Therefore only one question on consumer behaviour was included and two groups of respondents were formed in order not to ask respondents on the topic directly. The respondents thought that we were interested in the number of figures in the Wax Museum in Prague that they were able to recognise.

### 3 RESULTS

The first group of respondents was presented with the picture of Wax Museum in Prague with classical marketing banners and without the armed police officer. 23.2% of respondents from the first group indicated they would not pay anything to enter the museum. The following graph presents the distribution of admission fees the respondents were willing to pay to enter.

Tab. 1: Entry fee respondents were willing to pay to Wax Museum in Prague without an armed guard

Entrance fee without an armed guard	Proportion of respondents
nothing	23.2%
1–150 CZK	37.9%
151–300 CZK	32.0%
301–450 CZK	4.2%
451–600 CZK	2.1%
601–999 CZK	1.0%

Tab. 2: Entry fee respondents were willing to pay to Wax Museum in Prague with an armed guard

Entrance fee with an armed guard	Proportion of respondents
nothing	19.2%
1–150 CZK	39.4%
151–300 CZK	33.3%
301–450 CZK	6.0%
451–600 CZK	2.0%
601–999 CZK	0.0%

The second group of respondents was presented with the very same picture with just the difference

The research was carried in period from 25 October 2017 to 8 November 2017 with the rate of 74% of returned surveys. Overall 71% of respondents were women, 29% of respondents were men. 51% of respondents indicated not having children, which is given also by the relatively low age of respondents – 35% of the respondents were younger than 35. 50.8% of respondents indicated having a university degree, and 42.0% of respondents indicated only having a secondary school diploma.

that an armed police officer was standing in front of the Wax Museum in Prague on the picture. In this second group 19.20% of respondents stated they would pay nothing to enter the Wax Museum. The distribution of prices respondents were willing to pay to enter the Wax Museum in Prague can be seen in the next graph.

When we compare both groups (the blue group, which was presented with a picture without an armed police officer and the red group, which was presented with a picture where an armed police officer is present) we can see that when an armed police officer is present in front of the Wax museum in Prague, more people are willing to pay the entry fee to enter.

Tab. 3: Comparison of both groups

Entrance fee	Proportion of respondents in Group 1	Proportion of respondents in Group 2
nothing	23.2%	19.2%
1–150 CZK	37.9%	39.4%
151–300 CZK	32.0%	33.3%
301–450 CZK	4.2%	6.0%
451–600 CZK	2.1%	2.0%
601–999 CZK	1.0%	0.0%

To compare whether the measurement results in one group differ significantly from those of the second group we have used the T-test calculator at a significance level of 5%. The result of the T-test calculator shows a p-value of 0.47 and therefore the result is not significant at a significance level of 5%.

## 4 DISCUSSION AND CONCLUSIONS

These first results show that there is not a significant difference in the groups (the group presented with a picture with an armed guard and the group presented with a picture without an armed guard) and therefore the hypothesis that the presence of an armed guard in front of a tourist attraction can have an impact on the amount of admission fee Czech citizens are willing to pay as the entry fee when an armed police officer is present, cannot be confirmed at a significance level of 5%. There were only 194 respondents in this electronic questioning, therefore it is important to say that this study needs to be repeated on a bigger sample.

Until now there have not been studies that would focus precisely on this topic. We know that the safer people feel, the higher their tendency to spend. Previous studies have pointed out that certain behavioural and physical devices could have a stronger impact on tourists' overall perception of safety and therefore they tend to visit certain places. The already tested measures included deadbolt locks, closed-circuit TV cameras and door view ports, as well as caller screening by the hotel's telephone operators, locking side hotel entrance doors at night and routine visits by law enforcement agencies. According to research these have all helped the tourists to feel safer and increased their willingness to visit the facilities.

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# PREDICTING RESPONSES TO CZECH UNIVERSITIES' POSTS ON FACEBOOK

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## ABSTRACT

Nowadays, social networks contain huge amounts of easily available text data. This makes it a perfect source to which text mining and text analysis can be applied. The article focuses on predictions of the numbers of responses to Facebook posts on the pages of Czech universities and faculties. Machine learning classification was used as the principal tool. To achieve the goal software for downloading and analysing the necessary data and for providing results was developed. The results take the form of a percentage probability with which the number of responses to a new post can be determined. During the tests, an approximately 75% classification success rate was achieved.

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## KEY WORDS

text mining, text analysis, social networks, classification

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## 1 INTRODUCTION

Nowadays the amount of data stored in various systems is increasing. Data can contain hidden information that is not obvious at first glance. The discipline focused on revealing the hidden structures and dependencies in the data is known as data mining. There are several definitions of data mining, such as for example that data mining is a multidisciplinary field which intersects with statistics, machine learning, pattern recognition and database technologies (Hand, 1998). Another definition describes data mining as a decision-support methodology that identifies unknown and unexpected patterns in information to solve problems (Friedman, 1997).

Given that 80–90% of the world's data is in unstructured form, the text mining area is quite interesting. The main difference between data mining

and text mining is that text mining mainly processes unstructured or semi-structured content (Kosala and Brockeel, 2000) while data mining only works with structured data. Typical text mining tasks could be for example classification, clustering, natural language processing, information retrieval, concept extraction or web mining (Miner, 2012).

The growing popularity of social networks has led, amongst other things, state institutions like schools or universities to set up accounts for these networks. Using these accounts institutions try to reach potential new candidates. Therefore, it is important to identify which contributions lead to an increase in university popularity. And these, as well as many other problems can be solve by the application of text mining.

There are two basic approaches to learning in text mining – supervised learning and unsupervised learning. Supervised learning is based on the fact that the class of each training document is known and it is possible to determine whether the document has been classified correctly. Unlike in supervised learning, in unsupervised learning the classes of individual documents are not known. The classification algorithms use the first approach – supervised learning. Based on an analysis of training data, features that are able to assign individual inputs to the correct classes are searched for (Seel, 2012). Such trained classifiers are applied to new data which was not used for training, and the functionality of the classifier is tested. In practice, a large number of algorithms are used to train classifiers and it is useful to test several of them and not to rely solely upon the results of one of the algorithms. The most well-known and most commonly used supervised learning algorithms include for example decision trees, Naïve Bayes classifiers, support vector machines and logistic regression.

This paper focuses on classification problems. Classification is the division of data (here documents) into a set of predefined classes based on a certain common feature that the data contains (Goh and Ubeynarayana, 2017). Classification can be divided into two basic categories according to the number of

classes into which the processed documents could be classified: single-label and multi-label classification. If the document can be classified into only one class it is single-label classification, and if there are more than two possible classes for one document it is multi-label classification (Alshdaifat, Coenen and Dures, 2013).

In the historical development of classification two approaches have developed. The first manually builds a classifier that uses manually defined rules based on knowledge engineering. The second approach uses machine learning techniques that can automatically induce the classifier by finding some characteristics of each category from a set of training examples (Krabben, 2010). The advantages and disadvantages of both approaches are described by Krabben (2010).

In this paper, we tried to find which of the classifiers – decision tree, naïve Bayes classifier, support vector machine or logistic regression – achieves the best results for the prediction of the number of responses to a post for the data of universities in the Czech Republic. The data was obtained from the Facebook social network of the universities.

Firstly, the structure of the data and obtaining of the data is discussed, followed by a description of the functionality of the used classifiers and an analysis of the obtained results. A summary and discussion of the results and possible work extensions conclude the paper.

## 2 METHODOLOGY AND DATA

The beginning of this project was the idea of whether the data available on the social network pages of universities in the Czech Republic could somehow be useful. Among all social networks, Facebook was selected due to its widespread use in the Czech Republic.

First, the data had to be obtained, so a programme for getting the data from the Facebook pages was designed. The programme used a mechanism described by Paulo (2016). The data was downloaded and stored into a PostgreSQL database. The data contained more than 130,000 records. Examples of original posts and corresponding English translations are shown below:

- *Rektor Univerzity Karlovy Tomáš Zima přeje všem členům akademické obce krásné a radostné Vánoce a úspěšný rok 2017. (Rector of Charles University Tomas Zima wishes all members of*

*the academic community beautiful and joyful Christmas and a successful 2017.)*

- *Důvody k těšení se na nový semestr se vždycky najdou :-). Takhle vypadají zrekonstruované učebny ve 3. patře Staré budovy – nový nábytek, okna, více zásuvek, obrazovky s rozvrhem i lepší akustika! Výuka tu začne již v letním semestru! (There are always reasons to look forward to the new semester :-). This is how the renovated classrooms look on the 3rd floor of the Old Building – new furniture, windows, more drars, screens with schedules and better acoustics! Teaching will start here already in the summer semester!)*
- *Abychom předešli obdobným nepříjemným situacím v praxi, práskneme vám pro jistotu přehled prosincových změn otevírací doby Knihovny UP i sem. (In order to avoid similar unpleasant situations in practice, just to be sure we are giving*

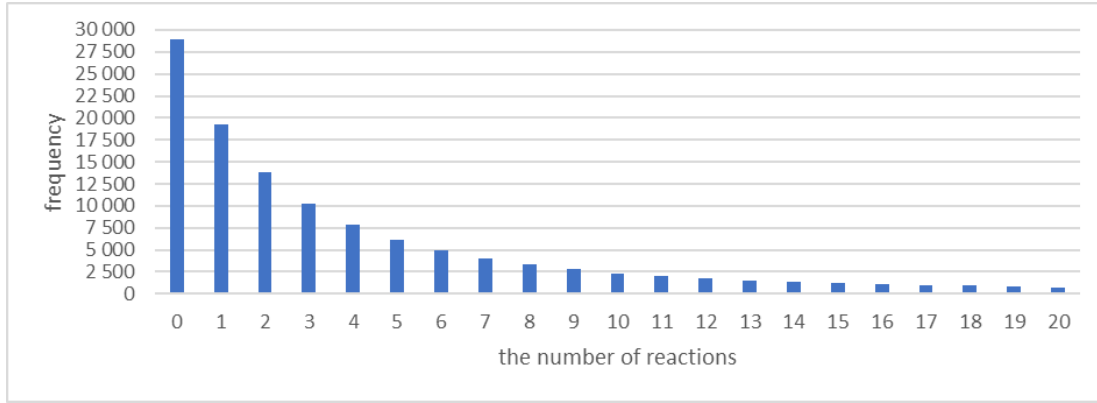


Fig. 1: The frequencies of the numbers of reactions to posts

*you an overview of the review of the December opening hours of the Palacký University Library.)*

The stored data consists of the text of each post, the number of reactions to the post, the faculty and the university to which the post belongs to. Figure 1 shows the frequencies of the numbers of reactions to the posts in an interval from 0 to almost 13 000 on the x axis and the number of posts with the same number of reactions on the y axis. Nearly 30 000 posts had no reaction at all.

Subsequently, the data needed to be prepared for the classification task. The records from the database were selected according to the criteria below and further analysed. The data was divided into two balanced classes based on the values of the feature determining the class. This feature was the number of reactions that divided the data into two groups – with the number of reactions less than or equal to and greater than that value was used. This value was determined first by estimation and later refined based on the results of the experiments. The first group of experiments thus focuses on finding the appropriate number of responses per post so that the data can best be distributed in relation to the classification goal. The second experimental group performs the analyses based on the average numbers of responses per post used to define the classes.

About 70% of the data was used to train the classifier and the remaining data was used for testing. The following classification algorithms were selected for analysis: support vector machine, decision tree, naïve Bayes classifier and logistic regression. The algorithms are described below in this paper.

Before the data could be used for training and testing, it was necessary to transform it into a suitable form. The methods of stemming and re-

moving stop words were used in the preprocessing phase and the data was subsequently converted into a vector representation. For data preprocessing a custom programme has been developed. Because the Czech language is complex, diacritics were deleted as well as special symbols and empty messages. In addition, a link to another page was replaced by the “http” string for easier handling of links.

The stemming method is based on creating the stem of a word from its various morphological forms (Singh and Gupta, 2016). The stemming algorithm applicable to the Czech language developed at the Brno University of Technology (Hellebrand, 2010) was used for the stemming process.

The removal of stop words is a process that removes words very often used in common speech and that do not directly affect text content (Kumova Metin and Karaoğlu, 2017). Such words can include, for example, articles, conjunctions or prepositions. The programme used the stop words included in the stemmer for the Czech language because it was a complex set of words.

All of the selected words were converted into vector form so that certain analytical algorithms could be applied. Typically the vector space model is used (Salton, McGill, 1983). In this model every document is represented as a term vector. The term can be a simple word, phrase or a string. The weighting in the vector space model are often calculated using the Term Frequency-Inverse Document Frequency (TF-IDF) scheme (Peng, Liu and Zuo, 2013). The value of the TF-IDF of  $i$ -th term in the  $k$ -th document determining the importance of each term in every document is calculated as:

$$x_{ik} = f_{ik} \cdot \log \frac{N}{n_i},$$

where  $f_{ik}$  is the frequency of the term  $i$  in the document  $k$ ,  $N$  is the total number of documents and  $n_i$  is the number of documents containing term  $i$ . After converting the documents to vector format, the data can be used for training classifiers and testing them (Raschka 2016; Witten and Frank 2005).

Subsequently the mentioned analytical algorithms were used on the modified data. These algorithms are implemented in the scikit library (Pedregosa et al., 2011), which was imported into the created programme.

## 2.1 Overview of the Classification Algorithms Used

### 2.1.1 LinearSVC

Linear Support Vector Classification belongs to the group of support vector machine algorithms (SVM, Sklearn.svm.LinearSVC, 2017). LinearSVC is the SVM algorithm implementation within the scikit library. SVM is an algorithm that searches for a (non-)linear boundary between two classes. This algorithm searches for a boundary zone and the boundary that separates the classes is placed in the middle of the boundary zone. It attempts to find the largest border zone separating the classes. The task is to find so-called support vectors – the points on the edge of the border zone (Wang, 2005). The documentation for LinearSVC is available in Sklearn.svm.LinearSVC (2017).

### 2.1.2 Decision Tree

The principle of a decision tree is to learn decision rules (series of tests) represented by a tree. A decision tree divides the heterogeneous set of the data according to the answer to the tests into more homogeneous subsets using for example the information entropy measure. In each internal node of the tree the data is separated into subsets associated with the highest entropy decrease to create a new tree level (Bramer, 2017). This process is repeated recursively until no further split is possible or when only homogeneous data remains. The leaves thus determine the class

of the object to be classified. The more levels the tree has the more complex the rules are and so can more accurately model the data. However, in some cases the tree can be large so that it is advisable to restrict the depth of the tree to a certain level. There is no universal method that determines the number of decision tree levels, so it must be determined experimentally. The advantages of a decision tree include its human interpretability and the possibility of visualisation; the disadvantage is its tendency to overfitting (Generalized Linear Models: Decision Tree, 2017).

### 2.1.3 Multinomial Naïve Bayes classifier

The Multinomial Naïve Bayes classifier is the implementation of the Naïve Bayes algorithm in the scikit library (Pedregosa et al., 2011). The Naïve Bayes classifier is based on the Bayesian theorem and allows less computational complexity using the assumption that the attribute values are mutually independent of the given output value (Maimon and Rokach, 2005). This assumption is not correct, which results in some distortion in the results. However, the distortion tends to be small in most cases and it is worth the considerable reduction in computational complexity. The multinomial Naïve Bayes classifier requires integer values of the terms, but in practice, the TF-IDF values work as well (Sklearn.naive\_bayes.MultinomialNB, 2017).

### 2.1.4 Logistic Regression

The logistic regression describes the data and explains the relationships between one dependent and one or more independent variables (Shmueli et al., 2017). In the logistic regression model, the probabilities describe possible outputs of one process and they are modelled by a logical function (Generalized Linear Models: Logistic regression, 2017). This is a model where the dependent variable (output) can acquire one of several values with a certain probability. The logistic regression is used in the classification of up to two classes. The multinomial logistic regression is used for classification to more than two classes.



### 3 RESULTS

The results obtained can be divided into two groups, as different variants of algorithms, their parameters, and data distribution options were studied.

#### 3.1 Finding an Appropriate Number of Reactions

At the beginning, the most appropriate threshold between classes was searched. The threshold took the form of the number of reactions to the post. Different values of the number of reactions to the posts, namely 3, 20, 30, 40, 50 and 100 reactions were tested. Tests with different numbers of attributes were used in the analyses. The attributes were defined as the most frequently occurring words in all the posts. In the analyses, the numbers of 100, 200, 300, 1000 and 2000 attributes were used. The experiments were also performed with and without the omission of stop words, with and without stemming, and with or without the omission of numbers. In this classification task the posts were divided into the classes “Less than 20” and “More than 20” reactions to the post.

A boundary with the number of 20 reactions to the post achieved the best results. Using the LogisticRegression classifier, a classification success rate of almost 75% was achieved as shown on the confusion matrix below (Table 1). As parameters of the classifiers, 1000 attributes were set, with the omission of stop words, without stemming and with numbers.

Tab. 1: Confusion matrix for the classifier Logistic Regression. An accuracy of 0.74915827 was achieved.

	Less than 20	More than 20
Less than 20	3,109	1,147
More than 20	1,011	3,336

The second-best results were almost 74% for the MultinomialNB classifier, with using 1000 attributes, stemming and the omission of stop words. LinearSVC was able to correctly classify with an almost 73% probability and the decision tree with approximately 68%.

With using three reactions per post as a threshold value, the 60% threshold could not be exceeded by any combination of test options. By testing options

with 30 or more reactions per post the threshold with 40 reactions achieved the best results, but the results were comparable to those for the 20 reactions threshold.

#### 3.2 The Average Number of Reactions Testing

Another attempt was to examine the average number of reactions and to determine whether the results obtained are better than the results with an explicitly determined value. The average number of responses was determined based on all responses to all posts from all universities and in this classification task the posts were divided into classes “Above Average” and “Below Average”. The same number of posts with below average and above average reactions was generated from the database. The confusion matrix for the best result of the analysis is shown in Table 2.

Tab. 2: Confusion matrix for classifier MultinomialNB with an accuracy of 0.68595560 achieved

	Above Average	Below Average
Above Average	5,804	2,895
Below Average	2,608	6,216

The best results were achieved by the MultinomialNB classifier, which was able to accurately rank a specific post in almost 69% of cases. The LinearSVC and logistic regression achieved a similar success rate of approximately 67%. The Decision Tree achieved the lowest results at 58%.

Subsequently the type of the post was included in the analyses of the average number of reactions – that is whether it was a text, image, video or a link to another page. This extension increased the classification success, but none of the classifiers could cross the 70% threshold. The highest increase was noticed with Decision Tree of about 6%. The remaining classifiers increased their classification success rate by about 1%.

The last extension was to join the previous case with the current data from the last 14 days. This extension proved insignificant as the results obtained were comparable to those of the previous case. The variances moved at the level of a hundredth of a per cent.

## 4 DISCUSSION AND CONCLUSIONS

In this paper, the data from social networks of universities in the Czech Republic was downloaded from Facebook, preprocessed, analysed using different classification algorithms to predict a number of reactions to posts and the success rate of the classification was evaluated. The trained classifiers were designed to predict the number of responses to a new post based on its content. The results of the various algorithms with various settings were quite similar. However, the selection of the parameters and the preprocessing methods have a greater effect on the results than the selection of the classifier.

The highest achieved value, almost 75%, is not perfect, but it can still be considered a success. One reason for that can be, in the most cases, the individual posts are short messages. Another reason

can be the morphology of the Czech language or the absence of a semantic analyser. In some cases, the use of the stemmer leads to deterioration of results, so it is possible to claim that word morphology is important. However, as is stated by the author of the stemmer Hellebrand (2010), the stemmer achieves only a 50% success rate.

Replacing a specific link for the “http” string could also cause the loss of some information. Therefore, it can be possible to improve the analysis results by analysing the content of the destination pages.

The extension of this work can be focused on other aspects of the entire process, for example, on improving the Czech stemmer or by adding other input information, like the type of reaction or the release date of the post.

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# TEXT MINING TECHNIQUES IN CZECH UNIVERSITIES' SOCIAL MEDIA COMMUNICATION

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## ABSTRACT

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Nowadays, social networks are frequently used for communication and promotion in all industries. Companies use social media to find new employees, raise awareness of the company or just to help their customers solve problems. This modern kind of communication provides opportunities for Czech universities too because it increases the chances of attracting young people deciding on their future. Two main questions arose in the proposed research: “Is it possible to analyse mostly short Czech social network text messages published by universities with machine learning algorithms?” and “Are there any topics that universities commonly write about?” These challenges were faced through a set of unsupervised clustering experiments applied to the public communications of Czech universities on Facebook. It was possible to identify typical topics in university communications and the most significant words in each group using the k-means algorithm and subsequent analysis of the generated clusters.

## KEY WORDS

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clustering, data mining, machine learning, social media analysis

## JEL CODES

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## 1 INTRODUCTION

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Nowadays the importance of social media is growing rapidly. Social media can be defined as a set of online tools used to support communications and social interactions (Fuduric and Mandelli, 2014). According to Kaplan and Haenlein (2014) it is a group of internet-based applications allowing the creation and exchange of user generated content. There are many kinds of social media such as social networks (LinkedIn and Facebook), social sharing services (Instagram and YouTube), blogs, microblogs (Twitter), discussion forums, text messaging and others (Fuduric and Mandelli, 2014).

Social media is a common source of information, especially for young people (Vanzetta et al., 2014). It is a fast and simple way of communicating and sharing information. Therefore, it is used not only by end users but also by companies, universities, etc. The importance of social media is even stronger for universities, because they are trying to attract the young generation, the main social media users. As far as the authors know, the most significant social media communication channel at Czech universities is Facebook. According to Czech Facebook statistics in Q1 2017, more than 4.8 million people accessed

Facebook every month and more than 3.7 million people every day (Newsfeed, 2017).

The strength of Facebook is based on building a community of members for personal and general use, while LinkedIn for instance is designed to get in touch with the business community (Penni, 2017) and to help employers to find talented candidates. The main activity on Facebook is the passive consumption of new updates (most of them positive) and one of the aims of Facebook is keeping users updated with a variety of posts (Wise et al., 2010). Several studies have examined the psychological effects of social media usage and people's behaviour while browsing Facebook webpages. Browsing social media (such as Facebook) can cause positive and negative feelings, but positive emotions are more prevalent (Lin and Utz, 2015). In addition, happiness can spread among users through new posted updates (Coviello et al., 2014). These facts seem to be the reasons for the daily consumption of the Facebook content and the motivation to return soon.

According to the text above it is logical that social media (and especially Facebook) are being used for a variety of research due to the amount of available data. Psychologists often use it to study personalities and individual differences. For instance, Marshall et

al. (2015) found that extraverts update their social activities and narcissists their achievements, diet and exercise more frequently.

Nowadays the amount of available data is so enormous that it has already outstripped the possibility of manual analysis. However, computers are becoming more powerful. The set of principles that guide and support the extraction of information from data is called data science and the actual extraction of information from data using technologies that incorporate these principles is called data mining (Provost and Fawcett, 2013). One of the parts of data mining focused on text is called text mining. Text mining includes many techniques, such as summarisation, categorisation of information or text, topic detection, text clustering, development and formulation of general taxonomies, etc. (Hashimi et al., 2015). Because of the huge content of text data, Facebook seems to be an ideal source for text mining.

In this study, we examined Facebook data published by Czech universities and tried to find out if it is possible to analyse short Czech social network text messages posted by universities with machine learning algorithms and if there are any topics that universities are commonly writing about.

## 2 METHODOLOGY AND DATA

Abualigah et al. (2017) mentioned that the text document should be transformed before the application of analysis techniques. Commonly used preprocessing technics include stemming, case folding, tokenising and removing stopwords (Uysal and Gunal, 2014). The transformation goal is to get a common word form (Dolamic and Savoy, 2009) so that different word forms could be processed as the same word. In the information retrieval task, stemming often leads to an efficiency improvement (Dolamic and Savoy, 2009). Such transformation processes are often language dependent.

As Uysal and Gunal (2014) mentioned, text preprocessing is usually followed by the creation of the vector space model. This model is the common form for describing textual documents in a structured way. In the vector space model, document representation is multidimensional and each document has weighted values representing the document terms. Although social networks contain mostly short messages, the

number of extracted features is usually high. A high-dimensional space with non-informative attributes often causes a lower quality of results (Abualigah et al., 2017).

The feature space created through text preprocessing is high-dimensional and thus complex for computations. Dimensionality reduction techniques reduce the space to a lower-dimensional one (Abualigah et al., 2017) and thus reduce computation time. Latent semantic analysis (known as LSA) is a text mining technique that uses the singular-value decomposition method for projecting source data to a new  $k$ -dimensional space. The difficult part is determining the  $k$  value representing the number of dimensions in a new space. If the  $k$  value is small, the important information might be lost. If  $k$  is too high, a lot of persistent noise threatens the results (Kwon et al., 2017). This process leads to the creation of a new vector space model with  $k$  new features that can be used for further analysis.



Clustering is an unsupervised data mining approach focused on discovering patterns. In general, it groups data together according to their similarities (Hasanzadeh-Mofrad and Rezvanian, 2017; Zahra et al., 2015). Two main types of clustering can be distinguished: partitioning and hierarchical. Hierarchical clustering creates a hierarchical structure (i.e., a cluster tree), which is cut into clusters. Flat clustering creates only a single level of clusters without their mutual dependency (Mur et al., 2016). From another perspective, clustering methods can be classified as hard, where each document is assigned exactly to one cluster, and soft clustering, with document memberships related to other clusters. The typical clustering algorithm is k-means, one of the mostly used partitioning clustering approaches (Zahra et al., 2015). K-means divides data into groups according to their similarities to cluster centres (Subbalakshmi et al., 2015). It is a centroid based algorithm, where each cluster centre is calculated as the mean value of the cluster members. A special initial part has the k-means++ algorithm, where the clusters are initialised over the whole dataset. Another version is known as k-medians, where median values are used (Hasanzadeh-Mofrad and Rezvanian, 2017). A problematic part is estimating the number of clusters that the algorithm requires before data processing (Subbalakshmi et al., 2015).

Many methods can be used for the decision on the number of clusters (the elbow method, cross validation, etc.). One of the methods estimates the correct number of clusters via experiments and examining the Silhouette cluster validity index. This coefficient ranges from  $-1$  to  $1$  for each clustered object. A higher value means that a document was correctly assigned to a cluster. If value is closer to  $-1$ , the choice of a different cluster is better. For the measurement of clustering correctness the average index for all clustered data is calculated (Subbalakshmi et al., 2015).

### 3 RESULTS

In the experiments, the Czech universities' Facebook statuses were processed. The data was downloaded via the Facebook GraphAPI, preprocessed using the techniques from Table 1 and analysed with standard methods slightly adapted to the Czech

## 2.1 Experimental Data

The researched data was published by Czech public universities on their Facebook pages.

Tab. 1: Preprocessing techniques

	Test input	Test output
Removing diacritics	ěščřžýáíé	escrZyaie
Removing numbers	Abc132Abc	AbcAbc
Transformation to lowercase	aBcAbc	abcabc
URL simplification	text www.address.com	text http
Removing special symbols	a#%-b*{}c	abc
Removing multiple spaces	a    b cd	a b cd

The list of universities was obtained from the Czech Statistical Office (Český statistický úřad, 2015) and for each school the relevant institutes were manually selected. In this way, 26 universities and 155 faculties or other school institutes based on the university structure were extracted. For 26 schools and for 133 faculties or school institutes their Facebook sites were found. The textual content from universities' sites was downloaded via the Facebook Graph API and the data was stored to a PostgreSQL database. The whole process of data extraction and storing was managed by a Python script written for this project.

164,538 textual statuses published by universities before 5 August 2017 were downloaded as the main data source for the experiments. The text was mostly in the Czech language as the native language in the Czech Republic, but a small part of the texts was in English.

The authors applied a trivial technique for data preparation as described in Table 1. For each technique, an example of input and the output of the text transformation are presented.

language. After the modification of a stopwords list, the language and its structure were not important for the given experiments so common implementation of the techniques, like the creation of a vector space model with TF-IDF values, was used. By



removing the stopwords and the terms with a minimal term frequency of less than 20 words, the set of attributes (words) was reduced to the 17,562 most significant ones. This new high-dimensional space was not sufficient for the computations so a dimension reduction algorithm was applied. With the Latent Semantic Analysis followed by normalisation, 100 new features were extracted. The computational efficiency improvement was significant and the Silhouette cluster validity index improved as described in Table 2.

Tab. 2: The Silhouette cluster validity index difference before and after the Latent Semantic Analysis application

Clusters	All text features	100 features after LSA
20	0.012	0.070
40	0.016	0.098
60	0.007	0.111
80	0.010	0.123

Repeating the clustering algorithm k-means++ with different cluster number configurations led to the discovery of 80 clusters as the most representative value for dividing the document collection into groups. In Figure 1, significant Silhouette cluster validity index improvements are not visible from 80 clusters. Little variation is caused by Silhouette cluster validity index testing on a sample of 20,000 randomly selected documents which speeded up the computations.

80 different clusters were represented by 80 unique k-means centroids. When a centroid's TF-IDF value for a term is higher, the term is more typical for a given cluster.

Due to a higher number of clusters, only some of them are presented in Table 3 and for each of them the terms with their TF-IDF values are mentioned. The document frequency characteristics in each cluster were examined. The median value was 1620.50, the arithmetic average value 1735.78 and the standard deviation 1037.50. Example values are included in Table 4.

From the clusters in Table 3 some significant groups are visible. An interesting but anticipated cluster is a group of English texts, where the most significant words were typical English stopwords, i.e., articles, conjunctions, and prepositions. The rest of the data was mostly in the Czech language. Although the texts were from different universities, they shared

some common topics. For example, the promotion of some key events, such as the European conference Gaudeamus, open days invitations, job offers, or just informing about universities' and students' successes. More than one group had among the most significant words academic titles, which are typical for groups such as lecture invitations or topics about academic employees.

The documents in each cluster were examined too. These documents differed in terms of their position relative to the centroid which describes the clusters in a general way. If a document is closer, the cluster is more representative for them. For the first and second clusters from Table 3, a few typical documents are presented in Table 4.

Tab. 3: Demonstrative lists of extracted centroids with the most significant terms

1496	soutez, nejlepsi, souteze, http, studentska, soutezi, student, ceny, pozor
1537	pracovni, moznost, hleda, nabizi, studentum, praci, spolecnosti, chcete, nabidka, pozice
2356	the, of, and, in, for, university, is, you, will, from
1440	rizeni, prijimaciho, vyberove, http, kolo, studijni, prijimaci, vyberoveho, prihlasek, naleznete
2223	zveme, prednasku, srdecne, zve, prednaska, uskutecni, zvani, hodin, kona, zajimavou
1483	najdete, http, informace, webu, muzete, podrobnosti, pef, chcete, dalsi, fotografii
1920	gratulujeme, soutezi, http, cenu, souteze, fakulty, oceneni, nejlepsi, student, uspechu
2348	vernissaz, vystava, vystavy, galerie, galerii, vystavu, fotografie, hodin, fotografii, atelieru
1627	prejeme, hodne, stesti, uspechu, studentum, krasne, obdobi, mnoho, noveho, vikend
1129	veletrhu, veletrh, gaudeamus, prilezitosti, pracovnich, vzdavani, brne, stanek, kona, pomaturitniho
1979	vice, informaci, naleznete, http, odkazu, info, hleda, webu, akci, najdete
1316	erasmus, programu, zahranici, ramci, studijni, http, rizeni, zahranicni, pobyty, staze
2082	otevrenych, dveri, den, dne, dny, studium, ledna, http, fakulte, fakulty
1935	ing, ph, doc, csc, mgr, prof, jan, katedry, jiri, cr

From the example clusters in Table 3 and Table 4 the absence of stemming is recognisable. For example, words like *soutez*, *souteze*, *soutezi* or *studentska*, *student* have the same meaning but are in different word forms.

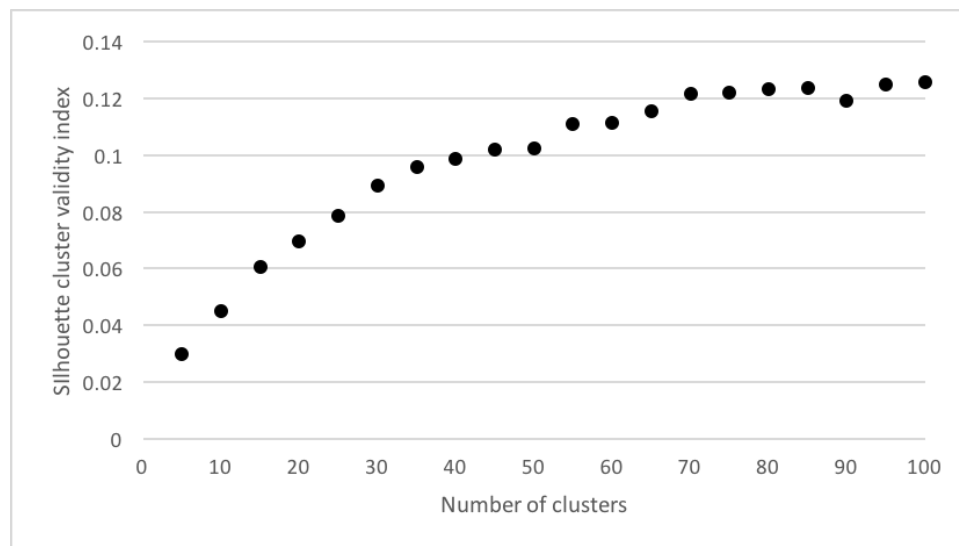


Fig. 1: The Silhouette cluster validity index for different numbers of clusters

Tab. 4: Typical document examples

Cluster	Documents (Facebook statuses)
1	[SOUTĚŽ S FRMS] Zítra končí soutěž s CK KUDRNA! Dali jste už lajk té nejlepší fotce? Soutěž o cenu Josefa Vavrouška – Liské hodnoty a problémy rozvoje civilizace a to v kategoriích: a) studentská b) vědecko-výzkumná
2	Chceš si zkusit Javu v praxi? Společnost IBA nabízí placenou stáž na pozici Java developer. Získáš zkušenosti z komerční sféry a rozšíříš si stávající znalosti. Hledáš brigádu na léto? Společnost PORR a.s. nabízí volnou pozici Asistenta stavbyvedoucího s možností domluvy absolvování odborné praxe.

## 4 DISCUSSION AND CONCLUSIONS

The paper describes the process of analysing the textual content from Czech universities' social network sites. As Žižka et al. (2012) mentioned, the k-means algorithm is fast and usually provides sufficient results. Using this algorithm, groups of documents sharing common topics were identified despite the fact that the universities differ in the fields of study. Typical groups were, for example, key events, open day invitations or job offers. In this research, the commonly used analysis techniques were applied to Czech universities' social network data. These techniques allowed the processing short messages with some limitations.

For cluster evaluation and the decision about the correct number of clusters the Silhouette cluster validity index was calculated. However, the value of the index did not reach over 0.15. As Subbalakshmi et al. (2015) used the Silhouette cluster validity index for a different problem they achieved in some cases much larger values. However, the textual data used

in this paper were language- and structure-specific as it came from the Czech universities' Facebook sites.

Another anticipated problem arises here – all universities do not share the same fields of study and some social network communication is field dependent. In the future, separating the universities and faculties according to the field of interest before analysing and processing each group separately can increase the chance of extracting more detailed branch-oriented results.

Despite the smaller Silhouette cluster validity index, the 80 clusters discovered differed enough for it to be possible to reveal and interpret the basic structures in the data. Different numbers of documents were assigned to clusters, but uniformly distributed topics cannot be expected. Some clusters had the same words in different forms among the most significant terms, which can be eliminated with the appropriate stemming method application and as Dolamic and Savoy (2009) mentioned, this

can improve the results in information retrieval tasks. After a deep examination of all 80 clusters some similar clusters, which in the authors' opinion could be grouped together due to their similarity, were identified. An important fact is that for one document not just one cluster must be suitable as a document can carry more than one topic. Future

research might therefore deal with Fuzzy C-means clustering, as mentioned by Zahra et al. (2015).

As this paper focused on discovering significant groups of documents, future research discovering user reactions connected with specific clusters could provide some recommendations for university social network communication.

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# WEB PAGE CREDIBILITY IN THE FIELD OF E-COMMERCE

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## ABSTRACT

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The research deals with the identification of the influence of certain website elements on customers' perceptions of credibility in the field of e-commerce. One of the objectives is to find out if there is any difference between credibility among small and big e-shops, or if social networks and reviews along with online chat can have an impact on web credibility. Three research methods (eye-tracking, in-depth interviews and questionnaires) were used to determine the influence of credibility. In total 30 respondents took part in this research.

## KEY WORDS

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credibility, web, e-shop, eye tracking, user experience, e-commerce

## 1 INTRODUCTION

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### 1.1 Internet Marketing

The beginning of real internet marketing can be observed already in the 1990s. The first advertisement on the internet appeared around the year 1994 and this was the milestone when marketing workers started to comprehend that the internet had potential. Initially access to the internet was very limited. However the technologies were getting better and more accessible for the general public. Companies began to present themselves on their websites and classical newspapers and booklets were being replaced by websites. Moreover even products and goods were being sold on the internet through companies' websites. At the same time, multimedia along with banners and newsletters were becoming highly efficient (Janouch, 2014).

The internet has a dominant position nowadays and plays a crucial role in companies' existence. It resulted into the fact that many firms and companies worldwide gave up presenting themselves in the offline environment. Using the internet for your marketing (e-commerce) offers many advantages. The results are very good and quick to measure and

analyse afterwards. We can address and approach customers with our offer, which can be easily and constantly adapted and changed (Janouch, 2010). Another remarkable advantage is connected with the ease of purchasing certain products in the online environment, as mentioned by Philip Kotler – “customers do not have to lose their precious time in jams, looking for a parking place or get lost among dozens of shelves.” Nowadays people can examine products in catalogues and newsletters sent to their e-mail address, compare prices and simply see all the company's offer. Marketers are able to personalise offers according to their customers' special needs and to advertise afterwards by their means of communication (Kotler, 2007).

E-commerce has recently become very effective and is developing rapidly; companies are spending huge amounts of money on marketing research and advertising. The total amount of online advertising reached 14.6 billion CZK according to the professional organisation SPIR. Companies are also investing in video-advertising, catalogues and mobile-advertising (MediaGuru, 2015).

## 1.2 User Experience

User Experience (UX) is part of cognitive science dealing with human perception. This category also includes for example linguistics and psychology. User experience can be freely translated as user's enjoyment. Definitions of this field by various authors are very similar to each other. UX is a qualitative, subjective, dynamic and holistic science (Nielsen, Norman Group, 2016). "*UX is a summary of feelings and thoughts, which arise in connection with using products or services.*" (Kraft, 2012). The aim of UX is to optimise the web in a way that leads to the user's enjoyment as much as possible. This term is actually connected with any product or service. The Czech UX association divides User Experience into sub-categories:

- research
- Interactive design
- Information architecture
- Visual design (UX association, 2015).

## 1.3 The Credibility of Websites

Credibility itself is created by many dimensions and layers that intermingle. It is worth mentioning that the perception of website credibility is a very subjective issue. The definition of credibility evaluation is viewed as a complex of expertise and trustworthiness by most researchers. Trustworthiness includes the origins of resources and can be defined as intended, true and unbiased. Whereas expertise is referred to as perceived knowledge of the resource and can be described as reliable, informative and competent. Consumers combine these two perceptions and based on that the final evaluation of real credibility is made (Fogg, 2003). Rieh and Danielson (2007) point out the existence of three different levels in measuring online credibility: 1) Web credibility evaluation as a type of medium. 2) Credibility evaluation of a concrete website. 3) Evaluation of the web's informative credibility.

Dr Brent Coker's (2007) and some other authors' opinions are identical. An increase in online credibility to customers is to some extent connected with the visual attractiveness of websites. Website credibility is compared with the attractiveness of people. It has been proven that the more attractive people are, the greater the credibility they have. Authors are trying to convert this metaphor into the online environment.

### 1.3.1 Factors in credibility evaluation

B. J. Fogg divides web credibility evaluation into four essential types: *Presumed credibility* is based on consumers' cognitive ideas that are created on the basis of general assumptions. A website domain can be mentioned as an example. *Reputed credibility* is the second type and is evaluated on the basis of third party information and other assumptions. It includes references from friends, a well-known brand or an organisation. *Surface credibility* is cognitive- and feeling-based credibility that is formed by the user while briefly scanning the website. This type of web credibility evaluation covers for example visual web design or an advertisement placed on pages. *Experienced credibility* refers to verified credibility, which is being created on the basis of previous experience. Once the user has a positive experience with a concrete website, he/she is rather likely to return to it (Fogg, 2003).

B. J. Fogg came up with guidelines based on research to increase credibility in the online environment:

1. *Ease of verifying information* – an increase in credibility can also be partly achieved by providing support from third parties (citations or references).
2. *Existing organisation* – the easiest way is to mention the company address. Photos taken in the office can be a nice example.
3. *Pointing to an organisation's expertise* – it is suitable to provide information about employees and their qualifications.
4. *Easy to find contact data* – visible publication of phone numbers, e-mail or postal address.
5. *Professional design* – appropriately adapted to a certain purpose. People evaluate websites quickly straight from seeing the visual design.
6. *Easy web accessibility and usability* – the easier it is to handle the website, the more easily it gains credibility.
7. *Web content updating* – constantly publishing new content
8. *Avoiding commercial content* – if possible it is better to avoid placing advertisements on websites. If it is not possible, commercial content must be visually different from other content. It is recommended to avoid placing pop-up windows. Those result in loss of credibility and are seen as annoying and useless in customers' eyes.



9. *Mistake elimination* – typographic and non-functional links influence credibility more than we imagine.

## 1.4 Web Design

Based on website credibility research, the appearance of the website is one of the most important aspects of credibility that play a role in gaining users' confidence. Website appearance is also connected with customer's behaviour. The decision to stay on a certain site or to leave it is made within the very first seconds. Therefore it is crucial to work on pages' attractiveness. There is no need to have the best and the most professional design, but there should be elements that can attract attention. It should be clear at first sight what the visited website is about and not require visitors to think about it for a long time (Krug, 2010).

### 1.4.1 Web design elements

We can use various techniques for drawing and directing attention when determining the design elements position based on findings from cognitive psychology. The positioning of particular elements should refer to their level of importance. Creating a strong and balanced visual hierarchy is one of the essential tasks of website design. Visual hierarchy can be achieved by visual interconnection (unity) or level of emphasis. We can get numerous different layouts depending on usage of elements (Dawson, 2012). According to Weinschenk (2012), it is suitable to use

patterns often, because people are looking for them automatically. If we want people to recognise some objects, he advises representing them by geometric lineation. As a result, it is easier to recognise a building structure, which leads to better and quicker remembering.

## 1.5 Eye-tracking

Eye-tracking technology is an identification process for where and how people observe. This modern technology has developed since it was invented and used for scientific purposes and refers to the field of neuromarketing. Eye-tracking technology can be placed for instance inside the computer's monitor and specialised software tracks movements of the eyes (Nielsen, Pernice, 2010).

Neuromarketing is a way to make access to marketing even more effective. It contributes to improvement of gaining knowledge about customers (Georges, 2013). According to marketing specialists, marketers should not always follow what respondents say during qualitative and quantitative research. Because in reality their behaviour may be different to what they claimed. Women especially are constantly calculating what is better for them in certain situations (Vysekalová, 2011).

Using eye-tracking technology has become of interest in the field of User experience. This scientific tool is used to evaluate and improve website design or product packaging, because it catches behaviour that is hard to control (Bojko, 2013).

## 2 MATERIALS AND METHODS

The research itself was implemented by three research methods. The first of these, eye tracking research, was conducted in the ET laboratory of the Business and Economics Faculty at Mendel University. Respondents were young people, so called Millennials or Generation Y (age 22–31). This generation is also known as the internet-generation. One-page websites focused on cell phone accessories were given to respondents to analyse. In total, three key elements (reviews, social networks and on-line chat) were the elements to be researched with the respect to one-site e-shops. According to the team of researchers, these elements play an important role when evaluating website credibility. Furthermore, their presence can

be easily observed with eye-tracking technology. After eye tracking research was completed, an in-depth interview could start with every single respondent. This qualitative method was used in order to gain deeper insights and impressions on given issues. Respondents were asked during interview to evaluate two sites (e-shops) with emotional cards (39). The research was completed by a third research method – questionnaires – where respondents were asked to evaluate concrete websites (e-shops) and their elements from the perspective of their effects on trust. The questionnaires were created with Google forms and spread on social networks.

In total, 34 respondents took part in this research, where 7 of them were men and 27 women. However, four respondents had to be eliminated because of high deviation ( $> 0.5\%$ ) measured within calibration of their pupils. This could have been caused by wearing dioptric glasses or contact lenses. The absence of those four respondents caused a decrease in total respondents by 11.76%, which is within the expected

norm according to most authors. As mentioned the participants consisted of young people of the age of 22–31, so called Millennials, studying at Mendel University and living in the South Moravian region. Questionnaires were answered by 155 respondents from Generation Y, where 102 were women and 53 were men.

### 3 RESEARCH ASSUMPTIONS

The main research assumptions were set up according to theoretical findings from a literature review for chosen elements.

$H_0$ : Online chat does not appear more trustworthy than offline chat

$H_0$ : Recommendations from an influencer are not more trustworthy than from a regular user

$H_0$ : A social feed news panel does not look more trustworthy than social network icons

$H_0$ : There is no difference between the credibility of large and small e-shops

$H_0$ : An influencing review does not attract more attention than a regular user

$H_0$ : The products presented in the open window do not attract more attention than the products in the graphic grid

### 4 RESULTS

#### 4.1 E-shop Lens for Mobile Phones

The main elements on this website are perceptions of online chat, social feeds and the CTA (call to action) button on the initial slider. Respondents were interested by the CTA button and the title above this button. The CTA button is also the first element of KPI (key performance indicators) respondents have paid attention to on the website. You can see the output from the heat map below. In the review section, attention was paid to the faces, with the most respondents focusing on the first review. The results of the scan paths are that the users are moving over the page according to the key points, which are indicative headings. There were 11 elements which were taken into consideration.

According to results, respondents always paid attention to the first element of each section of the page. Thus, it is useful to allocate the most important and most attractive information in order from left to right according to its relevance.

The half of the respondents reported that they do not use online chat, but they perceive it as a credible element and means of communication.

#### 4.2 Lens for Mobile Phone Product Detail

The researched elements in product detail were located in the feed with authentic photography from the social network Instagram and rankings and a number of reviews of the product. The aim was to find if Generation Y finds Instagram's feed useful. This website is displayed in the picture below. The results of ET and heat maps for the picture below suggest that respondents looked at the text on the right side of the page, and the images were perceptible. The most popular pictures in the news feed were pictures with a face displayed. Text represented in points was more appealing for respondents than text in sentences. From the detailed statistics of KPI, where 12 places of interest were selected, we can say that respondents paid attention most to price.

The Instagram feed had a great impact on the attention of respondents, and most respondents also found it positive for shopping decisions. The advantage is that customers see authentic product photos and their practical use. Feeds on social platforms directly from users (such as reviews) were more



Fig. 1: Heat Map

important for most respondents, followed by how specifically the company communicates on the social network. This means that reviews from customers were more important than content presented on the company's social network site.

### 4.3 E-shop Magnetic Car Holders

This page is set up as a typical one-page e-shop. One page is all about the product, product photos and the order form. The main goal of the research on this site is to find out what kind of references Generation Y perceives as most trustworthy and most helpful in terms of purchasing decisions, whether they are influenced by reviews from real customers or influencers.

The heat map analysis picture below shows that the CTA button caught attention on this page. In the picture, people focused on the top of the model silhouette. Attention was captured by the listing of texts about experience with the product. This finding is in line with the recommendations of the Nielsen Norman group (2012), which drew attention to the greater interest in text in points than in paragraphs. Rating stars are also areas that participants noticed. The social networking link was registered by 21 respondents. Of these, 13 of them returned and the

time spent on this element was 515.1 ms, or in relative terms 0.6%. In lower part of the website there was also a charity logo but respondents did not pay too much attention to this as was anticipated.

An announcement with a charitable purpose was not expected on this page. It had a low level of attention. Therefore, it is advisable to communicate it in a form that has a clear message for viewers. This can be seen as a competitive advantage in the choice among two similar products in the same price category.

### 4.4 Results of Questionnaires

The main purpose of this section is to understand the consumer behaviour of Generation Y in terms of e-commerce credibility. 155 responses were used to evaluate the questionnaire survey.

Three quarters of the surveyed respondents belonging to Generation Y make purchases on the internet. 63% of respondents answered positively about e-commerce credibility. Specifically 72% of respondents said they prefer to buy goods at large and established e-shops such as Alza.cz, Mall.cz and Datart.cz. This confirms the information from the interviews. The respondents perceive big e-shops as trustworthy and prefer to pick up goods in person and not to pay for



Fig. 2: Heat Map

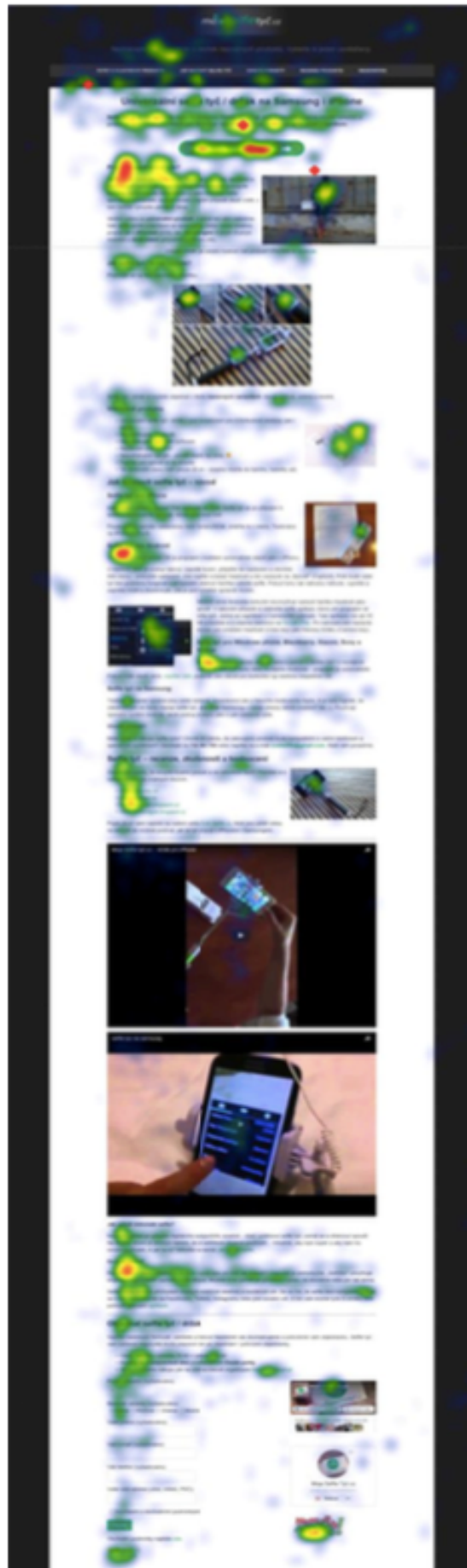


Fig. 3: Heat Map



postage. They further believe that these e-shops will be subject to a quick and easy purchase.

### Reviews

One of the elements explored through the questionnaires is e-shop reviews. The survey found that for the majority of respondents, reviews are important during purchasing decisions. More than 75% of respondents are more likely to search for reviews than in the e-shop itself.

### Online Chat

Respondents were asked about using online chat and most of them said they did not use it. However, the presence of online chat is considered a trustworthy element of the e-shop.

### Social Networks

More than half of the respondents did not pay attention to social network icons and also half of respondents said that before a buying decision they do not follow the content of the social network of the e-shop. More than 70% of respondents said they did not become followers after purchasing the product on social networks. From the point of view of perceiving and increasing the trust through social networks on e-shops, there was no clear evidence/opinion from the

results. For half of the respondents, social networks have a positive impact, and moreover, the higher the value of the responses is, the bigger the impact on the perception of trust social networks have.

For most of the respondents, an activity and content on a social network was not important for the credibility of the website. On the other hand, reviews on social networks can affect credibility. Authentic photography can increase the trustworthiness of the website. The assumption regarding users' trust in online chat can be confirmed. The majority of respondents find online chat a credible element of the website.

The following table summarises the verified hypothesis from ET research and from the questionnaire survey.

Tab. 1: Hypothesis

Online chat does not appear more trustworthy than offline chat	Rejected
A social feed news panel does not look more trustworthy than social network icons	Rejected
There is no difference between the credibility of large and small e-shops	Rejected
An influencing review does not attract more attention than a regular user	Allowed
The products presented in the open window do not attract more attention than the products in the graphic grid	Rejected

## 5 DISCUSSION

Three research methods were used to identify the influence of certain website elements on customers' perceptions of website credibility (one page e-shops) that the respondent had never encountered before. In total and after calibration, 30 respondents from Generation Y took part in this research.

Eye-tracking allowed us to gain objective data based on respondents' real reactions to certain elements. In other words, respondents could not lie or improvise as given situations were nearly identical to

real situations. On the other hand, the eye-tracking method was carried out in a laboratory environment. Thus it could lead to less natural respondent behaviour. Also the gender imbalance could have some small impact on results. This imbalance refers to the questionnaires and the in-depth interviews as well. All the research was onto generation Y. Therefore, the results are neither recommended for application to a different target group nor for generalisation due to a lack of a bigger sample of respondents.

## 6 CONCLUSION

The aim of this research was to identify elements of credibility and the credibility itself of one page e-shops in terms of e-commerce. Our target elements were reviews, social networks and online chat.

Findings from the research correspond with studies already realised. Furthermore, respondents' behaviour gained from ET research is identical to studies by Susan Weinschenk (2012).



The impact of perceiving social networks in terms of e-shop credibility is among the main findings. Even though there was not any explicit evidence of respondents' interest in social network activity, e-shops shown in the news feed can increase their credibility. Regarding attracting attention and credibility, and the possibility of sharing activities on social networks, it is suitable to place the news feed from a social network on websites. It is very helpful for Generation Y to include the feed also in the product detail. In general, respondents have greater confidence in bigger e-shops. But when it comes to buying cheaper goods, they find small and one page e-shops to be one of the options. We came to the conclusion that communication via online chat is credible for respondents. However, they do not

use it for some reason. As gained from in-depth interviews they rather prefer formal communication (e-mails). Reviews are very important elements for respondents when it comes to the decision-making process. Negative reviews are considered to be more credible. The most beneficial are objective reviews with an appraisal of pluses and minuses. Research did not prove that a review written by an influencer would have more significant impact on credibility for Generation Y than a review written by a regular user. Lastly, respondents claimed in in-depth interviews that they are attracted more by products in an open window than the products in the graphic grid.

The aim of this research was fulfilled and all questions regarding website credibility in the field of e-commerce were answered.

## 7 ACKNOWLEDGEMENTS

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# THE ROLE OF HUMAN RESOURCES DEVELOPMENT STRATEGY IN ACHIEVING CORPORATE SOCIAL RESPONSIBILITY: AT THE SME LEVEL

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## ABSTRACT

In this era of globalisation characterised by great high scientific and technological development, competition between institutions and companies is becoming more and more intensive in order to survive and achieve profitability, and achieve superiority over competitors. For this reason most companies have started striving for excellence by focusing on the most important resource, human resources, to achieve their economic, social and environmental goals, and then to also achieve social responsibility. This study aims to exam the role of human resources development strategy (training and development, organisational development and career development) in achieving corporate social responsibility at some of SMEs in Iraq, a special questionnaire has been prepared to collect data from a survey and a random sample which consists of (30) SMEs of the surveyed organisations was selected. The study found out HRD strategy effects significantly in achieving CSR (economic, environmental & social) dimensions, for this, it should be dealt in accordance to a strategic perspective, and develop it through many activities such as training and development, career development and organisational development so that it can play its role efficiently and effectively, and contribute to the achievement of specific goals.

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## KEY WORDS

human resource development, training and development, organisational development, career development and corporate social responsibility

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## JEL CODES

M21, M1

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## 1 INTRODUCTION

Human resource managers are well positioned to play an instrumental role in helping their organisation achieve its goals of becoming an economically, socially and environmentally responsible firm – one which reduces its negative and enhances its positive impacts on society and the environment. Further, human resource (HR) professionals in organisations that perceive successful corporate social respon-

sibility (CSR) as a key driver of their financial performance can be influential in realising that objective. Human Resource Management (HRM) and Corporate Social Responsibility (CSR) are two concepts that are becoming increasingly important to company strategies. Indeed, companies are in search of new practices to increase their productivity and their competitive positions. Moreover, HRM

is an indispensable tool for any organisation, and CSR is becoming increasingly crucial for companies' competitiveness (Claire Dupont, 2013).

Economic and financial crises have proved that the absolute freedom of the market economy leads to economic, social and environmental disadvantages. Therefore, concepts such as sustainable development and social responsibility can rebalance the economic, social and environmental aspects and address the gap between financial returns for companies and their duties to various stakeholders (Wahiba, 2011). The HR function plays a vital role in formulating and achieving economic, environmental and social goals while also balancing these objectives with traditional financial performance metrics. The HR function can serve as a partner in determining what is needed or what is possible in formulating corporate values and sustainability strategy. At the same time, HR should play a key role in ensuring that employees implement strategy consistently across the organisation (Elaine Cohen, 2010). Human resource professionals have a key role to play to help a company achieve its CSR objectives. Employee involvement is a critical success factor for CSR performance. Human resource managers have the tools and the opportunity to leverage employee commitment to, and engagement in, the firm's CSR strategy (Strandberg, 2009).

The CSR of firms is increasingly important because the philosophy of this responsibility derives from its flexible and comprehensive character. This allows and encourages any organisation, whatever its size and scope of business, to adopt what it deems appropriate procedures and practices in accordance with its capabilities and material capabilities in response to market realities and requirements (Imad, 2014). However, the success of the firm in its role of responsibility depends mainly on its commitment to three criteria: environmental protection, community support and respect and responsibility to workers and members of society. Human capital development is one of the challenges that firms face in achieving its CSR because the attention to working individuals in terms of increasing their skills and raise their abilities as well as attention to social aspects in the field of work is a key to increase competitiveness and maximise profits of the firms through contributing to developing of the employee's performance, competencies and acquiring them new skills. Therefore, Human resource professionals have a key role to play to help a company achieve its CSR objectives.

Employee involvement is a critical success factor for CSR performance.

## 1.1 Problem of the study

The area of the study can be formulated with the following questions:

1. What is the role of human resources development strategy in achieving corporate social responsibility of SMEs in Iraq?
2. What is the level of human resources development strategy and corporate social responsibility of SMEs in Iraq?
3. What is the role of human resource development strategy in achieving the economic dimension of corporate social responsibility of SMEs in Iraq?
4. What is the role of human resource development strategy in achieving the environmental dimension of corporate social responsibility of SMEs in Iraq?
5. What is the role of human resource development strategy in achieving the social dimension of corporate social responsibility of SMEs in Iraq?

## 1.2 Objectives of the study

1. To identify the human resource development strategy within a new context related to the integration of HR and CSR of SMEs in Iraq.
2. To exam the role of human resources development strategy in achieving corporate social responsibility at some of SMEs in Iraq
3. To highlight the human resource development strategy and its role in firms through its advantages as it is one of the approaches adopted by firms to address rapid environmental changes and to meet the challenges posed by these changes.

## 1.3 Significance of the study

The significance of this research can be addressed by two main aspects: The strategy of human resource development and CSR. The importance of the study lies in the importance of human resources development strategy which is represented as the only way that enterprises can meet the changes in the business environment and achieve survival and profitability. It also highlights the importance of the topic in providing an image of the corporate social responsibility of the SMEs and it extends to the contribution

of the strategy of human resources development in achieving corporate social responsibility.

### 1.4 The study Design/methodology/approach

The study adopted an empirical approach and applied it to a random sample (100) of managers and their assistants and heads of departments of (30) SMEs in Iraq. Data was collected by questionnaire, field visits, personal interviews and some official documents to complete the study data. Also, SPSS was used for data analysis and interpretation.

## 2 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

### 2.1 Human resource development

Until recently it was rarely realised that a firm's human resources and human capital are sources of competitive advantage. Competitiveness cannot be achieved without managing performance and at the same time developing the skills and competence of employees. Performance management potentially makes the most significant contribution to individual and organisational learning and helps to raise organisational efficiency and promote growth (Adhikari, 2010). Firms cannot achieve their goals without human resources, as the main element and core resource for them. Therefore, it is necessary to have an efficient workforce capable of achieving its objectives through the development of human resources in the organisation through activities such as training and learning (Imad, 2014).

Over the past two decades, human resource development has become the fastest growing area of management development, due to the great interest of organisations in the face of intense competition and changes in the business environment. HRD can be defined as the process of developing and/or unleashing human expertise through organisation development and personnel training and development for the purposes of improving performance (Swanson R., 2001; Naima, 2008). It is one of the basic elements in moving, refining, maintaining and developing human abilities and competencies in its scientific, practical, technical and behavioural aspects. It is therefore an educational tool that provides people

### 1.5 Hypotheses of the study

The main hypotheses of the study can be formulated as follows:

$H_1$ : There is a positive significant relationship between human resources development strategy and the corporate social responsibility dimensions (economic, environmental and social) in the surveyed organisations.

$H_2$ : The human resources development strategy has significant effects on corporate social responsibility dimensions (economic, environmental and social) in the surveyed organisations.

with knowledge, information, theories, principles, values or philosophies that increase their work and production capacity. A set of systematic and planned activities designed by an organisation to provide its members, individuals and groups, with the necessary skills, knowledge, and capabilities to meet current and future job demands.

There is an emerging consensus among human resource development (HRD) academics that HRD can play an important role in promoting corporate social responsibility (CSR), corporate sustainability (CS) and business ethics, and that these three areas are closely interrelated parts of the same system (Ardichvili, 2011). The HRD function can serve as a partner in determining what is needed or what is possible in formulating corporate values and sustainability strategy. At the same time HRD should play a key role in ensuring that employees implement the strategy consistently across the organisation. Sustainable human resource management (HRM) can be defined as using the tools of HR to create work that has the trust, values, skills and motivation to achieve a profitable triple bottom line (Cohen, Taylor & Muller-Camen, 2010).

For the purposes of this study Strategic HRD is defined as a systematic process of developing strategic human resources (including talent development, training/development, organisation development, performance development, and career development) in order to enable an organisation to achieve its strategic objectives.



## 2.2 Human Resource Development Components

Although everyone does not agree about the definitive boundaries of HRD within HR, most HRD scholars agree on the following as the three central components of HRD: organisation development, career development and training and development (Chalofsky, 1989; Jacobs, 2003, Burke & Hutchins, 2008, Thomas, Ragaven et al, 2016).

### 2.2.1 Organisation Development

Swanson and Holton (2001) suggest that there are many different views of OD, since the contexts of the needs for system change vary greatly across different organisations. They state that OD is essentially a method for defining and solving problems related to the organisation, and they introduce two popular models that are seen in many OD process models: action research and organisation development for performance system (ODPS). (Cummings & Worley, 2005). On the other hand, ODPS involves implementing a process of planned, systematic change to develop human expertise for improving individual, group, process and organisation performance: (a) analyse and contract, (b) diagnose and generate feedback, (c) plan, design, and develop, (d) implement, and (e) evaluate and institutionalise (Lynham, 2000). We can define organisation development as a systematic process of implementing organisation-wide change and development interventions in order to enable an organisation to achieve its strategic objectives.

### 2.2.2 Training and Development

Training and development is one of the important HRD functions in a constantly changing global economic environment, in which every individual in an organisation has an opportunity to develop competencies accordingly. Training is described as the extension of formalised programmes to develop knowledge, skills and abilities, and development is preparing for future responsibilities while increasing the capacity to perform at a current job (Evans & Davis, 2005). Jacobs & Washington (2003) indicate that training and development refers to an integrated set of planned programs, provided over a period of time, to help assure that all individuals have the competence necessary to perform their fullest potential in support of the organisation's goals. Also, the researches can define the training and development is a systematic process of providing

training and development of employees in order to enable organisation to achieve its strategic objectives.

### 2.2.3 Career Development

Chalofsky (1989) states that career development services have emerged as part of HRD functions, beginning in the early seventies. In this era, firms sent recruiting counsellors to schools in order to provide careers guidance and counselling to students. At the same time, they provided their employees with advice on how to pursue their career goals within the organisation. Career development involves the person's creation of a career pattern, decision-making style, integration of life roles, value expression and life-role self-concepts (niles & Harris-Bowlsbey, 2002). Career development interventions assist in building a partnership between the organisation and its employees, enriching their knowledge, skills and abilities by improving individual competencies, allowing simultaneous enhancement the organisational effectiveness (Gilley et al., 2002). We define career development as an ongoing process by which individuals progress through a series of changes until they achieve their personal level of maximum achievement

## 2.3 Corporate Social Responsibility

The new trends adopted by sustainable development in the achievement of social justice and the promotion of human well-being as well as the preservation of human rights have led to growing social responsibility of economic institutions through a voluntary and moral commitment towards the society in which it operates. The emergence of the term sustainable development has led to the emergence of new ideas and terminology on the concept of corporate social responsibility, which have changed over time as a result (Imad, 2014). The definitions of CSR have varied, there are many initiatives and events which depend on the nature of the work, the scope of organisational work and the financial and human capacities of the institution.

D'Anato, Henderson & Florence (2009) see social responsibility as the institution's commitment to the society in which it operates. Al-Ghalibi & Al-Ameri (2005) see the social responsibility as a representation of the expectations of society for the initiatives of business organisations in the area of responsibility borne by business organisations towards society



beyond the minimum level of compliance with the law in such a way that they do not impair a business organisation in performing its basic functions in order to obtain an adequate return on its investments.

## 2.4 Corporate Social Reasonability Dimensions

CSR has dimensions that can be determined or measured though some scholars and researchers consider that the dimensions of social responsibility are almost the same as the dimensions of sustainable development, which are economic, social and environmental.

### 2.4.1 Economic Dimension

The economic dimension concerning the processes for improving and changing production patterns (use of clean energies, introduction of improved technology, selection, financing and improvement of industrial techniques in the field of resource utilisation). In addition to the activities related to consumption (the sustainable management of natural resources), as well as the strategies and directions of economic development and taking into account environmental trends in the long term (Ibtissem, 2006).

### 2.4.2 Environmental Dimension

The environmental dimension revolves around the conservation of economic, environmental and climatic resources, the protection of the environment and rational exploitation of the possibilities available within specific priorities that ensure the needs of the present without affecting the abilities of subsequent generations to meet their needs (Saleh, 2008).

### 2.4.3 Social Dimension

It is a natural human being right to live in a clean and healthy environment and a right to practice all activities while guaranteeing their right to a fair share of natural resources, environmental and social services, invest them to serve their basic needs (shelter, food, clothing and air) as well as the complementary needs of improving their standard of living (work, recreation and fuel) and without diminishing opportunities for future generations (Nour El Din & Borghedh, 2016).

### 2.4.4 The role of human resource development strategy in achieving corporate social responsibility

The organisations strive to achieve their social responsibility to improve their reputation in the society and strengthening of their brand among customers, employees positively. (Imad, 2014) indicates that in order to achieve corporate social responsibility and its economic, environmental and social dimensions through HRD strategy which support and develop a framework that enables organisations to achieve this goal, where HRD strategies such as training and development, organisational development and career development are working to increase the knowledge, skills and abilities of employees and raise their experience and improve their competence in terms of achieving corporate social responsibility. CiPd (2013) indicates the great majority (81%) of HR managers see their contribution to the corporate responsibility agenda as vital and a similar proportion (78%) believe that they make a valuable contribution to driving and promoting it in practice.

Human resource development plays a key role in the success of institutions, whether economically, socially or environmentally. In the economic perspective where human resources development strategy contributes to increasing productivity, achieving sustainable competitive advantage and higher financial performance. HRM can be critical to employees' engagement, motivation and creativity in finding new ways to reduce inputs, design eco-friendly products and increase quality (Elaine Cohen, 2010). Environmentally, the human resource development strategy has an effective role in achieving the environmental dimension of social responsibility through environmental training and development, environmental management and policies of human resources rehabilitation. Socially, human resource development strategy works on design training programmes in terms of occupational health and safety procedures, raising awareness of the nature of risks and promoting of continuous learning culture within the institution. It can help a company address wider social problems that affect its external rights, safety practices, labour standards, performance development, diversity, employee compensation and more.

### 3 METHODOLOGY AND DATA

To achieve the study objectives and test the hypotheses, the study adopted an empirical approach and applied it to a random sample (100) of managers and their assistants and heads of departments of 30 SMEs in Iraq. Data was collected by questionnaire, field visits, personal interviews and some official documents to complete the study data. This study was based on a questionnaire as a major data collection tool, which included three major parts. The first part is related to the personal characteristics of the study sample, the second part is related to the independent variable which is HRDS and the third part is focused on the dependent variable CSR. The questionnaires were distributed to the sample and 90 questionnaires were returned, equivalent to 90%. In order to analyse the data profile, we used descriptive statistics. The data in Table 1 shows that service and manufacturing industry prevails in the sample over retail (92%), and those local companies are also more representative (80%). The analysis was carried out using the Statistical Package for Social Sciences (SPSS IBM Version 23). The summary of results was presented using frequency distribution and percentages, which was used to determine the proportion of respondents choosing the

various responses. Descriptive statistics (standard deviation, mean and relative importance) were used to identify the level of HRDS variables (Training & Development strategy and Learning strategy) and CSR variables (economic, environmental and social) in the surveyed SMEs. Pearson Correlation was used to identify the causal relationship with dependent and independent variables and ANOVA analysis was used to identify the effect of the independent variable which is HRDS on the dependent variable CSR.

Tab. 1: The personal characteristics of the study sample

Nature of industry	No. of enterprises	Sex		Total
		M	F	
Textiles	2	5	8	13
Furniture	3	10	1	11
Food	4	7	3	10
Telecom	2	8	4	12
Chemical	4	8	2	10
Petrochemical	3	10	–	10
Agricultural	4	9	2	11
Hotel & tourists	4	8	3	11
Banking	4	7	5	12
Total	30	72	28	100

### 4 RESULTS OF ANALYSING STUDY VARIABLES

#### 4.1 Human Resource Development

Table 2 shows the results of a descriptive test of human resource development, where the mean of human resource development is 3.265, which is more than the standard mean 3 and the standard deviation is (0.586), which mean that the individual's answers are located in the third box on the Likert scale. This leads to the conclusion that there is a good level of HRD in surveyed SMEs, the training & development strategy constitutes the highest relative importance 55% with a mean of 3.319 and then learning strategy 45% with a mean of 3.211.

Tab. 2: The results of the descriptive test of human resource development

HRD Variables	Mean	SD	Relative importance
Training & Development Strategy	3.319	0.611	55%
Learning Strategy	3.211	0.562	45%
Total	3.265	0.586	100%

Tab. 3: The results of descriptive test of CSR

CSR Variables	Mean	SD	Relative importance
Economic dimension	3.733	0.652	38%
Environmental dimension	3.245	0.864	30%
Social dimension	3.451	0.631	32%
Total	3.476	0.715	100%

## 4.2 Corporate Social Responsibility

Table 3 presents the responses of the sample of the study to the questions concerning with the level of CSR in surveyed enterprises, the respondents' responses reflected a good level of CSR with a mean of (3.476) and standard deviation of (0.715) which located it at a good degree of approval, which means that the individual's answers are located in the third box on the Likert scale. This leads to the conclusion that there is a good level of CSR in the surveyed SMEs, the economic dimension constitutes the highest relative importance (38%) with a mean of (3.733) and then social dimension and environmental dimension (32% and 30%) with means of (3.451 and 3.245) respectively.

## 4.3 Testing and Analysis of the Hypotheses

$H_1$ : There is a positive significant relationship between the human resources development strategy and corporate social responsibility dimensions (economic, environmental and social) in the surveyed organisations.

Table 4 indicates there is a positive significant relationship at a significance level of 0.01 among all of the variables where the correlation between human resources development strategy and corporate social responsibility is (0.624), which is strong and significant relationship at a significance level of 0.01, that means the hypothesis is accepted. Moreover, the results show the stronger significant relationship is between training & development strategy and the economic dimension which is (0.759).

Tab. 4: Correlation matrix

	Economic dimension	Environmental dimension	Social dimension
Training & Development strategy	0.759**	0.542**	0.651**
Learning strategy	0.630**	0.648**	0.517**
HRD & CSR		0.624**	

Note: Correlation is significant at the 0.01 level.

$H_2$ : The human resources development strategy significantly the corporate social responsibility dimensions (economic, environmental and social) in the surveyed organisations.

Table 5 (ANOVA analysis), which indicates the significance effect of the human resources development strategy in corporate social responsibility, where the F-value is (102.321) which is a highly significant value at a significance level of (0.05). The explanatory power of this model is high according to the value of ( $R^2$ ) which is (0.674) This indicates that human resources development strategy explains (61.7%) of the respondent variable, which is corporate social reasonability. Therefore, this hypothesis is accepted.

Tab. 5: ANOVA analysis for the effect of HRD in CSR

Sig.	F	Mean Square	df	Sum of Squares	Adjusted $R^2$	$R^2$
.000	102.321	37.42	1	41.321	0.631	0.674
		0.091	305	29.138		

Table 6 shows the analytical effect indicators of HRD variables in CSR, where training & development strategy has a significance effect on CSR, where F-value is 374.876, which is a high significant value at significance level 0.05,  $\alpha$  value is 0.546 and  $\beta$  value is 0.727. Thus, the equation of regression model is as follows:

$$CSR = 0.727 + 0.546 \text{ Training \& develop. strategy,}$$

where  $R^2$  is 0.553, this indicates that training & development strategy can explain 55% of CSR. Learning strategy also has a significance effect on CSR at a significance level of 0.05, where the equation of regression model is as follows:

$$CSR = 0.667 + 0.607 \text{ Learning strategy,}$$

where  $R^2$  is 0.467, that means learning strategy can explain 47% of CSR.

Tab. 6: ANOVA analysis for the effect of variables of HRD in CSR

	f	df	p	$R^2$	$\alpha$	$\beta$	Sig.
Training & Develop. strategy	374.876	1.214	0.000	0.553	0.546	0.727	0.05
Learning strategy	247.839	1.214	0.000	0.467	0.607	0.667	0.05

## 5 FINDINGS

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1. The results show that the human resources development strategy significantly effects CSR dimensions (economic, environmental and social) in the surveyed organisations.
2. The results show that there is a positive significant relationship between human resources development strategy and CSR dimensions (economic, environmental and social) in the surveyed organisations
3. The surveyed SMEs do not pay significant attention to human resources development strategy, where there is a lack of learning processes, weak exchange of ideas and communication among individuals, and a lack of designing appropriate training programmes to develop their skills, knowledge and competences.
4. The CSR priorities of the surveyed SMEs mainly focus on the economic dimension as a strategic objective, and then social and environmental dimensions.
5. The surveyed SMEs do not pay significant attention to integration and alignment between HRD strategy and CSR dimensions to achieve their strategic objectives.

## 6 CONCLUSIONS

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Our study sought to investigate the role of human resources development strategy (training and development, organisational development and career development) in achieving corporate social responsibility at some of SMEs in Iraq. The relevance of this study relies on the association of strategic human resource development with the advancement of corporate social responsibility.

Although there are studies that investigate the relationship between these constructs, they do not specify how SHRD influences the different dimensions of CSR (AOULA, 2013, Ardichvili, 2011, Imad, 2014). In this manner, our research verified that human resources development strategy significantly effects CSR dimensions (economic, environmental and social) in the surveyed organisations. SHRD acts more proactively in the economic dimension as strategic objective and is less present in social and environmental dimensions.

Another outcome of the analyses is that SHRD has a positive and marginal association with CSR dimensions (economic, environmental and social). We can infer that human resources development policies and practices help motivate employees to engage and commit to economic, environmental and social practices towards a sustainable future. But the role that HRD plays in contributing to sustainability and CSR in organisations is still not well understood (Sheehan, Garavan, & al., 2014).

Furthermore, we believe that this research could benefit more from other managers of companies that are concerned increasing their social performance as a factor of profitability, while providing to their workers socially responsible human resource development practices that can positively influence their working conditions and general well-being at work.

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# THE RELATIONSHIP BETWEEN CSR AND CORPORATE REPUTATION FOR SMES IN THE GERMAN HEALTHCARE MARKET

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## ABSTRACT

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This work is intended to demonstrate that Corporate Social Responsibility (CSR) is an issue not just for large enterprises in the healthcare sector, but also increasingly for small- and medium-sized enterprises (SMEs).

Nine out of ten enterprises in the German healthcare sector are SMEs and employ some 7 million people. The SME sector is thus an important factor in the German economy.

While the culture of SMEs was once shaped largely by their owners or founders, they are now undergoing cultural changes driven by a) the CSR disclosure requirements of large enterprises and b) the increasing media exposure of society. As a result, the entrepreneurial activities of SMEs stand at the centre of public interest. CSR is becoming increasingly important for meeting these increased demands from the marketplace and society.

Entrepreneurial practice and the results of research both suggest that CSR activities promote the development of specific, intangible resources. This includes corporate reputation created from subjective perceptions of a company's activities and which can influence its success.

The mechanisms that contribute to explaining this relationship are at the heart of this work.

## KEY WORDS

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corporate social responsibility, healthcare, SMI

## JEL CODES

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M140, I110, A110

# 1 INTRODUCTION

The present study investigates the subjective perceptions of corporate social responsibility (CSR) in small- and medium-sized enterprises (SMEs) in the German healthcare market.

## 1.1 Corporate Social Responsibility (CSR)

First, an attempt is made to define CSR. As it turns out, there is no uniform definition of the term “CSR” (Nemitz, 2014) used in the research, although the various definitions do intersect. CSR thus addresses the effects of entrepreneurial activities on the environment and society and how they might be done more responsibly. It thus has the goal of connecting enterprises with society in a constructive manner (Hofelen, 2017). Since the late 1990s, the social aspect of corporate responsibility has come to be treated as of equal importance as commercial and environmental objectives (Hardtke & Kleinfeld, 2010).

The importance of small- and medium-sized enterprises for the German economy is then discussed.

## 1.2 Small- and Medium-Sized Enterprises (SMEs)

Micro-, small-, and medium- sized enterprises (SMEs) are defined, for example, in EU Recommendation 2003/361 (Official Journal of the European Union, 2017), which defines an enterprise as an SME if it has no more than 249 employees, generates no more than €50 m in annual revenues, or has a balance sheet total of no more than €43 m. These thresholds apply to individual enterprises. For enterprises that are part of a larger group, the number of employees and the turnover or the balance sheet total of the group must be taken into account depending on the ownership share. For statistical/empirical analyses SMEs are, as a rule, defined either by the number of employees or by revenue. On the German healthcare market, this mainly impacts hospitals and medical technology companies.

To narrow the focus, this work will only consider Medtech enterprises. In 2016, there were 12,500 such companies in this sector with 210,000 employees in total. 92% of the enterprises had fewer than 250 employees (BVmed-Herbstumfrage, 2017) by

definition making them SMEs. They are, as a rule, owner-managed or, at the least, heavily influenced by their owners. This means that the values and moral concepts of the founder(s) are reflected in the corporate culture and thus shape and distinguish the enterprise (Hardtke & Kleinfeld, 2010). The autumn survey by BVmed shows that the hospital market is an important market for small- and medium-sized Medtech companies. The types of product offered by the companies include implants (47%), medical aids (35%), surgical products and operating theatre kits (33%), bandages (19%) and services such as home care (14%) (BVmed-Herbstumfrage, 2017). This illustrates the crucial role played by hospitals in the SMEs’ business models. Since these hospitals are now required in Germany to publish CSR reports from 2017, Medtech SMEs are also indirectly affected by the CSR rules set forth in EU Directive 2014/95/EU (Official Journal of the European Union, 2014) and will have to make more of an effort towards CSR in the future.

## 1.3 Healthcare Market and Sector Development

### 1.3.1 The German Healthcare Market

Statistical forecasts suggest that the healthcare sector in Germany, increasingly referred to in the literature as the health economy, will be a future growth market in Germany. While various sectors continue to struggle with lasting problems as a result of the global crisis, there has been a real upswing in the health economy (Schönhuber, 2014). The healthcare market and its predicted growth can only be briefly outlined here.

Germany spent €344.2 bn on healthcare in 2015 or €4,213 per resident. This equals 11.3% of gross domestic product. More than one in nine euros spent in the economy went to healthcare. Compared to 2014, healthcare expenditure increased by €15.0 bn or 4.5%, growing faster than GDP for a fourth consecutive year (Statistika, 2017).

### 1.3.2 Sector Growth

This study focuses on the Medtech sector, which is a very important part of the health product industry (BVmed-Herbstumfrage, 2017). The following key figures and facts illustrate the important role the

Medtech sector plays in the economy and labour market:

The German Medtech sector employs more than 210,000 people and realised more than €29 bn in revenues in 2016. Around two-thirds of the sales were generated by exports.

The Medtech sector is largely made up of small- and medium-sized enterprises. 92% of German Medtech companies employ fewer than 250 employees and are owner-managed.

The Medtech sector is innovative and has very short product cycles. It is characterised by continuous product improvement, so-called step innovations. On average the research-based Medtech enterprises invest around 9% of their revenues in research and development (BVmed-Herbstumfrage, 2017).

### 1.3.3 Basic Aspects of the German Health Economy

According to Simon, there are three basic aspects to the German health economy: regulation, financing, and service provision (Simon, 2017, pp. 69–81).

For better understanding, only figures related to CSR will be presented here:

- **Regulation:** The extent of government regulation in the healthcare economy can be regarded as high by international standards. The benefits offered by statutory health insurance and the most important payers for the health economy are subject to highly detailed state regulation. In addition, efforts are made to control important developments in the benefit structure by creating national statutory guidelines for the contract structure. In our case, this means in the future that the implementation (of CSR) can be required of contractual parties regardless of the EU directive.

- **Financing:** The main financing agencies for the German healthcare system are the various branches of the German social insurance system. They financed approx. 70% of the healthcare expenditures in Germany in 2014. At 60%, the statutory health insurance funds are the largest contributors. Private budgets paid about 10% of the costs. Key partners in the drafting and approval of new products or services for the contracting parties will therefore be the statutory health insurance funds (GKV). In turn, these could extend the approval criteria to aspects of CSR regardless of political framework requirements.
- **Provision of services:** The provision of services, also the contractual parties in the health sector, is carried out by public, non-profit and private enterprises. Maintaining this agency diversity is mandated by several state administration laws, promotion of free-living and private facilities being required as a public goal, for example, for the hospital area and for care. The aspect of SMEs comes to bear, with more than 90% of approved healthcare enterprises being covered by this term and therefore indirectly affected by the above processes (Federal Ministry of Health, 2016, pp. 158–160).

In summary, it can be determined that the German healthcare market is an important factor for Germany as a business location. A substantial contribution is also made here by SMEs, which are, as a rule, owner-managed or, at least shaped, by their owners. As the financing is done by the statutory health insurance funds, these can insist on quick adoption of CSR and in case of non-fulfilment not further continue the contracts, which would mean the commercial end for many small- and medium-sized enterprises of the Medtech sector.

## 2 METHODOLOGY AND DATA

This paper is based on an intensive literature analysis and internet research. It forms the basis of this Delphi study on Opportunities and Threats of Corporate Social Responsibility for SME in the German Homecare Market.

The aim of the study is to assess to what extent Medtech companies in particular are prepared for future intangible CSR reports. As described above,

there is no data on owner-managed companies and CSR, the aspect of corporate reputation should be investigated in an open-ended way. Partial aspects could be attractiveness, customer loyalty or social standing for a CSR to enhance the reputation of the employer. The target group of the first Delphi survey was experts in company management and owners. The Delphi method was chosen because it

is a systemised, multistage survey procedure with feedback and adaptations, which is able to assess future events, trends, technical developments and the like in little researched or new areas as well as possible. Ryota Ona described the method succinctly as the Cornerstone of Future research (Häder, 2013).

According to Kreuzhof, Nicolai & Heybrock (2016), the following points describe a typical feature of a classic Delphi study design and are scientifically recognised:

1. Literature Survey
2. Questions / Thesis
3. Interviews with Experts
4. 1st Delphi
5. Interim Balance Sheet
6. Survey
7. 2nd Delphi
8. Comments / Review
9. Conclusion

The following were in the framework of the autumn survey of BVmed. According to the three levels

of a Delphi study Interview with Experts; owner-managed Medtech enterprises, including also about the significance of CSR in their enterprise. BVMed conducted a comprehensive on-line survey of 30 questions in August and September 2017. Of the 225 BVMed member enterprises written to, 106 enterprises participated, including, above all, the major producers of medical devices, but also SMEs from Germany and the USA.

Participating in the survey were 73 per cent producers, 21 per cent trading enterprises, about four per cent suppliers as well as two per cent other service providers. 58 per cent of the enterprises participating in the survey had their headquarters in Germany.

Following the findings of this survey, experts who came from owner-managed SMEs were interviewed. The problem-centred interview according to Mayerhoff was applied in this empirical part. Specifically this work contains partial results from five expert interviews, from these, two enterprises already deal intensively with CSR, as well as three representatives to whom the concept of CSR was new.

### 3 RESULTS

Owner-shaped enterprises are considered unassuming in German society, operate quietly in the background, are usually close to their customers and, at the same time, have traditional values. Despite the advancing dynamics of economic structural change, they have extensively asserted themselves within globalisation and still play an important economic and social role in the German economy, also in the healthcare economy (Lotter, 2017). It is this close integration and connection of the entrepreneur with their business that gives this type of enterprise its special character.

This symbiosis feeds from fundamentally different systemic perspectives: firstly, from the enterprise in its family environment, where family rules and ethical responsibilities play a special role, and secondly, from the operation according to economic-scientific viewpoints where tough economic rules and decision-making patterns dominate. For owner-managed enterprises, like multinational corporations, it is important to make a rational goal-orientated decision, to develop market-oriented products and services as well as to design customer-oriented processes. From the perspective of the owner, this

process does not take place on a purely factual level. Dealing with family, employees and society is often more important than pure profit (Lotter, 2017). These enterprises are more often less shaped by efficiency and performance criteria than by family values such as caring, equality and equity.

A key difference with large enterprises is their familial nature, such as, for example, the tendency for informal verbal communication, the avoidance of formalised structure or the way and manner of recruitment (Lotter, 2017).

From the Delphi Study on Owner-Shaped Enterprises and Social Responsibility, it was found that family-shaped businesses practice a lived social responsibility out of a traditional self-image without ever having heard of the term CSR. For these enterprises, social responsibility is part of the reputation of the enterprise. However, to ascribe only ethical motives to the actions of the owners of enterprises would certainly not be a reasonable interpretation (Hardtke & Kleinfeld, 2010). This would deny these SME entrepreneurs economic rationality, disregarding the will to shape and the entrepreneurial spirit as an important connecting point for the further

spread of CSR in Germany. For regardless of whether ethical or economic motives of the owner prevail, all interviewees pointed to the commitment and the assumption of responsibility of the small- and medium-sized enterprises that occupy an important role in owner-managed enterprises.

Regardless of whether ethical, environmental or economic motives prevail, all well-known studies on SME engagement and assumption of responsibility indicate that in owner-managed enterprises a strong, action-oriented approach prevails (Hardtke & Kleinfeld, 2010). Practical solutions to problems and tasks as well as concrete reasons for action, for example through the EU Directive, also form important starting points for CSR activities in the enterprises surveyed (Schäfer, 2011).

For most of the interviewees, improvement and environmental protection as well as sustainability are

also important content-related motives for socially responsible action. In the end, owner-managed enterprises are concerned with the reputation of the enterprise, often closely tied to the family name of the owner. Especially in enterprises that are managed in the family name intrinsic motives play a prominent role in the assumption of social responsibility. These enterprises were involved in their social responsibility as a result of the inner drive and design of the owner – external influences or even constraints play a minor role (Bertelsmann Stiftung, 2007). The majority of respondents stated that the assumption of social responsibility is determined by the personal convictions of the enterprise founder. This is primarily about the reputation of the enterprise name or the family name, if this corresponds. Motives that relate to operational processes or to the value chain were considered less significant.

## 4 DISCUSSION AND CONCLUSIONS

CSR is becoming increasingly important for SMEs in the healthcare market. One of the main obstacles in the area of CSR is the scarcity of resources in small- and medium-sized enterprises in healthcare, both in terms of personnel, time and finances (Bertelsmann Stiftung, 2007). This information, which was collected by the Bertelsmann Foundation, was also joined by three out of five surveyed experts from the MedTech companies. Not infrequently, enterprises stated that they are so heavily involved in day-to-day operations or other administrative activities that there is little time to think about strategic reorientation or to think about or even plan specific projects. Due to this considerable time and work pressure, fundamental considerations regarding the general situation of the enterprise and about future activities such as CSR were put into the background.

In addition to this lack of time and the lack of human resources, also limited financial resources is another obstacle preventing investment in CSR. Most respondents (four out of five) stated that there was a lack of simple guidelines and implementation strategies, especially for SMEs, in healthcare. In response to these results, the entrepreneurs of the I. Delphi survey will receive in a second questionnaire a few more detailed questions based on the evaluations of the interviews. However, the feasibility of this

process must be tested, as it could be seen as wasteful of time.

In summary, it can be shown that owner-managed SMEs already have criteria for a CSR system, but these are usually not correct due to scientific analysis, lack of structuring and lack of strategic planning (Schäfer, 2011).

It is of considerable importance for this enterprise on the path to a strategy of responsibility in the sense of a CSR implementation to choose an inductive path (Keck, 2017). This means not initially wanting to develop the responsibility strategy as a whole and then deriving measures from it, but to tackle the obvious and close-by problem or task first. Thus to offer a clearly defined solution that is practicable, easy to implement and not too time-consuming, and where it is clear that they are meaningful and can be used at short notice. This does not have to be primarily monetary; it can also target the values and morals of the SME, thereby contributing to the reputation of the enterprise in the market and in society. In particular, addressing this intrinsic motive, such as corporate reputation and also value orientation, which arises from subjective perceptions of entrepreneurial activity and influences intangible business success for the owner (Nemitz, 2014), should be comprehensively embedded in CSR implementation for SMEs in healthcare.



In the final analysis, these measures, which are derived from the Bertelsmann Stiftung report (Stiftung Familienunternehmen / Bertelsmann Stiftung, 2007), provide a good indication of which factors or influencing factors are particularly important for companies in the healthcare sector. These assumptions will be included in the questionnaire in a further round of

the Delphi study and will be further researched and evaluated.

These results support SMEs in the healthcare sector to achieve sustainable and value-adding corporate management and thus make a significant contribution to securing the company's market position and survival in the healthcare market.

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# INFLUENCE OF THE INSTITUTIONAL ENVIRONMENT ON THE RETAIL INDUSTRY IN UKRAINE

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## ABSTRACT

The main aim of this paper is to identify and evaluate the influence of regulatory quality and formal legal institutions on the Ukrainian retail industry. The reference period focuses on the period 2006–2015 due to data availability and the paper analyses 4721 retail firms. As indicators of the regulatory quality and legal environment, Doing Business indicators are employed. The paper uses panel data regression analysis (OLS with fixed effects) for identification and quantification. The results indicate that the influence of the individual institutional indicators is ambiguous, however, statistically significant and positive effects prevail for the area of enforcing contract regulations (judicial system) and the ease of obtaining credit for retail companies.

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## KEY WORDS

institutional environment, regulatory quality, Doing Business, retail industry, Ukraine

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## 1 INTRODUCTION

Considering the Ukrainian retail trade, it is worth paying attention to the fact that despite the volatile political and economic situation and the high shadow business component of the country, this sphere remains one of the few industries that is developing and not only boosting its own profits but also creating visible support to the entire economy of the state (Dankeieva, 2016, p. 83). For example, Ukrainian retail trade turnover in January–October 2017 grew by 8.2% compared to the same period in 2016 (State Statistics Service of Ukraine, 2017a). Moreover, in 2015, the NACE category G (Wholesale and retail trade; repair of motor vehicles and motorcycles) accounted for 27.62% of Ukrainian GDP (State Statistics Service of Ukraine, 2017b). Therefore

attention should be paid to the study of this problem while concentrating on what can be improved by the state for the subjects of the retail trade. That is why it is worthwhile to devote a considerable amount of time to the study of institutional problems within the framework of this industry.

Post-transitive Ukraine within the framework of historical and political events of the past decade has chosen the path of European development and integration, which is already reflected in the regulatory quality and legal environment for doing business. “*Process of Europeanisation of economic policies and governance structures acts as a powerful drive of institutional convergence*” (Bartlett et al., 2013, p. 40). However, there is still “*the ineffectiveness*

*of many of the newly created young democratic formal institutions borrowed from other countries”* (Lemeshchenko, 2005, p. 88).

This work evaluates the impact of business regulation institutions and the legal environment on existing retailers. The research of Kafouros and Aliyev (2016) is the inspiration for the practical part of this paper.

The following paragraphs will briefly present an institutional theory on the studied issue. Then there will be a section describing the methodology and data, including a description of the database, the indices used and their criticism. There follows a description of the econometric model and the results of the research with their brief interpretation.

In the case of the paper, the legal environment will be contemplated as domestic government regulations on business operations. Regulatory quality will be understood as *“perceptions of the ability of the government to formulate and implement policies and regulations that permit and promote private sector development”* (World Bank Group, 2017a). However, both environments *“matter economically*

*in the actual costs (and benefits) they create for business, not in their compliance with ideal forms”* (Alston, Eggertsson and North, 1996, p. 95). Also, according to Alston et al. (1996, p.95) *“areas, where legal and regulatory institutions could create critical obstacles to efficiency, are:*

- *The start-up of a new business (entry);*
- *The regulations of business;*
- *Orders by customers; and*
- *Sales with credit.*

*The first two areas involve transactions between a business and the government, while the second two involve transactions between businesses”.* Mentioning the macro scale, it is about policies which impact upon entrepreneurship without having the entrepreneur as their prime target. In some cases, the entrepreneur is hardly even considered when such policies are formulated or discussed. Key examples include policies on the rule of law, on regulation, immigration, competition, taxation and social security entitlement as well as traditional macroeconomic policies to control inflation and aggregate demand (Van Stel, Storey and Hartog, 2010, p. 6).

## 2 METHODOLOGY AND DATA

The paper is focused on the retail industry in Ukraine. According to NACE Rev. 2, retail firms have the code number 47 (Retail trade, except motor vehicles and motorcycles) and the Amadeus database comprises 4721 firms, for which data are available for whole period.

### 2.1 Regression Analysis

The paper uses panel data analysis, namely fixed and random effects. The Hausman test was used for the determination of a suitable method (random effects are preferred under a null hypothesis while preference for fixed effects is an alternative hypothesis). The employment of fixed effects was assumed. Econometric verification is carried out by testing the occurrence of the unit root (the Fisher-type test and the Im-Pesaran-Shin test), homoscedasticity (the Wald test) and serial autocorrelation (the Wooldridge test). Drukker (2003) and Wooldridge (2010) selected the tests. The reference period is 2006–2015 due to data availability. The short time span limits the results because it does not enable the evaluation of the long-

term effects of the rule of law on economic growth. To sum up, the basic regression model contains 4721 cross-sectional and 10-time units; this means the sum is 47 210 observations. The robustness test is employed with incorporation of time-effect dummy variables into the regression models.

The regression model is based on Kafouros and Aliyev (2016, p. 373). The regression model consists of six control proxies, which are in accordance with the mentioned authors. There are fixed assets (Fixed), number of employees (Employment), debt to equity ratio (D/E), number of years since the firm has been established (Age), size of company (Size; dummy variables, 1 means total assets are higher than industry median), market share (Share) and GDP per capita (GDPpc). The first six variables explain the performance of companies from a firm-level perspective whereas GDP per capita is used as a control of the macroeconomic environment. The firm data are obtained from the Amadeus database (Bureau Van Dijk, 2017), whereas GDP per capita is obtained from the Worldwide Development Indicators database (World Bank Group, 2017c). The first

two proxies are employed as input factors, the debt to equity ratio (D/E) measures the inverse of potential slack, Age of firms controls the market experience of firms, Size and Share capture market position and GDP per capita represents living standards.

Instead of fixed assets and number of employees, Kafouros and Aliyev (2016) employed the aggregate variable Capabilities, which proceeds from the aggregate production function. The proxy is not exploitable in the paper because there is no available data for the added value of the individual firms, which is the necessary condition for computation in the programme Stata (see Petrin, Poi and Levinsohn, 2004). The authors used the other proxies representing the specifics of the individual industries (e.g. Herfindahl index or industry profitability). The variables are omitted since the paper is focused on the retail industry only, which means their incorporation is pointless.

As the dependent variable in the following regressions, Sales are employed for areas where the influence of institutions is illustrated by changes in this financial indicator. This is a simple absolute performance indicator (not effectiveness) for a retail company generated over a period of time, which also represents consumer behaviour connected with the macroeconomic environment and reflects the impact of institutional agents. The full amount of company data for this indicator was easily accessible in Amadeus, which is necessary to compose balanced panel data for this research. Sales are widely used as company performance indicators for the analysis of institutional impact by different authors (see Xiao, Park, 2018; Krammer, Strange and Lashitew, 2018).

Nevertheless, in the case of studying the impact of the tax system, the representative index of the financial situation of the enterprise is EBIT (Earnings Before Interest and Taxes). In this case it is better to work with a profit indicator, due to specific conditions proceeding from Ukrainian tax law (Tax Code of Ukraine, 2017). As a rule, firms falling under the Ukrainian common system of taxation try to hide their profits, thus optimising their expenses for the payment of taxes (Dementiev and Vishnevskiy; 2010).

## 2.2 Doing Business

Returning to the critical characteristics of the institutional environment, that have already been

mentioned above, the following paragraphs will be devoted to the explanations of the Doing Business rating and its indicators chosen for this research: “Getting Credit”, “Paying Taxes”, “Trading Across Borders” and “Enforcing Contracts”. Changes in these indicators are represented in the Doing Business DTF (Distance to Frontier) points. The Doing Business rating evaluates the level of regulatory quality in previous year, which means that data in the 2006 ranking correspond to the year 2005 (World Bank Group, 2018a).

*“In a series of annual reports Doing Business presents quantitative indicators on business regulations and the protection of property rights that can be compared across 190 economies, from Afghanistan to Zimbabwe, over time” (World Bank Group, 2017a). Indicators used in the Doing Business report “refer to a specific type of business, generally a local limited liability company operating in the largest business city. Because standard assumptions are used in the data collection, comparisons and benchmarks are valid across economies.” (World Bank Group, 2017a)*

Only four out of the 10 Doing Business indexes have been chosen as indicators of regulatory quality and the legal environment. The remaining six indicators are not used since:

1. “Starting a Business” and “Resolving Insolvency” refer to enterprises that may potentially emerge, or have already completed their commercial activities; however, this research is engaged in the study of existing enterprises that are still in operation (World Bank Group, 2017a).
2. “Dealing with Construction Permits”, “Getting Electricity”, and “Registering Property” – these indicators cannot be attributed to all enterprises from this research, since many firms from the database used for analysis do not own their spaces for commercial activities but lease them (World Bank Group, 2017a). However, companies that can afford it have a significant share of the market, when it comes to sales level.
3. “Protecting Minority Investors” – again, this indicator cannot be attributed to all enterprises from the research in equal measure, since not all mentioned enterprises are joint-stock companies (World Bank Group, 2017a).

The methodology of the selected indices will be described below.

### ***Getting Credit***

The Doing Business rating uses two sets of indicators for this index. The first measures whether certain features that facilitate lending exist within the applicable collateral and bankruptcy laws. The second set measures the coverage, scope, and accessibility of credit information available through credit reporting service providers such as credit bureaus or credit registries. Obtaining a bank loan is an important operation for a retailer, since not every company is capable of self-financing to expand the network or purchase new goods in a commodity loan from a supplier, which as a result has a direct effect on the sales level (World Bank Group, 2017a).

The research paper uses the DB05-14 methodology in Doing Business DTF points to represent changes in the Getting Credit index in 2006–2013 and DB15-18 methodology for 2014–2015 (World Bank Group, 2018a).

### ***Paying Taxes***

The Paying Taxes index considers the taxes and mandatory contributions that Ukrainian retail companies must pay in a given year, as well as the administrative burden of paying taxes, time costs, contributions and complying with post-filing procedures. This index measures all the taxes and contributions that are government mandated and have an impact on a firm's financial statements, including the abovementioned EBIT indicator (World Bank Group, 2017a).

This paper uses the DB06-16 methodology in Doing Business DTF points to represent changes in the Getting Credit index in 2006–2015 (World Bank Group, 2018a).

### ***Trading Across Borders***

This Doing Business index measures the time and cost (excluding tariffs) associated with three sets of procedures – documentary compliance, border compliance and domestic transport (World Bank Group, 2017a). The impact of this institutional issue is decisive for costs (and correspondingly the sales level) of Ukrainian importers, especially taking into account the constant fluctuation of the hryvnia exchange rate and changes in the purchasing power of the population during the reference period.

The research paper uses the DB06-15 methodology in Doing Business DTF points to represent changes in the Getting Credit index in 2006–2014 and the

DB16-18 methodology for 2015 (World Bank Group, 2018a).

### ***Enforcing Contracts***

The Enforcing Contracts index *“measures the time and cost for resolving a commercial dispute through a local first-instance court and the quality of judicial processes index, evaluating whether each economy has adopted a series of good practices that promote quality and efficiency in the court system”* (World Bank Group, 2017a). The negative impact of these institutional agents can have a significant influence on the work of the enterprise reflected at the sales level, especially in the case of long judicial seizures or a large number of them, which is no exception for retailers.

This paper uses the DB04-14 methodology in Doing Business DTF points to represent changes in the Getting Credit index in 2006–2014 and the DB16 methodology for 2015 (World Bank Group, 2018a).

### ***Empirical Limits***

The Doing Business indicators, as with the other institutional indexes, are frequently criticised, e.g. Cappiello (2014, p. 79–86), Hoyland et al. (2016) and the World Bank Group (2008). However, it is important to point out that the Getting Credit index cannot be regarded as complete since it only considers loans from a bank type enterprise, and alternative opportunities like factoring or forfaiting are not considered. Also, it is important to notice that the difference between the quality level of institutions is strongly dependent on the region of Ukraine, which was described by Diez et al. (2016).

It is worth mentioning that information from the Amadeus database on the financial performance of the enterprises selected for the research may not be true in every case, due to the high level of corruption in Ukrainian private sector. Management of Ukrainian retail companies is *“minimising mandatory payments from the profits of enterprises to the state and minority shareholders”*, which manifests itself in various corruption schemes hiding the real profit of the enterprise (Dementiev and Vishnevsky; 2010, p. 89). *“Many registered firms sell much of their output and hire much of their labour through unofficial channels”* (Johnson et al., 2000, p. 514). Also, *“tax inspectors allow concealing some of the revenues for a certain reward”*, where the word “reward” should be understood as a bribe (Garaschuk and Mukhatayev, 2010).

## 2.3 Regression Model

To sum up, the regression model consists of seven control proxies and four proxies measuring business regulations. The Doing Business indicators are singly added to benchmark regressions in order to avoid the problem of multicollinearity. The regression model is as follows:

$$\begin{aligned} \text{Sales}_{it} = & \beta_0 + \beta_1 \text{Fixed}_{it} + \beta_2 \text{Employees}_{it} + \\ & + \beta_3 \text{D/E}_{it} + \beta_4 \text{Age}_{it} + \beta_5 \text{Size}_{it} + \\ & + \beta_6 \text{Share}_{it} + \beta_7 \text{GDPpc}_t + \\ & + \beta_8 \text{DoingBusiness}_{t-1} + \\ & + \gamma_i + \mu_{it}, \end{aligned} \quad (1)$$

$$\begin{aligned} \text{EBIT}_{it} = & \beta_0 + \beta_1 \text{Fixed}_{it} + \beta_2 \text{Employees}_{it} + \\ & + \beta_3 \text{D/E}_{it} + \beta_4 \text{Age}_{it} + \beta_5 \text{Size}_{it} + \\ & + \beta_6 \text{Share}_{it} + \beta_7 \text{GDPpc}_t + \\ & + \beta_8 \text{DBPayingTaxes}_{t-1} + \\ & + \gamma_i + \mu_{it}, \end{aligned} \quad (2)$$

## 3 RESULTS

The results of regression analysis are presented in the chapter. First of all, descriptive statistics of the selected proxies are shown (Table 1).

Tab. 1: Descriptive statistics for the retail industry (47 NACE rev. 2)

Variable	Obs.	Mean	Std. Dev.	Min	Max
Fixed	47,210	0.29	6.4	3.83e-06	347.81
Employees	47,210	43.84	579.1	1	39762
D/E	47,210	2.61	98.1	-5797	10875.3
Age	47,210	12.51	3.9	0	55
Size	47,210	0.5	0.5	0	1
Share	47,210	0.01	0.6	1.24e-08	100
GDPpc	10	8112.6	411.2	7449.7	8761.7
DB – Getting Credit ( $t-1$ )	10	0.67	0.11	0.56	0.81
DB – Trading Across Borders ( $t-1$ )	10	0.46	0.09	0.29	0.65
DB – Enforcing Contracts ( $t-1$ )	10	0.66	0.03	0.57	0.68
DB – Paying Taxes ( $t-1$ )	10	0.30	0.18	0.18	0.71

where  $i$  and  $t$  are firm and year indicators,  $\text{Sales}_{it}$  and  $\text{EBIT}_{it}$  are the dependent proxies,  $\text{Fixed}_{it}$  is fixed assets,  $\text{Employment}_{it}$  is the number of employees,  $\text{D/E}_{it}$  is the debt to equity ratio,  $\text{Age}_{it}$  is the number of years since the firm has been established,  $\text{Size}_{it}$  is a dummy proxy representing the size of the firm (1 if total assets are higher than the industry median),  $\text{Share}_{it}$  is the retail market share,  $\text{GDPpc}_t$  is GDP per capita,  $\text{DoingBusiness}_{t-1}$  are four proxies of the Doing Business concept representing regulatory quality (Getting Credit, Paying Taxes, Trading Across Borders and Enforcing Contracts) lagged by one year,  $\gamma_i$  are fixed effects and  $\mu_{it}$  is an unobserved error term.

Tab. 2: Results of econometric tests

	Getting Credit ( $t-1$ )	Trading across borders ( $t-1$ )	Enforcing Contracts ( $t-1$ )	Paying Taxes ( $t-1$ )
Hausman test	0.00 (10640)	0.00 (10721)	0.00 (10827)	0.00 (1133)
Fisher-type test	0.09 (1.29)	0.00 (33.11)	0.00 (28.61)	0.00 (56.34)
Im-Pesaran- Shin test	0.00 (-9.64)	0.29 (-0.54)	0.00 (-4.57)	0.00 (-11.19)
Wald test	0.00 (4.6e+10)	0.00 (1.0e+11)	0.00 (6.2e+10)	0.00 (9.9e+12)
Wooldridge test	0.06 (3.52)	0.06 (3.53)	0.06 (3.53)	0.77 (0.08)

Notes: the Hausman test,  $p$ -value ( $\chi^2$ ); the Fisher-type test,  $p$ -value (inverse  $\chi^2$ ); the Im-Pesaran-Shin test,  $p$ -value ( $t$ -statistic); the Wald test,  $p$ -value ( $\chi^2$ ); the Wooldridge test,  $p$ -value ( $F$  statistic).

Subsequently, the results of econometric tests are presented in Table 2. The table consists of the Hausman test (preference of fixed effects to random effects), the Fisher-type test and the Im-Pesaran-Shin test (at least one-panel data are stationary), the Wald test (occurrence of heteroscedasticity) and the Wooldridge test (occurrence of serial autocor-

Tab. 3: Influence of business regulation on sales in the Ukraine retail industry

Dependent proxies	Sales						EBIT	
Fixed	1.63*** (3.7)	1.62*** (3.7)	1.63*** (3.7)	1.62*** (3.7)	1.63*** (3.7)	1.62*** (3.7)	0.41 (1.9)	0.42 (1.9)
Employees	0.04*** (6.7)	0.04*** (6.7)	0.04*** (6.7)	0.04*** (6.7)	0.04*** (6.7)	0.04*** (6.7)	0.01** (3.0)	0.01** (3.0)
D/E	0.01 (1.3)	0.01 (1.4)	0.01 (1.3)	0.01 (1.3)	0.01 (1.3)	0.01 (1.3)	-0.01 (-1.4)	-0.02 (-1.5)
Age	-0.03 (-0.6)	-0.1 (-1.1)	0.12*** (5.6)	-0.95* (-1.7)	0.11*** (5.9)	-0.65 (-1.6)	0.03 (1.6)	-0.02 (-1.07)
Size	-0.2*** (-2.7)	-0.2*** (-2.8)	-0.16** (-2.5)	-0.22** (-2.84)	-0.2*** (-2.8)	-0.22** (-2.84)	-0.002 (-0.1)	-0.005 (-0.1)
Share	-2.84** (-2.1)	-2.83** (-2.2)	-2.83** (-2.1)	-2.28** (2.2)	-2.83** (-2.1)	-2.84** (2.2)	-0.001 (-0.6)	-0.19 (-0.1)
GDPpc	-0.001 (-0.4)	-0.001 (-0.1)	0.001** (2.0)	0.002* (2.1)	0.001 (0.6)	0.01* (1.86)	-0.19 (-0.1)	0.004 (1.05)
Getting Credit ( $t - 1$ )	0.03*** (2.6)	0.06** (1.8)						
Trading across borders ( $t - 1$ )			-0.03* (-1.9)	0.28* (1.78)				
Enforcing Contracts ( $t - 1$ )					0.06*** (3.2)	0.08* (1.8)		
Paying Taxes ( $t - 1$ )							-0.003 (-1.1)	0.39 (1.08)
Time effects	NO	YES	NO	YES	NO	YES	NO	YES
N	47,210	47,210	47,210	47,210	47,210	47,210	47,210	47,210
R <sup>2</sup> (within)	0.8	0.8	0.8	0.8	0.8	0.81	0.29	0.29

Notes: (.) denotes  $t$ -statistic, \*/\*\*/\*\* means a significance level of 10%/5%/1%; Robust standard errors are included; R<sup>2</sup> means adjusted (within) R-squared.

relation). On the basis of the econometric tests, the robust standard errors are incorporated into regression analysis (see Hoechle, 2007).

Table 3 shows the influence of the selected parts of the Doing Business on sales and EBIT within the Ukraine retail industry. The even columns show results with the incorporation of time-effect dummy variables.

There are four statistically significant variables in the case of control proxies (Fixed, Employees, Size and Share) and two statistically ambiguous (Size and GDP per capita). According to exceptions the proxies of regulatory quality are significant. On the other hand, the only improvement of possibility to getting credit and higher enforcement of property rights have had a positive influence on sales, whilst better assistance in trade across borders has ambiguous effect. The regression coefficients can be interpreted that an increase of regulatory quality (Getting Credit and Enforcing Contracts) of one percentage point leads to an increase in sales of about 3 to 6% or rather 6 to 8%. On the other hand an increase in the Trading Across Borders of one percentage points leads to changes in sales from -3% to 28%. Changes in regulatory quality connected to the Paying Taxes index are not significant, as the results show.

The ambiguous results for the Trading Across Borders index are mentioned in some papers (see Mazaraki, Melnik and Izovit, 2011; Busol, Lozhkin, 2008). Nevertheless, it is important to note the non-systematic nature of the customs legislation of Ukraine, which contains legal conflicts and leaves many important issues unresolved (see Goutsu, 2013). Imports in the retail industry are also influenced by such factors as the high level of corruption at the Ukrainian customs, inexpedient practice in determining the customs value of goods and significant volumes of smuggled goods. Weak legislature, constant changes in the customs system, even positive ones, and redundancy in the legal system make enterprises resort to more sophisticated illegal practices in the context of Ukrainian corruption, which lead to a decrease in sales (including moderate concealment of sales information).

Results for the Getting Credit index are consistent with Ukrainian realities studied by Dzyublyuk (2010) and Bilomistnyi (2010). It is important to note that Ukraine occupies 29th place out of 190 in the world in quality of institutions connected with getting credit procedures (World Bank Group, 2018b) and that the two main problems can be identified as follows: insufficient support from the state expressed in high



interest rates and fact that many of retailers hide their real income and cannot expect to receive a loan.

The great influence of the judicial system (Enforcing Contracts) on Ukrainian enterprises has been described by many authors (see Grytsenko, 2014; Iwanski, 2017). It should be noted that during the

reference period the index did not suffer dramatic changes caused by reforms. However, the situation in this area began to improve from the last year, when judicial reform was launched and case law was adopted.

## 4 CONCLUSION

In this contribution the influence of business regulation and the legal environment on the performance of Ukrainian retail enterprises was identified and analysed. To sum up, the results of the paper indicate that the influence of individual institutional indicators is ambiguous in the case of trading across borders regulations and the taxation system. On the other hand, it seems that the higher quality of enforcing contracts and better legal security in getting credit have a positive and statistically significant influence. The impact of the selected institutional indicators on the retail industry in the framework of transitive Ukraine was experimentally assessed. However, the Ukrainian retail industry is full of institutional pitfalls that cannot be immediately noticed in the World Bank Group ratings or within the results of regression analysis. On this basis, policy-makers in the first place should focus on areas that affect retail in the most positive way. So

firstly the state should take care of a stable legal environment (see Grytsenko, 2014) and the legislative framework for obtaining a loan by the enterprise (see Pikhnyak, 2012). Only then should international trade institutions (see Dankov, 2014) connected to imports (see Papkova, 2015) be improved.

The research allows for a deepening of the study of the following issues, based on its results. For example, to investigate why changes in the institutional environment affect different branches of retail in different ways, or to interpret the results of research through the prism of the informal institutions that have been established in Ukraine. The work can be expanded by using a benchmark – a country with similar economic and political development (Georgia or Moldova). Also, an in-depth study of the results will allow proposing exact changes for Ukrainian formal institutions.

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# USING WORD EMBEDDINGS FOR ANALYSING TEXTS FROM THE EDUCATIONAL DOMAIN

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## ABSTRACT

The application of machine learning to natural language data is very attractive for a data scientist. Modern algorithms and text representations allow the discovery of information about the semantic content of texts with more possibilities than before. The article deals with algorithms for word embeddings – namely word2vec and fastText. The goal was to analyse Facebook posts from the pages of universities in the Czech Republic. After creating and querying the natural language models, we were able to discover what is the most interesting information and the relations for the names of universities, job opportunities, specialisations, events, freshmen, or out of school activities.

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## KEY WORDS

word embeddings, machine learning, semantics, educational domain

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## 1 INTRODUCTION

Today the application of machine learning to natural language data is a very important tool for data scientists. Modern algorithms allow us to discover information about the semantic content of texts. This can be used to characterise articles, create various tags, understand the content of user reviews and for auto-completing search queries. Many natural language processing systems treat words as discrete atomic symbols. A word like “economics” can be represented as the attribute *wordId100* and the words “business” as *wordId350*. This provides no useful information regarding the relationships that may exist between individual words. This means that a model can leverage very little of what it has learned about “economics” when processing data

about “business”. A solution is the use of the vector representations of words.

This article deals with algorithms for word embeddings. Most important and influential in this area in recent years have been word2vec (Mikolov et al., 2013) and the newest algorithm fastText (Bojanowski et al., 2016). Our goal was to analyse Facebook posts from the pages of universities in the Czech Republic. Thanks to the new techniques we were able to find out what the most interesting information is and relations for the names of universities, job opportunities, specialisations, events, freshmen or out of school activities.

## 2 WORD EMBEDDINGS

Word embeddings are a modern approach for representing text in natural language processing. The two most popular embedding algorithms are word2vec and fastText. The described methods enable the mapping of a word to its surroundings or vice versa. These two approaches are known as the continuous bag of words and skip-gram.

### 2.1 Continuous Bag of Words (CBOW)

This model tries to predict a word based on its neighbours. The model summarises all the input vectors in the projection layer. This layer is therefore shared for all words. All words are projected onto the same position. The order of these context words does not affect the result. According to Mikolov (2013), CBOW is a few times faster in model training than skip-gram, and provides a higher accuracy for frequently occurring words (Rong, 2014).

### 2.2 Skip-gram

This model tries to predict the neighbours of a target word. Skip-gram is similar to CBOW, but instead of predicting the current word it tries to maximise word classifications based on another word in the same sentence and predicts words within a certain range before and after the current word. According to Mikolov (2013), skip-gram works very well with a small amount of training data and can discover rare words or phrases.

### 2.3 Word2vec

Word2vec is an effective technique that offers us a chance to get high-quality vector representations of words by measuring the syntactic and semantic similarity of words. It works at the level of words and its aim is to understand the semantic relation between words in low dimensional space. The basic idea is the use of a three-layer neural network that is designed for text processing. Vectors are actually mathematical representations of word functions and can be numerically compared to other vectors by the distance between two words. This algorithm suggests that similar words are close to each other and words can have different degrees of similarity. Semantically

similar words are mapped to nearby points (Reese and Reese, 2017).

Word2vec works on the principle of a neural network that consists of three layers (input layer + hidden layer + output layer). The input layer is set to have as many neurons as the vocabulary has words for training. The hidden layer is set according to the dimensionality of the resulting vectors. The output layer is set similar to the input layer.

If we have a vocabulary for learning word vectors consisting of  $V$  words and we know the number of dimensions of the word vector  $N$ , then the input to the hidden layer can be represented by a  $W$  matrix of  $V \times N$  size where each row of the matrix is represented by a word from the dictionary.

Similarly, it is possible to describe the connection from the hidden layer to the output layer which is represented by the  $N \times V$  size matrix  $W'$ . The output given by the hidden layer can be labelled as the 'word embedding' of the input word (Rong, 2014).

### 2.4 FastText

FastText is a framework developed by Facebook. It provides a fast and efficient method for learning word representation and can classify texts. The word vector is composed of the sum of the n-gram characters, which are a powerful source for enriching verbal representation. It works very well for morphologically rich languages like Czech, because it can use information from the subwords. The advantage over word2vec is that fastText can generate word vectors from n-gram characters even if the word does not appear in the training dictionary.

### 2.5 Using Word Vectors

Word vectors are useful in many situations. Wang (2017) used word2vec to extract restaurant aspects from Yelp reviews where better performance results were achieved than in the case of using statistical topic models. A new semantic-based method for estimating sentence and passage similarity with word2vec was used by Brlek, Franjic and Uzelac (2016) in plagiarism detection. Sentiment classification related to hotel reviews was reported by Polpinij, Srikanjanapert and Sopon (2017). Tang et al. (2014) used sentiment-specific word embeddings for Twitter

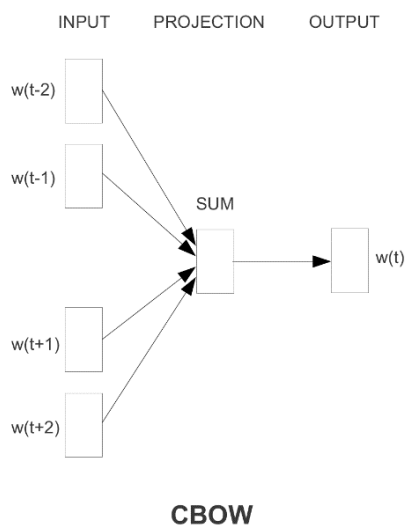


Fig. 1: A graphical representation of the CBOW model (Mikolov, 2013)

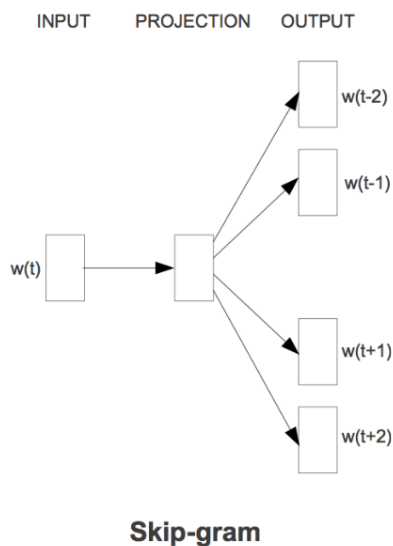


Fig. 2: A graphical representation of the skip-gram model (Mikolov, 2013)

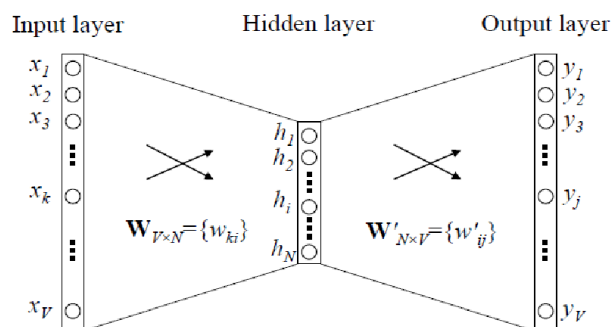


Fig. 3: A graphical representation of the word2vec network model (Rong, 2014)



sentiment classification. A proper diagnosis might be determined based on relationships found between words from medical texts (Minarro-Gimsénez, Marin-Alonso and Samwald, 2014). The applications of word2vec to Facebook data include the detection of

hate speech in Facebook posts and comments (Del Vigna et al., 2017), while for sentiment analysis of Twitter data word2vec was used by Acosta (Acosta et al., 2016).

## 3 METHODS

The research consisted of several steps. At the beginning, it was important to preprocess text data and then we could create a model which served to find the necessary information.

### 3.1 Text Preprocessing

For the input data, we used posts and descriptions of events from Facebook. These short texts were typically published by the representatives of faculties and universities.

In the first step, the data needed to be transformed into a form suitable for processing with word2vec and fastText. Each Facebook post was split into so-called tokens. This step was accomplished by using the NLTK python library, which supports word-tokenisation functions on words. In experiments where fastText was used the text was cleaned of punctuation marks as well. On the other hand, emojis, hashtags and links that can often provide the necessary information we want to get were preserved.

### 3.2 Word2vec Model Creation

In order to use word2Vec, the python gensim library was used. It is a framework that focuses on the fast modelling of vector spaces. An advantage is the possibility of formulating queries to the model. The implementation of Numpy or Cython can be used in Gensim. Cython is approximately 70 times faster than Numpy (Řehůřek, 2013).

For FastText implementation, fasttext 0.8.3, a Python interface for the Facebook fastText library was used. The model that is created is in the format .vec or .bin. This model can be loaded by gensim. Gensim also has a module that supports the training of skip-gram and CBOW models for FastText.

The input contains a sequence of sentences. Each sentence is then a list of words. The output is word vectors trained according to the model and training parameters:

- Number of dimensions: The basic setting for word2vec is 100 dimensions. We can say that 50 dimensions can provide a low accuracy. In most cases, word2vec works in the range of 100–300 dimensions with good accuracy (Bailey, Mayer and Aeron, 2017). With increasing numbers of dimensions, the accuracy increases but the time demands for training a model increase.
- Context window: The size of the context window determines how many words before and after the word will be included within the context words of that word. For example, in the sentence: “šestý ročník uvítací akce prvákoviny se opět povedl”, for the size of the context window 3 and the target word “prvákoviny”, the context words will be – “ročník”, “uvítací” and “akce” which are before the target word and then the words that follow the word, i.e., “se”, “opět” and “povedl”. The size we use depends on the data we have available for the training. Generally, larger windows can also include words that are actually not out of context so the model could be of a lower quality.
- Minimal count: The dictionary used in the model should be cleaned. Words that have very small frequencies in the text are not interesting because they are often mistakes or not very informative words. We also do not have enough data for these words to train a meaningful model. In this case, words that are present less than five times are excluded from the dictionary.

The model was trained with different setup parameters, and the most appropriate setting for our dataset was as follows:

```
model = Word2Vec(sentences, size=300,
                 window=7, min_count=5)
```

In Gensim, it is possible to find out a vector representation of the words in texts. The following example shows the vector representation of the word “mendelu”.

```

model.wv['mendelu']
array([ 0.32373372, 0.35493279,
 -0.28104991, 0.33996668, 0.4077895 ,
 -0.32015732, 0.34215474, 0.78893197,
 0.18337294, -0.61697584,
 ...,
 0.39131036, -0.21626352, 0.27102077,
 -0.10117463, 0.33383569], dtype=float32)

```

The model was trained on data that consisted of 164,539 statuses and 17,919 event descriptions.

### 3.3 Querying the Model

The generated model can be used to answer placed queries. In our case, we were interested in words about universities and students. Gensim has a built-in function for finding the similarity between words. If we want to know what words are similar to the word “economy”, then we just submit a query:

```

model.most_similar(positive=['economy'],
                    topn=10)

```

## 4 RESULTS

To obtain meaningful results, training of a word2vec model with the CBOW approach was used. For training and querying FastText models, skip-gram methods provided the most useful results. The results achieved using fastText were in some cases similar to the results from word2Vec. The following texts show some examples of querying the created models.

What names are most similar to the word “ekonomická” (“economic”)?:

```

model.most_similar(positive=['ekonomická'
                             (economic)], topn=4),
('podnikatelská' (business),
 0.8372701406478882),
('národohospodářská' (national economic),
 0.8131749629974365),
('pedagogická' (pedagogical),
 0.8129578828811646),
('podnikohospodářská' (business
management), 0.8098452091217041)

```

As can be seen, the word “ekonomická” (economic): is closest to the word “business” with a similarity of 0.837. As this word is contained in the name of economical faculties we can find out what other words are used by other faculties within the same or similar fields. The query gives

Then we will get the result containing a word and a number that expresses the similarity to the given word. According to the creator of Gensim: “This method computes cosine similarity between a simple mean of the projection weight vectors of the given words and the vectors for each word in the model. The method corresponds to the *word-analogy* and *distance* scripts in the original word2vec implementation.” (Řehůřek et al., 2017)

Based on querying the model, we can determine the quality of the model we have created. This means that if we search the most similar words for a specific word from a certain topic, we can expect the first words in the result for the most similar words to give us a logical sense. By adjusting the settings for model training (window size, cbow or skip-gram model...) it is possible to achieve a state when words which have a logical relationship to our word will also have a higher similarity to it. We can find the best setting for creating a model for our data with this approach.

us an answer containing three good matches, i.e., “podnikatelská (business), národohospodářská and podnikohospodářská” (business management).

Using this approach, we were able to find the following information:

- Which universities are similar in their type – for the word “lesnická” (forestry) we got “dřevářská, agronomická, zahradnická” (woodworking, agro-nomic and horticultural). Similar results were achieved with fastTex.
- The fields of study that are discussed most often. The most similar words to the word “obor” (field) are “informatika, humanitní učitelství” (Informatics, Humanities and Teaching).
- For the word “obor” (field) the most similar word is “magisterský” (master’s degree) then “bakalářský” (bachelor’s degree).
- The word “prvák” (freshman) is associated with “warm-up, prvákoviny, záškolovák, vítání, seznamovací”. The strong connection with the emoji for beer is interesting. It can be thus guessed that Facebook posts are quite focused on welcoming freshmen. The related events include “párty, warm-up, prvákoviny, záškolovák”.

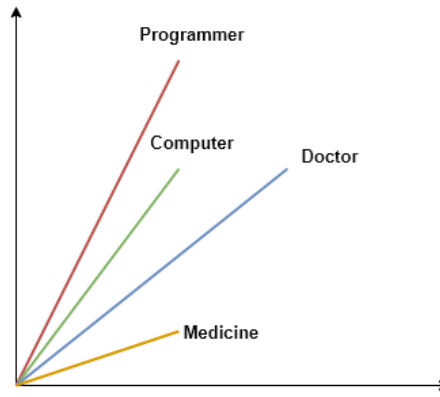


Fig. 4: A simplified representation of the vectors for the words Programmer, Computer, Medicine and Doctor

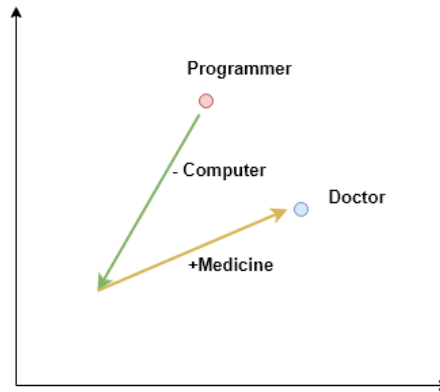


Fig. 5: The result of a vector composition  $\text{Programmer} - \text{Computer} + \text{Medicine} = \text{Doctor}$

- For the word “sport“, the most similar words are “fotbal, basketbal, florbal, volejbal“ (football, basketball, floorball, volleyball).
- For the hashtag #gis, the query retrieves the most similar hashtags, which include “#igi, #geologie, #studiumprobudoucnost”. The results for queries containing hashtags were best with the application of the skip-gram approach.
- For the word “kariéra” (career) it was possible to find several companies which are most similar to the target word: “lidl, ibm, valeo, honeywell”. This means that these companies give information about the possibilities of practice for the students. Among the most similar words to the target word were also words like “marketing, logistika, automotive”. This means that the companies offer practice possibilities to students in these domains.
- When the skip-gram model was used, for the word “kariéra” (career) we received the names of events like “jobfair, jobday, profesia”.
- It is interesting to see what the universities write about Europe. The retrieved result included words related to the refugee crisis and Ukraine.
- As most similar to the word “noviny” (newspaper) the following words were found: “lidové, hospodářské, idnes.cz”. It can be assumed that these results include the names of newspapers that contain articles about universities.
- Using fastText, it was possible to discover that the word “Gaudeamus” is most related to the words “maturita, veletrh”. The results included also the word “Akadémia”, which is the name of a similar fair, and also a link to an event (“https://gaudeamus.cz/”).

The advantage of using fastText was also the possibility of retrieving various variants of a given word, for example, for the word “informatici” the list of the most similar words also contained “informatiku, informatiky, informatici, informativní, informatický, informatických, infromatického”.

Besides the words that are closest to the queried words, we can identify the negative ones that are farthest. The vectors allow us to capture also the relationships between words. The following example demonstrates using the knowledge that a programmer uses a computer in his work. This might be used

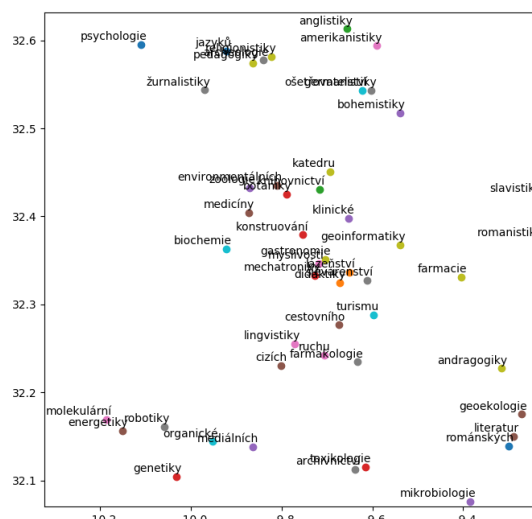


Fig. 6: A graphical representation of a small part of the model in 2D space where it is possible to see the captured relationships between fields of study

to find out what word is associated with the word medicine based on the mentioned relationship. Using the word vectors and vector operations we can denote this situation as follows:  $\text{vector}(\text{programmer}) - \text{vector}(\text{computer}) + \text{vector}(\text{medicine}) = ?$ :

```
model.most_similar(positive=['programmer',  
                          'medicine'],negative=['computer'],topn=10)
```

The best results for the given situation were achieved using the model created in fastText. Using the fastText model, the word “doctor” was obtained which could be expected.

For the graphical representation of the model, the algorithm t-SNE implemented in scikit-learn was used. Because it is impossible to graphically visualise a 300-dimensional vector it was important reduce the number of dimensions of the vector space. The main goal was to transform the word vector that has 300 dimensions into a 2-dimensional vector. This gave us an opportunity to represent the model graphically with a graph where it is possible to see that the most similar words have the closest distance to each other.

## 5 DISCUSSION AND CONCLUSIONS

In this work, the latest methods of vector representation of words (word2vec and fastText) were used to discover interesting information regarding Czech universities in social media texts. The goal was to find out what information was hidden in the Facebook posts of universities and faculties. Text preprocessing and the right settings for the models used were very important. The CBOW and skip-gram models gave us different results. For example, in a few situations we could see that the CBOW approach gave us general information and the skip-gram method gave us the names of events for a specific query word. Using vector operations above the created word vectors was quite limited because of the small dataset available. One of the biggest problems was that we did not have much data. This is because many universities started using Facebook only in recent

years. In Facebook posts emojis and hashtags are not very often used. Other social networks (Twitter and Instagram) are not widely used in the Czech Republic. Use of newspaper articles from the Internet may provide additional information. With a bigger dataset and using additional social networks getting more accurate and interesting results is possible.

A practical application of this research can be used by search engines, where a user can get hints for his search, for example for faculties with a similar field of study. For universities it would be possible to monitor information on social networks and find information for specific words like *prvák* (freshman), *kariéra* (career), etc. With the knowledge acquired, universities could create better posts and events on social networks.

## 6 ACKNOWLEDGEMENTS

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# PROCEDURES FOR THE QUANTIFICATION AND REPORTING OF GOODWILL

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## ABSTRACT

This article provides a basic overview of procedures for the quantification and reporting of goodwill. It analyses different methods and opinions on the advantages and disadvantages of the procedures for the quantification and reporting of goodwill. This article deals with goodwill especially in relation to business combinations according to IFRS and US GAAP. It captures the development of these standards and shows how IFRS and US GAAP tend to converge.

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## KEY WORDS

secondary goodwill, business combinations, reporting

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## 1 INTRODUCTION

In the beginning, we discuss the historical concept of goodwill. We try to offer a complete overview of the theoretical background of goodwill. A chronological review of the definitions of goodwill can be found in Curtis (1983) or Ratiu and Tiron (2012).

The first author who attempted to build a theory which best integrates the concept of goodwill was Leake (1921). Leake (1921) defines goodwill as “the right which grows out of all kinds of past effort in seeking profit, increase of value or other advantage”. He advances the theory of the super-profits of goodwill, which means “the amount by which revenue, increase of value, or other advantage received exceeds any and all economic expenditure incidental to its production”. Leake claims that the entity acquiring the goodwill is paying for a share of the next year’s super-profits. He suggests that goodwill should be written-off in the period that

the super-profits are expected to be earned. He even suggests that the super-profits are a given because the amount paid for secures of goodwill. What Leake actually proposes is the writing off of goodwill against the purchaser’s future earnings, for a certain period of time in which these earnings are supposed to arise. After all of the acquired goodwill is written off, Leake does not question that internally generated goodwill may appear and support future super-profits, but he advises against the recognition of this type of goodwill in the balance sheets.

A second author who offers his concept of goodwill is Robert Nelson. In 1953 Robert Nelson advanced the Momentum Theory of goodwill which advances the hypothesis that “a businessman purchases a promotional push instead of an Annuity”. Nelson clearly defines that the goodwill of a company consists of:



- goodwill,
- customer lists,
- organisation costs,
- costs of development,
- trade names,
- secret processes,
- patents,
- copyrights, licenses and franchises,
- superior earning power and going value.

The “push” is only explained by Nelson in connection to marketing. Nelson’s and Leake’s theories appear to be similar. Both propose amortisation against future income, but there are major differences between the two. Nelson does not link the existence of goodwill to the necessity of future super-profits. He considers that the momentum one gains from acquiring the goodwill of an existing business resides more in the time one saves from starting a new business from scratch and creating all the advantages the existing business brings along. Even though a company may have profits, the existence of super-profits is not essential in Nelson’s theory. The only proof a prospective client needs in order to buy an existing business is that a marketing, promotional or other push exists, and thus it is more profitable to buy an existing business than to build it from the beginning. Nelson proposes that the initial investment would be amortised against income in a period of two to ten years, depending on how long the push lasts.

Loneragan (1995) was the first author to build a theory around goodwill through its components. The reason behind the idea of distinguishing between goodwill’s components is that Lonergan aims to find a non-arbitrary amortisation period for goodwill. He considers that knowing exactly what the elements aggregated under goodwill are is decisive in finding the correct amortisation period. Lonergan’s theory is consistent with the bottom-up perspective, according to which attention is given to goodwill’s components rather than its measurement. Bloom (2008) borrows Lonergan’s theory, and presents the constituents of goodwill, with some adaptation. According to this improved list, goodwill consists of:

- various synergy effects,
- the quality of the marketing team and general market expertise,
- consumer loyalty,
- economies of scale within the organisation itself or resulting from acquisition,
- well-developed distribution network,
- benefits arising from location in a particular area.

In order to achieve his initial purpose to find the right amortisation period for goodwill according to its components, Lonergan creates four categories into which each component might fall:

- short term (of 0 to 3 years),
- medium term (from 3 to 7 years),
- long term (from 7 to 10 years),
- very long term (from 10 to 20 years).

## 2 METHODOLOGY AND DATA

This article mainly uses the method of critical comparison of expert articles published on the topic of goodwill, but partly also the method of analysis and synthesis is used. The article tries compare the historical concept of goodwill and offers a complete overview of the theoretical background of goodwill. Specifically, the chronological development of individual standards according to the International Financial Reporting Standards (IFRS) and the Generally Accepted Accounting Principles (US GAAP), are analysed.

This article compares IFRS such as IAS 22 (1983), IAS 22 (1993), IFRS 3 (2004) each other and US

GAAP such as ARB (24) and ARB (43) (1944), APB 16 and APB 17 (1970), FAS 141 and SFAS 142 also each other. IFRS and US GAAP are also compared with each other.

The authors cited in this article mostly concentrate only on the one chronological part. In this article, using the synthesis method, their partial results were summarised and chronologically arranged. This article serves as a basis for creating a comprehensive overview and serves as the basis for further exploration of procedures for the quantification and reporting of goodwill.

### 3 THEORETICAL OVERVIEW

In this section, the development of individual standards according to the IFRS and US GAAP are analysed. IFRS is the accounting standard adopted by the International Accounting Standards Board (IASB). Before IFR, IAS (International accounting standards) by the International Accounting Standards Committee (IASC) were issued. The US GAAP is the accounting standard adopted by the U.S. Securities and Exchange Commission (SEC).

#### 3.1 IFRS

The first IFRS dealing with goodwill was the IAS 22 Accounting for Business Combinations issued in 1983. This Standard defined goodwill as the “excess of acquisition cost over fair value”. Such a excess was a depreciated asset. Goodwill was amortised over its “useful life”. However, the Standard offered a second solution, to not report goodwill and settle the observed difference equally to the equity.

IAS 22 (1993) defined goodwill as the “excess over the acquirer’s interest in the fair value of identifiable assets and liabilities at the date of the exchange transaction”. Goodwill could be reported under two conditions. One of them was the existence of future economic benefits. The second condition was to determine reliable estimated acquisition costs or to determine the fair value of net assets. Goodwill was amortised over its “useful life” but was to be written off within five years. However, the maximum limit for amortisation was set at 20 years. This Standard set the obligation to write off goodwill directly into costs provided that the recoverability of future economic benefits from the acquisition. If negative goodwill arises, the fair value of non-cash assets has been reduced. If any part of the negative goodwill remained, it was recognised as deferred income and should be settled within 5 years, but not more than 20 years. The second option was to put negative goodwill into deferred income.

More significant changes were brought by the IAS 22 (1998a) which allowed goodwill to be reported only in the case of an acquisition through the purchase method. Goodwill was a payment to the acquirer that expects future economic benefits and was considered to be a reportable asset under this standard. The Standard defined goodwill as any “excess acquisition cost over the acquirer’s interest

in the fair value of identifiable assets and liabilities acquired at the date of the transaction”. Other direct costs associated with the acquisition were also included in the acquisition cost.

The entity may have amortised goodwill for longer than 20 years if certain conditions were fulfilled. One of these conditions was the entity’s obligation to test goodwill by the impairment test each year. The test was performed in accordance with IAS 36 (1998b) Impairment of Assets. Goodwill depreciation was linear. In isolated cases, goodwill depreciation could have been different if it better reflected the pattern of consumption of goodwill for future economic benefit. The Standard required the reporting of negative goodwill as a negative item in the same place as positive goodwill.

In 2004, the new IFRS 3 Business Combinations Standard was issued. Its main objective was to reduce the number of possible alternative goodwill reporting practices. In January 2008, this standard was amended. The amendment changed the method of purchase and the method of determining goodwill. The amendment aimed to increase the reliability and comparability of business combination information that is reported in the reporting entity’s financial statements.

One of the major changes in IFRS 3 was to replace the *two-component approach amortisation* (with an additional impairment test when required) with an *impairment-only approach* (non-amortisation but with annual, or more frequent if necessary, impairment tests).

##### 3.1.1 Advantages of the impairment approach

The first argument for prohibiting the traditional amortisation method is that straight-line amortisation of goodwill over an arbitrary period does not reflect economic reality. Straight-line amortisation does not provide useful information to the users of the accounts (Wines, 2007)

Another argument against the amortisation of goodwill is that amortisation of goodwill is based on ignoring the fact that part of what is recognised as goodwill may have an indefinite useful life that could last as long as the business is considered a going concern (FASB, 2001b).

The third advantage is the fact that the impairment-only approach to goodwill requires an annual impairment test irrespective of whether there is any indication that goodwill may be impaired. Absence of a specific impairment trigger gave firms too much discretion in timing the write-offs, which could be used by managers opportunistically to meet certain reporting objectives (Henning, 2004).

### 3.1.2 Arguments against the impairment-only approach

For example, Watts (2003) criticised the impairment approach based on the subjective and unverifiable fair value estimates used in testing goodwill for impairment.

The next argument was that the useful life of acquired goodwill cannot be predicted with a satisfactory level of reliability, nor can the pattern in which goodwill diminishes be known. However, systematic amortisation over an, albeit arbitrary, period provides an appropriate balance between conceptual soundness and operability at an acceptable cost; the respondents concluded that amortisation is the only practical solution to an intractable problem (IASB, 2004a).

The third argument against impairment approach is that preparers (managers) are more likely to lobby for the impairment-only approach since it allows them greater scope and discretion in deciding when to recognise an impairment loss. Ramanna (2008) provides evidence consistent with the idea that the FASB issued SFAS 142 in response to political pressure by firms (preparers) over its proposal to abolish the pooling of interests method with potential for opportunism.

In IFRS 3 the IASB describes six components of goodwill used by both the IASB and FASB during the preparation of IFRS 3 and FAS 142. The six components were first presented in an article by Johnson and Petrone (1998):

- *Measurement conservatism.* The first component represents the excess of fair values over carrying values in the acquired entity. The first component addresses the measurement of assets and liabilities already recognised in the acquired entity, here referred to as measurement conservatism.
- *Recognition conservatism.* The second component represents the fair values of assets and liabilities not previously recognised. The second component addresses unrecognised operating net assets in the acquired entity and refers to assets and liabilities

that fulfil the asset(liability) definition criteria but not the recognition criteria, referred to here as recognition conservatism

- *Going-concern element of core goodwill.* The third component is referred to as the going-concern element and represents the ability of the acquired entity, on a stand-alone basis, to earn a higher rate of return on its net assets than if these assets had been held separately.
- *Synergy element of core goodwill.* The fourth component refers to the fair value of the expected synergies and other benefits that arise from incorporating the acquired entity into the acquirer.
- *Measurement error of consideration paid.* The fifth component relates to measurement errors associated with the consideration transferred; these are not considered an asset.
- *Overpayment or underpayment by the acquirer.* The sixth component is referred to as overpayment or underpayment by the acquirer.

Johansson (2016) works with six previous components and develops a theoretical model of the initial and subsequent accounting for goodwill. The model shows that the current impairment-only approach creates a buffer that protects accounting goodwill from impairment. The buffer is created as a result of both internally generated core goodwill and the fair value of assets not recognised in the statement of financial position. The impairment test will understate the economic loss and serve as a weak indicator of acquisition success. The Johansson model wants to use the same measurement and recognition criteria as at the initial recognition. Which would cause that the representation of goodwill on the statement of financial position, and the effectiveness of goodwill impairment losses, would improve.

## 3.2 US GAAP

A modern accounting standard for reporting goodwill was the Accounting Research Bulletin (ARB) 24 Accounting for Intangible Assets, which dates back to 1944. The Standard included secondary goodwill in assets and goodwill was totally depreciated. The one-off write-off was not supported by this standard. The Accounting Research Bulletin (ARB) 43 definitely rejected a one-off write-off of goodwill and emphasised support for systematic depreciation.

In 1970, two standards for goodwill, namely APB 16 and APB 17, were adopted. According to APB

16, business combinations could be accounted for by the acquisition method of acquisitions and the share-sharing method for those business combinations that do not establish a relationship between acquirer and acquiree. However, when using share-sharing method, the specified conditions were met. Reporting goodwill allowed the standard only for the purchase method.

According to APB 17, goodwill was defined as an “excess of the acquisition cost over fair value attributable to its acquired identifiable assets, which was reduced by the liabilities assumed”. As well as IAS 22, it included in the acquisition cost the direct costs associated with the acquisition. The Standard also prohibited reporting by an enterprise of goodwill. Under APB 17, goodwill depreciated for the period after which goodwill would benefit. The depreciation period could not exceed 40 years. The most appropriate was a straight-line write-off, but the entity might have decided that another method would be better. Furthermore, this Standard defined the obligation to carry out the impairment test of goodwill.

One milestone in the development of procedures for the quantification and reporting of goodwill was when the SFAS 141 and SFAS 142 were adopted, followed by the transition to a similar approach under IFRS. According to the new approach, acquisition premiums should be allocated to the acquired entity’s identifiable net assets to a greater extent than before, and goodwill should no longer be amortised but subjected to periodic impairment tests.

## 4 RESULTS

The development of individual standards is illustrated in Table 1. The standard and the appropriate

Wen (2016) studies the association between goodwill and net-worth covenants after the adoption of SFAS 141 and 142. Wen’s work is building on Frankel, Seethamraju, and Zack’s (2008) finding that the use of net-worth covenants that include goodwill in the net-worth calculation moderately declined after SFAS 141 and 142, this paper investigates the differential effect of SFAS 141 and 142 on firms with different levels of goodwill. The results show the standards do not have a negative impact on the use of net-worth covenants, suggesting that the standards do not reduce the usefulness of goodwill for debt-contracting purposes.

Knauer and Wohrmann (2015) examine the information content of goodwill write-downs under IAS 36 and SFAS 142. They investigate whether the informational value depends on the reliability of the news. Using a sample of 564 goodwill write-down announcements issued from 2005 to 2009, they find a negative capital market reaction to announcements of unexpected goodwill write-offs. Results indicate that investors react more negatively when a country’s level of legal protection is low and allows more management discretion. Market reaction is associated with managers explaining the write-down decision and depends on the verifiability of these explanations. Investors react more negatively when an unverifiable internal explanation is given and less negatively when a verifiable external explanation is provided. Knauer and Wohrmann (2015) did not find significant differences between write-down announcements under SFAS 142 and IAS 36.

depreciation method are always included and the conditions are defined if necessary.

## 5 DISCUSSION AND CONCLUSIONS

Table 1 shows that both IFRS and US GAAP tend to converge. The next step in my analysis could be an attempt to statistically examine whether a business entity’s merger decision is based on the idea that, by acquiring a second business entity, the merging firm will obtain better sales, a better market position, etc. It would also be possible to examine whether the value disclosed in the closing

report or the annual report play a role in the merger decision. An intangible asset plays an important role, which can be very significant for business but is not valued and recognised in the closing statement and is described only in the appendices.

Another option is to work with the idea that “goodwill generates another goodwill”. This means that the way of recognising and reporting goodwill

Tab. 1: Development of individual standards

	Standard	Amortisation of goodwill	Conditions
IFRS	IAS 22 (1983)	“useful life” OR settle the difference equally to the equity.	×
	IAS 22 (1993)	“useful life” but should be written off within 5 years. Maximum limit for amortisation was set at 20 years.	to existence of future economic benefits and determine reliable estimated acquisition costs or to determine the fair value of net assets
	IAS 22 (1998)	longer than 20 years	to test goodwill on impairment test each year
	IFRS 3 (2004, 2008)	The main method of accounting for business combinations was the purchase method and the share-sharing method was banned.	cancellation of goodwill depreciation and introduction of its regular impairment test
CAS	Czech Accounting Standards	60 months or longer	
US GAAP	ARB 43	rejected a one-off write-off of goodwill	
	APB 16	The main method of accounting for business combinations was the purchase method	
	APB 17	no longer than 40 years	obligation to carry out impairment test of goodwill
	SFAS 141 and 142		cancellation of goodwill depreciation and introduction of its regular impairment test

and subsequently managing goodwill affects the attitude of the investors, the interest in the shares, or the takeover, the purchase, etc. This procedure requires looking at the break-even moments of goodwill reporting. There is an opportunity to monitor the impact of goodwill recognition, goodwill recognition and subsequent goodwill management on the perception of investors and share price.

The other direction is earnings management through goodwill management. The key question is what role goodwill plays in managing profits. One option is whether management really follows a faithful and honest image of the Financial Statements or whether goodwill is used to achieve the kind of image the company wants it to show.

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# WHY SOME HOUSEHOLDS WASTE MORE AND SOME LESS?

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## ABSTRACT

The topic of food waste is being discussed across all the EU countries. Research estimates that one-third of world food production is thrown away. The largest producers of food waste are consumers. Each year, 76 kg of food is wasted per person in the EU. Research dealing with this issue in the Czech Republic is only starting. The aim of this research was to find out about consumer shopping habits and how they perceive the issue of food waste? Whether the issue is a concern or actively addressed. The survey was conducted through in-depth interviews attended by 15 respondents. The findings show that the main reason for food waste is insufficient awareness and the confusion of the “best before” and “use by” dates.

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## KEY WORDS

food waste, consumer behaviour, in-depth interviews

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## JEL CODES

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## 1 INTRODUCTION

Food waste exists at all levels of the food chain. Studies in individual countries of the EU show different causes. Gustavsson et al. (2011) draw attention to the different terms food loss and food waste; use-by date and best before. Food loss is categorised in the area of production, harvesting and processing. It is characteristic especially of developing countries. In industrial countries there is mostly food waste, which is caused by the disposing of food fit for human consumption. Typical examples are mainly in the retail trade and among consumers.

Monier et al. (2011) conducted research in the area of the European Union. They established consumers as the biggest producers of food waste. The average annual production of food waste per resident of the EU was estimated at 179 kg, while households created 76 kg per person. Other studies (Gustavsson

et al., 2011) proved that over one third of world food production is not consumed.

The solution to the issue of food waste is still in its infancy (FAO, 2014). So far, neither the Czech Republic nor the European Union has a single definition that would unequivocally define the term food waste. The European Parliament (2011) includes in the definition of this term food products that have been removed from the food/supply chain for several reasons: economic, aesthetic or closeness to use-by date. Yet all this food could have been used for consumption since it is edible. In other studies (WRAP, 2009) food waste was divided into three categories: avoidable (food and drink that could be eaten and was thrown away, e.g. a slice of bread), possibly avoidable (food and drinks that some people eat and some do not, e.g. apple skins) and unavoidable (under normal circumstances it is

not edible, e.g. meat bones). The amount of research concerning waste by consumers is growing every year, but its focus is only on the awareness, attitude and behaviour of the consumer. It does not look into the actual amount of food waste (Porpino, 2016).

Food waste has impacts on the environment, on economic development and the food security of poor people according to Gustavsson et al. (2011). Evans (2011) supports the idea that food waste should be approached as an issue of individual consumer behaviour and suggests that it focuses more on state intervention and the conditions in which the food is subsidised.

One of the goals of the European plans is reducing the amount of food waste by one half by the year 2030 (The European Environment Agency, 2016).

Food waste is a topic that has lately started gaining attention in the Czech Republic. One of the pieces of research deals with what citizens do with unused food, the frequency of their disposal in connection with purchasing. There were two groups identified that waste food the least: people over 60 and people with a monthly income of up to CZK 14 000. (Centrum pro výzkum veřejného mínění, 2014). Individual activities which provide a warning about this issue are beginning to function. The missing data and disunity of terms do not contribute to the possibility of solving the issue more actively.

## 2 METHODOLOGY AND DATA

Primary data for qualitative research was gathered by means of in-depth interviews. These were held with the household members responsible for buying food and its preservation and processing. Half-structured questions were chosen for the interview. The advantage of interviews is the interviewer's chance of gaining an insight into the respondent's mind. The respondent may answer single questions with his own opinions and possibly explain their experience. If the respondent does not understand the question they can ask the interviewer for an explanation. This method is appropriate especially for understanding the deeper meaning, and not only because of what the respondents say, but also because of their non-verbal behaviour. The interviewer has the possibility of developing the topic in connection with how the interview progresses (Kolb, 2018). A disadvantage of in-depth interviews is the high demands on time and money. It is also important that the interviewer meets certain requirements. They must be able to listen, coordinate and maintain the conversation well (Hendl, 2018).

### 2.1 Interview

Each interview began with the interviewer introducing herself, explaining the purpose of the interview and assuring the respondent that the interview is anonymous, and no personal data would be published, that it is only necessary to know the consumer's personal opinions and experience. To

know how they decide before and during shopping, what they do with food in the household in the case there is an abundance. Then questions concerning their awareness of the topic of food waste were asked, as well as their awareness of the existence of food banks and the possibility of donating food.

Half of the interviews took place at shopping centres after buying groceries. The other half took place outside in a park. The length of one interview was around 30 minutes. The respondents were chosen to cover individual age groups and variety as concerns the place of residence. In total, 15 consumers participated in these in-depth interviews (8 women and 7 men).

The interviewer tried to induce a pleasant atmosphere that would make the respondents feel calm and open to questions about their households. The goal of the good atmosphere was to make the respondents talk about their experience without being afraid to say they waste food or throw away food that was still edible.

Audio recordings of individual interviews were made. These were afterwards converted into text form. An analysis of the content of each interview was executed using special software designated for analyses of qualitative MAXQDA data.

To code the content of the interviews, the main codes were defined that complied with the issue of food waste and the subcodes of single factors. Some of them were then expanded into sub-subcodes. Subsequently, results were transformed into a mind map and comments were added.

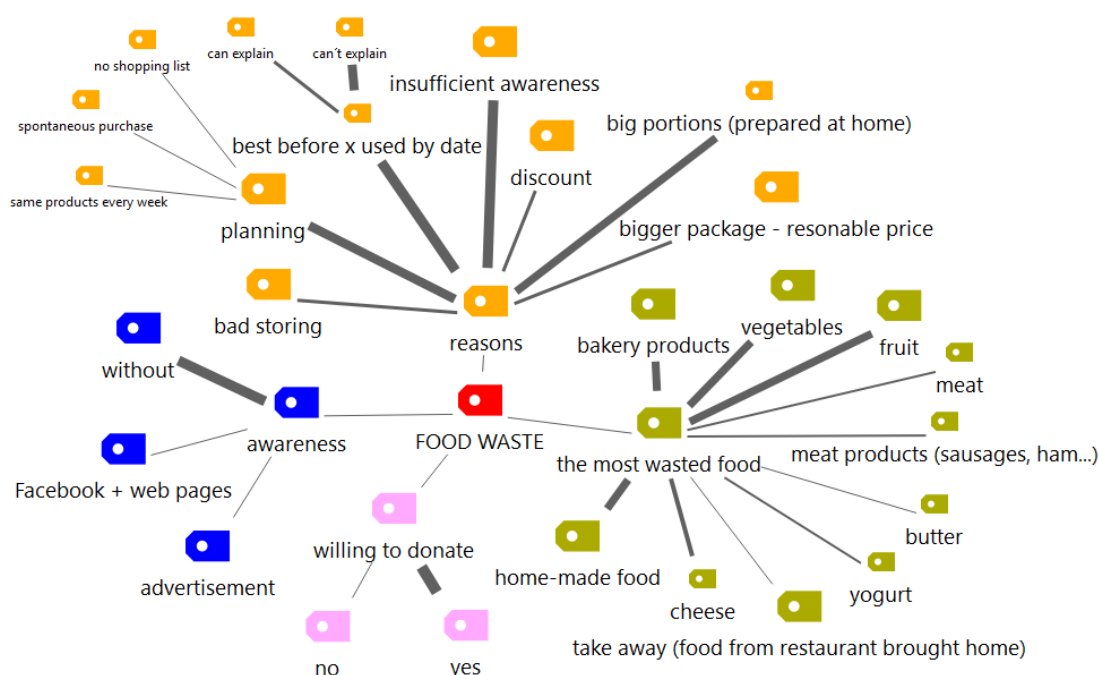


Fig. 1: Mind map (Code Theory Model) from in-depth interviews,  $n = 15$ , 2017

### 3 RESULTS

Research concerning the issue of food waste is still in its infancy in the Czech Republic. There is no statistical data that would determine the amount of food waste per person. The main goal of this research was to find out how this issue is perceived by the consumers themselves, what habits connected to shopping they have, which food they waste the most and what would influence them to prevent waste.

The interview started with one of the main reasons for food waste which is deciding what to buy. Four women and one man said that they prepare shopping lists before buying groceries. However, each of them has a different ritual. A woman (31 years old) said: “I regularly make a big purchase before every weekend. Before I go shopping, I go through the missing food and write it down. During the weekends I try to cook using cook books and buy some more food I find in the recipe.” At the same time, she admits she sometimes gets lured in by special offers and buys food she does not need at the moment as well.

All respondents acknowledge the influence of the price of the food. Man (23 years old): “I am a student and I try to save money. But if there is a discount on food that I like, I buy it even though it wasn’t a part of my plan.” Woman (25 years old): “When I see a bigger package for a reasonable price, I always reach

for it.” This is one of the main reasons why people waste food. They do not realise that even though they have bought a bigger package with a more convenient price they will not be able to consume all the food in time and eventually it is going to spoil and will have to be thrown out.

Another reason why consumers throw out food is the spoiling of the food, most commonly fruit, vegetables, bakery products and home-made food.

Only two respondents managed to explain the difference between the terms use-by date and best before. Once the food is past this date, they throw it out. Only one student (20 years old) admits he does not mind eating food after its use-by date and believes the food to be harmless. However, a woman (25 years old) had a different opinion on this date, “I am on maternity leave and I try to make sure that both me and my son only get what is the best. I automatically throw out food after its use-by date, as well as fruit or vegetables that don’t seem alright to me. I know I should think more economically while on maternity leave, but for me healthy food is essential.” At the same time, she admits she has never thought twice about why the dates differ.

A man (36 years old) was able to deduce the difference in these terms from their names, yet he

admits he had not noticed the difference before and used to throw the food out. He would rarely open it himself and make sure it was inedible. Another man (40 years), who voluntarily participates in food collecting campaigns and helps people in need, knew the difference and when it is possible to consume food with these dates given.

A woman (68 years old) considers the small font which she cannot read to be a problem. Due to a lack of knowledge in this area, respondents get rid of food that is fit for consumption and harmless.

Other reasons for throwing out food are excessive amounts of food cooked during weekends that no one will eat on Monday or food forgotten in the pantry or the fridge.

14 out of 15 respondents reacted positively to the question about helping others. All would be willing to donate food to a food collecting campaign or a food bank. However, 13 of them admit they did not know about the existence of food banks and are not informed about how they work.

## 4 DISCUSSION AND CONCLUSIONS

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Insufficient awareness, bad planning and ignorance of the terms. These are the main causes of food waste in the chosen sample of consumers.

Most respondents began to think more about the issue of food waste only as a result of the in-depth interview. They agree they are insufficiently informed and do not remember having recently seen any advertising or reading any articles connected to food waste.

General raising of public awareness, publishing information about the impact of food waste on the environment and more publicity on the possibility of donating spare food would make customers think more about what they buy. Respondents living in cities are open to the possibility of donating food, but they do not know how and where. Qi and Roe (2016) consider the disunity of terms and insufficient awareness of the population to be the biggest problems. Keeping people informed about threats to the environment caused by food waste should lead to reducing food waste.

A journal survey (Richter, Bokelmann, 2017) that took place in Germany proves that growing families have a larger share in wasting food. They generally exhibit more food circulation, storing, buying and wasting. The more household members there were, the more spontaneous purchases and stockpiling took

place. The in-depth interviews show that bigger households, living with one child or more, think more about what they are going to buy. However they admit there is also greater waste since they do not want to feed their children with food that does not seem to be fresh anymore. Households that waste less are for example older people and families living in villages. Tokareva (2014) points out the connection between one's place of residence and the possibility of avoiding waste. People living in villages or close to places where they can see crops grow or where they grow them themselves tend to waste significantly less compared to people from cities who do not have chance to see how much effort it takes to grow a good crop. These respondents also tend to be in worse financial situations and need to save money and therefore waste less.

Research concerning the issue of food waste is still only beginning in the Czech Republic. The sample of 15 respondents cannot represent the whole South Moravian Region. It is also necessary to realise that the respondents could have slightly changed some of their answers, e.g. concerning food donation, so as to seem more accommodating. However the results of these in-depth interviews reveal some basic problems that should be addressed.

## 5 ACKNOWLEDGEMENTS

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# SUBJECTIVE DATA GATHERING IN ASSISTED RETAIL

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## ABSTRACT

One of the current methods of evaluating the performance of sales points in assisted retail is the direct collection of subjective values by the vendor. This data is very easily tampered with in two ways. The first is by not recording the data, not to confess the presence of customers and thus not recording the offer to such a customer. The second is the distortion of data to their own benefit, or the recording of more or different information than is the reality. In the retail sector, where there is an extreme pressure on the sales performance of employees and ratings are often for the larger part according to their own sales, the ideal means of exerting pressure is not done by regulation. It is essential to provide a quality and simple tool and to adequately explain its merits to the vendor himself in order to maximize the chances of correct information.

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## KEY WORDS

retail, UX, subjective, data, gathering

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## JEL CODES

O39, M11, M150

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## 1 INTRODUCTION

As found in the IGA 2017 project: Formulation of retail reporting rules, frequent reporting of numbers, bids and results is actively performed by retailers in assisted retailing. A typical example is when we talk to a salesperson in the store, and after sales or during the sale he records the presence of the customer, the offer to the customer or the products sold. We can often see this phenomenon at petrol stations, tobacco stores, or at the grocery and other commodity stores (even though this is not assisted sales). This method is directly dependent on the will and interest of the vendor to store this information. We can doubt the correctness of such information, but if we do not have other ways to record at least the number of customers, this method is necessary (Luthans, 2002).

### 1.1 Collecting Customer Counts

For performance management, convenience and comparison the actual number of customers is absolutely crucial. We talk here about assisted retailing – from the principle of the usual case of a small number of customers (compared to other types of retailers). Every customer can decide if we are successful in business. This counts above all other calculations and therefore forms the basis for any retail rating. In addition to the collecting of this information by the retailer, there are more reliable methods, and these methods are dealt with in the article “Current Methods of Data Collection by Automated Systems in Assisted Retail” (Machalický, 2017; Skwadi, 2016).



## 1.2 Collecting Sales Agent Offers

In addition to awareness of the number of customers, it is easy to go further and register the products offered within the business case. Thanks to this, we can easily identify our employee's weaknesses. It can be said that there are only two reasons for failing to sell. The first is that our retailer does not offer enough products to our customers. Of course, the solution is to increase the offer. The second reason is poor bidding. The solution here is more complex, but some training and similar development activities can be introduced. Knowledge of the offer may also help us in a different direction. At the moment we know how many times a product needs to be sold, we can easily calculate the effort made to sell such a product and thus define what the product is worth for us. This may also help us to set up the commission system correctly.

## 1.3 Collecting Sales

Sales information is likely to be captured in other ways throughout different systems. In view of the obligation to record your sales, it is likely in all cases. However, this information may have its value in two cases in particular. The first case is the situation where the cash register does not record enough detail. For example, in a beverage store we know we sold lemonade to a certain value, but not the flavor. Then it may be interesting to ask and offer some flavors and reward our retailers accordingly. The second case is the excessive robustness of our company. Especially

in larger companies or corporations, it's a common problem to get back sales data and because their processing is time consuming we cannot talk about real-time results. At this point, it is a great advantage to record these subjective data in such a way that actual results are immediately available in real time (data are no delayed).

### 1.3.1 Collected sales validation

Once we have sales data it's a good idea to verify them. It would be ideal to verify the numbers of customers and offers. This is often not possible. On the other hand sales can be verified. It only covers the extent to which data can be matched. i.e. we can have the subjective information that we sold three raspberry lemonades and two blueberries, and we'll have information from the pouch that we sold five lemonades, so then the data can be considered as confirmed. If the system allows us, we can parse more details – even the number of business cases. Focus on the concrete realisation of our problem. The need for data capture is common to all domains. All previous statements were derived from earlier papers (Machalický, 2017; Marketos, 2006).

## 1.4 Goal Definition

The goal of this paper is to define two different approaches to how to design a mechanism to collect data about the number of customers, count products offered to these customers and sales data. Next step is test them in a non-theoretical environment and according the results of the test pick one approach and use it for further development.

# 2 METHODOLOGY AND DATA

The first step was to conduct an analysis in the Czech retail sector about what the reality is. This was done only from the point of view of the customer, without sophisticated knowledge of the background. In addition, the possibilities of proposing their own solution based on the experience gained were explored. The two best designs were implemented and tested. During the test, results were measured. At the end, the user's opinion was taken into the test by expressing satisfaction with the one or the other implemented solution.

## 2.1 Description of Experiment

For the purposes of the experiment, the structure of products of one sales network consisting of more economic entities was studied. Prototypes that were passed to the incriminated company were implemented for testing. This was deployed at 50 outlets, where both models were successively implemented. The experiment consisted of using an application integrated into the main service system of the company and finding the best solution. The best solution is to get the best quantitative and qualitative results.

## 2.2 Definition of Test Subject

The subject of the solution being tested is the retail network of assisted stores selling services and complementary goods to their customers. On Figure 1 we can see the structure of customers and their services within this test. A service in this context is the same thing as a product. Each customer can have 1 to  $N$  billing groups. In each billing group there may be 1 to  $N$  main services. Finally each major service may have 0 to  $N$  complementary services. In this case, the main service is always a regular monthly payment service and the supplementary service may again have its regular monthly payment or it may be a one-off purchase. In the chosen field, we are interested everywhere in the following information:

- the number of customers,
- the number and definition of the main service offer,
- number and definition of supplementary services,
- the resulting sale of major services,
- the resulting sale of ancillary services.

The bid definition may be partial, limited to the type of offer without full details. Conversely, the definition of the resulting sales must be with the definition of all the details. By all details we understand the type of sale made, the type of product (or service) with all the necessary details, the commission information from such sales, and finally the trade identifier of the primary system under which the sale was made. As mentioned above, a cooperative company falls into the category of a company with very complex primary systems. Thus, the step of gaining information on customer numbers, bids, and sales will also yield real-time results that would otherwise not be available.

## 3 RESULTS

Two different data collection proposals were received in the final round, and are detailed below.

### 3.1 Tested Designs

The first design is reminiscent of a tree crawl in which it is possible to return. The second solution is based on the optimisation of the interface leading to minimum clicks. For illustration, we have a hierarchy of possible bids according to Figure 2 we have

## 2.3 Collected Data Validation

The collected subjective data in the experiment must be confirmed in some way. We have several tools available to help us verify the data. We have three ways to get the real number of baskets. The first is that each served customer needs to be loaded in the main systems. In this way, we will find the number very easily, but some customers (especially the most valuable – potential new customers) might not be systematically solved at all. Therefore, there is a second way of counting based on images from cameras installed in all stores. This will determine the number of people but not the customers (Huadong, 2012). The last entry is the number of queue systems that are also installed in all stores. Unfortunately, this is not the exact number, because customers can be served without interacting with the waiting system if there is no queue at the time. Additionally, it is possible to confirm the quality of sales data retroactively based on reports from primary systems. In this case, this activity is delayed by three days. For confirmation, it is necessary to correctly save the I identifier (i.e. number of order) from the primary system so that data can be matched. For the purposes of this experiment, data is matched manually and not automatically. Integration with primary systems is not possible for the purposes of the project. In theory, we could also evaluate the quality of bids. This could be the case, for example, based on a manager's listening or by mystery shopping. Both require extra costs; the experiment will be neglected and we will focus only on confirming the number of views and the quality of sales records.

different types of offer for existing customers, new customers and customers who have come for a one-off product. For existing customers we have two kind of offer – A and B (C is a one-off product). If we are successful with offers there will be a sale. For sale A and B extra parameters are required. In A, B, C, D and E offers there are possible additional sales. Menu B also requires additional parameters and has additional services available. Menu C contains only additional services. Offer D

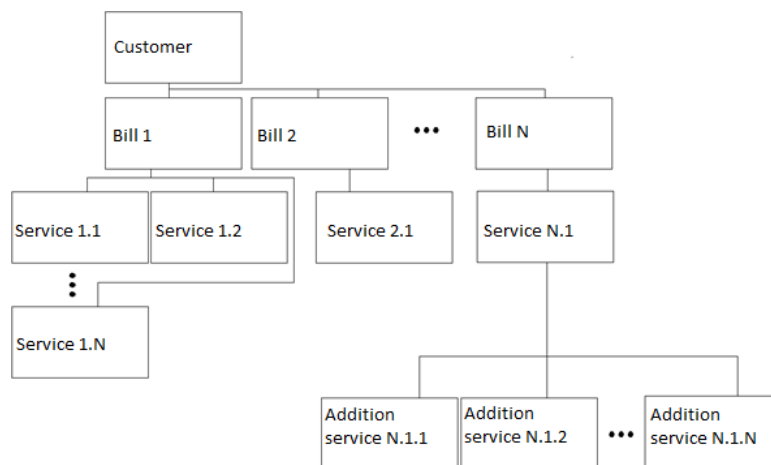


Fig. 1: Customer and Services Structure

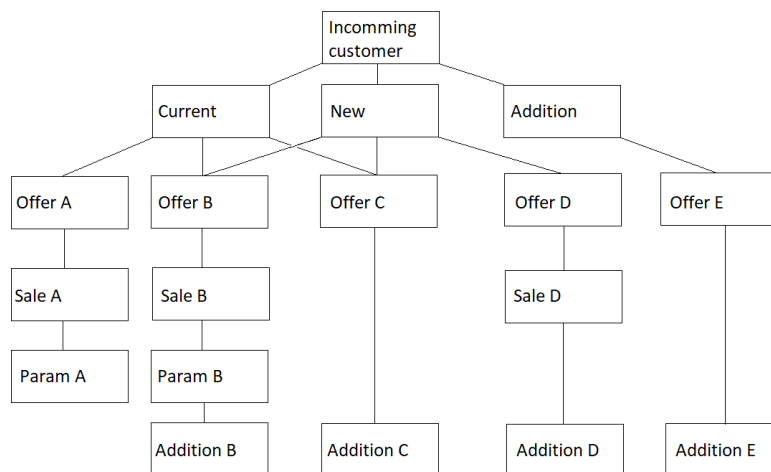


Fig. 2: Offer Hierarchy

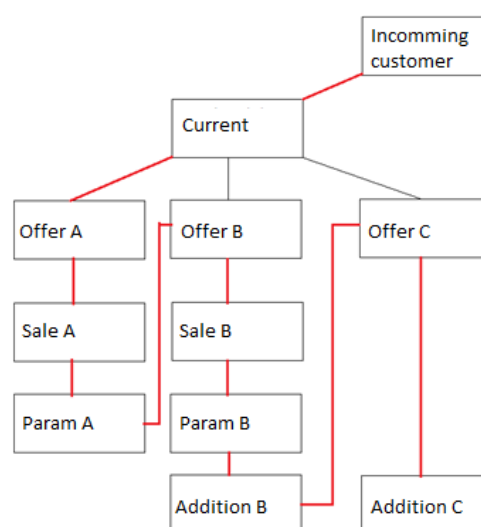


Fig. 3: Tree-like Hierarchy

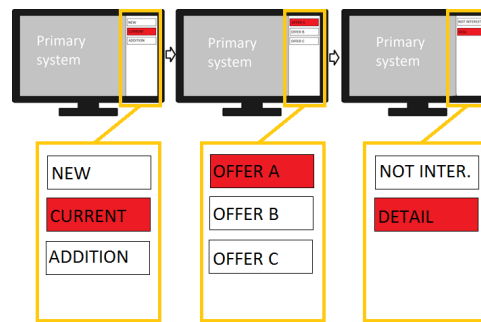


Fig. 4: Tree-like User Hierarchy

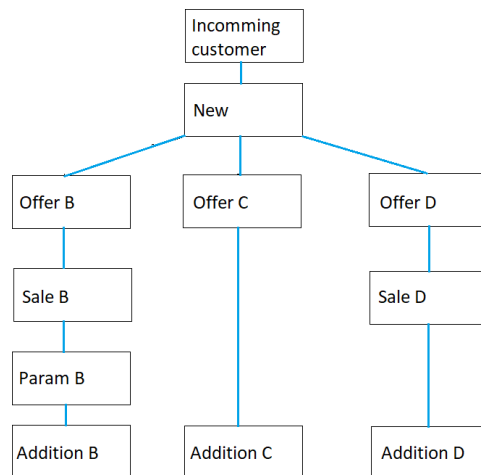


Fig. 5: Click-minimisation Hierarchy

does not require any additional parameters, and finally offer E has available additional services E (Garrett, 2011; Caldiroli, 2017).

The following chapters will illustrate the path of customised screens for individual solutions.

### 3.1.1 Tree-like user interface

A great advantage of this user interface designed as a tree is the guidelines. In each completed step we can continue to connect to the related offer. This can help drive performance on its own, and it can be beneficial for inexperienced sellers when we give them a sales map. The disadvantage is the time requirement of the assignment. A single-screen passage is shown in Figure 3.

As you can see a total of ten screens need to be gone through this simplified offer. In a real environment the situation is even more complicated. Figure 4 shows what passage through individual screens looks like (shortened to the first three steps).

## 3.2 Click-minimisation strategy

The advantage of this click-minimisation lies in the speed of entry; everything can be entered in parallel

within a single screen and theoretically during the interview with the customer. User is still moving on a single screen. The disadvantage is the need for system knowledge and less guidance on the move, leading to easily forgetting to enter a certain part of the offer or sale.

Figure 5 shows how a similar passage looks. This time everything can be handled in parallel.

The interface is much more complex than the previous one, as shown in Figure 6, but it is all on a single screen (Garrett, 2011; Caldiroli, 2017).

## 3.3 Overall Satisfaction

After the experiment a user satisfaction survey was conducted with individual solutions. The number of respondents was 243. The rating was as in Czech schools, where 1 is the best and 5 worst. The first tree-like solution received a average mark of 2.71. The second solution gave an average rating of 1.89. Despite the greater difficulty users are more comfortable with time-saving solutions.

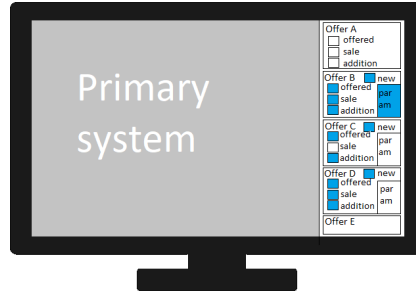


Fig. 6: Click-minimisation Hierarchy

### 3.4 Collection Rate

During the experiment the user was required to work with the application. However, no negative (penalty for not filling) or positive (rewarding) motivations were set. As mentioned above, the total number of customers cannot be uniquely determined. For this evaluation, the count of served customers was recorded in the main systems. The resulting number is higher than the correct result<sup>1</sup> than 100% to opened customers. This is due to customer service outside the main system. In the first case (tree-like), the result was 62% and in the second 79%. This percentage means that shop-assistants successfully recorded 62 out of 100 customers in the first case and 79 out of 100 customers in second case. This metric also records the second solution.

### 3.5 Data Quality Rate

There are three situations during data capture. Full match is when the business identifier along with other parameters corresponds to data entered by the user with data from primary systems. A partial match means identity in the form of an identifier but the contradiction of some other parameters. The

remaining situation, a mismatch, means a complete mismatch – the absence of data in the main system or the absence of data in our test application. In Table 1, On the first row, there is 47% and 38% for data existence only in primary systems. This means that only about half was entered into our application (50% and 55% from the second and third rows). The rest of the data (3% and 7%) are nonsense data, probably tests from users.

Tab. 1: Data Quality Rate Table

	Tree-like	Click-minimisation
Primary system only	47%	38%
Partially	8%	19%
Full	42%	36%
Test only	3%	7%

As can be seen in Table 1, the tree-like solution leads to a smaller number of entries and therefore to lower overall quality. On the other hand, if record is already created, it is more likely to be error free. The second solution also shows better results if we take into account the total sum of partial and total agreement.

## 4 DISCUSSION AND CONCLUSIONS

An interface design for the collection of subjective data within assisted retail sales has been made. The two selected designs have been validated and the results evaluated.

### 4.1 Preferred Solution

From the two selected designs the second one is better in each criterion. There is a higher percentage of

noted customers and also a better quality of data. On the other hand this solution has lower usability due to need for knowledge about the system. These results are substantiated by the collected usage data showed above. In this paper there are only two approaches tested. There may be a better solution, mostly for the companies who care for their customers over time. Both of the presented solutions do not care about customer history or about connections between

<sup>1</sup>Correct result is considered as a state when count of served customers is the same in our system as in reality.

customers' products. This will be the next step in a future research. The further development of this topic is highly focused on finding applications which lead to sales growth in retail. The user interface is one of

the hardest parts of this solution because this kind of application is fated to not be popular with salesmen. It always means extra work for them.

## 5 ACKNOWLEDGEMENTS

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# CORPORATE COMPLIANCE WITH INTERNATIONAL FINANCIAL REPORTING STANDARDS OF LISTED BANKING FINANCIAL INSTITUTIONS IN GHANA

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## ABSTRACT

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This study aims to investigate the extent of compliance with International Financial Reporting Standards (IFRS) disclosure requirements and also to examine the association between five firm-specific characteristics with the level of compliance of banks listed on the Ghana Stock Exchange. The five firm-specific characteristics are profitability, leverage, size, multiple listing and auditor type. The study uses secondary data which were obtained from annual financial statements of six listed banks covering the period 2010 to 2014. The findings of the paper showed an overall mean of 83.7% compliance with only profitability and firm size showing a positive significant relationship with the level of compliance. In line with the findings, the study recommends strict regular monitoring by the regulatory bodies to ensure that preparers of the financial statement comply fully with the standards. The study contributes to the literature on financial reporting in Ghana.

## KEY WORDS

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international financial reporting standards, compliance, listed banks

## JEL CODES

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G30, M40, M41

## 1 INTRODUCTION

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In recent years organisations have prepared their financial statements in agreement with standards peculiar to a country, popularly known as National Generally Accepted Accounting Practice (GAAP). The reason was that common accounting standards and disclosure did not exist globally. The global investment community had an impediment because of the absence of common standards. Accounting principles that look foreign and the absence of disclosure prevented investors from spreading their portfolio globally in an optimum way (Eiteman, et

al, 2012). The need arose for the use of a uniform international reporting language (Flynn, 2008). In recent years, many countries world-wide have adopted the International Accounting Standards (IAS) or International Financial Reporting Standards (IFRS) with the aim of making companies disclose better quality information in their annual reports. The IFRS is the globally applied accounting system contributing greatly to the operations of global capital markets and international financial capitalism. The purpose of IFRS is to enhance transparency to out-

side investors mainly through consistent standards and enhanced disclosure (International Accounting Standard Board (IASB) and Financial Accounting Standard Board (FASB), 2008).

The study is premised on this motivation. There is scant research on compliance with IFRS/IAS in Ghana. Even with the ones conducted, just a handful have been done on the banking industry. Also, those done were on a single IFRS. Simply put, not much study has been conducted on compliance with IFRS by banks in Ghana.

Banks listed on the Ghana Stock Exchange were used for the study since most investors' decisions are centred on publicly listed firms. The banking sector is seen as appropriate for study since it is a sector with the potential to promote private sector growth and subsequent growth in the national economy.

To fill the gap in the literature, this study works to investigate the extent of compliance with IFRS/IAS by listed banks on the Ghana Stock Exchange. The study also examines five firm characteristics that

affect IFRS compliance. The study seeks to address the following questions:

1. What is the extent of compliance of listed banking institutions with the disclosure requirements of IFRS/IAS?
2. What is the impact of corporate characteristics on disclosure levels of the listed banking institutions?

Two key contributions are made by the study. Firstly, the study is not consistent with prior studies on listed banks in developing countries which mostly use cross-sectional data. The study is comprehensive in analysis as it uses a panel data to establish the level of compliance and the company attributes that influence the level of compliance. Secondly, the study contributes to the line of research that presents empirical evidence that company specific characteristics influence the disclosure requirements of firms in the context of developing countries.

The subsequent Literature Review section is followed by Methodology and Data. Section 4 looks at Results and Discussion and section 5 is the Conclusion.

## 2 LITERATURE REVIEW

Many developing and developed countries have embraced the use of IFRS. Ghana sought to ensure that the benefit to be derived from the new financial reporting approach was not overlooked. According to (ROSC, 2004) there existed a compliance gap in companies who claimed compliance. The International Federation of Accountants (IFAC) has also seen auditors stating that a financial statement complies with IAS when the notes and accounting policies disclose something else (Cairns, 1997). On 1 January 2007 Ghana, as a country wanting to promote the increasing growth of its economy in both the public and private sectors, adopted IFRS in place of its obsolete Ghana National Accounting Standards (GNAS). Following the Reports on Standards and Codes [ROSC] issued in March 2006 by the World Bank, Ghana expected compliance from all its entities with a public interest (insurers, banks and companies listed on the Ghana Stock Exchange) to submit to the IFRS.

IFRS adoption world-wide is one of the most noteworthy regulatory changes in the history of

accounting. The speed of globalisation of financial markets has also brought about a need for comparing financial reports globally. Bodies such as the International Accounting Standards Committee (IASC) now the International Accounting Standards Board has since its establishment played a significant role through the pronouncing of a number of standards that seek to guide accountants globally on financial statement preparation and presentation (Larson and Street, 2004). This has led to the facilitation of the reproduction diffusion of specific accounting and accountability practices across the world by notable global organisations such as the World Bank [WB] and International Monetary Fund [IMF] (Chand, and White, 2007; Nolke, 2005; Richardson, 2009; Unerman, 2003; Lehman, 2005). Consequently, these world-wide institutions have pushed for the adoption of IFRS by developing and transitional countries as part of their restructuring programmes. This move has been regarded as essential to command the confidence of investors (Mir, and Rahman, 2005).

### 3 METHODOLOGY AND DATA

#### 3.1 Sample and Sampling Technique

A quantitative research approach is used to determine the level of compliance with International Financial Reporting Standards of listed banks in Ghana. The population for the study is made up of nine banks listed on the Ghana Stock Exchange. A sample of six listed banks is used for the study. The sampling technique used to select the sample was judgmental sampling because of its appropriateness for a small size sample.

#### 3.2 Data and Compliance Checklist

Secondary data was used for the study. The data were gathered from the annual financial statement of the sampled banks. The data selected for the analysis covers the period between 2010 and 2014. With six banks for a five-year trend, it results in a 30-year data set which fulfils the sample size. (Stutely, 2003) suggests that a minimum of thirty (30) for statistical analyses should be the case and a useful rule of thumb. IFRS/IAS disclosure checklists were assessed from the websites of Ernst and Young and KPMG. The checklist was used as the instrument employed to collate the secondary data. The reason for using these checklists was to ensure completeness of the checklist and to help to distinguish between disclosure and measurement items since the study was on disclosure. It helped to determine a more efficient sequence for checking items, ... The compliance checklist was used for sixteen standards (IAS 1, IAS 7, IAS 10, IAS 12, IAS 16, IAS 18, IAS 19, IAS 23, IAS 24, IAS 28, IAS 33, IAS 36, IAS 38, IFRS 5, IFRS 7 and IFRS 8) ignoring those which were deemed not usable by the researcher. 36 IFRS/IAS existed as of 31 December 2013, 28 of which are still IAS and 8 IFRS.

#### 3.3 Data Analyses

The data for the study were analysed using descriptive statistics and the stepwise multiple regression. To address the first objective which is to establish the extent to which banks listed on the Ghana Stock Exchange comply with the mandatory disclosure requirement, descriptive statistics were used. The stepwise multiple regression approach is used to

address the second objective, which seeks to establish the relationship between the level of compliance with IFRS by banks listed on the Ghana Stock Exchange and the five company-specific characteristics.

The Pearson correlated coefficient was also used. Prior to running the multiple regression correlation of the independent and the dependent variables was verified. This was done in order to test the propositions by ascertaining the relationship between the variables. On the basis of the defined variables, dependent and independent, an econometric multivariate linear model was generated for the study. Therefore the outcomes and discussion were based on the outputs generated by the software.

#### 3.4 Hypotheses/Propositions

Prior studies found significant variations in the level of compliance with IFRS/IAS across countries. Company characteristics have been noted to be the cause of the variations. The characteristics influence a firm's financial statement reporting. It is on this premise that the study develops the hypothesis using five company characteristics to know the extent to which banking financial institutions comply with IFRS disclosure requirements. The following attributes were chosen for the study: leverage, profitability, multiple listing status (cross listing), company size and auditor type. The hypotheses are stated as follows:

1. Profitability is positively associated with the level of compliance with IFRS disclosure requirements of Ghanaian listed banking financial institutions.
2. Company size is positively associated with the level of compliance with IFRS disclosure requirements of Ghanaian listed banking financial institutions.
3. Leverage is positively associated with the level of compliance with IFRS disclosure requirements of Ghanaian listed banking financial institutions.
4. The type of auditor is positively associated with the level of compliance with IFRS disclosure requirements of Ghanaian listed banking financial institutions.
5. Multiple listing status is positively associated with the level of compliance with IFRS disclosure requirements of Ghanaian listed banking financial institutions.

### 3.5 Measurement of Dependent Variable

The total compliance index is the dependent variable. There exist two main approaches to a disclosure index but the unweighted index is widely embraced (Glaum and Street, 2003) since it gives equal weight to any disclosed item on the checklist (Wallace and Naser, 1995; Owusu-Ansah and Yeoh, 2005; Owusu-Ansah, 2000). The flipside of the unweighted disclosure index is the variation in the disclosure items of various standards. For example, IAS 10 requires few number of disclosures, whereas IAS 1 requires more. Therefore, to deal with the challenge of unequal treatment of standards, the partial unweighted disclosure index is used (Street and Gray, 2001). For the scoring any expected checklist item if disclosed is scored 1 but if not then 0. The index on disclosure is ascertained by expressing the aggregated disclosed items over the highest possible score that is applicable to the company. This approach is in line with prior studies (Demir and Bahadir, 2014; and Street and Gray, 2001). Mathematically the overall compliance index is defined as:

$$PC_k = \frac{\sum_{i=1} X_i}{A_k}, \quad (1)$$

where  $PC_k$  is the aggregate score of compliance for each company  $0 \leq PC_k \leq 1$ ,  $X_i$  is the compliance level with each standard mandatory disclosure requirement,  $A_k$  is aggregate number of standards applicable for each company  $k$ . The aggregate of these compliance scores ( $X$ ) was expressed as the ratio of the aggregate number of standards applicable for each company  $k$ , that is  $A_k$ .

### 3.6 Measurement of Independent Variables

Data for profitability, multiple listing status, company size, auditing firms and leverage were obtained from the annual financial statements of the studied

listed banks. Below are the independent variables and their measurement.

*Company size:* Measured as the logarithm of revenue and logarithm of assets.

*Profitability:* Defined as return on capital employed: Earnings before tax and interest divided by capital employed. This has been used in previous studies such as (Wallace et al., 1994 and Street and Bryant, 2000).

*Leverage:* Measured as Book value of total debt / (debt + equity).

*Type of auditor:* A variable that is 1 when the company is audited by any of the big four auditing firms (PricewaterhouseCoopers, Ernst and Young, KPMG, and Deloitte & Touché) company and 0 if not. The measure is consistent with prior studies by (Wallace and Naser, 1995 and Owusu-Ansah and Yeoh, 2005)

*Multiple Listing:* Designed to capture cross listings and their potential implication on disclosure level. 1 if the company is listed on other overseas stock markets and 0 if not.

### 3.7 Model Development

On the basis of the defined variables, dependent and independent, an econometric multivariate regression model was generated for the research. A panel regression analysis was used on how to explain the dependent variable given the predictive variables. The panel data regression model is of the form

$$\begin{aligned} PC_{Kit} = & a_1 + a_2 \text{Size}_{it} + a_3 \text{Profitability}_{it} + \\ & + a_4 \text{Auditor type}_{it} + \\ & + a_5 \text{Listing status}_{it} + \\ & + a_6 \text{Leverage}_{it} + \epsilon_{it}, \end{aligned} \quad (2)$$

where  $PC_k$  is the compliance index (the dependent variable),  $a_2, a_3, a_4, a_5, a_6$  is the regression coefficients,  $a_1$  is intercept of the model,  $\epsilon$  is error term. The a priori expectation is that  $a_2, a_3, a_4, a_5, a_6 > 0$ .

## 4 RESULTS

### 4.1 Descriptive Statistics of the Dependent Variable

Table 1 shows the descriptive statistics of the dependent variable in the study. A mean of 83.7% is

reported for the level of compliance for the selected banks for the study. The results show a minimum of 3.3% and a maximum of 100% disclosure compliance by the six banks.

Tab. 1: Statistics of the dependent variable

Mean	Standard Deviation	Minimum	Maximum
83.70%	24.90%	3.30%	100.00%

## 4.2 Compliance Disclosure by Banks

With respect to compliance disclosure by the banks, Ecobank had the highest disclosure compliance score of 89.7%, followed by CAL bank (89.5%) and GCB (89.4%). UT bank had the minimum disclosure compliance score at 76.6%

## 4.3 Descriptive Statistics of Selected IFRS/IAS standards

Table 2 presents the descriptive statistics for the selected individual IFRS/IAS that were used in this study. As described in the table, the study shows the compliance percentage for the 17 IFRS/IAS used.

Tab. 2: Descriptive Statistics of Selected IFRS/IAS Standards

Standard	Title	Percentage Compliance
IAS1	Presentation	97.40%
IAS7	Statement of cash flow	100.00%
IAS10	Events after reporting period	100.00%
IAS12	Income tax	97.50%
IAS16	Property, Plant and Equipment	92.20%
IAS18	Revenue	100.00%
IAS19	Employee benefit	74.40%
IAS23	Borrowing cost	75.00%
IAS24	Related Party disclosure	86.30%
IAS28	Interest in associate	39.00%
IAS33	Earnings per share	86.70%
IAS36	Impairment	100.00%
IAS37	Provision, contingent liabilities	93.00%
IAS38	Intangible Assets	87.40%
IFRS5	Non-current asset held for sale	3.00%
IFRS7	Financial Instrument	98.00%
IFRS8	Operating Segment	92.80%

From Table 2, inference can be made that statement of cash flow, events after reporting period, revenue and impairment were completely disclosed at 100% compliance by all the banks selected for the study. Further, the results of the study explored non-current assets held for sale as the least disclosed IFRS/IAS standard at 3%.

## 4.4 Descriptive Statistics of the Independent Variables

The following section discusses the results of the independent variables; Profitability, (ROE), Leverage and the Size of the banks.

### *Profitability (ROE)*

From Table 3, the profitability of the banks ranged from 0.07 (7%) to 0.491 (49.1%) with a mean of 0.155 (15.5%). From the data results, the inference can be drawn that CAL Bank had the highest ROE at 24.9% which was followed by ECOBANK with a mean value of 0.189 (18.9%). The bank with the lowest ROE was SGSSB. The implication is that, at an average of 0.155 for the selected banks, there is the likelihood that the banks may have been discouraged from complying with the IFRS/IAS standards. The result is in line with signalling theory, which suggests that managers are more likely to get the market informed by disclosing profits to attract investors and thus increase management compensation.

### *Leverage*

From Table 3 it can be observed that leverage for the companies ranged from 0.63 to 0.93, with a mean score of 0.86. SGSSB was highly geared (0.874), followed by HFC (0.873), UT (0.866), GCB (0.863), CAL Bank (0.859) and then ECOBANK (0.859). Considering the high leverage, the implications are that these banks comply to a greater extent with IFRS/IAS as per 'agency theory'. As a result these banks are required to provide enough information to decrease agency costs by giving further assurance to debt holders that stakes are secured.

### *Size*

The size of the banks which comprised of the assets and revenues of the banks ranged from 8.63 to 9.8 with a mean value of 9.4 while dispersing the mean at 0.32 as inferred from Table 3. The results show that CAL Bank was highest in the sample (9.53) followed by ECOBANK (9.446), UT bank (9.437), SGSSB (9.415), HFC (9.39) and GCB (9.371).

The differences in the banks by their sizes are mainly due to economies of scale as well as other managerial strategies that impact on the assets and the revenues of the banks.



Tab. 3: Independent Variable

Variables	Minimum	Maximum	Mean	St. Deviation
ROE	0.07583	0.49177	0.155451	0.11330632
Leverage	0.638	0.928	0.865654	0.054378
Size (GHC, Billion)	8.632	9.83	9.434182	0.323363

Tab. 4: Correlation Matrix

Variables	Auditor	Multilist	ROE	Leverage	Size	Compliance
Auditor	a.					
Multilist	a.	a.				
ROE	a.	a.	1			
Leverage	a.	a.	-0.35	1		
Size	a.	a.	0.729**	0.85	1	
Compliance	a.	a.	0.579**	-0.22	0.651**	1

Notes:  $p < 0.05$  significant level or Correlation is significant at the 0.01 level \*\* (2 tailed); "a." = cannot be computed because at least one of the variables is constant. Number of observations is 30.

### Multiple Listing Statuses

Out of the six banks studied, none of the banks had multiple listing statuses. The implication is that the banks preferred being listed only on the GSE.

### Type of Auditor

Regarding the type of auditor, all the banks were reported by the big four auditing firms in the country; PricewaterhouseCoopers (PWC), KPMG, Ernst & Young and Deloitte.

## 4.5 Correlations and Testing of Propositions

Prior to running the multiple regression, correlation of the independent and the dependent variables was verified. In order to test the propositions by ascertaining the relationship between the variables Pearson correlation was used. From the results presented in Table 4, the inference can be drawn that the relationship between auditor type and the multiple listing statuses of the banks were not computed. This was due to the fact that auditor type and the multiple listing statuses of the banks had individual constant values.

## 4.6 Profitability and Disclosure

In testing the proposition that profitability has a positive connection with compliance level with disclosed IFRS requirements of Ghanaian listed banking financial institutions, Pearson correlation

was used. The correlation results as indicated in Table 4 show that profitability is positively connected with disclosure at a significance level of  $p < 0.05$ . The correlation coefficient of .57 implies that the positive relationship between profitability and disclosure is strong. Moreover, the results contradict the findings of (Street and Bryant, 2000) as well as (Tower et al, 1999) that profitability has no connection with the level of mandatory and voluntary compliance with IFRS/IAS standards.

## 4.7 Company Size and Disclosure

Moving on, the proposition that company size has a positive connection with compliance level with the disclosed IFRS requirements of Ghanaian listed banking financial institutions is not rejected. This is because the correlation coefficient depicts a positive relationship between size and disclosure compliance at  $r = 0.651$  ( $p < 0.05$ ) as presented in Table 5. The implication is that banks with higher profits are likely to comply with IFRS/IAS standards. Contrary to the findings of (Archambault and Archambault, 2003) this result contradicts the report that company size has no association/relationship with disclosure compliance.

## 4.8 Leverage and Disclosure

The results depict that the leverage of banks has an insignificant ( $p > 0.05$ ) negative (-0.22) relationship with disclosure compliance as shown in Table 4. As a result, the proposition that leverage has a positive



connection with the compliance level with the disclosed IFRS requirements of Ghanaian listed banking financial institutions is rejected. In summary, the correlation results showed an insignificant positive relationship between the variable that is dependent; disclosure compliance and leverage at a correlation coefficient of .907. However, at significant  $p$ -values, disclosure compliance interacted positively with ROE and Size at correlation coefficients of 0.579 and 0.651 respectively.

## 4.9 Multiple Regression

A stepwise multiple regression method was used to identify the factors that predict the disclosure compliance levels of financial institutions listed on the Ghana Stock Exchange. This multiple regression test checks whether when holding all other variables fixed each independent variable predicts variation in compliance. The model takes up that compliance is distributed normally with equal variance across all values of any independent variable.

In order to predict individual values of compliance taking into consideration the regression line, the model takes the form:

$$PC_{it} = -0.388 - 0.078 \text{ Leverage} + 0.223 \text{ ROE} + 0.133 \text{ Size} + \epsilon_{it}$$

## 5 DISCUSSION AND CONCLUSIONS

Little study has been made of the compliance of listed firms in Ghana with all the standards. This study attempts to fill this gap by measuring total compliance by the listed banks and determining the factors that influence compliance with the mandatory disclosure requirement in Ghana. High mean disclosure by the listed banks in Ghana is consistent with the motivation to protect their reputational risk, the desire to attract investors and also the avoidance of policy sanction as revealed by (Watt and Zimmerman, 1978). A prior study of the compliance of listed financial companies in Nigeria showed a mean of 85.9% (Tsegba et al, 2016) compared to the findings of this study which revealed an average score of 83.7%, but this was higher than those documented in Turkey (79%), (Demir & Bahadir, 2014) and Kuwait (69% & 82%), (Al Mutawaa & Hewaidy, 2010; Al-Shammari, 2011)

Tab. 5: Regression Results

Variables	Pearson Coefficient $r$	Beta	$p$ -value	Decision
Intercept		-0.388	0.160	
ROE	0.579	0.133	0.001	Accept
Size	0.651	0.223	0	Accept
Leverage	-0.22	-0.078	0.907	Reject
Auditor Type	-	-		
Multiple Listing	-	-		

Notes:  $p < 0.05$  significant level; overall  $R$  square = 0.424; Adjusted  $R$  Square = 0.403,  $F$ -value = 20.609; observation = 30

From Table 5  $r$ -squared is 0.424 (adjusted  $r$ -squared = 0.403) which tells us that the model based on the results from the current data explains 42.4% of the variation in compliance. As a result the model is 42.4% efficient in predicting variances in disclosure compliance.

The regression results show that leverage has no statistical relationship with compliance ( $\alpha > .05$ ). The profitability of the banks, thus ROE, has a statistical impact on compliance ( $\alpha < .05$ ). Holding all other variables fixed, the size of the banks also has a statistically significant positive impact on compliance. In the multivariate linear model if size increases by a unit, compliance increases by 0.133 (13.3%),  $t = 4.540$ ,  $p = 0.000$ .

The study reported a positive association of profitability and IFRS compliance which is consistent with the study by (Ali et al, 2004; Tsegba et al, 2016) but inconsistent with (Demir & Bahadir, 2014; Al Mutawaa & Hewaidy, 2010). The positive relationship of profitability is consistent with the signal theory explanation meaning that profitable firms invest in compliance to paint a good picture of themselves. A positive relationship also exists between IFRS disclosure compliance and company size. This supports the study of (Ali et al, 2004; Al Mutawaa & Hewaidy, 2010) but is inconsistent with the study carried out in Turkey (Demir & Bahadir, 2014). Large firms are deemed to comply with IFRS because of reputational risk. They are seen to comply to reduce information asymmetry.

To conclude, the study showed minimum and maximum disclosure of compliance of the IFRS/IAS

at 3.3% and 100% respectively. Ecobank had the highest disclosure compliance score of 89.7% followed by CAL bank 89.5% and GCB 89.4%. UT bank had the lowest disclosure compliance score of 76.6%. Moreover, findings of the study results show that leverage is found to be insignificant in explaining compliance. However, ROE and Size were seen to have a positive association with the level of compliance at correlation coefficients of 0.579 and 0.651 respectively. Auditor type and multiple listing were both constant with the explanation that all the banks were audited by the big four accountancy firms and none of the banks were cross listed.

The way forward could be for Ghana Stock Exchange to make IFRS compliance a requirement for continuous listing. The Institute of Chartered Accountants Ghana (ICAG) which has the backing of the law to regulate the accounting profession in Ghana, must provide accountancy services to the preparers of the annual report especially where the understanding of some of the standards is poor. The ICAG in collaboration with other regulators must make firms report their own level of compliance in their financial statement and question them when full compliance is not stated.

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# MAKING UP A SOAP RECIPE USING A LINEAR OPTIMISATION MODEL

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## ABSTRACT

This paper presents a new mixed integer linear optimisation model, which improves the make-up of a recipe of soap. The model respects the manufacturing process of the soap, takes the soapmaker's favourite fats into account, prevents unbalancing of the soap ingredients and so the soap does not cause any harm to the skin. The model ensures that the recommended indexes of quality are met and that certain types of fats are mutually balanced in a suitable proportion when applicable. Using the mixed integer linear programming model, we compute the corresponding balanced soap recipe with minimal production cost. Then we show the final product, which is as acceptable as possible.

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## KEY WORDS

linear programming, soap recipe, mixed integer linear programming

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## JEL CODES

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## 1 INTRODUCTION

The origins of using the soaps of many variants date back to thousands of years ago. Today, the question of using soap is a fundamental question for the whole world. People need to clean the skin and they usually use a type of soap – liquid or solid soap, natural or synthetic, milk soap or transparent soap, etc. The skin is our biggest organ and that is why we should pay attention to the hygienic items that we use every day.

Soap can be produced by soapmakers at home or in big cosmetics companies. Home soapmakers usually make soap from natural materials (known as natural soap) and their quantity of production is very small. If we look at the labels of bars of soap by big companies with mass production, we will see many chemical ingredients which are added (known as synthetic soap). Bars of soap by home soapmakers are more expensive than those by the big

cosmetic companies thanks to the price of the natural ingredients.

Soap made from ingredients in the wrong proportions can harm our skin. Soap making is a very responsible process and it is necessary to have a correct soap recipe. There are some books for beginners, see Cavitch (2002) or Seidlová (2015), which contain a few basic and well-known soap recipes. But if the soapmakers want to make up new soap recipes, the make-up requires experience and practice. Anyway, recipes are always the secret know-how of the soapmakers.

In this article, we show a model which can offer soapmakers a new approach when making up soap recipes. The soapmakers usually use a soap calculator (Botanie Natural Soap, 2017), but the final recipe is composed manually. They have to choose particular fats and adjust the amounts until the

Tab. 1: Fats and their fatty acids (in % of total weight)

	Lauric	Myristic	Palmitic	Stearic	Ricinoleic	Oleic	Linoleic	Linolenic
Almond butter	0	1	9	15	0	58	16	0
Duck fat	0	1	26	9	0	44	13	1
Olive oil	0	0	14	3	0	69	12	1
Coconut oil	48	19	9	3	0	8	2	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

recipe is balanced. This process takes more time if the soapmakers work with more fats. That is why soapmakers do not use many fats.

The model constructed below will greatly help soapmakers. They will be sure that their new recipes

are meaningful and the final product will have the correct properties, all in a short time. Above that, we minimise the production cost in the model.

## 2 THE PROBLEM

Soap is made from the sodium or potassium salts of fatty acids. Sodium carbonate is used to make a bar of soap while potassium hydroxide is used to make liquid soap. There are two types of manufacturing process – the *cold* and the *hot process*. The cold process uses the temperature needed to melt all solid fats and this method is very fast. The hot process consists of cooking the soap ingredients at a temperature of 50 – 60°C for several hours.

Here we use the cold manufacturing process, in which the soap is made from natural fats, sodium hydroxide (lye) and water which dissolves the sodium hydroxide. As we mentioned above, the choice of fats and their optimal amounts, the right amount of sodium hydroxide and water are the key to a soap bar of the best quality.

In fact, the optimal amounts of fats are governed by the optimal amounts of their fatty acids. The amount of each fatty acid contained in some fats is presented in detail in Table 1.

If we use a fat with a large amount of fatty acid, it can cause a good *bubbly lather* of the soap (soap's ability to lather up and get bubbly), but on the other hand the soap can dehydrate our skin. Another fatty acid can cause a less bubbly lather, but the final soap bar is very hard (*hardness*). Another fatty acid can cause good *cleansing* qualities (dirt is washed away), but the final soap is not too hard.

Table 2 presents fatty acids and their influence on the qualities of the final soap bar. *Creamy lather* refers to the stability and creaminess of the lather,

*conditioning* refers to the soap's emollient content (Botanie Natural Soap, 2017).

Tab. 2: Fatty acids and the qualities of the soap

	Hardness	Cleansing	Bubbly lather	Creamy lather	Conditioning
Lauric	Yes	Yes	Yes	No	No
Myristic	Yes	Yes	Yes	No	No
Palmitic	Yes	No	No	Yes	No
Stearic	Yes	No	No	Yes	No
Ricinoleic	No	No	Yes	Yes	Yes
Oleic	No	No	No	No	Yes
Linoleic	No	No	No	No	Yes
Linolenic	No	No	No	No	Yes

Tab. 3: Indexes of quality (in points from 0 to 100)

	Hardness	Cleansing	Bubbly lather	Creamy lather	Conditioning
Almond butter	25	1	1	24	74
Duck fat	36	1	1	35	58
Olive oil	17	0	0	17	82
Coconut oil	79	67	67	12	10
⋮	⋮	⋮	⋮	⋮	⋮

Considering Table 1 and Table 2 as matrices, we multiply them (with the convention that Yes = 1 and No = 0) to obtain the *indexes of quality* of the fats. The result is presented in Table 3. As a result of this, we could describe the properties of the fatty acids in

Table 2 by real numbers in the interval  $[0, 1]$ , but the values are not available.

We have to recognise other two parameters which have an influence on the soap. The first is the *iodine value* which means the mass of iodine (in grams) that is consumed by 100 grams of fat, see Table 4. Further details can be found in Botanie Natural Soap (2017).

Every fat has a value of *saponification*. The saponification means the amount of sodium hydroxide (in milligrams) needed to react with one gram of the fat to make the soap. Let us denote the second parameter as INS (Iodine In Soap), which is a measure of the physical qualities of the soap based on the saponification and iodine value (Botanie Natural Soap, 2017).

We can summarise all the observed qualities and the optimal ranges of their indexes in the following table.

The optimal ranges of the indexes of quality were established experimentally and the final combination of fats should comply with them (Botanie Natural Soap, 2017). To this end we propose using our mathematical model.

Tab. 4: Iodine values

	Iodine value
Almond butter	70
Duck fat	72
Olive oil	85
Coconut oil	3
$\vdots$	$\vdots$

Tab. 5: INS

	INS
Almond butter	118
Duck fat	122
Olive oil	105
Coconut oil	258
$\vdots$	$\vdots$

Tab. 6: Optimal ranges of quality

	Optimal range
Hardness	29–54
Cleansing	12–22
Condition	44–69
Bubbly lather	14–46
Creamy lather	16–48
Iodine	41–70
INS	136–170

### 3 MATHEMATICAL MODEL

The aim is to propose a soap recipe whose qualities are in the optimal ranges.

Let us consider fats  $i = 1, \dots, I$  (such as almond butter, duck fat, olive oil, coconut oil, etc.). Each fat has some types of quality  $j = 1, \dots, J$  (such as hardness, cleansing, condition, etc.).

Let us have a real non-negative matrix  $A = (a_{ij})$  such that each of its entries  $a_{ij}$  means the index of the quality  $j$  in the fat  $i$  for all  $i = 1, \dots, I$  and  $j = 1, \dots, J$  (see Tables 3 – 5). Denote the minimal and maximal recommended indexes of quality (optimal ranges in Table 6) by a non-negative vector  $b^{\min} = (b_j^{\min})$  and a non-negative vector  $b^{\max} = (b_j^{\max})$ , respectively, with  $j = 1, \dots, J$ . Let us have real non-negative vectors  $d^{\min} = (d_i^{\min})$  and  $d^{\max} = (d_i^{\max})$  where  $d_i^{\min}$  and  $d_i^{\max}$  denotes the minimal and

maximal relative quantity of the fat  $i = 1, \dots, I$  in the soap if the fat  $i$  is used in the recipe.

Now we can proceed with the formulation of the mathematical model. Let  $x_i$  be a real non-negative variable which means the relative amount of the fat  $i$  in the soap to be produced.

We should meet the optimal ranges, so we use the conditions

$$\sum_{i=1}^I a_{ij} x_i \geq b_j^{\min}, \quad (1)$$

$$\sum_{i=1}^I a_{ij} x_i \leq b_j^{\max}, \quad (2)$$

$$\sum_{i=1}^I x_i = 1, \quad (3)$$

for all  $j = 1, \dots, J$ .



The relative amount should be non-negative, so we add the conditions

$$x_i \geq 0 \quad (4)$$

for all  $i = 1, \dots, I$ .

We also want to use reasonable relative amounts of fats in the recipe, or some fats should be between some lower and upper bounds. For example, the relative amount of castor oil should be between 2–3%. So we add inequalities

$$x_i \geq d_i^{\min} y_i, \quad (5)$$

$$x_i \leq d_i^{\max} y_i, \quad (6)$$

for all  $i = 1, \dots, I$ , where  $y_i$  is a new binary variable. The variable means whether the fat  $i$  is used ( $y_i = 1$ ) or not ( $y_i = 0$ ). We can fix the variable  $y_i = 1$  in computations if we want to use some particular fat  $i$  in the recipe.

We also want to use some reasonable number of fats. Denote the total maximal number of fats by a non-negative  $e^{\max}$ . We use the condition

$$\sum_{i=1}^I y_i \leq e^{\max}. \quad (7)$$

There can be some groups of fats which should be balanced in certain proportions. For example, according to Seidlová (2015), the ratio of solid and liquid fats should be in the ratio 50 : 50. Let  $M_1 = \{M_{11}, M_{12}, \dots, M_{1\mu_1}\}$  denote the set of groups of fats which should be in the ratio  $\zeta_{11} : \zeta_{12} : \dots : \zeta_{1\mu_1}$  where  $M_{11}, M_{12}, \dots, M_{1\mu_1} \subseteq \{1, \dots, I\}$  are pairwise disjoint sets of fats. Let  $M_2 = \{M_{21}, M_{22}, \dots, M_{2\mu_2}\}$  denote the set of groups of fats which should be in the ratio  $\zeta_{21} : \zeta_{22} : \dots : \zeta_{2\mu_2}$  where  $M_{21}, M_{22}, \dots, M_{2\mu_2} \subseteq \{1, \dots, I\}$  are pairwise disjoint sets of fats. Etc. and let  $M_\nu = \{M_{\nu 1}, M_{\nu 2}, \dots, M_{\nu \mu_\nu}\}$  denote the set of

groups of fats which should be in the ratio  $\zeta_{\nu 1} : \zeta_{\nu 2} : \dots : \zeta_{\nu \mu_\nu}$  where  $M_{\nu 1}, M_{\nu 2}, \dots, M_{\nu \mu_\nu} \subseteq \{1, \dots, I\}$  are pairwise disjoint sets of fats. The fats can be in the ratios with some tolerances. Let  $\epsilon_{\iota\kappa}$  be the tolerance of the coefficient  $\zeta_{\iota\kappa}$  for  $\iota = 1, \dots, \nu$  and  $\kappa = 1, \dots, \mu_\iota$ . We assume that  $0 < \epsilon_{\iota\kappa} < \zeta_{\iota\kappa}$ .

We can express that as follows

$$(\zeta_{\iota\kappa} - \epsilon_{\iota\kappa}) \sum_{i \in M_{\iota\lambda}} x_i \leq (\zeta_{\iota\lambda} + \epsilon_{\iota\lambda}) \sum_{i \in M_{\iota\kappa}} x_i, \quad (8)$$

$$(\zeta_{\iota\kappa} + \epsilon_{\iota\kappa}) \sum_{i \in M_{\iota\lambda}} x_i \geq (\zeta_{\iota\lambda} - \epsilon_{\iota\lambda}) \sum_{i \in M_{\iota\kappa}} x_i \quad (9)$$

for all  $\iota = 1, \dots, \nu$ , for all  $\kappa = 1, \dots, \mu_\iota - 1$  and for all  $\lambda = \kappa + 1, \dots, \mu_\iota$ .

Some people might not like to use some type of fat in the recipe. We introduce sets  $G_1, G_2, \dots, G_T$  of fats that are related to some characteristics. For example, set  $G_1$  is the set of all animal fats, set  $G_2$  is the set of plant fats, set  $G_3$  consists of palm oil and palm kernel oil, etc.

So let us consider the set of all animal fats  $G_1$ . We express the condition that these fats are not used by putting

$$x_i = 0 \quad (10)$$

for all  $i \in G_1$ .

In the end, we add an objective function. We minimise the price of the used fats as follows

$$\sum_{i=1}^I c_i x_i \rightarrow \min. \quad (11)$$

The entire model is a mixed-integer linear programming model and consists of constraints (1)–(10) with the objective function (11). We need to find a feasible solution with the minimal value of the objective function.

## 4 RESULTS

The aim is to find a recipe for solid soap composed of vegetable fats, except for palm oil and palm kernel oil, so that the soap is as cheap as possible. Let us describe such a particular soap recipe.

Table 7 presents the optimal relative amounts of fats. The total price of 100 grams of all calculated fats is about 20 CZK (0.7 EUR). In the calculations we used 53 fats out of the total number 136 (Botanie

Natural Soap, 2017) because of their availability in Czech stores. In total, there are 106 variables, out of which 53 are integers, and 70 constraints in the model.

This model was solved by the optimisation software FICO® Xpress Optimisation Suite on a Windows 10 Enterprise computer with 8 GB RAM and

an Intel Core 2.50 GHz CPU. The computation took less than 1 second.

Tab. 7: Optimal amounts of fats

	%
Castor oil	3
Coconut oil, frac.	22
Olive oil	24
Shea butter	28
Sunflower oil	23
Total	100

Tab. 8: Final result

	Optimal range	Solution
Hardness	29–54	41
Cleansing	12–22	22
Condition	44–69	58
Bubbly lather	14–46	25
Creamy lather	16–48	22
Iodine	41–70	70
INS	136–170	147

Table 8 presents the minimal and maximal recommended indexes of quality (in the Optimal range column) and the solution for the soap (in the Solution column).

For the final product we need to calculate the rest of the components – sodium hydroxide and water. If we do not use enough water, the sodium hydroxide will not dissolve in water. It can cause brittleness of the soap and also means the soap will be dry. If we use too much water, the soap will be too soft and not very hard.

We know that the optimal solution of the INS value is 147 which is the amount of sodium hydroxide (in milligrams) needed to react with one gram of the fat for complete saponification. If we use 500 grams of all oils, we need  $(147 \cdot 500)/1000$  grams of sodium hydroxide. Actually, we do not need complete saponification, but approximately 85–95% (called as *super fat*). We use 94%. We also need to know the purity of the sodium hydroxide. It is always about 98% so we divide the value by 0.98. In total, we need 71 grams of sodium hydroxide. The amount of water should be 33% of the total weight of fats so we need 165 grams of water (Cavitch, 2002, Seidlová, 2015).

If we are not sure about the quality of water from our tap, it is better to use distilled water. The use of the soap also constitutes a problem. The soap is used to wash dirt down from our skin in hot, soft and alkaline water. The effectiveness of the soap depends on the quality of the water.

Once we have the optimal amounts of fats, sodium hydroxide and water, the recipe is done. Let us go on to finalise the product. We add the sodium hydroxide to cold water carefully and blend it quickly. We leave the blend to mature for several hours. If we use solid fats, we let them melt down and blend together. Then we pour the blend of water and sodium hydroxide into fats and blend it fluently and quickly. Then we can pour it into a mould.

Soaps can be perfumed by essential oils in the amount of 1–2% of the total amount of fats. The soapmakers can also use some colouring, spices, herbs or preservatives.

After solidification, the soap is successfully made.

Just as a matter of interest, we can show a recipe which gives the most expensive bar of soap. We minimised the objective function (11) in Section 3, but we maximise the objective function now. The result is presented in Tables 9 and 10.

Tab. 9: Optimal amounts of fats

	%
Avocado butter	45.2
Buriti oil	14.6
Coconut oil, frac.	4.8
Laurel fruit oil	35.4
Total	100

Tab. 10: Final result

	Optimal range	Solution
Hardness	29–54	36
Cleansing	12–22	14
Condition	44–69	60
Bubbly lather	14–46	14
Creamy lather	16–48	23
Iodine	41–70	67
INS	136–170	136

The price of 100 grams of all the corresponding oils is 287 CZK (11 EUR). For 500 grams of all the oils we need 66 grams of sodium hydroxide and 165 grams of water.



Fig. 1: Fats



Fig. 2: Melting down the fats



Fig. 3: Soap in moulds



Fig. 4: Final product

## 5 DISCUSSION

This article presents a new idea of how to improve the working steps of soapmakers when making up a soap recipe.

The soapmakers are unable to make up a soap recipe which respects the optimal amounts of ingredients and uses the cheapest fats in a short time. We have introduced a tool which makes the make-up of the soap recipe more efficient and also makes the final product optimal, safe and cheap. The tool is a linear optimisation model, which saves time not only by generating just one soap recipe, but by generating all soap recipes.

Using the presented mathematical model means that the problem is reduced to choosing fats which should be used, setting the minimal and maximal total amount of fats and setting the maximal number of fats which should be used. The model can also be extended to recipes of other cosmetic products and can be useful for home soapmakers or soapmakers in cosmetics companies.

The model offers an opportunity to discover new soap recipes effortlessly.

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# LINGUISTIC DIFFERENCES BETWEEN SUCCESSFUL AND NON-SUCCESSFUL CEOS DURING THE FINANCIAL CRISIS

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## ABSTRACT

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The present study represents an important attempt to explore some of the rhetorical aspects of effective leadership. The main purpose is to investigate possible linguistic differences between 104 effective and non-effective CEOs during the Financial Crisis (years 2008 and 2009) – using language and company performance as predictor variables. The word usage of the top and bottom 25% of CEOs from the S&P500 within their corresponding letters to shareholders were analysed via the LIWC2015 quantitative content analysis software. The main focus is on the following linguistic markers: use of a) present achievement, b) present power, c) present risk, d) emotionality, e) present positive work, and f) visionary words. The results revealed that successful and non-successful CEOs use language equally, indicating that both also have the same leadership attributes. Our findings highlight the important role which communication plays in the leadership process, as well as, leadership effectiveness.

## KEY WORDS

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linguistic differences, financial crisis, CEO effectiveness, LIWC2015

## JEL CODES

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M1, M2, M5

## 1 INTRODUCTION

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### 1.1 Characteristics of Chief Executive Officers

Chief Executive Officers or simply “CEOs” are arguably the most powerful managers within an organisation. They can be the driving force behind a company’s performance and are essentially important for the future of an organisation. Hart (1993) stated that the conflicting demands on senior executives are to keep the balance between flexibility and stability, having the focus on the inside and the outside of the organisation, as well as, targeting processes and outcomes. Selecting a CEO for example is one of

the most influential and significant events for an organisation. Research suggests that the leadership of a CEO accounts for 15% of the total variance in profitability or total return to shareholders (Nohria et al., 2003). This is a surprisingly large number since the same study found that the whole industry in which a company operates accounts for the same variance. This indicates that choosing a CEO has the same impact as deciding whether to stay in the same industry or to enter a new one. Nevertheless it has to be mentioned that there is a large variance in the degree of actual influence and level of achievement; some CEOs are highly capable and perform well,

whereas others perform worse. In 1991, Barrick, Day, Lord, and Alexander compared average performing CEOs to high performing CEOs by examining 132 organisations from the Fortune 500 over a period of 15 years (1971–1985). The results revealed that during their tenure, effective CEOs provided an additional 25 million dollars in value to a company, contrary to averagely effective CEOs. These findings emphasise the need to identify those characteristics that separate effective CEOs from non-effective CEOs.

Firstly there are some directly observable features, like the demographic information that is linked to effectiveness. In particular the age and education of a CEO seems to influence investment policy, financial policy, organisational strategy and the performance of a company (Bertrand and Schoar, 2002). Older CEOs, for example, tend to be more conservative in their decision-making. This can be seen through lower capital expenditure, higher cash holdings and less financial leverage. The reasons for this may be that a more mature CEO has more business experience and goes beyond his self-interest to cope with the demands of the organisation, employees and stakeholders. Further, Zaccaro and Klimoski, (2002) identified career experience, relevant education and functional background as highly favourable. Highly efficient CEOs are able to deal with cognitively complex tasks, have a high self-efficacy and a strong need for achievement compared to non-effective CEOs. This aligns with the findings of Kaplan et al., (2012), that highly effective CEOs often excel on executive-related measures, such as efficacy and organisation. Moreover, personality traits such as for instance being detail-oriented, proactive, as well as a strong focus on achievements through setting high standards were all found to be important attributes of successful CEOs (Kaplan et al., 2012).

A strong focus on performance is also linked to success in the work environment. Indeed, the difference between effective and non-effective CEOs is, amongst others, a strong need for achievement and self-efficacy (Zaccaro and Klimoski, 2002). Here, Sashkin (1990) added the power motive as a requirement for effective leadership. Besides positive effects on the employees and the company, a high power motivation has an influence on the performance of the individual. For example, a need for power is linked to work promotions (McClelland and Boyatzis, 1982). Managers who have a high need for power

were significantly more likely to get promoted in their workplace, compared to those with a lower need. Further, CEOs with a socialised power motive are more emotionally mature and they use their power for the benefit of the whole organisation (McClelland, 1985). So, not surprisingly, the need for power is frequently found in executive leaders (Bass and Bass, 2009, pp. 157–159).

Additionally the ability to take reasonable and calculated risks is linked to effectiveness. CEOs especially must have the capacity to take legitimate risks, even when there is limited information available or in times of uncertainty, such as an economic crisis (Hoskisson, Chirico, Zyung, and Gambeta, 2017). Effective CEOs are more ready and willing to take risks compared to their non-effective colleagues (Zaccaro and Klimoski, 2002). Further, the level of a CEO's tolerance toward risks is correlated to company growth (Graham, Harvey, and Puri, 2013). Researchers have shown that companies with high former or future growth rates are more likely to be managed by risk-tolerant CEOs. Risk-taking managers would initiate more mergers and acquisitions than their risk-averse colleagues. This might be because CEOs know that risk-aversion makes incentive pay costly and being too cautious could result in failing to detect possible rewarding opportunities. Because of that companies prefer to hire those individuals as CEOs who are capable of taking and handling risks.

The Graham et al. (2013) study made two further interesting discoveries. CEOs are on average significantly less risk-averse and show much more positive emotion than the general population. This is truly interesting, since researchers emphasise that emotions play a key role in the process of effective leadership (Bono and Ilies, 2006). For example, positive emotions have been proven to influence motivation and effort. Those managers who are able to trigger emotional responses from their followers have a higher chance of accomplishing changes in the working environment (Conger and Kanungo, 1998). Further, CEOs who can build positive relationships with people at all levels of the company and who inspire followers can foster positive attitudes which can lead to improved corporate performance (Nohria, Joyce, and Roberson, 2003). This is because individuals who experience a positive affect have a stronger feeling that their efforts lead to performance and that this performance will result in rewards,



compared to those who are in a negative mood state (Erez and Isen, 2002). On the other side, leaders will also transfer their negative mood states onto their subordinates, which can lead to lower group achievement (Sy, Côté, and Saavedra, 2005). These findings emphasise that effective CEOs ought to show positive emotions to their followers and try to avoid negative ones.

## 1.2 Effective Leadership in Times of Crisis

Highly stressful situations in particular require effective leadership and highly skilled CEOs. Minor or major crises can be severe scenarios which can have harmful and disruptive impacts on organisations (Reilly, 1993). They can affect the national or even the global economy, as could be seen during the Financial Crisis. According to Reilly (1993), crises are outside of a company's typical operation and thus they put extreme demands on the organisation, especially the time and attention of senior management. In such times people want a leader who seems to be powerful and is able to provide a clear direction (Pillai, 1996). The followers will accept, even need, the influence of a leader who can show high self-confidence and provide a solution to the current problem. Therefore a CEO ought to convey meaning and understanding of the current situation, which can be accomplished by giving assurance that solutions are available to cope with the demands of the present situation (Shamir and Howell, 1999). Hoffman et al. (2011) state that this can be achieved by conveying a positive, collective vision with which the employees can identify. Articulating a clear and appealing vision has been proven to have a strong influence on effective leadership and charismatic leaders are able to motivate and inspire their followers through a persuasive way of communicating (Conger and Kanungo, 1988). Therefore effective CEOs need to convey the image that there will be a positive outcome to a crisis, which can be accomplished by presenting dramatic changes as positive challenges and not as potential disturbances (Hoffman et al., 2011).

However, a crisis does not only have a strong effect on the entire firm, but also on its employees. The accompanying uncertainties and struggles can cause high levels of stress for those individuals affected by it. Findings from clinical psychology

found that stress in general can lead to depression (Caspi et al., 2003), post-traumatic stress disorder (Brewin, Andrews, & Valentine, 2000) and anxiety (Maes et al., 1998). In return these conditions can lead to poor work performance, a higher degree of absenteeism and a decrease in work productivity (Naghieh et al., 2015; Colligan and Higgins, 2005). Moreover, perceived stress in the work environment is related to lower job satisfaction (Thoresen et al., 2003) and employees who have a negative approach towards their workplace significantly lower the performance of the whole company (Brief, Burke, George, Robinson, and Webster, 1988). Conversely, an optimistic view towards work was shown to lower perceived stress and increase the overall well-being of individuals (Mäkikangas and Kinnunen, 2003). Employees who have a positive view of their work are more satisfied and happy with their job and show more organisational commitment, proving that an employee's positive view of his work increases the overall performance of the organisation (Youssef and Luthans, 2007). Therefore, employees who like their job relate to and contribute to the effectiveness of the whole company. Further, this suggests that in order to be effective, CEOs ought to have an optimistic view of their workplace and should therefore rate their work as likeable. By doing so they can positively contribute to the company's performance, even if the current situation is highly stressful.

## 1.3 Content Analysis and Effective Leadership

Various researchers emphasise that effective leadership lays in the process of communication and that language use plays a key role in the process of leadership (Conger, 1991; Conger and Kanungo, 1998; Gardner and Avolio, 1998; Shamir, Arthur, and House, 1994). Or as Bass, (1990, p. 340) stated that "*communication distinguishes leaders who are successful and effective from those who are not*". Therefore, and not surprisingly, investigating the language use of leaders has become a growing trend within the social sciences. Quantitative content analysis tools especially have proven to be highly effective. Here, the main assumption is that everything an individual expresses reflects his emotions in the present moment. Thus, it can be scientifically analysed and replicable inferences can be drawn from the context of their use (Krippendorff, 2013).

Content analysis can give important insights into the psychological and social worlds of leaders (Tausczik and Pennebaker, 2010), proving to be a highly reliable and powerful scientific tool. Nevertheless, even though content analysis made major contributions to the study of leadership, current research examining possible linguistic differences between effective and non-effective CEOs is quite sparse. In particular there seems to be a great lack of research during times of severe economic crisis. A possible reason might be that adequate data are just beginning to emerge. However, there are two studies worth mentioning.

The first study by Bligh and Hess (2007) was conducted on the use of positive and negative emotion words in times of economic crisis. In the study, the degree of optimism, pessimism, certainty, immediacy and activity of the former Federal Reserve CEO Alan Greenspan were studied. The researchers investigated his use of language during the economic recession of 2001, the following bull market and in times when the general U.S. economy showed clear signs of recovery. Two main patterns were identified, namely that during economic good times, the CEO used more words related to certainty and activity. Whereas economic bad times diminished the use of certainty and activity words and increased the usage of pessimistic words, immediacy and jargon. Nevertheless, there are two major implications of the Bligh and Hess (2007) study. First of all, the researchers were only focusing on one individual, namely Alan Greenspan. Having only one-test subject could be problematic in making adequate and reliable assumptions, since there is no reference sample or reference corpus. Secondly, Bligh and Hess (2007) were only investigating a small subset of effective leadership and its corresponding linguistic markers (degree of optimism, pessimism, certainty, immediacy and activity).

The second study by Poole (2016) investigated the language change in letters to shareholders of two major banks (Bank of America and Citigroup) between the years 2008 and 2010. It could be shown that in economic bad times, effective CEOs would create more messages that contain a vision and a strategy for future success, while at the same time the managers distanced themselves from past failures. After the crises, so when the companies performed well again, non-effective CEOs tend to accept praise and attribute the company's success to their own actions. Here again there are two

limitations. Even though the study did contain two reference corpus sets, they only consisted of 18 other companies (8 outside the banking industry and 10 within the banking industry) and only two banks were investigated, which can be considered quite a small sample size. Secondly, the Poole (2016) study focused primarily on the banking industry. Since the U.S. economy is quite broad, considering multiple branches could help gain a deeper understanding of the linguistic differences between effective and non-effective CEOs. This brings us to the purpose of the present study.

### 1.3.1 Aim of the Study

Research concerning leadership and content analysis in times of the Financial Crisis is quite sparse and relevant data are just beginning to emerge. The main goal of the present study is to expand on the current state of the literature and close some of the existing knowledge gaps. By using more appropriate frameworks, instruments and methodologies, the present study wants to improve on some of the weaknesses identified in earlier research. Additionally, with a larger sample size and considering various industry branches of the U.S., the present study aims to create a consecutive picture of the language use of leaders during this highly stressful time. To our knowledge, this makes this study one of the first that explores in detail the linguistic characteristics of a CEO's communication during this highly stressful time.

It could be seen that during the Financial Crisis some companies were performing well, whereas others performed much worse or even went into bankruptcy (e.g. Fannie Mae and Freddie Mac). Therefore, the present study raises the following research question: Do the CEOs of well-performing companies talk differently to CEOs of poorly-performing companies? The main goal is to investigate whether effective and non-effective CEOs and, more broadly leaders, use language differently during an economic crisis – using language and company as predictor variables. Due to the innate complexity and richness of language, it is often unavoidable to focus on a finite number of variables as well as leaders that can be measured and analysed. Therefore, and in accordance with the previously summarised literature, the present research investigates the following six linguistic parameters: use of a) present achievement, b) present power, c) present risk, d) emotionality, e) present positive work, and f) visionary words.

## 2 METHODOLOGY AND DATA

### 2.1 Equipment and Measurements

#### 2.1.1 Equipment Used

All data were analysed using the IBM SPSS Statistics Version 22. The written content was analysed using Linguistic Inquiry and Word Count 2015 (LIWC 2015) (Pennebaker, Booth, Boyd, and Francis, 2015). All of the investigated companies were listed on the Standard and Poor's 500 index (S&P500) within the investigated time period (2006–2011). Further equipment included letters to shareholders, which were extracted from the annual reports of the investigated companies.

#### 2.1.2 Content Analysis Software – LIWC2015

The present study relies on the quantitative content analysis software Linguistic Inquiry and Word Count or LIWC2015 (Pennebaker, Booth, Boyd, and Francis, 2015) to analyse the written language use of CEOs within their corresponding letters to shareholders. LIWC2015 proves to be a highly effective, efficient and reliable tool (Pennebaker, Booth, Boyd, and Francis, 2015). It is the most widely used content analysis software for psychological purposes all over the world. Most importantly, the programme has been largely validated and provided substantial evidence that social and psychological processes can be analysed through language use and communication (Pennebaker et al., 2003). The programme relies on a word counting strategy, running through each word within a text and categorising them into a total of 93 psychological categories. The heart of the programme is its internal dictionary that consists of nearly 6400 words, word stems and selected emoticons (Pennebaker and Jordan, 2015). After running through every word, LIWC2015 shows the percentage of word usage in each category. These percentages were used for the statistical analysis.

In alliance with the previously summarised literature, the present study focuses on the following LIWC2015 categories:

a) Present Achievements (PA): The CEO's focus on achievements is measured through the combination of a) present focus and b) achievement scores from the LIWC2015 output. This variable is labelled "Present Achievements (PA)", formed for

each investigated company and used for further analysis.

- b) Present Power (PP): The CEO's power motive is measured through the combination of a) present focus and b) power scores from the LIWC2015 output. This variable is labeled "Present Power (PP)", formed for each investigated company and used for further analysis.
- c) Present Risk (PR): The CEO's ability to take reasonable and calculated risk is measured through the combination of a) present focus and b) risk scores from the LIWC2015 output. This variable is labelled "Risk Taking (PR)", formed for each investigated company and used for further analysis.
- d) Emotionality (EMO): The CEO's ability to express positive and negative emotions is measured through an emotionality scale, consisting of a) positive emotion and b) negative emotion scores from the LIWC2015 output. The emotionality scale consists of the a) positive emotion scores divided by the sum of a) positive and b) negative emotion scores.

$$EMO = \frac{PosEmo}{PosEmo + NegEmo}$$

This variable is formed for each investigated company and used for further analysis.

- e) Present Positive Work (PPW): The CEO's positive attitude towards their workplace is measured through the combination of a) present focus, b) positive emotion and c) work scores from the LIWC2015 output. This variable is labelled "Present Positive Work (PPW)", formed for each investigated company and used for further analysis.
- f) Vision: To measure the CEO's ability to provide a clear and appealing vision, the present study relies on the definition of Avolio and Bass (1995), since it is widely quoted and referred to within the social sciences (e.g. Awamleh and Gardner, 1999; Bass and Bass, 2009; Conger and Kanungo, 1998; Thoms and Greenberger, 1995). Here, visions have an optimistic, positive tone and focus on collective group goals. Furthermore, they target achievements and these achievements can be motivated by promising rewards. Therefore, visions are measured through the combination of a)

first person plural (to define the collective group aspects); b) positive emotion; c) achievement and d) reward scores from the LIWC2015 output. This variable is formed for each investigated company and used for further analysis.

### 2.1.3 Investigated Time Period

The present study investigates possible linguistic differences between effective and non-effective CEOs during an economic crisis. Since the latest Financial Crisis is considered to be the worst since the Great Depression of the 1930s (Eigner and Umlauf, 2015), this time period in particular chosen as the definition of an economic bad time. The crisis started in December 2007 and ended two years later in June 2009 (NBER). Therefore, the present study investigates language use within letters to shareholders between the years 2008 and 2009 (t1).

### 2.1.4 Linguistic Data Analysed

The present study analyses the written language use of CEOs within their corresponding letters to shareholders (in the following text they will be referred to just a “letters”). Since the contents of letters are neither regulated, nor dictated by any other party, there are no specific requirements of what the CEO can include or exclude (Geppert and Lawrence, 2008). Therefore, they offer a great opportunity to analyse the implicit and explicit information which the CEOs want to portray to the public. Within the letters the CEO usually elaborates on the last year’s struggles, explains the achievements, and gives an outlook onto the upcoming business year (Geppert and Lawrence, 2008).

In order to gain a good portrait of the total U.S. economy, all CEOs and subsequently their letters were selected from the Standard and Poor’s 500 Index (S&P 500). This is because the S&P 500 is one of the most watched indices in the world and analysts widely regard it as the best representation of the U.S. stock market. The letters were manually extracted between the 15 April and 2 June 2017. They were downloaded from either the official SP500 website, <http://www.annualreports.com>, <http://www.bloomberg.com> or the individual homepages of the companies. A letter had to fulfil the following criteria to be either included or excluded for further analysis:

- i. The letter had to be written by the CEO. This criterion was fulfilled when the signature of the

CEO was present at the bottom of the individual letter.

- ii. To ensure a high degree of reliability, there had to be at least four letters per CEO present during the investigated time period (years 2006–2011).
- iii. The total word count had to be a 100 or more words per letter. This is due to the fact, that according to the LIWC’s official website (<http://www.Liwc.net>) texts with less than 50 words can cause problems with internal reliability. This is why LIWC suggests that they should only be used with caution. Other researchers argue that reliability is violated in texts with less than 70 words and suggest the use of at least 100 words for an appropriate content analysis (Gottschalk, Winget, and Gleser, 1979). Thus, to ensure a high degree of internal reliability we compromised to consider only those letters with at least 100 words.

A total of 197 letters from 104 CEOs fulfilled these criteria and were used for further analysis. A closer look at the SIC codes of the companies revealed that the present sample represents more than 12 different industries within the U.S., including the Technology, Consumer, Telecommunication and Energy sectors. Therefore, the present sample can be considered an excellent representative of the total U.S. economy.

### 2.1.5 Demographic Information on CEOs

Out of the 104 CEOs, 100 were male (96.15%) and four were female (3.85%). The average age was 53.15 years (with a SD of 6.993). Regarding educational background, the analysis revealed three have no formal college/university education (2.9%), 29 hold a bachelor’s degree (27.9%), 43 a master’s degree or MBA (Master of Business Administration) (41.3%), 19 have a higher education degree (18.3%) and for 10 there was no or unclear information available (9.6%). The higher education level included PhD, honorary doctorates (h.c.) and juristic doctorate (J.D.) degrees. The marital status or country of origin were not considered in the study because they came from untrustworthy sources or were simply not available.

### 2.1.6 Measurement of Effectiveness – Earnings per Share (EPS)

To assess companies’ performance and subsequently the effectiveness of the individual CEOs, the present study relies on the financial indicator Earnings per Share (EPS). EPS is an accounting-based measure and is widely used by investors and analysts to rate



the future value of a firm. It serves as one of the most obvious indicators of company achievement and practically every CEO tries to increase its value. For this reason, previous researchers have used EPS scores as a measure of company performance (e.g. D. Davis and Daley, 2008; Schneider, Hanges, Brent, and Salvaggio, 2003).

All EPS scores were publically available and accessible. They were manually downloaded for every company from the official <http://www.nasdaq.com> webpage and double-checked by comparing them to the German financial site <http://www.finanzen.net>. Those companies ( $N = 5$ ) with different

EPS scores on either website, were excluded for further analysis. All EPS scores were displayed in US dollars. The mean EPS scores for the years 2008 and 2009 was 2.18 (with a SD of 2.43). Since the EPS scores were used to define the effectiveness of the CEOs, we divided the investigated companies into quartiles. The bottom quartile, so those companies with the lowest 25% EPS scores were defined as the *non-effective CEO group*. The top quartile, those companies with the highest 25% EPS scores, were defined as the *effective CEO group*. This resulted in 50 effective and 50 ineffective CEOs in  $t_1$ , which were further investigated.

### 3 RESULTS

All data were analysed using the IBM SPSS Statistics Version 22. Data are mean  $\pm$  standard deviation unless otherwise stated.

#### 3.1 Present Achievements (PA)

There were 49 effective CEOs and 50 non-effective CEOs in our analysis. An independent-samples  $t$ -test was run to determine if there was a difference in the use of Present Achievement scores between effective and non-effective CEOs in economic bad times. There was one outlier in the effective group with a PA score of (15.20) as assessed by the inspection of the boxplots. The outlier was excluded for further analysis. PA scores were normally distributed, as assessed by Shapiro-Wilk's test ( $p > .05$ ). There was homogeneity of variances, as assessed by Levene's test for equality of variances ( $p = .512$ ). PA scores were slightly higher for effective leaders ( $M = 9.411$ ;  $SD = .277$ ) than for non-effective leaders ( $M = 9.357$ ;  $SD = .237$ ). However there was no statistically significant difference in the mean PA scores with  $-.05422$  (95% CI,  $-.777$  to  $.669$ ),  $t(97) = -0.149$ ,  $p = .882$ ,  $d = .03$ . The results indicate that effective and non-effective CEOs rate the present achievements of their company approximately the same.

#### 3.2 Present Power (PP)

There were 49 effective CEOs and 50 non-effective CEOs in the analysis. An independent-samples  $t$ -test was run to determine if there was a difference in the use of Present Power (PP) scores between effective

and non-effective CEOs. There was one outlier in the effective group with a score of (13.04), as assessed by the inspection of the boxplots. The outlier was excluded for further analysis. The assumption of normality was assessed using the Shapiro-Wilk's test ( $p > .05$ ). The results revealed that the effective group was normally distributed ( $p = .930$ ). However the non-effective group was not normally distributed ( $p = .027$ ). At this point we had to make a decision on which test to continue with, either the independent-samples  $t$ -test or the Mann Whitney  $U$  test. Since the independent-samples  $t$ -test is fairly robust to deviations from normality and only the non-effective CEO group was not normally distributed, we decided to continue with the Independent-samples  $t$ -test to determine if there were differences in mean Present Power scores. There was homogeneity of variances, as assessed by Levene's test for equality of variances ( $p = .257$ ). PP scores were slightly higher for effective leaders ( $M = 9.200$ ;  $SD = 1.450$ ) than for non-effective leaders ( $M = 9.115$ ;  $SD = 1.667$ ). But, there was no statistically significant difference in the mean PP scores with  $-.0825$  (95% CI,  $-0.706$  to  $0.541$ ),  $t(97) = -.263$ ,  $p = .793$ ,  $d = .058$ . Again, the results indicate that there seems to be no difference in usage of Present Power words in effective and non-effective CEOs during economic bad times.

#### 3.3 Present Risk (PR)

There were 49 effective CEOs and 49 non-effective CEOs in our analysis. An independent-samples  $t$ -test was run to determine if there was a difference in

the use of Present Risk (PR) scores between effective and non-effective CEOs. There was one outlier in the non-effective group with a PR score of (2.45) and one outlier in the effective group (11.41) as assessed by the inspection of the boxplots. The outliers were excluded for further analysis. The PR scores were normally distributed, as assessed by Shapiro-Wilk's test ( $p > .05$ ). There was homogeneity of variances, as assessed by Levene's test for equality of variances ( $p = .430$ ). The PR scores were slightly higher for non-effective leaders ( $M = 6.152$ ;  $SD = 1.270$ ) than for effective leaders ( $M = 6.132$ ;  $SD = 1.447$ ). However, there was no statistically significant difference with  $.020$  (95% CI,  $-0.525$  to  $0.566$ ),  $t(96) = .074$ ,  $p = .941$ ,  $d = .015$ . The results indicate that there seems to be no difference in the risk taking abilities of effective and non-effective CEOs during an economic crisis.

### 3.4 Emotionality (EMO)

There were 50 effective CEOs and 50 non-effective CEOs in the analysis. The assumption of normality was assessed using Shapiro-Wilk's test ( $p > .05$ ). The results revealed that the non-effective CEO group was normally distributed ( $p = .264$ ). However the effective CEO group was not normally distributed ( $p = .022$ ). For the same reasons as in the Present Power analysis (see above) we decided to continue with the independent-samples  $t$ -test. There were no outliers in the data, as assessed by the inspection of the boxplots. There was homogeneity of variances, as assessed by Levene's test for equality of variances ( $p = .735$ ). Emotionality scores were higher for effective leaders ( $M = .854$ ;  $SD = 0.082$ ) than for non-effective leaders ( $M = .831$ ;  $SD = 0.082$ ). However, there was no statistically significant difference in the mean Emotionality scores of  $-0.023$  (95% CI,  $-0.055$  to  $0.0099$ ),  $t(98) = -1.385$ ,  $p = .169$ ,  $d = .282$ . The results indicate that effective and non-effective CEOs do not differ in Emotionality words in economic bad times.

## 4 DISCUSSION

In the present study we examined possible differences between effective and non-effective CEOs, and in the broader picture, leaders during an economic crisis – using language and company performance as

### 3.5 Present Positive Work (PPW)

There were 49 effective CEOs and 50 non-effective CEOs in the analysis. An independent-samples  $t$ -test was run to determine if there was a difference in the use of Present Positive Work (PPW) scores. There was one outlier in the effective group with a PPW score of 27.19 as assessed by the inspection of the boxplots. The outlier was excluded for further analysis. PPW scores for effective and non-effective CEOs were normally distributed, as assessed by Shapiro-Wilk's test ( $p > .05$ ). There was a homogeneity of variances, as assessed by Levene's test for equality of variances ( $p = .651$ ). PPW scores were higher for effective leaders ( $M = 19.169$ ;  $SD = 2.439$ ) than for non-effective leaders ( $M = 18.617$ ;  $SD = 2.448$ ). But, there was no statistically significant difference in the mean PPW scores with  $-0.551$  (95% CI,  $-1.526$  to  $0.424$ ),  $t(97) = -1.122$ ,  $p = .265$ ,  $d = .226$ . Therefore, the results indicate that in economic bad times non-effective and effective CEOs talk equally positively about their current work situation.

### 3.6 Vision

There were 50 effective CEOs and 50 non-effective CEOs in the analysis. An independent-samples  $t$ -test was run to determine if there was a difference in the use of visionary words. There were no outliers in the data, as assessed by the inspection of the boxplots. Vision scores were normally distributed, as assessed by Shapiro-Wilk's test ( $p > .05$ ). There was homogeneity of variances, as assessed by Levene's test for equality of variances ( $p = .354$ ). Vision scores were minimally higher for non-effective leaders ( $M = 15.945$ ;  $SD = 3.110$ ) than for effective leaders ( $M = 15.938$ ;  $SD = 3.595$ ). However, there was no statistically significant difference in the mean Vision scores with  $.00680$  (95% CI,  $-1.327$  to  $1.341$ ),  $t(98) = 0.010$ ,  $p = .992$ ,  $d = .0015$ . The results indicate that effective and non-effective CEOs do not differ in terms of visionary outlook during an economic crisis.

predictor variables. The results gained did not show any significant linguistic differences and therefore our previous assumptions were not supported. The results rather show that the language use of effective



Tab. 1: Summary of Linguistic Differences between Effective and Non-Effective Chief Executive Officers (CEOs) in the midst of the Financial Crisis (2008–2009)

Linguistic Variables (a)	Effective Mean $\pm$ SD	Non Effective Mean $\pm$ SD	<i>t</i>	df	<i>p</i>
PA	9.41 $\pm$ 0.277	9.82 $\pm$ 1.70	−0.149	97	0.882
PPW	19.17 $\pm$ 2.44	18.62 $\pm$ 2.45	−1.122	97	0.265
PP	9.20 $\pm$ 1.45	9.12 $\pm$ 1.67	−0.263	97	0.793
PR	6.13 $\pm$ 1.45	6.15 $\pm$ 1.27	0.074	96	0.941
EMO	0.85 $\pm$ 0.08	0.83 $\pm$ 0.08	−1.385	98	0.169
Vision	15.94 $\pm$ 3.60	15.95 $\pm$ 3.11	0.010	98	0.992

Notes:  $N = 100$ ; Independent Samples *t*-test; Results are Mean Scores  $\pm$  Standard Deviation

and non-effective CEOs is approximately the same in economic bad times, which might indicate that both have the same leadership qualities. This rather contradicts earlier studies, since linguistic differences could have been expected. Nevertheless, the non-significant results might be due to a variety of reasons:

First of all, it has to be considered that some of the previous studies investigated a variety of different types of leader. The present study used CEOs as leaders, since they are arguably the most powerful managers within a company. Contrary to this, McCann (2001) and Simonton (2003, 2009) for example investigated political leaders, such as American presidents, U.S. senators or Canadian Prime ministers. Other researchers, like Cassell et al. (2006) use adolescents from a virtual online forum and it can be doubted that teenagers use the same language as highly successful CEOs. Further, it is most likely that political and business leaders talk very differently, since they have quite contrasting jobs and different tasks to fulfil on an everyday basis. Therefore, these potential linguistic differences might be one of the reasons for the differing results.

Secondly, earlier researchers used different corpuses for their content analysis. The present research focused on letters to shareholders, since they are reported to be highly credible (Tilt, 1994) and they have an enormous rhetorical importance in the business world (Hyland, 1998). Other researchers used different and possibly less objective corpuses, such as online journals (Cohn et al., 2004), press conferences (Pennebaker and Lay, 2002), photographs in the annual reports (Chatterjee and Hambrick, 2007) or biographies (O'Connor et al., 1995). Even though the studies showed significant differences in a variety of leadership qualities, some of the measures

are arguable much more subjective than letters to shareholders.

Thirdly, the present study relies on the financial variable Earnings per Share (EPS) to define the effectiveness of the CEOs. Previous researchers used different performance indicators. For example, Kohut and Segars (1992) used return on equity to distinguish between high-performing and low-performing companies, whereas Clatworthy and Jones (2003) relied on the percentage change in profit before taxation to differentiate between the top 50 and bottom 50 U.K. companies. Bertrand and Schoar (2002) used a combination of return on assets, capital expenditure, debts and dividends to measure effectiveness. Therefore, using a different indicator might have yielded different results. It can also be seen that previous studies, including ours, solely defined effectiveness via measurable financial variables. Here, future research could go one step further. It could be interesting to define leadership in a much broader sense, for example by considering employees' ratings of their manager, or their general job satisfaction as a measure of effectiveness. Using these more subjective but no less important indicators can lead to a clearer picture of the language use of today's leaders.

Fourthly, earlier research used a broad range and often largely differing methodology. For example, Chatterjee and Hambrick (2007) were only partly focusing on the language use (first-person singular pronouns) in their analysis, but also considered the relative subjective prominence of the CEO's photographs in the annual reports, press releases and compensation in relation to the second highest-paid firm executive. The present study solely focused on possible linguistic differences. Since we wanted to eliminate any potential biases, we did not consider any other data for analysis. Furthermore, Raskin and Shaw (1988) used extemporaneous monologues,

thus the content of verbal language. Additionally the study was conducted in an experimental setting, which involved undergraduate students of the University of California at Santa Cruz. Our study investigated language in a naturalistic, real-life setting and the letter to shareholders were written. Therefore, they could be revised several times before publication. This is impossible for spoken language and thus might partly justify the differing results. Since verbal language is much faster and more spontaneous than written language (Pennebaker and Stone, 2003), their analysis could be highly interesting for future research. Prospective studies could make a distinction between the oral and written differences in the communication of leaders and thus show whether our results are truly reliable and valid.

Lastly, it has to be considered that even though many of the previous studies relied on LIWC software, hardly any were conducted with the latest version, LIWC2015 (Pennebaker, Booth, Boyd, and Francis, 2015). LIWC2015 has significantly changed both the dictionary and software options – they are new rather than just a basic update (Pennebaker and Jordan, 2015). There is a higher internal consistency of the language dictionaries, which allows for a more reliable and valid analysis. Furthermore, the word categories of LIWC2015 were evaluated by over 2000 independent judges, enabling high inter-coder reliability (Pennebaker and Jordan, 2015). Therefore, the present research might actually be more accurate than earlier studies, which might justify the differing results. Moreover, some researchers used different software or content analysis applications. For example, Davis et al. (2012) relied on DICTION (Hart, 2001) to investigate the linguistic markers of optimism and pessimism in quarterly earnings press releases. Even though DICTION and LIWC most likely greatly overlap, there might still be some differences. For instance, in DICTION the variable “optimism” consists of words such as praise, satisfaction and inspiration (Hart, 2001). On the other hand, LIWC is more psychologically precise

and relevant. Here, “optimism” is partly measured through the use of positive emotion words, such as “love”, “nice” and “sweet” (Pennebaker and Jordan, 2015). Therefore, the more or less slight differing language categories within the programmes might be one of the reasons for the contrasting results.

## 4.1 Conclusion

The present study is an important attempt to explore the rhetorical aspects of the leadership process. The general aim was to examine whether high and low performing CEOs, and more broadly leaders, use language differently. We relied on the widely used financial indicator EPS to define effectiveness and investigated language use during the Financial Crisis. As earlier mentioned, the research in this field is quite sparse, possibly due to the broad nature of its topic and since relevant data are just beginning to emerge. We expanded on this by identifying and improving some of the weaknesses of earlier studies and by using, possibly, a better methodology, more reliable and valid software, as well as more adequate corpuses.

The results showed that successful and less successful leaders use language equally. This indicates that both also have the same important leadership attributes; namely a focus on achievements, the ability to communicate a vision, portraying emotions, being able to take risks, a need for power, as well as a positive view of their work. Nevertheless, our results contradict earlier findings; we were not able to show that effective and non-effective CEOs speak differently. But, we also identified some of the possible reasons for these differing results. Furthermore, our results highlight the role which communication plays in the leadership process, as well as leadership effectiveness. Future researchers, professionals and leaders are encouraged to further explore language use as a method for gaining a better understanding of the overall leadership phenomenon and facilitate interventions and directions that benefit leaders, teams and organisations.

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# DOES EU MARKET ABUSE REGULATION CREATE SUFFICIENT DETERRENCE FROM FINANCIAL CRIMES IN THE FORM OF INSIDER DEALING?: USING THE EXAMPLE OF GERMANY

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## ABSTRACT

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EU regulators and legislators have introduced numerous new requirements after the financial crisis in 2008, such as the Market Abuse Regulation with the aim of reducing financial crime. The paper analyses financial crime cases in the form of insider dealing in Germany only, however the results are believed to be transferrable to other member states. Policy-makers may benefit from this work by gaining a better understanding as to whether the regulation sufficiently deters potential insiders. This shall be assessed by applying the expected utility function known from Economics of Crime concepts to insider dealing. The conviction rate/detection rate of insiders has been found to be low when comparing these to trade activities on the market. The results indicate that unless such insider dealing detection and conviction rates change significantly going forward, more severe sanctions on their own are not sufficient to deter abusers.

## KEY WORDS

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economics of crime, compliance, financial market regulation, financial crime, crime prevention

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G14, K42

## 1 INTRODUCTION

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This paper focuses on a market abuse practice referred to as insider dealing where insiders exploit or attempt to use their knowledge of material non-public information in an unlawful manner. Whilst regulation around insider dealing in the European Union (EU) has been around for decades, the

sanctions regime has become stricter and more harmonised with the introduction of the Market Abuse Regulation (MAR) in the EU with an effective date of 3 July 2016.<sup>1</sup> Unlike other forms of market abuse, insider dealing was not the root cause of the financial crisis, however it is still an unwanted

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<sup>1</sup>MAR: Regulation (EU) No 596/2014 of the European Parliament and of the Council of 16 April 2014 on market abuse (market abuse regulation) and repealing Directive 2003/6/EC of the European Parliament and of the Council and Commission Directives 2003/124/EC, 2003/125/EC and 2004/72/EC Text with EEA relevance.



practice that can pose a significant risk to market integrity. MAR was specifically enacted to address the shortcomings referred to in the High-Level report on supervision by the de Larosi re Group (2009). The report claimed that strong supervisory, investigation and sanction regimes were absent during the financial crisis.

This work analyses whether the increased sanctions and measures from MAR in the EU are likely to result in a significant deterrent effect on insider dealing by using the observations in Germany, a country that had already implemented a sanctions regime for insider dealing for several years, i.e. under the MAR's predecessor – the EU Market Abuse Directive (MAD), which was implemented in Germany with a sanctions concept close to today's MAR across the EU. Aussenegg et al. (2017) assessed that Germany

ranks relatively high on their evaluation of Insider Trading Enforcement (ITE) in terms of supervisory capacity, but rather poorly on sanctioning.

Significant deterrence can be assumed, if potential insider cases are to be expected in much lower magnitude or quantity now that MAR is effective. The aim of the paper is to measure the deterrence effect of the new regulation in general, but also to increase understanding of whether the new regulation with its stricter sanctions regime is likely to meet its objectives. The added value from the research results is not only expected to be of importance to policy makers who need to revisit the effectiveness by July 2019, but also to the regulatory authorities who are mandated to regularly evaluate the supervisory framework.

## 2 METHODOLOGY AND DATA

Basic criminal behaviour theory in the wider field of the economics of crime will be applied to insider dealing, which qualifies as a financial crime. Becker's economic approach to crime theory and related punishment, initially published in 1968, which has become more popular with other researchers, forms the foundations of the model.<sup>2</sup> Becker introduced an approach to also measure the social loss from offences, and wanted to understand the level of resources and punishment required to enforce different kinds of legislation.

The basic model of Becker defines the expected utility as a function of the probability of gaining perceived income (both monetary and psychic) versus the probability of a subjective "cost of punishment" expressed as:

$$E[U] = PU(Y-f) + (1-P)U(Y),$$

whereby  $U$  is utility function,  $P$  is subjective probability of being caught and convicted,  $Y$  is monetary plus psychic income ("non-monetary benefit"),  $f$  is monetary equivalent of the punishment. As highlighted by Anderson et al. (2017), Becker's model neither considers repeat offences nor their observation that past convictions create higher deterrence for future offences. An insider will be deterred, if the

expected utility function is negative, and might use inside information in unlawful manner, if the result of the utility function is expected to be positive.

Insider dealing is considered a white-collar crime, a crime that under criminal theory is committed by respected individuals with high social status not suffering from poverty (Braithwaite, 1991).<sup>3</sup> Insider dealing is a crime that can be committed by everybody in position with access to inside information, hence, it is not limited to a certain individual carrying out a specific role. However, we find potential insiders typically as employees in the financial services industry with more exposed job functions. Their employer's business model can give them preferential and earlier insight into trading transactions and/or the financial situation of their clients, such as listed companies as part of loan activities by banks. Other individuals that are more likely to become subject of inside information are employees of listed companies who as part of their role receive information about their employer that may significantly impact the company's market value.

An insider's core motivation is to increase or protect of monetary wealth, i.e. monetary gain derived from insider dealing or the prevention of losses.

<sup>2</sup>See Harel (2012) and Landes (1974).

<sup>3</sup>Braithwaite (1991) in: McShane (2013), containing Gary S. Becker's essay on "Crime and Punishment: an economic approach" (1968).

The insider will know that non-public information is price sensitive, and would act before the information becomes public knowledge. However, the insider is not always clear to what magnitude the market may react. Common knowledge is that a listed company surprisingly declaring they cannot pay their outstanding debts will see a drastic impact on the market prices of their debts and the company's share price in general. The different types of financial instrument available to insiders offer them a relatively reliable possibility of generating monetary benefit. The investment methodology chosen (e.g. financial derivative contracts, warrants, etc.) can ensure that even small movements in prices can lead to a leveraged result.

In line with the utility function, it is known that the expected magnitude and probability of punishment will have an impact on deterrence from crimes. Accordingly, the research methodology will compare the magnitude of the sanctions, and factors that potentially influence the perceived probability of being punished. Additional deterrence from MAR should be significant if the sanctions regime has a sufficient marginal increase over existing regulation, hence when comparing it to the one already in existence in Germany, the probability of being punished should be significantly higher, the sanction itself would be perceived as significantly higher by the insider, and the sanctions regime would positively correlate with the (expected) gains or (expected) prevented losses of an insider.

Whilst MAR is a harmonised European regulation, the paper will use the specific circumstances in Germany as an approximation for the rest of the EU. Given that the MAR sanctions regime is directly applicable to all EU member states without additional national implementation, these observations are believed to be largely transferable to the EU.<sup>4</sup> Due to previously existing insider dealing restrictions in Germany, many of them already similar to the new MAR, Germany appears to be a good proxy for predicting MAR effects across many other EU member states.

According to MAR definitions (chapter II of MAR), insider dealing not only includes decisions to buy or sell financial instruments (or their attempt), but comprises decisions to reduce, increase or cancel

a standing order. MAR also sanctions unlawful use of inside information that can also include another person who did not have this information before, if the insider discloses their information. Such unlawful use of information as well as other market abuses will remain out of scope, as they are not considered as insider dealing itself. For this research, only actual or attempted insider dealing for direct economic benefit to the insider will be considered.<sup>5</sup>

Geographically, the focus will be on insiders subject to the German enforcement and sanctions regime. The Federal Supervisory Authority in Germany (BaFin) publishes statistics on suspicious insider activities and the outcome of these cases in their annual reports. These cases can include referrals from foreign supervisory authorities. BaFin also provides data on selected insider activities where these typically resulted in successful conviction.

To approximate the population of trades in general, and the probability of being detected as an insider, which is a significant factor of the expected utility function, trade statistics from stock exchanges are being analysed and compared against actual insider case statistics. Such data is made available by the Deutsche Börse Group who facilitate more than 90% of the trades in Germany. It should be noted that the population of trades will be significantly higher, as insiders can use capital markets around the world these days.

BaFin does also facilitate the register of corporate insiders in line with existing prevention mechanisms for insider trades. All corporate insiders with pre-defined managerial responsibilities need to promptly report their trading activities ("Directors' Dealings") in the shares of their employer to the supervisory authority within five days (or with MAR now three days). Such trade data is publicly available for one year from BaFin's website ([www.bafin.de](http://www.bafin.de)). The volume of trades will be used for comparison to assess the plausibility of BaFin's detected / suspected insider dealing cases, as corporate insiders may have a higher probability of acting unlawful.

The probability of being detected and convicted as an insider does typically correlate with the level of enforcement activities. Therefore, the research focuses on conviction and detection data, and consequently on the subjective probability of being caught

<sup>4</sup>Unlike EU Directives, EU regulation does not require additional national implementation, as these acts do apply directly in the member states. Although MAR allows severe monetary sanctions on the corporate level, these are not considered as being materially significant for the expected utility function of the insider.

<sup>5</sup>See Art. 14 (a) MAR.

and convicted. Del Guercio (et al., 2017) have more recently considered the effects of enforcing insider trading laws with one result being that by analysing insider cases filed by the US Securities Exchange Commission (SEC) in the period 2003 to 2011, we see that aggressive SEC enforcement activity does indeed deter unlawful behaviour.

This supports the view that not only the regulation itself, but the level of enforcement (and the communication of successful convictions) tends to be an important deterrent factor.

Zuzak (2008) looked at the Swiss insider regulation and confirmed in his work that the probability of being discovered is the most important determinant for deterrence and suggests a principal witness model. He also suggests that state prosecutors should focus

on insider dealings that intend to prevent losses, as insiders would typically expect more utility in these types of activity.

As part of the results, it will be considered whether additional measures for detections have been implemented or communicated, as far as this is public knowledge and as far as these are likely to influence the subjective perception of potential insiders. Trade surveillance departments and other supervisory authorities are using sophisticated electronic systems that can screen huge volumes of trade data with the aim of detecting potential inside trades, e.g. comparing trade activities before and after price sensitive (ad-hoc) event notifications (such as mergers, acquisitions, profit warnings, etc.).

### 3 RESULTS

Looking at the 10-year period of insider statistics in Germany (see Table 1), cases of insider investigations in general appear extremely low, especially when comparing them to the total number of registered crimes. The simple 10-year average calculation derived from annual crime statistics in Germany (Statista, 2017, I) are 6,112,108 for the same period.<sup>6</sup> The percentage of solved crimes is relatively stable with an average of 55.2% of all identified cases.<sup>7</sup> Thus, convicted insider dealers are extremely rare compared to other forms of crime.

BaFin reports the number of suspected cases as well as the number of individuals involved in these cases as very low in any of the observed years. It is common for investigations to take several years before they are either closed or before complaints are raised against suspects with the relevant state prosecutor.

The statistics (Table 2) for the last 10 years indicate that 90.9% of all cases do not result in any court settlement. In the last three years, discontinued cases without any sanctions varied from 75.6% to 84.8%, and slightly more than 95% did not result in any court decision; hence, the three-year average sank to less than 5%. These figures seem to support

BaFin's view, re-confirmed in their 2016 annual report, that insider dealing activities are difficult to prove by state prosecutors and require in-depth expertise.<sup>8</sup>

Such publicly available information may send potential insiders an additional level of comfort when they are assessing the probability of being convicted. Table 2 highlights that cases tend to be settled (out of court), typically by the defendant agreeing to pay a monetary fine.

To predict the total quantity of orders that could be subject to insider trading and in the absence of sufficient other public information on trade statistics, the total number of EUR trades (2,433 in the 12-month period ending 31 October 2017) by corporate insiders subject to Directors' Dealing reporting has been assessed.<sup>9</sup>

The median of these trading activities is approx. 45,000 EUR. This figure is used as a proxy to estimate how many trades are traded on the above stock exchanges, which results in an equivalent of buy or sell transactions of around 120,289 per day (5,413m EUR divided by 45,000 EUR), or 30,312,828 trades per year (252 trading days).

<sup>6</sup>Statista (2017, I), URL: <https://de.statista.com/statistik/daten/studie/197/umfrage/straf-taten-in-deutschland-seit-1997/> (last accessed on 5 November 2017)

<sup>7</sup>Statista (2017, II), URL: <https://de.statista.com/statistik/daten/studie/12788/umfrage/aufgeklarte-straf-taten-seit-1993/> (last accessed on 5 November 2017)

<sup>8</sup>BaFin, Annual Report Federal Financial Supervisory Authority 2016

<sup>9</sup>Own calculations as of 1 November 2017 using the Directors' Dealings database on the BaFin website.

Tab. 1: Insider Investigation Statistics (Germany)

Period	New Investigations Insider	Discontinued Insider	Prosecutor referrals Cases	Prosecutor referrals Persons	Ongoing Investigations Total
2007	42	29	20	64	99
2008	44	54	27	67	62
2009	30	37	28	78	27
2010	34	17	10	33	34
2011	29	14	20	52	29
2012	26	12	11	25	32
2013	42	13	35	99	26
2014	50	11	22	45	43
2015	43	19	26	87	41
2016	42	23	21	49	39

Note: Data extracted from BaFin Annual Reports 2007–2016 ([https://www.bafin.de/EN/PublikationenDaten/Jahresbericht/jahresbericht\\_node\\_en.html](https://www.bafin.de/EN/PublikationenDaten/Jahresbericht/jahresbericht_node_en.html))

Tab. 2: Completed Insider Trading Proceedings

Period	Total	Discontinued	Out of court	Court Judgments	Summary proceedings	Convictions (full trial)	Acquittals
2007	82	65	14	0	3	0	0
2008	102	84	12	0	3	3	0
2009	53	28	14	1	7	3	0
2010	69	32	26	0	2	9	0
2011	31	24	4	0	1	1	1
2012	46	34	10	2	2	3	0
2013	27	12	5	0	8	0	2
2014	46	39	5	1	1	0	0
2015	41	31	8	1	1	0	0
2016	93	75	14	3	1	0	0

Note: Data extracted from BaFin Annual Reports 2007–2016

Gebka et al (2017) identified that after the move to MAR such corporate insiders in the EU have changed their behaviour towards higher frequency trading with smaller quantities, or kept the same frequency but increased the quantity per trade instead.

BaFin and other trade surveillance authorities are using automated systems to identify unusual activities that require further analysis before a pattern can be material enough to become an investigation. Public companies do have to maintain lists of corporate insiders and report ad-hoc, if there is price-sensitive information that needs to be shared with the public. Financial service companies

do also maintain dedicated personal account dealing restrictions and monitoring for most of the investment activities by staff in scope. This includes pre-approval requirements or bans for trades, and regular reporting of holdings, deposits and transactions to their employer. Violations are typically sanctioned with warning letters, or can lead up to dismissals.

Tab. 3: Trade Volumes

Order Volumes/Values	Total Order Book Value <sup>a</sup> in € m	Total Financial Derivatives <sup>b</sup> Number of Eurex contracts
3y monthly avg.	113,672	141,202,116
Per trade day (21d)	5,413	6,723,910
Per year (252d)	1,364,064	1,694,425,320

Notes: <sup>a</sup>) Refers only to securities transactions executed on the major German exchanges XETRA, Frankfurt Stock Exchange and Tradegate (all belonging to the Deutsche Börse Group). <sup>b</sup>) Eurex contracts include underlyings in equities, indices and interest rates. Own calculations based on monthly statistics by Deutsche Börse Group at <http://deutsche-boerse.com/dbg-en/meta/Major-business-figures---monthly-statistics/2533394>.

Bris (2000) refers to studies by Lakonishok and Lee in relation to stock trading activities (in the 90's) on the key US markets that in more than 50% of the listed companies there was a form of insider dealing happening, however, clarifying that not all forms of these activities are unlawful. The challenge for authorities is to separate the unlawful from the legitimate insider dealing activities.

Comparison of insider trading proceedings (e.g. 93 in 2016, Table 2) from the BaFin statistics with the estimated amount of trades per year (30,312,828) and comparison with publicly reported Directors' Dealings (2,433) raises concerns as to whether the crime detection rate can be considered relevant. It should be highlighted that this trade estimation neither includes financial derivatives transactions (see Table 3), which are typically used by more professional financial investors, nor is it able to predict the level of trading activities on offshore trading venues.

An own in-depth analysis of convicted insider cases published by BaFin for 2007–2016, which is solely related to insider dealing (i.e. excluding any combination with other forms of crime, such as market manipulation or unlawful disclosure), identifies 55 cases.<sup>10</sup> The results of this analysis

<sup>10</sup>Two cases without sufficient clarity on the financial impact (e.g. gains or fines) have been excluded.

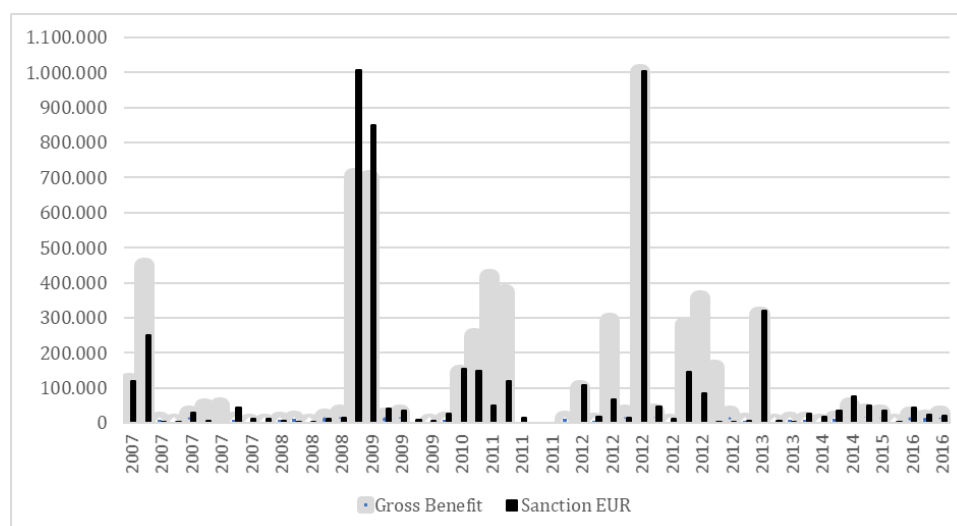


Fig. 1: Comparison of Gross Benefit vs. Sanctions from Insider Dealing (2007–2016)

are that insiders typically trade ahead of ad-hoc publications (e.g. positive or negative outlook, often in relation to take-over bids). More than half of the insiders (54.5%) were corporate insiders, almost a quarter of the insider dealings were executed by their immediate family members (23.6%), and the rest of insider activities (21.9%) were either committed by externals (e.g. consultants or legal advisors) or their family member.

Only two cases were committed by employees in the financial services industry. Probably the intensive regulatory monitoring requirements for investment firms applicable to their employees' personal account dealings create a high level of deterrence.<sup>11</sup>

None of the convicted insiders were sent to prison. All sanctions were in monetary form (except for one case where an additional suspended jail term of 1.5 years was ordered and where it is known that the bank dismissed their employee). Most trading activities by far took place in the form of share transactions (44), followed by warrants (6) and forms of option trade (5). Detected trading activities on foreign markets were the rare exceptions (3).

When comparing the monetary benefit vs. the monetary sanctions calculated by analysing published insider cases by BaFin, insiders did create neutral or mainly positive benefit in 25 of the 55 cases (45.5%), generating a total excess of 1.88m Euro over the monetary fines. Those insiders who suffered losses (30) had to pay 0.78m EUR on net aggregate (see Fig. 1 for comparison on individual cases). This

is typically due to most insider activities – as also shown in Table 2 – being settled out of court. Sanctions often include an out of court settlement below the monetary benefit, or in the case of convictions results in full forfeiture of the gains plus an amount established in line with criminal proceedings that is calculated in daily units multiplied by a EUR amount (depending on the severity of the crime and the salary/wealth of the convicted insider). Even when estimating other monetary impact, e.g. tax burden of profits, legal costs of the defendant, opportunity costs, etc., it can be argued that insiders did not need to expect severe monetary consequences or any other form of severe punishment in Germany so far. Article 30 MAR introduces new and higher sanctions compared to the previous regime in Germany, incl. severe monetary penalties for companies.

However, amongst the measures having more severe impact on Becker's utility function are increased imprisonment. Germany opted for up to five years (MAR: min. four years) and increased monetary sanctions up to 5m EUR (previously 1m EUR). The concept of "naming and shaming", hence the MAR requirement (Art. 34) to publish information on offenders in a public register for five years, is believed to have a certain level of deterrence, which was not in place before.

Under Becker's utility function, this can also be subsumed as negative psychic income. However, this can also have wider implications, e.g. for those insiders that have been dismissed and/or are com-

<sup>11</sup>Criminal convictions in the German financial services industry can lead to dismissal and/or to an industry-wide professional ban.

peting in the job market, as employers could more easily receive such negative information through their background checks. Forfeiture under MAR can amount to three times the value from the gain or the loss prevented. In the case of convicted insider dealing, this can have a more severe monetary impact on potential insiders. Prosecutors and authorities have only been given very few additional tools by MAR (e.g. widening the scope of instruments to debt instruments or requesting a certain insider to report their activities within three days rather than five days) when comparing it to those under German insider rules in the last decade.

Thus, it remains unclear how MAR is equipped with new methods to solve the existing issue that

the probability of detecting insider dealing activity in the first place and proving the crime to achieve conviction is very low.<sup>12</sup> BaFin (2014) highlighted work performed by the European Commission that communicated the difference amongst the other member states prior to MAR becoming effective: monetary sanctions for insider dealing varied from 200,000 EUR to more than 1m EUR, however, not all member states had criminal sanctions, or they decided not to impose sanctions for more than two years. Probably, MAR could now have more of a deterrent effect in those EU member states that apply the rules more strictly.

## 4 DISCUSSION AND CONCLUSIONS

In line with results from this research, Gaughan (2007) summarises the existing controversy in the literature as to whether insider dealing laws effectively deter insider dealing in general by pointing to studies from the 90's by Nejat Seyhun, Lisa Muelbroek and Jon Garfinkel. However, these refer to the US legal system. Both regulation and level of enforcement have changed in the US since then.

The MAR action points that led to the new regime do support the view that the low number of insider proceedings is not a result of successful deterrence, but more a result of insufficient mechanisms available to detect unlawful insider dealing activity. The increase in monetary sanctions under MAR is not likely to deter insiders who know how difficult insider dealing can be to prove under the existing legal regime. Furthermore, Schulze (2016) questions whether the EU supervisory authorities will apply the new MAR administrative sanctions (e.g. three times the amount of the gain or up to 5m EUR), as in the example of BaFin the sanctions remained at around 15–25% of the maximum in the past. This concern is also substantiated in line with observation by Aussenegg et al. on the actual low level of sanction enforcement by Germany.

Applying Schulze's observation where authorities applied a maximum of 25% of the maximum fine, and assuming full forfeiture of the gain, then Becker's

function can only become negative for the insider if the detection-conviction rate would increase to 57.1%, with Y: 100,000 EUR and f: 100,000 EUR forfeiture + 75,000 EUR sanction (25% of maximum).

Even if the authorities do deviate significantly from the above practice in the EU (incl. Germany) going forward, then one conclusion is that MAR is still at risk of achieving its goal of creating sufficient deterrence. Using Becker's formula with an example where Y: 100,000 EUR, f: 300,000 EUR (e.g. full forfeiture + 2x of the gain), then the expected utility  $E[U]$  breaks even at P: 33.3% probability.

In summary, the results support the view that going forward the authorities would need to implement measures that significantly increase the detection rate, which is still very low. MAR is not yet believed by the author to deter typical insider activities in Germany, especially as confession and admission of guilt do have direct impact on the magnitude of the sanction in the EU. In accordance with para. 153a German Code of Criminal Procedure, the state prosecutors or the court can still close the case, typically after payment of a (often significantly lower) monetary fine than the maximum sanctions allow for. This approach will not apply though to more severe cases, where prosecutors do see a very high level of criminal intent (and a very high benefit

<sup>12</sup>In line with German Criminal Code principles, only a deliberate act of violating insider dealing prohibitions can be punished. Gross negligence cases can also be sanctioned, but to a lesser extent. Cases based on simple negligence cannot be sanctioned at all.



being generated), which could prevent an out of court settlement.

Probably the strongest weapon will be the communication of more successfully identified and “shamed” insider cases, as under Becker’s utility function such communications should have an impact on the subjective/perceived probability of being detected.

Significant data about insider cases under the new MAR regime will only be available in the coming years. Article 38 MAR provides an opportunity and

requirement for further research and to reconsider the legislation, as MAR needs to be reviewed by 3 July 2019. The European Commission will then need to report on how appropriately MAR has or has not been functioning. To ensure successful deterrence, increasing sanctions on their own will not help, if the prosecutors and regulators do not find methods to significantly increase the conviction rate or to prove that their enforcement practices have been enhanced significantly.

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# CONSUMER COMPLAINT BEHAVIOUR AND CULTURAL ASPECTS

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## ABSTRACT

Recognising and understanding consumer complaint behaviour (CCB) in terms of cultural dimensions is crucially important for business organisations in combating market penetration challenges including building and maintaining effective long-term customer relationships. CCB has no general pattern for consumers belonging to different cultures with diverse needs, preferences, and expectations. The purpose of this review article is to study and assess the extent of cross-cultural differences in CCB. Based on a literature review, the research outcomes show the impact of cultural aspects across a range of CCB-related phenomena: perception, attitudes, intentions, responses, attribution of blame, compensation, emotion, loyalty, price level, product/service failure location, social relationship and social presence. Existing cultural models explain the differences and help develop strategies that target consumers across cultures more effectively. The findings provide insights into cross-cultural consumer complaint behaviour having theoretical and managerial implications.

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## KEY WORDS

consumer, consumer complaint behaviour, cross-cultural, business organisations

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## 1 INTRODUCTION

In today's highly convoluted and competitive business world, it is critically important for organisations to have a deep understanding of consumers' post-purchase behavioural intentions with their needs and expectations. If the consumer's experiences with a product/service are higher than or equal to expected then that consumer is satisfied, or else dissatisfaction emerges. From companies' perspective, maintaining consumers' satisfaction is crucial as it is related to revenue generation and market share establishment. However, product/service failures are unavoidable and no organisation is so perfect in the delivery of superior customer performance that significant levels of dissatisfaction (the source of complaints) do not exist

(Wysocki, Kepner and Glasser, 2001). Moreover, dissatisfied consumers must be a major concern to businesses as those consumers can express their dissatisfaction via actions, such as lodging complaints, spreading negative word-of-mouth (NWOM), ending patronage, switching firms or remaining silent. These actions, in turn, may have negative consequences on firms' relationships with their consumers. Hence, when product/service failures happen, inescapably followed by consumer dissatisfaction, the effective handling of complaints becomes essential to the retrieval of consumer satisfaction (Namkung, Jang and Choi, 2011).

Complaints from customers provide organisations with opportunities such as revealing problems related to products/services; taking corrective actions and product/service recovery efforts; providing information for product/service improvements and preventive measures. Moreover, proper handling of customers' complaints presents chances for companies to reduce customers' dissatisfaction, increase repurchase intentions and thereby turn potentially lost customers into loyal ones. Consequently, organisations that evidently comprehend the significance and practicality of consumer complaint behaviour (CCB) have the prospect of developing effective complaint resolution strategies which might be pertinent to enhancing customers' satisfaction; diminishing NWOM; improving companies' performance and customer service; generating higher consumer retention, revenues, and profitability (Ekiz, 2009; Sayanti Shaw, 2017). Hence, identifying and understanding the patterns, perceptions, attitudes, intentions, and determinants

of CCB is critical for developing, strengthening, and maintaining long-term customer relationships.

Culture plays an important role in CCB. Consumers from diverse cultures exhibit varied complaint behaviour, perceptions, expectations and intentions. Furthermore, consumers belonging to different cultures evaluate the product/service quality differently and thereby show various kinds of complaint behaviour (Loo, Boo and Khoo-Lattimore, 2013). Accordingly, organisations willing to penetrate new markets, expand their market shares and compete favourably need to identify as well as understand the cultural multiplicity of their consumers' complaint behaviour. Thereby, they need to develop effective complaint handling and management strategies based on their consumers' cultural settings. In order to retain existing customers and attract potential customers, organisations are prompted to handle and manage complaints properly according to the cultural diversity of their consumers.

## 2 PURPOSE AND METHOD

The purpose of this review article is to study and assess the extent of cross-cultural differences in CCB. This current article is based on the extant literature, i.e. existing theoretical and empirical research papers.

The article highlights and identifies the impact of cultural aspects across a range of CCB-related phenomena.

## 3 CONSUMER COMPLAINT BEHAVIOUR AND CULTURE

A consumer complaint refers to an action taken by a person who wants to communicate something negative regarding a product/service (Jaccard and Jacobi, 1981). The concept of CCB can be expressed as a set of multiple responses, some or all of which are triggered by perceived dissatisfaction with a purchase. Several research studies have been conducted to enhance the knowledge base concerning CCB, specifically to study the factors related to CCB, i. e. personal, service, situational and macro factors. The issue of CCB is dynamic and has tendency to change with respect to place, time, and sector (Shaw, Chovancová and Bejtkovský, 2017). The responses of consumer complaint behaviour could be generally classified into several possible categories, for example, voice responses, personal/private responses, third-party responses, and non-action/inertia (Mousavi and Esfidani, 2013).

Culture, as representing one's values, beliefs and patterns of behaviour, is a significant variable that profoundly influences CCB. CCB has no general pattern for consumers belonging to different cultures with diverse needs, preferences, and expectations. Existing cultural models explain the cross-cultural differences in CCB and help develop strategies that target consumers across cultures more effectively. Based on a literature review, this research paper presents the impact of cultural aspects across a range of CCB-related phenomena: perception, attitudes toward complaining, intentions, responses, attribution of blame, compensation, emotion, loyalty, price level, product/service failure location, social relationship and social presence.

### 3.1 Intentions and Responses

CCB depends on consumers' intentions and responses to product/service failure with consequent dissatisfaction. Consumers' intentions and responses vary as a function of cultural orientation. In cross-cultural studies, Hofstede's dimensions of culture have been widely deployed. According to the Hofstede model, societies differ along cultural dimensions such as power distance, individualism-collectiveness, masculinity-femininity, uncertainty avoidance and long-term orientation. Among these the individualism vs. collectiveness dimension has been investigated most widely. Individualism versus collectiveness refers to the extent to which individuals are integrated into groups (Huang, Huang and Wu, 1996). In an individualistic cultural society individuals are concerned with their own interests and expected to take care of as well as stand up for themselves. In contrast, in a collectivist cultural society, people are considered members of a cohesive group and are expected to look after, work and be rewarded as a group. Significant cultural differences in complaint behaviour intentions exist among consumers with collectivist and individualistic cultures. Prior studies have suggested that complaint intentions of collectivist consumers are low and they are more likely to engage in private complaint intentions. In spite of the fact of being dissatisfied with product/service failures and having intentions to complain however consumers from collectivist cultures may not actually do so. This happens due to their tendency to avoid face-to-face conflict, concern about losing face or disturbing harmony (Gi Park, Kim and O'Neill, 2014).

In the occurrence of product/service failures, consumers in individualistic (vs. collectivist) cultures are more likely to voice their complaints (Liu and McClure, 2001). Conversely consumers from collectivist cultures are less likely to voice complaints and more prone to engage in private responses, such as spreading NWOM or switching product/service providers. In response to product/service failures, collectivists are more likely to engage in private word of mouth with the intention of warning family and/or friends about their unsatisfactory experiences (Swanson et al., 2011). With the desire to maintain social harmony, collectivists (vs. individualists) are less inclined to lodge complaints directly with product/service providers, thereby avoiding public responses involving direct confrontation. Due to the

fear of 'loss of face', the tendency to avoid situations that create shame, embarrassment or hurt other people's feelings in public, consumers with collectivist (vs. individualistic) culture are less likely to complain and rather remain silent. Consumers from individualistic (vs. collectivist) culture, having the characteristics of expressing their opinions and the sense of responsibility to complain for quality improvements, are more prone to publically voice complaints. When faced with unsatisfactory product/service experiences, collectivist consumers are more tolerant, tend to forgive and forget product/service failures, whereas individualistic consumers are more likely to complain and seek remedies from companies or third parties.

Aside from the individualism-collectiveness dimension, other cultural dimensions also provide explanations for varying consumer responses and intentions across cultural groups. Power distance is the extent to which people in a society expect and accept that power is unequally distributed among levels in a social structure (Kim, Lee and Mattila, 2014). Consumers with low power distance perceive product/service providers as relative equals and are less lenient toward product/service failures. Thereby they are more prone to complain as well as to engage in private responses such as NWOM, switching or boycotting when they encounter unsatisfactory product/service experiences. However, in the occurrence of product/service failures, consumers with high power distance are less inclined to complain, as they perceive themselves as less powerful than product/service providers and view unsatisfactory experiences as an unpleasant fact of life. Nevertheless there is also evidence that shows that when consumers with high power distance faced product/service failures, they are more likely to lodge complaints, spread NWOM, switch or express their negative feelings to product/service providers i.e. engage in both private and public complaint behaviour.

Uncertainty avoidance refers to the degree of feeling threatened by uncertain or unknown situations. Consumers from cultures with high uncertainty avoidance (vs. low uncertainty avoidance) are less tolerant of product/service failures, more resistant to change as well as less likely to take risks. Therefore they are more tend to engage in private and public complaint behaviour in response to unsatisfactory product/service performance (Ngai et al., 2007).

Moreover, they will opt not to complain in the case of unknown or unclear complaint channels. On the other hand, consumers from cultures with low uncertainty avoidance will try their level best to find out how to complain, even if they are unfamiliar with the complaint channels (Swanson et al., 2011).

Masculinity-femininity is about the relative emphasis on the achievement and interpersonal harmony that characterises gender difference in national cultures, thus the way gender roles are allocated in societies. Prior studies have indicated that the masculinity–femininity cultural dimension has little impact on product/service encounter interactions and related behaviour. However, consumers belonging to highly masculine cultures possess characteristics such as aggressiveness and assertiveness. Hence, consumers from highly masculine cultures will be more likely to voice their complaints to management and third parties in response to product/service failures (Yuksel, Kilinc and Yuksel, 2006). Long-term relationships with service providers are expected in cultures having a long-term orientation. Consumers from cultures with a long-term-orientation are more accepting of unsatisfactory product/service performance and less prone to complain, in order to avoid the risk of confrontation and maintain a long-term relationship with product/service providers (Swanson et al., 2011). Therefore cultural dimensions can help in identifying and explaining the cross-cultural differences in CCB, specifically consumers' intentions and responses.

### 3.2 Perception and Attitudes toward Complaining

Culture influences consumer perceptions and reactions to product/service failures. Consumers from different cultures express different perceptions and complaint behaviour. Consumers from individualistic cultures have the perception that complaints held the company accountable and could make the service quality better, and so they complain frequently about unsatisfactory product/service performance (Jahandideh et al., 2014). Due to this perception, individualistic consumers are more inclined to express their complaints to firms. However, collectivist consumers have the perception that complaining may lead to 'loss of face' and/or disturb harmony (Fan, Mattila and Zhao, 2015). Hence, they are less likely to complain and more prone to choose private

responses, such as spreading NWOM and/or stopping repurchasing.

Consumers' attitudes toward complaining are the personal inclination of dissatisfied consumers to seek redress or compensation from the product/service providers. Complaint intentions are influenced by favourable/unfavourable attitudes toward complaining. Consumers with positive-favourable attitudes toward complaining are more prone to express their complaint intentions to the product/service providers and thereby seek redress from them. Consumers with negative-unfavourable attitudes toward complaining are reluctant to seek redress and more likely to engage in NWOM and/or exit silently. Cultural aspects, such as the propensity to complain; fear of confrontation; concern about 'loss of face' and harmony, all shape consumers' attitudes toward complaining. The unique characteristics of individualistic cultures and collectivist cultures have substantial impacts on consumers' attitudes and behaviour (Gi Park, Kim and O'Neill, 2014). Consumers from individualistic cultures have the view that complaining is a necessary, worthwhile and important function of consumerism and hold positive-favourable attitudes toward complaining. Thus they are more likely to complain in response to product/service failures. Conversely, consumers from collectivist cultures with the inclination to avoid confrontation, fear of losing face or damaging harmony, hold negative-unfavourable attitudes toward complaining. Hence, they are more prone to spreading NWOM, switching to competitors and/or exiting. Moreover, collectivist consumers tend to be avoidant and silent when they encounter unsatisfactory product/service performance (Chan et al., 2016).

### 3.3 Attribution of Blame and Compensation

In the event of product/service failure, the consumer's attribution of blame has its effect on CCB. Consumers who attribute the blame for product/service failures to the company are more prone to complain, to want restitution, and to alter their beliefs in a more negative direction. Moreover, if consumers believe that the problem is within the control of the product/service provider, their dissatisfaction and intention to complain increase. Asian – collectivist (vs. Western – individualistic) consumers are less inclined to complain for fear



of losing face, have less familiarity with complaint channels and are more likely to attribute the blame for product/service failures to the company (Ngai et al., 2007). Conversely, there is evidence which indicates that Asian consumers with collectivist cultures are more likely to engage in private complaints or do not complain because they attribute the blame for product/service failures to external causes or fate instead of the product/service providers (Lee and Sparks, 2007). Moreover, no difference has been observed between collectivist and individualistic consumers in the level of self-blame (An, Hui and Leung, 2001). Consequently, consumers' behaviour, intentions and responses to product/service failures can be influenced by the consumer's attribution of blame.

In response to consumers' complaints, offering compensation is a common remedy from the company's side. From the consumers' perspective, compensation not only provides them with tangible benefits but also acts as a symbolic acknowledgement of the company's fault and regret (An, Hui and Leung, 2001). Hence, providing compensation increases the extent of consumers' attribution of blame to product/service providers. On the other hand, offering compensation decreases the level of consumers' self-blame.

### 3.4 Emotion

Culture plays a pivotal role in shaping emotional expressions and CCB. In the context of product/service failures, cultural dimensions such as individualism-collectiveness, uncertainty avoidance as well as power distance influence consumers' expression of emotions and complaint behaviour. In response to unsatisfactory product/service performance, consumers from individualistic cultures have no urge to maintain harmony, and therefore freely express their negative emotions and voice their complaints to firms or third parties (Matsumoto, 2006). On the other hand, consumers from collectivist cultures prefer to maintain harmony and tend to avoid expressing negative emotions in public settings. Moreover, collectivist consumers often repress and do not express their negative emotions externally, thereby avoiding complaining in public or they tend not to complain when they encounter product/service failures.

Cultures that are high in uncertainty avoidance are characterised as having higher levels of nervous energy from unknown situations that manifest in high

emotional expressiveness. In the occurrence of product/service failure, the high uncertainty avoidant consumer feels personally threatened and stress or negativity associated with the incident increases (Baker, Meyer and Chebat, 2013). Thus the increased negativity influenced by emotional expressions rises with the possibility of complaining in response to product/service failure. In the context of unsatisfactory product/service encounters, consumers with a high power distance culture have a greater tendency to express emotions and are more likely to engage in complaints.

### 3.5 Consumer Loyalty and Price Level

Customer loyalty is an important factor in an organisation's success and can be considered as the key element of a firm's long-term goal. Customer loyalty plays an essential role in influencing CCB. In comparison with infrequent consumers, loyal consumers are more lenient toward product/service failures with less tendency to complain, communicate their negative experiences or switch to competitors (Zhang, van Doorn and Leeflang, 2014). Furthermore, loyal customers are more likely to pay attention to satisfactory prior experiences or the strong relationship with the product/service providers, which act as a buffer in the event of product/service failure (Evanschitzky, Brock and Blut, 2011). This leads loyal consumers to be comparatively munificent in occurrences of product/service failure. Nonetheless, when loyal customers have a strong bond with the product/service providers, they may still prefer to complain with the hope of the problem being resolved and to provide feedback about product/service quality to the product/service providers.

Product/service price may act as a signal of quality, specifically in the case of high priced and/or less familiar products/services. In reference to previous research, there exists a positive relationship between price and CCB. Consumers are less lenient to product/service failure when the price is high with more prone to complain compared to low-priced product/service (Leisen and Prosser, 2004). High-priced products/services indicate consumer status, hence they are more inclined to complain if the actual product/service performance threaten their status to any extent.



In the literature, culture-based variations in CCB have been observed between Asian and Western consumers. Asian consumers (vs. Western consumers) are more likely to prefer private responses and less inclined to choose public responses, based on cultural values, such as collectivism; concern over loss of face; harmony; high power. However, there is also evidence to suggest that when customer loyalty and price level together with power distance as a cultural value are considered, this relationship does not hold true (Kim, Lee and Mattila, 2014). Consumers in high power distance cultures are less tolerant of product/service failures and more prone to voice their complaints under the condition of loyalty and high price. Hence, loyalty and price level can act as boundary conditions in the context of cultural impact on CCB.

### 3.6 Social Presence and Social Relationship

Prior research has shown that the presence (actual, imagined, or implied) of other consumers can influence consumers' judgments and behaviour. Specifically, other consumers' presence can affect focal consumers' product/service experience and assessment of the experience with changing their behaviour and attitudes. Social others can be categorised into the in-group and out-group, however, based on culture their definition varies. Depending on the social presence of in-group and out-group members, variations in consumers' perceptions and behavioural responses can be observed (Weber, Sparks and Hsu, 2017). Consumers belonging to collectivist cultures (vs. individualistic cultures) are more likely to be

interdependent and are more concerned about others' opinions. Hence, the impact of the social presence of others is more salient on consumers with collectivist cultures (vs. individualistic cultures). Collectivist (vs. individualistic) consumers' greater concern for others with the intention of keeping a positive image and good impression on others lead to the consequence that they are less prone to complain about a product/service failure in the presence of other consumers (vs. alone) (Fan et al., 2016). Following product/service failure, collectivist (vs. individualistic) consumers are more likely to complain in the presence of in-group members. On the other hand, in the presence of out-group members, both collectivist and individualistic consumers possess high complaint intentions.

In the scenario of a product/service failure, the failure location has no effect on consumers' perceptions and behaviour either by itself, in combination with consumers' country of residence or their extent of acculturation. However, product/service failure location when integrated with social presence exhibits an impact on consumers' perceptions and behaviour. Moreover, when there exists a strong social relationship between consumers and product/service providers, consumers tend more to complain of the occurrence of product/service failures. Consumers with a collectivist culture perceive themselves to be an element in an encompassing social relationship. Collectivist consumers' emphasis on social relationships leads to an increased need to keep face in the presence of social others and they are inclined to complain in the context of product/service failures (Fan, Mattila and Zhao, 2015).

## 4 DISCUSSION AND CONCLUSIONS

The present paper is an exploratory literature survey on CCB, particularly focusing on the effect of consumers' cultural orientation. From the literature survey it has been observed that culture has a profound influence on CCB. The review study has provided information and insights into CCB from the perspective of culture; specifically how consumers' culture leads them to engage in different complaint behaviour. The research findings suggest cross-cultural differences exist among consumers and the differences have a significant impact on CCB, and therefore on firms' strategies and responses.

For business organisations intending to penetrate new markets and cater to customers from different cultures, identifying and comprehending CCB in terms of cultural dimensions is crucially important. Companies need to tailor their complaint handling – management strategies and mechanisms according to their target consumers' cultural background.

Generally, consumers with cultural dimensions of individualism, low power distance, masculinity and low uncertainty avoidance are more likely to complain. Managers are recommended to handle and resolve these complaints more sensitively, promptly

and efficiently. Consumers with a cultural orientation of collectiveness, high power distance, long-term orientation and high uncertainty avoidance tend not to complain or engage in private complaints. Companies should take initiatives influencing these consumers to register complaints directly with them. For tailoring complaint handling means according to the consumers' cultural orientation, management can train their employees about the diverse complaint behaviour of consumers with respect to cultural dimensions. The findings of this article will help management and marketing practitioners to formulate strategies for effective handling as well as management of consumers' complaints. Previous

studies have investigated the impact of cross-cultural differences among consumers leading to diverse CCB; however post complaint satisfaction and repurchase intention has not been well addressed. A future study would try to fill this research gap and incorporate those aspects while analysing the effect of cultural dimensions on CCB. The current review article can be extended by considering Schwartz's dimensions of culture. In future, empirical work including qualitative and quantitative analysis should be performed. This study will contribute to the body of knowledge in the area of consumer complaint behaviour, with a particular emphasis on cultural aspects, having theoretical as well as practical significance.

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# KNOWLEDGE MANAGEMENT AND THE COSTS OF EXPLOITATION OF MACHINES

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## ABSTRACT

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The article concerns the exploitation of machines used in underground mining. During the machinery's operation many unplanned breaks have been recorded. The identification of the real causes of these breaks is an important problem which has not yet been solved. Determining these causes should reduce the breaks and lead to higher availability and, consequently, more effective use of machines. The increased effectiveness has a significant impact on operating costs, especially as most of the machines are leased and the costs of their operation depend on their work time in a mine. Practice shows that without the cooperation of employees it is difficult to identify the causes of the breaks. The article presents an example of using employees' knowledge to improve the effectiveness of the mining machines and discusses economic effects. It has been assumed that to optimise operating costs, it is necessary to make the best use of the machines.

## KEY WORDS

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knowledge management, costs, machines

## JEL CODES

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D240, D830, L200

## 1 INTRODUCTION

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One of the key aspects of any business is management, which refers not only to the human factor but also to financial, material and information resources. To manage is to achieve the goals set by the company and furthermore the greatest possible success. Management can concern the entire enterprise as well as selected processes, resources, projects and other spheres. In recent years, intangible resources have become increasingly important. They include knowledge that can also be managed. In addition, knowledge can become a key resource for an organisation and be used to gain a competitive advantage. However, having knowledge does not guarantee profits. The most important thing is to properly use it

through the proper knowledge management process. The way of managing knowledge is not universal but depends on the specificity of the enterprise. This means that the process of knowledge management in every industry and even in every company is different. Hence, not only employees, materials and finances but also internal relations, work atmosphere and aspects of the informal sphere require being well-managed.

The article presents an example of the use of employees' knowledge in a mining company. It is one of the Polish hard coal mines located in Upper Silesia. The selection of the company results from the fact that the mining industry has undergone a

lot of social pressure in recent years and operates in a very competitive global market. To survive, it has been forced to take actions to optimise costs and improve effectiveness. At the same time, it should be emphasised that mining is one of the most dangerous activities. It is associated with the numerous natural hazards to which underground mining is exposed. The most dangerous are ventilation hazards (Brodny, Tutak, 2016a; Brodny, Tutak, 2016b). All these factors make knowledge, abilities, responsibility and the correct attitude highly valued in this industry.

The article shows that the knowledge of employees in a specific company, such as a mining company, can also contribute to achieving better economic results. The analysed area was the effectiveness of mining machines. This effectiveness has been

improved by limiting unplanned breaks in their work. The economic aspects related to the protection of mining excavations have been discussed as well. In this range, predicted economic effects resulting from the application of new construction solutions for mining roof supports are presented (Brodny 2010, Brodny 2011, Brodny 2012). The predicted economic benefits are the result of using knowledge and technological development. The results confirm the thesis that one of the most important resources is the knowledge and potential of the employees as well as the ability to use scientific achievements. By using the mentioned potential production costs decrease and the level of safety increases. Hence the enterprise achieves better economic results.

## 2 KNOWLEDGE MANAGEMENT

In recent years, management as a scientific discipline has grown to a great extent in both theoretical and practical terms. Numerous new concepts, strategies, theories and models of management provide the evidence. Some of them have not been implemented into practice, remaining only purely theoretical. Nevertheless, a significant part of these achievements has been used practically contributing to the economic success of many companies worldwide. Efficient and cost-effective enterprise management solutions are being implemented rapidly by companies. This concerns enterprises from different kinds of industry (Stecula, Tutak, Brodny, 2017). There are many revolutionary ideas that are becoming more and more popular all over the world and have become the basis for the operation of both small companies and large international corporations. Effective company management has been and will be crucial to the existence of an enterprise. Economic results, success and the achievement of goals depend on the appropriate management. It is worth emphasising that management is not just about work delegation by the manager. It is a comprehensive science that combines many elements and is associated with many disciplines.

Management can be defined as a set of actions directed at the resources of an organisation and performed to efficiently and effectively achieve the organisation's goals. Activities in this area are related to four basic management functions, including plan-

ning, organising, controlling and motivating (Griffin, 2005). In each organisation, there are four types of resource, namely human, financial, material and informational. Management must address all resources to maximising the efficient achievement of goals (Griffin, 2005). Managers, whose scope of activity is constantly expanding, have there a meaningful role. Requirements for managers in the range of responsibility and ability to take risks, human and workforce management, skills and decision-making competencies are increasing. The success and even mere survival of the company depend on the accomplishments of the *"managers of tomorrow"* (Drucker, 1998).

As was mentioned before, management refers to human resources as well. People are the company's most valuable capital because through their personal efforts and their collective work they contribute to achieving the organisation's goals. In addition, each employee owns skills, competencies, experience, ideas and knowledge that distinguish him or her from others. Knowledge can be defined as a sensible set of information that is a factual and justified belief and/or technical skill (Nonaka, Takeuchi, 1995). One of the present challenges for the manager is to optimally manage knowledge that will bring the company many benefits, mainly economic.

Knowledge management is a systematic activity based on the capitalisation of an enterprise's intellectual assets (Stewart, 1999). There are two



types of knowledge – explicit and tacit knowledge. Explicit knowledge is formalised, codified; easy to communicate and transfer to other employees. Tacit knowledge is related to a specific person and has a personal character. It is difficult to share and formalise it. It is linked with individual predispositions and experiences of the unit (Nonaka, Takeuchi, 1995). Organisations focus their efforts mainly on explicit knowledge. Nevertheless, to increase their effectiveness they should try to disclose tacit knowledge. The main elements analysed in the process of knowledge management are: explicit knowledge, management, trust-based relationships, information technologies, knowledge culture, organisational structure, performance measures and motivation, which means prizes (Liebowitz, 1999). Knowledge management can be interpreted in different ways. According to one of them, the essence of knowledge management is explicit knowledge management using information technology. The explicit knowledge gained from the employees and stored in computers' memory plays the main role. The knowledge systems and knowledge available through information networks and technologies (e.g., e-mail and network applications) are also important (Stecula, Brodny, Tutak, 2017;

Brodny, Tutak, Michalak, 2017; Stecula, Brodny, 2017). Therefore, gaining, organising and restoring information, and referring to information technology aspects in an appropriate manner are essential (Thomas, Kellogg, Erickson, 2001). Knowledge management is also related to social factors. Knowledge is embedded in human consciousness and can be differently perceived by individuals. Knowledge management should also take into account social factors, especially with regard to economic aspects.

The article analyses the effectiveness of the use of mining machines in the context of the knowledge of employees (dispatchers). It turned out that the social factor was the main barrier that limited the use of workers' knowledge (Stecula, Brodny, Tutak, 2017). In turn, it limited the use of technical resources owned by the company. The lack of using knowledge – in this case, tacit knowledge – resulted in poor economic effects on the mine. It has been confirmed that knowledge management is a very complex process and requires a wide-ranging look at this issue. In this example, the economic factor is just one of many that determines the survival and success of an enterprise.

### 3 CHARACTERISTICS OF HARD COAL MINING IN POLAND

In Poland the main energy source on which the entire energy industry is based is hard coal. It is due the fact that Poland has one of the largest deposits of this material in Europe. At the same time, it has been successfully exploited and used economically for several decades. The possession and use of hard coal make the Polish economy largely self-sufficient in energy. It directly translates into considerable energy independence of the country. In Poland, as well as in Europe, hard coal mining has a rich history. In Europe it is already several hundred years old, and in Poland the origins of hard coal mining go back to the middle of the 18th century. Later, the development of surface lignite mining also occurred. The main hard coal deposits are located in three basins: the Upper Silesian Coal Basin, Lublin Coal Basin and Lower Silesian Coal Basin. Lignite is found mainly in the Konin, Turoszów and Bełchatów basins. Figure 1 shows the locations of these deposits.

From an economic point of view, both lignite and hard coal are very important for the country's energy system. Practically all of the lignite extracted in surface mining system is used in power stations. Hard coal is used in the power industry, in coke production (for the metallurgical industry) and by individual households to heat the buildings.

The main hard coal basin in Poland is the Upper Silesian Coal Basin, covering an area of app. 5600 km<sup>2</sup>. About 80% of Polish hard coal resources are located there (Bilans zasobów złóż kopalin..., 2016). At present, the Lublin Coal Basin is developing dynamically but there is no further exploitation in the Lower Silesian Coal Basin. In 2016, 70.4 million tonnes of hard coal were produced which is 1.8 million tonnes less than in 2015. At the end of December 2016, 84,645 people were employed in the mining sector, with nearly 65,000 working underground. It was 7,438 people less than in 2015 (Portal Gospodarczy, 2017). Over the last few years,





Fig. 1: Map of coal deposit locations in Poland (Polska. Nie tak łatwo ..., 2016)

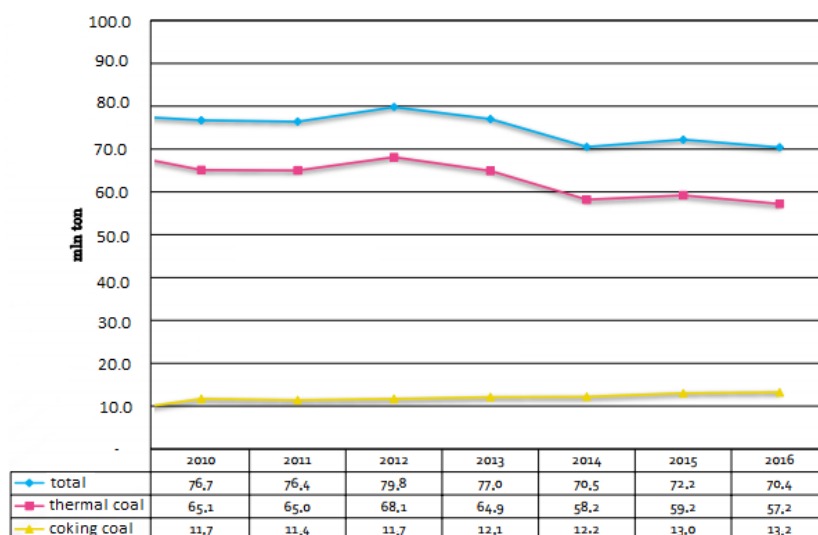


Fig. 2: Hard coal extraction in 2010-2016 in Poland (Olszowski 2017)

the level of hard coal extraction has been gradually decreasing. Figure 2 summarises hard coal extraction in 2010-2016 showing energy coal and coal for coking plants.

In Poland, coal is excavated in underground mining plants. At present, the main operation system is the longwall system. It enables fast and fully-mechanised as possible operation in large quantities. For this exploitation, machine sets, called mechanised longwall systems, are used. The exploitation process includes coal cutting, loading, horizontal transport and vertical transport to the surface. Subsequently, the excavated material is subjected to a process of enrichment in the processing plant. In this process,

the most important part is the first stage, which is the direct cut out of the excavated material from the rock mass and its transport from the zone of the longwall face. At present a longwall shearer is commonly used for cutting coal. In addition, this machine also loads the excavated material on the armoured face conveyor. This conveyor transports the material to the beam stage loader, and then to the mining shaft. Crushers are also used in this process. They crush large pieces of coal. A very important element of the longwall system is the mining roof support, which directly protects the longwall excavation. Steel arch yielding supports are used to secure adjacent mining corridors.

## 4 METHODOLOGY AND DATA

As it has already been mentioned, high competition in the energy market and growing environmental requirements mean that the mining industry needs to optimise costs to survive. Employees' knowledge and innovative scientific solutions can be helpful in this process. This paper discusses two cases of using these factors to reduce costs of mining operations. The first example concerns the improvement of the effectiveness of the machines included in the longwall system. The second example refers to the use of new lighter supports in the mining corridors. In this case the solution and the data are based on the results of the study (Brodny 2010, 2011, 2012).

The research methodology included many steps and phases. The first step was to select the mining machines to study. Then it was very important to choose the proper work parameters of the studied machines. These parameters became the data for the whole research. The data about the machines' work was obtained by the industrial automation system which had to be accordingly adjusted beforehand. The data registered by this system was sent to the data warehouse and archived there. Based on the data about the work of the machines it was possible to identify the breaks during the work. Knowing the work time of the particular machines, calculations of the costs of these breaks as well as their economic analysis were made. This analysis enabled the determining of the potential losses for

the whole mining company. This research aimed at addressing the question of whether it is possible to develop a research methodology for the use of mining machines which would enable the development of a system to improve the effectiveness of these machines. It refers especially to the identification of the reasons for the breaks in machines' work and the reduction of numbers of the unplanned breaks.

Economic effects of the whole mining operation process significantly depend on the reliability, durability and performance of the longwall system. The result of the system's work is the excavated material which after the enrichment process becomes commercial coal. The quantity and quality of the excavated material is essential for a mine's final economic results. Therefore, it is justified to carry out research and analysis to fully use production capabilities of the machinery. It is also important that, in most cases, the mining machines are leased. This means that the costs of their maintenance depend on the time of their work. They should cut as much excavated material as possible, and it should have the best possible quality as well. Then, the mine gets double benefits. On the one hand it has a lot of good product and on the other the costs of obtaining coal are low. This simple mechanism seems to be missing in coal mines in Poland. It turns out that very expensive, reliable and modern machines are used to a small extent.

## 5 EXAMPLES OF USING KNOWLEDGE TO REDUCE THE COSTS OF MINING EXPLOITATION

Figure 3 shows the temporal current waveforms consumed by engines of the cutting heads (cutters) of the longwall shearer and velocity of its feed during one work shift. These waveforms were determined by independent industrial automation systems, which means that the data is independent of the influence of the mine workers. They determine the real work of the tested machines.

The analysis of the recorded waveforms clearly indicates that for the 6 hours, (360 minutes) in which the shearer was supposed to work, there were 148 minutes of unplanned downtime. Hence, the shearer's availability was only about 59%. This means that

the shearer as well as the entire longwall system did not operate during almost half of the work time. An analysis of the availability of the shearer for one month (21 work days = 63 work shifts = 378 hours = 22680 min) showed that its availability was around 63.4%. It can be assumed that 36.6% of the work time the shearer did not operate while it should have. It means that for 8300.88 minutes (138.35 hours = 23.06 work shifts) it was unused. Then, for 7.7 days the shearer and the entire system did not operate.

The costs associated with the lease of the shearer are about 12,000 PLN (approx. 2,850 EUR) per day. This indicates that the mine lost about 92,400 PLN

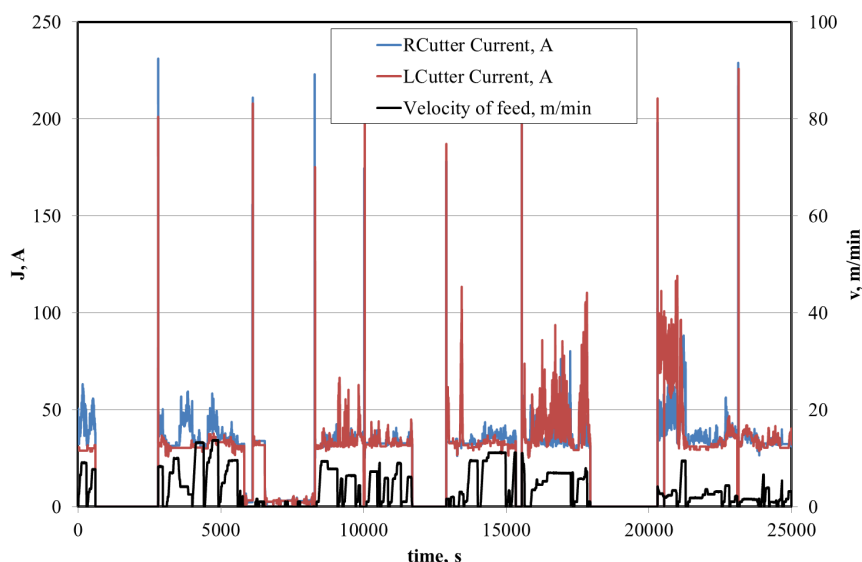


Fig. 3: The temporal current waveforms consumed by engines of the cutting heads (cutters) of the longwall shearer and velocity of its feed during one work shift

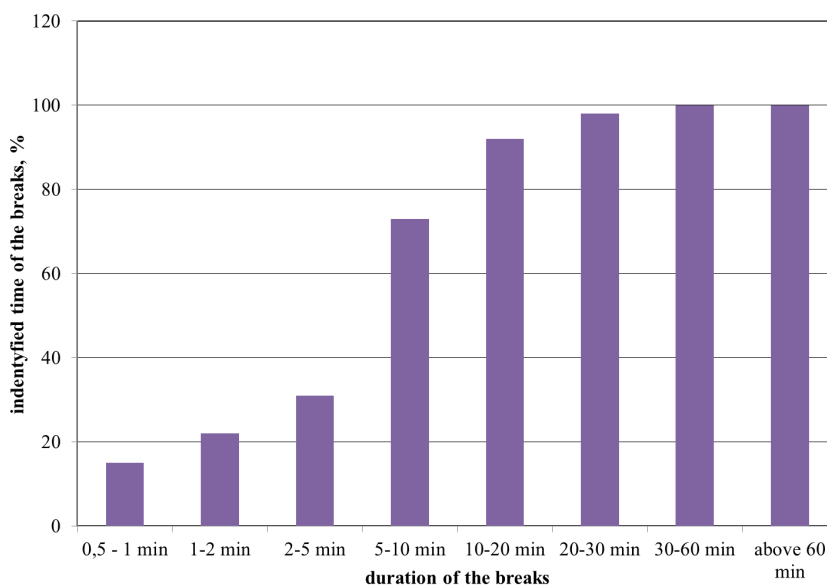


Fig. 4: Percentage of identified reasons for the breaks for the selected groups of time

(21,940 EUR) for the shearer's lease during that one month. Taking into account the fact that the studied longwall was exploited for 10 months, the loss is almost one million PLN (238,473.34 EUR). It is about 20% of the shearer's value, considering that the average cost of a shearer is about 5 million PLN (1.19 million EUR). This unplanned downtime also led to other costs of not using other machines and others associated with the operation of the longwall (e.g. employees' salaries). For the presented problem, it seems natural to take actions to limit the breaks in the shearer's and other machinery's work. What

is more, the studied longwall has very favourable mining and geological conditions.

Therefore, it could have been constantly exploited. However, the study focused on identifying the causes of unplanned breaks in the shearer's work. Figure 4 shows the percentage of identified reasons for the breaks for the selected groups of time. In practice identifying the reasons turned out to be very difficult. Operators and dispatchers responsible for reports about the machines' operation described only a few of the breaks. Authors applied the original system of registering the causes of the downtime, taking



Fig. 5: View of steel arch yielding support (<https://upload.wikimedia.org>)

into account the anonymity of the dispatchers. This system made it possible to improve the situation.

The development of this system was preceded by research involving expert interviews and surveys. The results of the research have shown that knowledge of the state of machines' use is tacit knowledge. The employees, fearing consequences from their superiors and co-workers, did not disclose this knowledge. At the same time, they did not note all the breaks in the machines' work. Only independent results obtained from the industrial automation system have created the conditions for the discussion of this topic. As a result of the new system application, in the first month it was possible to identify around 70% of the reasons for unplanned breaks in the longwall shearer's work. Figure 4 shows their time structure. Currently, work aimed at eliminating these breaks is being carried out. It was assumed that a satisfactory result would be a reduction of about 30% of them. It should improve the availability of the shearer by about 10%, which should preferably translate into economic effects on the mine.

A second example of the use of knowledge for improving the effectiveness of the underground mining exploitation is to apply new construction solutions and results of scientific research when selecting supports for the mining corridor excavations

(Figure 5). The use of heavy steel profiles for building this support can be limited by using the results of the study (Brodny 2010, 2011, 2012). Nowadays, the most often used profiles to increase the bearing capacity of this support are V32 and V36, and more and more often V44 profiles. The number in the name of these profiles determines the mass of their one current meter. The studies conducted show that the weakest point of the support made of these profiles is the friction joint work. Introducing changes in the process of support assembly as well as inspecting the support's condition, especially threaded connections, may increase its bearing capacity. In turn, it should lead to the use of the lighter profiles which at the same time are better built in mining excavations. When the profiles are lighter, building the support is easier, which results in higher quality of the support. Using lighter V29 profiles instead of the V32 and V36 means gaining from 3 to 7 kg (from about 9% to about 19%) of steel per metre of the profile. These changes will not reduce either the bearing capacity of the support or the safety in the excavations. Assuming that about 150,000 tonnes of steel are used per year to build this support, the proposed changes should save approximately 25,000 tonnes of steel per year. Hence, the economic effect of introducing these changes is very beneficial.

## 6 DISCUSSION AND CONCLUSIONS

The paper discusses issues which are very important for the Polish economy due to its energy security. Mining companies have to pay more and more attention to the economic effects of their operations. This necessitates optimisation of the individual parts of the production process in mines. This process must definitely be based on internal and external knowledge. Only development through knowledge can guarantee these companies' further existence. Any changes in this industry must also take into account social aspects. Specific working conditions and high security risks make employees have different attitudes towards the proposed changes. Hence, it

seems to be necessary to conduct wide-ranging educational activities.

The two presented examples of the use of internal (tacit) and external knowledge to improve the economic effectiveness of mining companies prove that there is great potential for cost optimisation in mines. Moreover, it is necessary to implement the results of technological progress and development of new disciplines, mainly IT, in the mining industry. The presented work can also be treated as a "voice" in the discussion on improving the condition of mining in Poland, since the presented examples are very concrete solutions that are currently at the practical implementation stage.

## 7 ACKNOWLEDGEMENTS

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# POINT DETECTION FOR GRASPING UNKNOWN OBJECTS

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## ABSTRACT

This contribution is focused on the design and implementation of the algorithm intended for point detection for grasping unknown objects. The Hough transform method was used for the implementation of this algorithm. A Basler acA1600-20uc industrial camera with a Computar M2514-MP2 lens was used for obtaining the input data. The programming language C# and EmguCV library were used for the implementation of algorithm. The correctness of the designed algorithm was verified using detection of the various objects.

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## KEY WORDS

Grasp point, unknown objects, EmguCV

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## 1 INTRODUCTION

Robotic assistants are nowadays at the forefront of scientific research. Robotic assistants are not only used in the industrial area but increasingly also in the home. Therefore, these assistants must be able to handle objects of everyday use. For these purposes, the robotic assistants must be able to detect different objects in the environment and compute the grasp point of these objects. Subsequently the robotic assistants can grasp an object.

There are currently a lot of approaches to the detection of the grasp point of an unknown object. These approaches are based upon a point cloud analysis in most cases. Approaches that detect a

grasp points in the image are used in fewer cases. The detection of the grasp point brings many problems that have to be solved. The detection of the stable grasp is the biggest problem. If the detected contact surfaces are curved or not parallel then the object can be dropped. Therefore contact surfaces that are as little curved as possible and parallel must be detected. Then the grasp point can be obtained from these contact surfaces.

The main goal of this article is the design and implementation of an algorithm for the purpose of grasp detection for unknown objects.

## 2 METHODOLOGY AND DATA

### 2.1 Actual state of the issues solved

There are various approaches to the detection of the grasp point for unknown objects as was discussed above. Because a camera is used to obtain the input data in this article, similar approaches are discussed in this chapter.

Web cameras, a stereo camera and two laser scanners for obtaining point clouds were used to get the input data in this approach. The approach is made up of four parts. Object detection and grasp point detection is carried out in the first part of this approach. Obstacles detection is performed in the second part. If obstacles are detected then the robotic arm must avoid these obstacles. Therefore trajectory planning is carried out for this purpose in the third part. The grasp of the detected object is performed in the fourth part. 3D models of real objects before object detection train the learning algorithm. The training process for the algorithm is carried out by the detection of the image features e.g. edges, contours or object surfaces. The algorithm of logic regression is used for the detection of these features. The detected points are converted into the united coordinates system by the triangulation method. The 3D image of the object is always created from the input data. It is possible detect the object and the grasp points based on the earlier training of this algorithm. All detected grasp points are stored in the set. The best grasp point is selected based on the position of the end effector. This grasp point must be accessible and nearest to the end effector. (Saxena, 2011) Authors (Popović, 2010) and (Leeper, 2014) also detect characteristic features of the object in the image. One author (Lefakis, 2010) uses histogram analysis for the detection of surfaces and only one camera to obtain the input data.

Two cameras with a resolution of 640 x 480 px are used to obtain the input data. The image obtained is converted into a point cloud in the next step. The object is first extracted from the surroundings by the GrabCut algorithm in the conversion process. Then, the SURF (Speeded Up Robust Features) algorithm is used in the conversion process. The particle filter performs the estimation of the object's position. The SSA (Scaling Series Algorithm) algorithm was selected from this area of methods. A median filter

is used for obtaining a noiseless point cloud. Further, the PCA (Principal Component Analysis) algorithm is used for checking the right position estimation. The five-finger gripper is used to grasp the object, because this algorithm had been tested on a humanoid robot. The grasp of the object is dependent on its shape and the kinematics of the gripper. The determination of the grasp is carried out so that each finger sequentially touches the object or another finger. If the grasp is accessible then it is added to the set of possible grasps. The accessibility of the grasp is determined by the inverse kinematics. Further, each grasp is evaluated and the grasp with the smallest value is selected as best (Saut, 2014).

The approach, which uses the Microsoft Kinect sensor for obtaining the input data, is another solution of the real-time object detection. The data are obtained in RGB-D format. The segmentation of points is carried out based on the image depth by the two-pass binary image labelling technique in the first step. The middle colour of the segments is subsequently determined by the analysis of their histogram. Then segments with a similar colour are clustered. This process creates particular surfaces. Further, these surfaces are clustered into objects. The clustering of the surfaces is represented by the graph. Nodes represent surfaces and edges represent common edges of surfaces in this graph. The greedy search algorithm clusters surfaces. If two neighbouring surfaces have a convex shape then they are connected by an edge. If these surfaces have another shape then an interface is created between them. The grasping points are selected from the edge points. These edge points must meet the mirroring condition in 2D or 3D space. The selected point pairs are stored. The point that has in its surroundings the most place and has a suitable shape of contact surfaces is selected as the most suitable grasp point. (Asif, 2014) One author (Eppner, 2013) developed an approach which uses the RANSAC method for object segmentation.

The next approach is focused on the bin-picking problem. Holz developed this approach. The detection of a transport box by three horizontally-mounted laser scanners is performed in the first step. Further, the Microsoft Kinect sensor performs the perception of the content of the transport box. The content is scanned from three different views

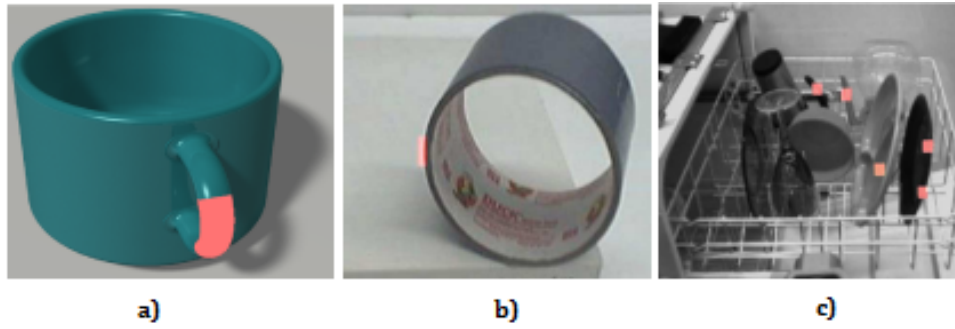


Fig. 1: Grasp point detection of objects in everyday use (Saxena, 2011)

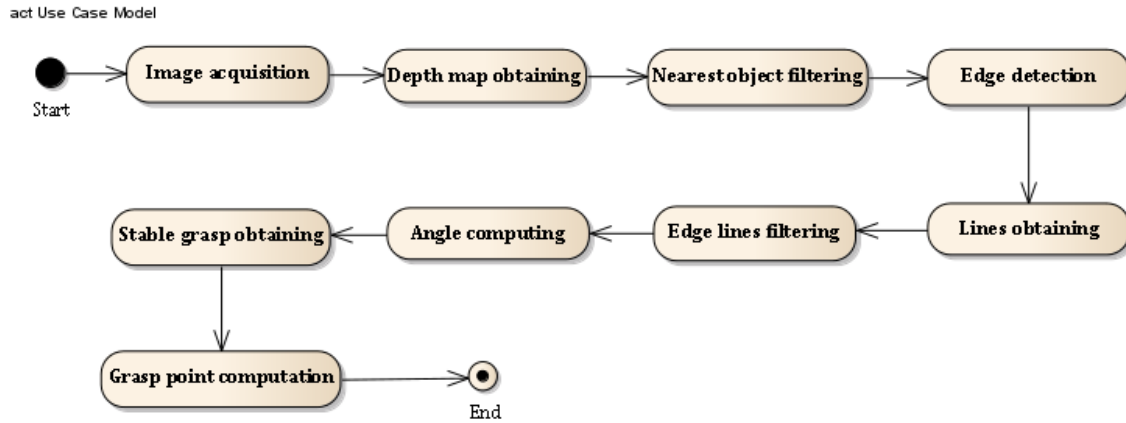


Fig. 2: Diagram of the algorithm

and these views are merged into one point cloud by the Iterative Closest Point (ICP) algorithm. The detection of simple geometric shape primitives e.g. planes, cylinders and spheres is carried out in the next step. These primitives are detected by the RANSAC algorithm. Objects are detected by shape graph matching. This approach is able to learn new objects from CAD models. New objects are detected by using the RANSAC and ICP algorithms. Finally the grasp planning is performed. This approach finds the feasible and collision-free grasp of the object (Holz, 2014). The authors Chang and Wu also deal with the bin-picking problem (Chang, 2016).

## 2.2 Approach Used

The Basler acA1600-20uc industrial camera with a M2514-MP2 Computar lens was used for the purpose of obtaining input data. Frame rate 20 fps, resolution 1624x1234 and chip size 1/1.8" are the key parameters of the camera. Focal length 25mm and optical size 2/3 are the key parameters of these lenses.

The algorithm for this solution is divided into several parts and is shown in Figure 2. The detection

of the object nearest to the camera is performed after obtaining the input data. The depth map is obtained for this purpose. A modified SAD (Sum of Absolute Difference) algorithm is used for obtaining the depth map, see Equation 1. Subsequently, the nearest object is selected and the background of this object is filled with white colour.

$$\sum_{(x,y) \in W} |I_R(x,y) - I_L(x+d,y)| \quad (1)$$

The line detection in the image is carried out in the next step. Edge detection by the Canny edge algorithm is performed in the first step. The line determination by the Hough transform algorithm is carried out based on the detected edges. Lines with width 10px were detected in the Hough transform algorithm. Further the edge lines are filtered from all the detected lines. Subsequently angle computation for each line is performed. Parallel lines or lines with a difference of 5° are filtered based on computed angles. These filtered lines are detected for the purpose of obtaining a stable grasp. Then the detection of the best grasp is performed. The lines with the smallest

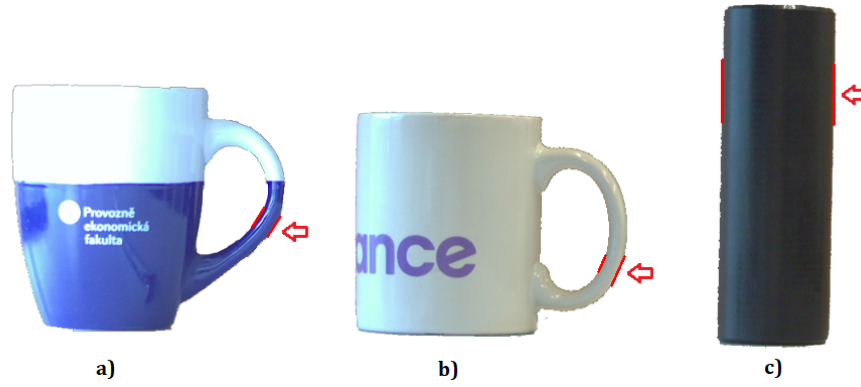


Fig. 3: The result of the developed solution

distance and angle difference are selected as the best grasp. Further, the grasp point is computed based on

the lines' end points. The end effector of the robotic arm will achieve this grasp point.

### 3 RESULTS

The algorithm for grasp point detection of unknown objects was designed in the previous chapter. This algorithm was subsequently implemented. This algorithm was implemented using C# programming language with the EmguCV library. The testing process was performed by the detection of a small group of objects in everyday use with various shapes. This group primarily contained mugs. The detection of mugs achieved a 60% success-rate. The result of grasp point detection is shown in Figure 3. The red lines on objects represent contact surfaces. These tests proved the usability of the designed algorithm. Moreover the

testing process demonstrated the accomplishment of the defined goal.

The testing process of the algorithm revealed advantages and disadvantages. The main advantage of this solution is prevention of the grasped object dropping from the gripper. If the grasped object only has a circular shape then the grasping point can be detected incorrectly. This is the main disadvantage of this algorithm. Therefore, future work will also be focused on the detection of the circular parts of objects.

### 4 DISCUSSION AND CONCLUSIONS

This article deals with the detection of the grasp point of unknown objects. Finding a stable grasp is the biggest problem in the process of grasp point detection. If the grasp is not stable then the grasped object can be dropped. The proposed solution eliminates this problem by the detection of parallel lines at the object border. The Hough transform algorithm is used for these purposes.

The results were compared with the solution (Saxena, 2011). This author also tested his algorithm with objects in everyday use. These objects were separated into four groups by their shapes (plates, bowls, mugs and wine glasses). Each group contains five objects. The overall grasping success-rate of Saxena's algorithm is 80%. The success-rate for grasping mugs

is 60%. The proposed algorithm detects roughly the same grasp points, see Figure 3a, b) and Figure 1a). The success-rate of the proposed algorithm during mug detection is 60%.

The newly implemented method of grasp point detection for unknown objects will be further expanded. Further work will be focused on circular part detection on the grasped object. Circular part detection will bring information about less stable contact surfaces. If no lines are detected then the selection of the grasp point will be performed from these surfaces. The proposed algorithm will be further integrated into the dissertation thesis with the title "Manipulation of objects based on soft computation".

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# THE RELATION BETWEEN RATE OF TAXATION, PRODUCTION AND CONSUMPTION OF SPIRITS IN THE EU COUNTRIES

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## ABSTRACT

This article is focused on the relation between the excise duty on spirits and its consumption and production in European Union countries. The main aim of this research is to analyse the association between these three variables, furthermore to prove the existence of protectionism by domestic producers. The relation is examined by correlation analysis, namely by the Pearson correlation coefficient. The received results have shown that the relations between the variables of excise duty on spirits are statistically significant, even though the intensity of the dependence is weak. Moreover, the results reveal that protectionist behaviour by EU member states has not been demonstrated. On the other hand, a relationship between the variables with a fiscal objective was confirmed.

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## KEY WORDS

excise duty, spirits, tax rate, consumption, production

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## JEL CODES

E62, H20

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## 1 INTRODUCTION

Excise taxes represent a fiscal policy instrument of indirect taxation in all the developed economies in the world. Traders include the tax in the prices of products and services which are offered on the market. The primary purpose of excise duty on spirits is to generate revenues for the state budget and to regulate the consumption of alcohol (Fidler et al., 2015).

From a historical point of view, alcohol has been produced and consumed in Europe for thousands of years. Some countries associate spirits with their national culture and identity, which has led to protection of the rights related to production of these beverages (Anderson and Baumberg, 2006). Recent

studies (Anderson, Moller, Galea, 2012; Sopek, 2013) characterise the European Union as a region with the highest alcohol consumption in the world. Alcohol is, according to the authors, the third most common cause of illnesses and premature death just after low birth weight and unprotected sex. At the same time, alcohol is the third most dangerous factor causing disease and mortality in Europe, just after smoking and high blood pressure. Studies also indicate that the average consumption of alcohol in the countries of Central and Eastern Europe is higher than in the rest of the EU, and traditionally, spirits have a large share of total consumption in most of these countries.



Šafránek (2016) and also Trasberg (2015) state two fundamental reasons for taxation of selected types of goods and services. The first reason is to decrease negative externalities and discourage consumers from socially undesirable consumption. The second reason is to raise funds for public finances. The difficulty in substituting goods with other products gives excise taxes the opportunity to receive a permanent income to the state budget. For these reasons, excise duty on spirits is considered as an instrument that can rectify inefficiencies of the market. The consumption of spirits is part of the everyday culture of society. Cultural traditions, ways of life and festivals that have persisted for several thousands of years are often associated with the consumption of alcohol. It is evident that the consumption of alcohol should be also sensitive to these problems. Except for the facts stated above, the domestic government can use excise taxes not only to increase tax revenues but also to protect domestic producers against foreign competitors.

Kubátová (2015) as well as Šafránek (2016) simultaneously focused on the problematic consequences of excise duty on spirits. The main reason is the regressive impact of tax, which means a relatively higher tax burden for payers with lower incomes. This is due to the fact that the consumption of spirits is not proportional to the payer's income, but greater share of the consumption of spirits is paid by people with lower incomes. The results of other studies (Cnossen, 2007; Rabinovich et al., 2012) found elasticity of alcohol consumption with price. This means that increasing the prices of alcoholic beverages will induce a reduction in their consumption. Elasticity differs depending on the type of alcohol, and it is highest in the case of spirits.

The harmonisation and regulation of excise duty on spirits via directives began with the accession of countries to the EU. Despite harmonised levels of excise duty on spirits, member states of the EU implement their own tax policies (Trasberg, 2015). The main issue of the taxation of alcoholic beverages and its consumption is solved by Directive 92/84/EEC (Council Directive 92/84/EEC, 1992). This directive states that countries, whose tax rate is between €550-1 000/hl of ethanol, cannot reduce this rate. At the same time, countries that use a higher tax rate than €1000 cannot reduce the rate below €1 000. Furthermore, the directive allows individual

countries of the EU to implement a reduced tax rate for small producers with annual production up to 10 hl of pure alcohol. However, the reduced tax rate may not be less than 50% of the standard national rate. Related to numerous differences in tax rates applied in different countries of EU, it is evident that there is no consensus on the optimal taxation levied on spirits (Sopek, 2013).

The amount of excise duty on spirits is influenced by many varied factors. This has been confirmed for example by Chaloupka et al. (2002), who argue that higher excise duty on spirits in the case of young people leads to a significant reduction in their consumption of spirits. Fidler et al. (2015) state that a high tax share on the final price, especially in the case of cheaper spirits, creates space for a black market. Additionally, stricter regulation in the form of higher rates and more intensive supervision of official producers may lead to higher motivation to shift production and consumption into the shadow or black economy. For this reason the profitability of excise duty on spirits is influenced negatively. According to Fidler et al., it is necessary to focus on specific measures to fight unofficial producers of spirits instead of regulation in form of increasing tax rates. This is because higher excise rates affect only legal producers. On the other hand, Trasberg (2015) analysed the association between consumption and the tax rate in the countries of the EU, and concluded that the correlation between the level of tax burden and consumption per capita is insignificant. This means that richer countries do not consume more alcohol per capita in comparison with countries with a lower income. If the impact of excise duties on alcoholic beverages was negligible, thought of protectionism would disappear.

Scientific papers show there are more factors having a significant impact on excise duty on spirits. The aim of this article is to analyse the association between production, consumption and the tax rate on spirits in the countries of the EU. Furthermore, to check whether there is any relation between these three variables. The purpose is to verify these options: there is no correlation between production, consumption and tax rate, or on the contrary, there is a correlation between variables with a fiscal aim, alternatively, if the protection of domestic producers is confirmed.

## 2 METHODOLOGY AND DATA

In order to fulfil the above-mentioned objectives, the analysis of panel data is used, which is also named as factually-spatial data using a model means of solution. Baltagi (2008) claims that this data is more informative. They also have larger variability and less correlation between the variables, and thus, they bring the effectiveness of observed results. The data represents the longest possible time series, the period from 2005 to 2014. The selected research indicators include the consumption and production of spirits per capita, the development of excise duty rates on spirits in the countries of the EU.

There are different methods by which the consumption of spirits can be measured. The most often analysed variable for international comparison is the consumption of spirits ( $C$ ) per capita – the amount of ethanol in litres per year, which is consumed by every inhabitant older than 15 years. Alcohol consumption is freely accessible to people over 18. Therefore, consumption by children and adolescents who have not reached minimum legal age limit is not expected. In addition, data about the consumption of spirits per capita may draw a more accurate picture of total consumption compared to surveys that usually lead to lower estimates of total consumption by the population. The data that records the consumption of spirits per capita is grouped together and they are taken from the national official statistics of the World Health Organisation (WHO, 2016).

The production of alcoholic beverages is an important sector. It provides working opportunities and it is a source of income for example farmers, producers and retailers. The data regarding the production of spirits ( $P$ ) is drawn from Eurostat's website (Eurostat, 2013). Within the analysis we used annual data regarding the volume of sold production in litres, which is then divided by the number of inhabitants in each country. The consumption of alcoholic beverages for children and adolescents younger than 18 is again not expected. Data processing detects countries whose production is insignificant according to statistical data system from Eurostat in 2005–2014. It includes the following countries: Cyprus, Luxembourg and Malta. Despite that fact we are going to analyse the data of these countries. However in Slovenia the production of spirits is restricted, based on this the country is excluded from the analysis to avoid the distortion of results. Moreover,

Croatia is also excluded from the countries of EU, due to its recent joining of the EU in 2013. All in all, our analysis dealing with the relation between production, consumption and rate of taxation in total consists of 25 EU member countries.

The data on the development of the excise tax rate on spirits is gained from the CIRCABC–Library (European commission, 2005–2014). The tax rates used in individual years are always related to 1 January of the calendar year. The development of the tax rates is recorded in the currency used by most EU countries, in EUR/l. For the purpose of this research the excise duty rate (EDR) on spirits is used in two forms. The first is given in absolute value. The second one is the modified excise duty rate (MEDR), and it is determined as a ratio of the fundamental excise duty rate and the gross domestic product per capita, which is considered as an objective measure of relative economic wealth in comparisons of countries.

The used method is a correlation analysis, where standard output of the analysis is a correlation coefficient, which describes a degree of dependence. The formula for calculating the correlation coefficient is as follows:

$$r_{\text{EDR},C} = \frac{\sum_{i=1}^n (\text{EDR}_i - \overline{\text{EDR}}) \cdot (C_i - \overline{C})}{\sqrt{\sum_{i=1}^n (\text{EDR}_i - \overline{\text{EDR}})^2 \cdot \sum_{i=1}^n (C_i - \overline{C})^2}}, \quad (1)$$

where  $\text{EDR}_i$  is the excise duty rate for measurement  $i$ ,  $\overline{\text{EDR}}$  is the arithmetic mean of excise duty rate,  $C_i$  is the consumption of spirits for measurement  $i$ ,  $\overline{C}$  is the arithmetic mean of the consumption of spirits,  $r_{\text{EDR},C}$  is the correlation coefficient between EDR and  $C$ .

The same formula of the correlation coefficient is also valid for the other indicators, in the case of the production of spirits ( $P$ ), where  $C$  values change to  $P$  values. By this change we get another formula (2). Finally, the same formula is also used for the modified excise duty rate (MEDR), where we substitute MEDR for EDR in the formula (1) and (2), thus forming additional formulas (3) and (4).

The mutual linear correlation between the two variables can be derived from the correlation matrix by a Pearson correlation coefficient, the values of which can be from interval  $\langle -1, 1 \rangle$ . The more the

coefficient deviates from 0, the stronger the correlation between variables is. According to Ostertagová (2013), the correlation intensity can be determined by the scale that evaluates the tightness of linear dependence between variables using 3 divisions, where the value  $r$  represents the absolute value of the correlation coefficient: weak correlation, if  $0 < |r| \leq 0.3$ , mild correlation, if  $0.3 < |r| \leq 0.8$ , and strong correlation, if  $0.8 < |r| \leq 1$ .

Subsequently the testing of the statistical significance of the correlation coefficient, which is evaluated via a  $t$ -test in the Gretl programme, is carried out. The null hypothesis of this test is that a parameter is not statistically significant, and on the other hand the alternative hypothesis asserts that the parameter is statistically significant:

$$H_0 : r = 0, \quad H_1 : r \neq 0. \quad (2)$$

There are two options for examining statistical significance: comparing test statistics with a critical region and using  $p$ -values. The  $t$ -test is frequently used in the test statistics under the assumption that the null hypothesis validity has Student's  $t$ -distribution with  $n - 2$  degrees of freedom. Testing

statistics takes the following form:

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}. \quad (3)$$

The assessment of the  $t$ -test in the case of the mutual alternative hypothesis is determined by the critical region:

$$W = (-\infty; t_{\frac{\alpha}{2}}(n-2)) \cup (t_{1-\frac{\alpha}{2}}(n-2); \infty), \quad (4)$$

where  $W$  is the critical region,  $n$  is the range of choice,  $\alpha$  is the significance level,  $r$  is the correlation coefficient,  $t$  is the test statistics.

If the calculated value of the test statistics from formula (6) belongs to the critical region defined by the formula (7), we reject the null hypothesis. At the same time, it is also advantageous to use the  $p$ -value from Gretl statistical software, if this value is lower than the required significance level, we reject the null hypothesis and the correlation coefficient is statistically significant. Within our testing a standard significance level of 5% is used.

### 3 RESULTS

The first part of the analysis is focused on descriptive statistics of the studied indicators. The main information about the panel data is shown in the Table 1. All variables are converted to per capita form, the consumption and production of spirits are stated in litres, and the fundamental and modified excise duty rates are presented in €/l.

Based on the results we can observe that the average annual consumption of spirits in the case of people older than 15 years in the EU is 2.64 l per capita. At the same time, it exceeds the average production of spirits by more than 0.5 litres. Compared to the median which divides the values into two equal parts and determines the middle value of data, the average results do not differ significantly. The lowest value is zero for the consumption and production of spirits. However, the tax rate on spirits in comparison with other alcoholic beverages does not have a zero value. The main reason for this is the minimum tax rate of spirits which is 5.50 €/l. In observed time period, most of spirits are consumed on average in Lithuania. Furthermore, Ireland can be

considered as the largest average producer of spirits within the EU.

The standard deviation shows how widely the values are distributed from the average. The lower the value is, the closer it gets to the average. Standard deviation values show that there are more significant deviations from the average at fundamental tax rates. The coefficient of variation, which is given by the ratio of the standard deviation and the arithmetic mean, reaches the highest value in the production of spirits. The arithmetic mean in this case loses significance, as the value of the coefficient of variation, that is 0.9503, exceeds 50%. In such results, the use of median rather than the arithmetic mean is a more suitable solution.

In addition, there is a visible positive (right-sided) skewness that indicated that most states within the EU are below average. The most skewed distribution of values is in the fundamental tax rate. On the other hand, negative values are shown in the case of consumption of spirits and modified tax rates, which means a more even distribution.

Tab. 1: Descriptive statistics

	Consumption of spirits (l)	Production of spirits (l)	Fundamental excise duty rate (€/l)	Modified excise duty rate (€/l)
Expected value	2.6418	1.9919	15.5700	0.0008
Median	2.2750	1.4950	11.6730	0.0008
Minimum	0.0000	0.0000	2.8000	0.0001
Maximum	7.8700	9.6700	59.7680	0.0018
Standard deviation	1.5480	1.8929	11.3360	0.0004
Coefficient of variation	0.5860	0.9503	0.7281	0.5264
Skewness	0.6442	1.4145	2.1361	0.3554
Kurtosis	-0.1094	2.2579	4.1369	-0.8851

Tab. 2: Correlation coefficients in relation to the fundamental and modified tax rate of excise duty

	Fundamental tax rate		Modified tax rate	
	Consumption of spirits	Production of spirits	Consumption of spirits	Production of spirits
Correlation coefficient	-0.3226	0.1992	0.2022	0.2157
<i>T</i> -test	-5.3670	3.2010	3.2520	3.4780
<i>P</i> -value	1.84e-07	0.0015	0.0013	0.0006
Tightness of linear dependence	mild	weak	weak	weak
Direction of dependence	-	+	+	+

In total, we can evaluate that the consumption and production of spirits is heterogeneous in the EU countries. So far there is no agreement about the optimal amount of excise duty rate on spirits between EU countries. For this reason tax rate determination depends on the tax policy of each individual country; however, it is necessary to follow the stated minimum tax rate.

For further comparison scatter plots are drawn to illustrate the expected tax rate dependence on variables of the consumption of spirits in the EU. In Figures 1 and 2, it is presented a visible direction of dependence. Moreover we used a trend line curve.

Figure 1 shows the fundamental rate of excise duty on spirits, which depends on the per capita consumption of spirits. Because of the evident decreasing trend, we assume the negative dependence of both indicators. The figure also confirms an assumption: the higher the tax rate on spirits, the lower the per capita consumption of spirits.

Figure 2 shows the modified rate of excise duty. The fundamental tax rate was divided by GDP per capita and it depends on the per capita consumption of spirits. There is a clear difference from Figure 1, as in this case the trend line is increasing. It is evident that with growing production of spirits, the tax rate on spirits is also increasing. Due to the increasing trend, we assume a positive association

between these indicators. The points are distributed around the trend line and therefore we predict a weaker dependence. At the same time, the figure confirms that there are no zero tax rates on spirits. The positive correlation also applies in the case of the dependence between the fundamental or modified tax rates on the production of spirits.

In the following section, the individual correlation coefficients expressing the degree of dependence between variables are determined according to formulas (1) to (4). The value of the test statistic was calculated according to formula (6) and the *t*-test using the critical region via using formula (7). The statistical significance of the correlation coefficients is then examined by the *p*-value received from the Gretl programme. Finally, the direction of dependence is analysed by the sign of the correlation coefficient. Table 2 shows the number of observations, the critical value of the *t*-test and the values of correlation coefficients in the case of using the fundamental and modified tax rate of excise duty on spirits.

Table 2 includes in total 250 observations. The critical value of the *t*-test is 0.1241 and the significance level used is 0.05. The explanatory variables (consumption and production of spirits) are examined in order to find out how they affect the tax rate.

In the case of testing the association between the fundamental tax rate and the consumption of spirits,

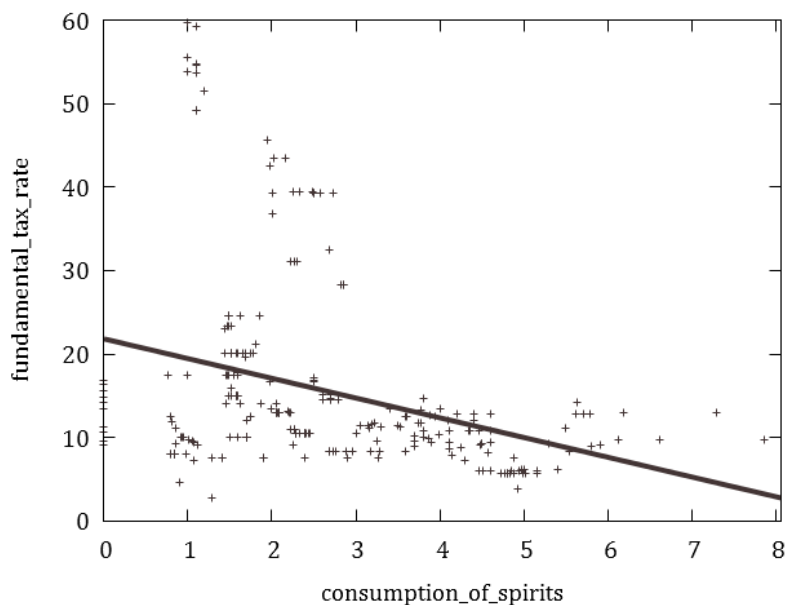


Fig. 1: The dependence of the fundamental tax rate on the consumption of spirits

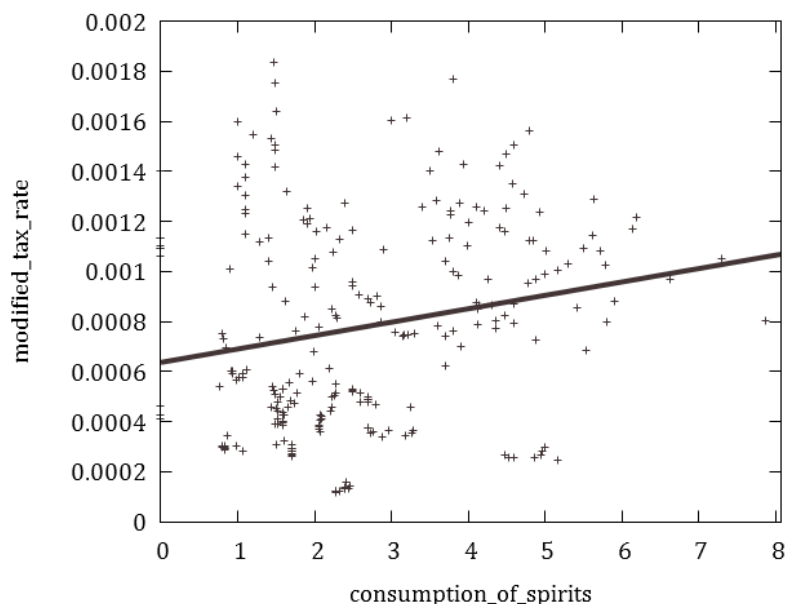


Fig. 2: The dependence of the modified tax rate on the consumption of the spirits

the value of the correlation coefficient is negative and therefore the negative relationship between variables can be confirmed. The value of the correlation coefficient exceeded the absolute value 0.3, hence we can say that there is a mild correlation between the analysed variables. This points out on fiscal target of the state, it raising funds for public finances. This implies that that the fiscal objective of the state, which depends on raising funds for public finances, can be fulfilled. On the other hand, with higher excise duty there is a decrease in the consumption of spirits.

Consumers are discouraged from consuming spirits and the educational function is therefore fulfilled. Conversely, there is only a weak positive correlation between the production and fundamental tax rate of spirits. The correlation coefficient is positive, which indicates a positive association between production and the value of the fundamental tax rate on the excise duty on spirits. From a statistical significance point of view, based on the  $p$ -values we can reject the null hypothesis and therefore the correlation coefficients can be considered significant.

Moreover, the modified tax rate on spirits is included in the correlation analysis. The results of the correlation matrix show that the value of both correlation coefficients is positive, and thus the assumed positive correlation between the indicators is confirmed. The positive correlation indicates the higher modified tax rate is, the higher the consumption, or respectively the production of spirits is. An important role is played in consumption by GDP that includes household expenses. When this indicator is lower, the modified tax rate on spirits is higher. This shows that lower expenses of the household, for example for living, food and education, mean an increased consumption of spirits. At the same time,

the lower the final value of created goods in the given territory is, the higher the modified tax rate is, and higher production of spirits can be expected. Based on Ostertagová (2013), the absolute value of the correlation coefficient is less than 0.3, therefore, we can say that there is a weak association between consumption and the tax rate on spirits, and also between production and the tax rate on spirits. The results of the  $p$ -value are below the significance level of 5%. The statistical significance of the correlation coefficient is proved. In conclusion, based on these results we can reject protectionist behaviour by EU countries.

## 4 DISCUSSION AND CONCLUSIONS

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The received results of this research dealing with the relation between production, consumption, and the fundamental and modified rates of excise duty on spirits indicate a weak dependence, and in one case a mild linear dependence. The occurrence of mainly weak dependence can be influenced by fluctuations caused by the economic cycle or also by insufficient time series of used data. Dependency values are expressed by the correlation coefficients, which were statistically significant. The mild linear dependence and negative correlation coefficient were proved only in relation between the fundamental rate of excise duty and the consumption of spirits. This result does not confirm the statement of Trasberg (2015), whose work proves that the correlation between consumption and the tax rate is insignificant. Based on his opinion the level of taxation does not affect the consumption of alcohol. As part of our test, it is found out that an increase in excise duty on spirits causes a decrease in consumption. This is also confirmed in the study conducted by Chaloupka et al. (2002). According to him, higher excise duty on spirits among young people means significantly reduced consumption of spirits. In the case of testing the other relations between analysed indicators a positive correlation was confirmed. Within examining the dependence of the modified tax rate on the consumption of spirits, different results were received. It was shown that an increase in the modified excise duty will also increase the per capita consumption of spirits.

The aim of the research was to verify whether there is any relation between the variables. Based on the received results, we can claim that protectionist behaviour by EU member states has not been proved. On the other hand, there is evidence of dependence between variables with a fiscal objective. There is a need to get as much money as possible, ensuring stable government revenues. An educational function is also fulfilled, as the established tax rate discourages consumers from excessive consumption.

In spite of harmonised levels of excise duty on spirits, member states implement individual tax policies. As a result there are considerable differences between individual EU countries. One of the limitations of this work is the availability of individual data regarding the consumption and production of spirits. Data from some countries is not available for certain time periods. For further research related to this issue, it is also appropriate to take into account time lags resulting in changes in the rate of duty on spirits. Furthermore, to focus on specific associations before and after changing the tax rate. Focus on the specific research of relation before the change and after the change in the tax rate or make more detailed research only for a shorter period of time where all necessary data is published. Simultaneously, it can be assumed that there are other relevant indicators for the correlation analysis, such as revenues from spirits in individual EU countries or average wages of households.



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# THE ASSESSMENT OF SERVICE QUALITY LEVEL PROVIDED BY PUBLIC ADMINISTRATION IN POLAND

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## ABSTRACT

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The authors of this article have surveyed the quality level of service provided by Municipal Councils in the Silesian voivodeship. The analysis was conducted on the basis of research conducted by means of questionnaire based on the Servqual methodology. Twenty eight variables were included within the scope of the research. Municipal Councils placed in Silesia have the biggest problem with accessibility to services (problems with parking places, opening hours and facilities for handicapped) and attitude to clients (politeness and willingness to assist) which proves hypothesis H<sub>1</sub>. Whereas the attitude clients mainly requires a change in officials' mentality, which has been taking place in the last couple of years, problems with the accessibility is a serious issue as it cannot be solved without financial outlays.

## KEY WORDS

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quality services, level of services, Servqual, public administration

## JEL CODES

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D73, H55, H83

## 1 INTRODUCTION

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The main aim of public institutions is to serve the local society and provide services at the highest level (Tari, 2008). Meeting clients' needs and fulfilling their requirements is in this case very difficult because petitioners who come to the public services constitute a very complex group and thus may have

different expectations, and each of them assesses the level of provided services differently (Hohman, 2005).

The aims of the conducted investigations include measurement of the quality of services provided by public administration institutions in the south of Poland (in the Province of Silesia) using the identified hidden factors.

## 2 LITERATURE REVIEW

According to the definition in the EU (Art. 6 Act 1, VI Directive), providing services means each and every transaction which does not constitute selling goods. In the literature, the concept of a service is understood mostly as an expression of a man's economic activity which is characterised as not material but as an interaction between a service provider and a client.

Simply, service quality is nothing more than meeting a client's demand by entities running a service activity (Tsekouras et al., 2010). Precisely, the services can be defined as a level at which all the inherent properties (Dowty and Wallace, 2010) of a service fulfil a client's demand (Dagger et al., 2006; Yip et al., 2011; Janke, 2013; Hysa and Grabowska, 2014; Awan and Mahmood, 2013).

According to the definition it is the client who decides whether and to what extent the service fulfils his expectations and meets his needs. Therefore he is 'the judge' in the assessment of service quality but not only in the moment of purchase but also during its usage. In other words, the assessment conducted by a client is the final measurement of service quality. Obviously this does not mean that the procedures of service quality assessment are excluded (Egan, 2010; Martinez Garcia and Martinez Caro, 2010; Michna et al., 2015; Aurel and Bucur, 2016).

Consequently, the rise in quality level should be defined not only by client satisfaction but also by efficiency improvements and cost reductions in the organisation providing services (Tan and Rae, 2010; Crostack et al., 2011; Ferrari et al., 2010; Łuczak and Wolniak, 2013; Samkar and Alpu, 2013; Wolniak and Skotnicka-Zasadzień, 2017).

In the subject literature the Servqual method has been applied in different branches of services for a long time.

Municipal offices are institutions which provide services for all citizens; a resident of a given town cannot move to competitors, therefore in offices which are monopolists in this situation the level of provided services should be evaluated constantly and problems eliminated straight away. The disabled live in every society, constituting a large group of people.

Pursuant to the Law included in the Journal of Laws No. 123, item 176 as of 1997, with subsequent changes in 2002, concerning professional and social rehabilitation as well as employment of the disabled, the definition of a disabled person is as follows: "The disabled are people whose physical, psychological or intellectual condition permanently or periodically hinders, limits or makes it impossible for them to fulfil social roles, in particular limiting their ability to perform professional work".

Disabled people very often make use of services provided by public institutions, which include municipal offices. It is important that local government units are prepared to provide services to the disabled, both those coming to the office and those using e-administration (Kažemikaitienė and Bilevičiėnė, 2008). Handicapped people have different degrees of disability and therefore it is essential to ensure them a possibility of running errands in offices (Garbat, 2013). A municipal office that provides high-level services and fulfils its role should become the major goal for the management of each office (Ruso et al., 2013). The quality of services should be controlled and monitored on a regular basis; offices have to pay attention to and promptly eliminate any problems in communication between the client and the clerks (Kasprzyk, 2011). It is important that these organisations immediately react to problematic situations and remove their causes.

## 3 METHODOLOGY

The authors of this article have surveyed the quality level of service provided by the Municipal Councils in the Silesian voivodeship. The Silesian voivodeship is placed in the south of Poland, on the south Silesian borders with the Czech Republic and Slovakia.

Within 600 km from Katowice there are many European capitals: Warsaw, Prague, Bratislava, Vienna,

Budapest and Berlin. Silesia is in 14th place in terms of size and second in terms of population. 4 714 982 citizens live on this relatively small area of 12 331 km<sup>2</sup> (3.9% of Poland). There are four agglomerations in this area: Upper Silesia – of European importance and Bielska, Czechochowska and Rynicka – of domestic importance. The voivodeship is divided into 36

districts including 19 magistrates and 17 counties. The following cities have the biggest administrative, economic and cultural roles: Katowice, Sosnowiec, Bytom, Gliwice, Zabrze, Tychy and Chorzow. There are universities, cultural institutions and most of the companies. Rybnik, Bielsko-Biala and Czestochowa are the capitals of the rest of the sub-regions. The region is unique thanks to the Upper Silesia Agglomeration aggregating towns which are almost connected and create a 70-kilometre-strip – from Dabrowa Gornicza up to Gliwice. The agglomeration covers 18% of the voivodeship area (1200 km<sup>2</sup>) and is inhabited by 60% of the inhabitants of this region.

It is quite obvious that it is communications that is one of the biggest challenges in agglomeration of this type. Silesia has a privileged position in terms of transport infrastructure, not only due to a well-developed transport system which covers 20% of all domestic railways. Silesia is situated on the intersection of two communication routes (corridor III: Berlin – Wroclaw – Katowice – Krakow – Lwow and corridor IV: Gdansk – Katowice – Zylina). The research was conducted in 19 random Silesian cities: Bielsko-Biala, Chorzow Cieszyn, Czerwionka-Leszczyny, Dabrowa Gornicza, Gliwice, Katowice, Knurów, Mikołow, Myslowice, Olkusz, Oswiecim, Pszczyna, Ruda Slaska, Sosnowiec, Tychy, Wojkowice, Zawiercie and Zory.

The research was conducted in 2016 with 1250 people using Municipal Council services in the Silesian voivodeship. We use the random sampling methods. From all the municipal offices in the Silesia province we have chosen 19 random cities. In each municipal office we use random sampling – asking every person leaving the office on the particular day to fill in the questionnaire. We did that up to the moment we had 50 questionnaires from a particular municipal office.

The following analysis was conducted on the basis of research conducted by means of a questionnaire based on the Servqual methodology. The following, twenty eight variables were included within the scope of the research (the variables were generated by talking to people working in municipal offices and scientific specialists in the field using the Delphic method):

- Z1 – The Municipal Council should have modern equipment (computer, office equipment),
- Z2 – The Municipal Council should be placed conveniently (easy access),

- Z3 – The Municipal Council should have a big parking area,
- Z4 – The Municipal Council should have facilities for the handicapped,
- Z5 – The officials should be neat and trim,
- Z6 – The Municipal Council should have attention drawing brochures,
- Z7 – The Municipal Council should have a good website,
- Z8 – The Municipal Council should be renovated,
- Z9 – The officials provide services in strictly defined time periods,
- Z10 – The Municipal Council should be open in the afternoon and at the weekends,
- Z11 – The Municipal Council settles matters in an appropriate way the first time,
- Z12 – The Municipal Council tries to settle clients' matters in an appropriate manner and relatively fast,
- Z13 – In the Municipal Council, all measures are taken to resolve the matter ,
- Z14 – The Municipal Council's employees serve the clients urgently and are willing to provide them all the necessary information,
- Z15 – The Municipal Council employees are always willing to help clients,
- Z16 – Municipal Council employees should quickly respond to e-mails,
- Z17 – The Municipal Council keeps clients informed about realisation of their issues,
- Z18 – The Municipal Council's websites should be updated systematically,
- Z19 – The Municipal Council employees should be qualified,
- Z20 – Municipal Council employees should be trustworthy,
- Z21 – The Municipal Council should look after security of clients' personal details,
- Z22 – The Municipal Council should always be polite and kind to clients,
- Z23 – Officials should help the client if he does not know which Department he should go to,
- Z24 – The Municipal Council should treat each and every client individually,
- Z25 – Officials should serve to the last client even if the Council work time is about to finish,
- Z26 – The Municipal Council should put the client's interest first ,
- Z27 – Officials should understand the specific needs of its clients,

- Z28 – Officials should always be understanding and patient with clients.

The literature quotes different Servqual scales, which have been described in the previous chapter. The list of 28 variables prepared for the needs of this research has been based on the previously discussed classical Servqual method – adequate questions have been assigned to each area. The questions have been prepared on the basis of a Delphi Panel participated in by a group of experts. It included employees of public administration institutions in Poland, customers using the services provided by these institutions as well as people from university circles dealing with the Servqual method. In the process of brainstorming, the experts developed a list of several questions which were next limited (on the basis of the Delphi technique results) to the list of 28 variables included in the investigations.

Within the scope of this research, these variables were divided into five basic dimensions used in the Servqual methodology:

- W1 – tangibles – variables Z1–Z8,
- W2 – reliability – variables Z9–Z13,
- W3 – responsiveness – variables Z14–Z17,
- W4 – assurance – variables Z18–Z21,
- W5 – empathy – variables Z22–Z28.

The research is said to check to what extent the division of variables into five dimensions used in the Servqual method suits to the analysis of the issue of quality service in public administration. It is important to take into account that at the beginning

the Servqual method was used to analyse quality in financial services. Then, it was utilised in other branches (which have been described in the earlier part of the publication) without changing the areas already used in financial services.

In order to divide variables of service quality assessment into dimensions, the extrapolation analysis of factors was used for the differences between a client's perception of quality and expected quality. The classical method of factor analysis of principal components was used. In this case, factor analysis was used to define the structure of the data set and to point out the minimal number of dimensions by means of which a considerable part of variations of variables (Gantar and Walesiak, 2004). The factors being looked for are hidden but have importance in an analytical description of a problem. These factors represent the biggest subset of original variables (Aczel, 2000). To define a number of factors, Kaiser's criterion was used, which recommends to leave in analysis those factors with values bigger than one.

In order to gain a simple structure of a matrix of factors with loadings which presents correlations between variables and isolated principal components, they were subjected to an orthogonal rotation by means of varimax methods. Varimax rotation is especially useful when looking for factors with the highest loadings because it attributes each factor to a couple of variables with the highest loadings and the rest to variables with low loadings. As a result, the factors with variables with the highest values of loadings are marked (Aczel, 2000).

## 4 RESULTS

Firstly, to find factors influencing service quality we conducted confirmation factor analysis. As a consequence of having used the extrapolation analysis of factors of 28 attributes of service quality in public administration, they can be divided into five factors (Table 1). All together, these factors explain 58% of the variability. In order to use the prepared model of factors to measure service quality in the studied councils, it should be checked whether a reliable definition of dimensions and assigning variables was done in the case of each found factor. It can be done by means of alfa-Cronbach's coefficients which are the minimum limit of reliability estimator scale for single dimension scales. This factor can take on values

from 0 to 1, yet its value is recommended to be bigger than 0.7. In the case of the factors of alfa-Cronbach's coefficients values being described in the research, they fall within the range 0.7–1 and thus, they can be perceived as reliable.

As a consequence of the research the following factors were identified:

- Factor 1 – attitude to client (20% of explained variability)
- Factor 2 – reaction (17% of explained variability)
- Factor 3 – physical appearance (9% of explained variability)
- Factor 4 – accessibility (6% of explained variability)

- Factor 5 – material aspect (6% of explained variability).

The factors defined in the research were used to assess the level of perceived service quality in Municipal Councils. Table 1 presents a juxtaposing of separate dimensions and service quality in the nineteen studied towns. All the results are negative, as it is a result of a specification of the Servqual method which assesses the difference between expected quality and perceived quality. The expected quality is always higher and thus, the result is negative. In this research, the following interpretations of parameters were established:

- above 0 – very good,
- above –1 – good,
- $\langle -1, -1.5 \rangle$  – mediocre,
- $\langle -1.5, -2 \rangle$  – bad,
- $\langle 2, -7 \rangle$  – very bad.

## 5 DISCUSSION

The results, on the basis of analysed data, that defined hidden factors differ in comparison with the Servqual dimensions. The results indicate that public services are characterised by a specific division into factors, which is different from other types of service. As in the results of other researchers using the Servqual methodology in other industries we can also invent a special set of factors not exactly corresponding to ordinal Servqual dimensions. This confirms the results obtained by others researchers.

On the basis of the study three hidden factors correspond to Servqual's dimension – tangibility (along with some variables from other dimensions). This dimension seems to be excessively aggregated in the case of the classic Servqual method yet it turns out that it covers different problems in an essential way. The above-mentioned dimension can be divided into three independent factors: physical appearance, accessibility and material conditions. All the variables together comprising the above-mentioned factors cover all variables within the scope of tangibility (and two other variables of other dimensions – website image and opening hours). However there is a completely different situation in the case of other Servqual dimensions. In this case, the level of aggregation is too low. In the classic Servqual, the assurance and empathy dimensions are separately distinguished while after having con-

ducted the research in Municipal Councils, it seems that Ruda Slaska is the best graded (all areas were assessed well apart from tangibility) and Bielsko-Biala, where a lot of material aspects can be observed. The factor for this council was –0.16. The analysis result confirms the research conducted in four Silesian towns on a sample from two years earlier by the author of this publication. In the case of that research, it was Ruda Slaska that scored the best (Wolniak and Skotnicka-Zasadzień 2009).

The overall result analysis seems to be most valuable as it shows the most typical drawbacks in Municipal Councils in Silesia (Table 2). The area of accessibility was assessed as worst. It comprises of two badly assessed variables – parking places (–2.16) and opening hours (–2.02). Also, the accessibility of facilities to the handicapped was valued poorly (–1.93).

ducted the research in Municipal Councils, it seems that these dimensions should be joined into one dimension – the attitude to the client. This dimension covers all the problems included in responsiveness and empathy without variable Z18 – website image, which as has been already mentioned, should be included in the factor – physical appearance.

A very similar situation appears in the case of reliability and responsiveness. The client in fact perceives it as one factor – responsiveness, which means that an official's reaction should not only occur but it should be conducted at the appropriate level, in other words, it should be realisable. The reaction factor covers all the variables included in the reliability and responsiveness dimension in a classical Servqual analysis, apart from the two variables Z10 – opening hours which should be included into the area of accessibility and Z 16 – replying to e-mails, which was included into the area of attitude to the client.

The research result is a consequence of the fact that Municipal Councils are mostly located in the city centres and it is very difficult to create a sufficient number of new parking places. This is a very serious problem of the development of contemporary towns. More and more people come to settle matters with their own cars whereas the number of parking places has not increased for the last 20 or 30 years. Due



Tab. 1: Assessment of factors of service quality in the studied towns

Municipal Council	Attitude to client	Reaction	Physical appearance	Accessibility	Material aspect	Average
Bielsko-Biala	-1.13	-0.44	-1.17	-1.35	-0.16	-0.85
Chorzow	-3.36	-3.19	-2.07	-3.31	-1.14	-2.61
Cieszyn	-2.07	-1.64	-1.68	-2.24	-2.76	-2.08
Czerwionka-Leszczyńy	-0.29	-1.29	-1.13	-3.35	-1.49	-1.51
Dąbrowa Gornicza	-1.94	-1.16	-1.04	-1.73	-1.02	-1.38
Gliwice	-1.49	-1.22	-0.91	-2.30	-0.94	-1.37
Katowice	-2.26	-1.88	-1.51	-2.49	-1.25	-1.88
Knurow	-1.55	-1.23	-1.05	-1.65	-0.68	-1.23
Mikolow	-2.60	-2.05	-1.64	-2.89	-1.11	-2.06
Myslowice	-2.01	-1.62	-1.71	-1.79	-1.04	-1.63
Olkusz	-1.52	-0.53	-0.59	-3.03	-0.73	-1.28
Oswiecim	-1.03	-1.13	-1.09	-2.12	-1.00	-1.27
Pszczyna	-1.41	-1.31	-1.22	-1.85	-1.33	-1.42
Ruda Slaska	-0.60	-0.63	-0.67	-0.96	-1.35	-0.84
Sosnowiec	-1.96	-1.67	-1.88	-1.77	-1.89	-1.83
Tychy	-1.63	-0.82	-1.10	-1.38	-1.18	-1.22
Wojkowice	-2.43	-2.27	-2.34	-2.31	-2.43	-2.36
Zawiercie	-1.36	-1.35	-1.92	-2.50	-1.84	-1.79
Zory	-1.85	-1.57	-1.41	-2.07	-1.08	-1.60
Average	-1.64	-1.35	-1.31	-2.04	-1.29	-1.53

to the cramped building development and high cost of land in the centres, they cannot be extended unless building multilevel or underground garages is considered. Unfortunately, such a solution seems to be far too expensive for most of the studied towns. When it comes to opening hours, councils are usually open until 15:00 or 17:00 and clients would expect them to be open longer in the week as well as being open at the weekend. Solving this problem seems also to be difficult without an increase in operating costs because shift work would have to be introduced. Perhaps, the development of e-administration, which can be used twenty-four hours, can eliminate this problem.

The area of the attitude to the client (grade -1.64) in Silesian Councils performed a bit better, but still poorly. In this case, clients complain that officials do not answer their mails quickly, they are not patient and understanding, they do not treat the client individually and mostly that they lack empathy and kindness. What is interesting is the fact that officials' competence and their reaction was assessed better. Thus, it can be assumed that clients assess officials as relatively competent and prepared

for their work professionally but that they are not always willing to assist.

This situation is a consequence of an old paradigm of public administration where a client was treated as a petitioner and his needs were not treated as a priority. However, it is important to underline that this situation is changing for the better because the result of presented research was better than the results of research conducted in four towns of the same voivodeship two years earlier (Wolniak and Skotnicka-Zasadzień, 2009). What is best assessed is the variables concerning material aspects of service and physical appearance. The variable concerning the exterior appearance of the building in the town scored best (-0.82).

The paper has some limitations. The research has been conducted on broad sample but only in the Silesia province in Poland. We cannot be sure that if we had conducted the research on a sample of municipal offices from others provinces of Poland or in other countries the results would be the same. Also confirmation factor analysis has identified factors in researched offices but we cannot be sure if the results would be the same in other offices. Future research should try to broaden the range of the research. It

could cover what factors influence quality of service in other countries. For example we think research into the problem in all the Visegrad Group countries could be an interesting direction for further research. Also it could be interesting to add to the questionnaire a question about the person who filled it in (age, financial status, place of residence, etc.). On this basis we could conduct a deeper statistical analysis of the problem. The results are only a static view

of the problem. It could be interesting to know how the problem changes over time. To do this it would be necessary to research the problem yearly for some years and on this basis have a dynamic view of the results and analyse trends. Also another limitation is that not everyone agreed to fill in the questionnaire. The missing data could add some information to the results.

## 6 CONCLUSION

Municipal Councils, which are placed in Silesia, have the biggest problem with accessibility to services (problems with parking places, opening hours and facilities for handicapped) and attitudes to clients (politeness and willingness to assist). Whereas the attitude to the client mainly requires a change in officials' mentality which has been taking place in the last couple of years, the problems with accessibility are a serious issue as they cannot be solved without financial outlays.

On the basis of our research we can formulate some recommendations for public organisations such as:

- to have longer opening hours of the municipal council (maybe also at weekends),
- to build and maintain more parking spaces,
- improve (for example via training) the attitude of employees to clients.

If municipal offices were to implement these actions the quality of the public service in the municipal office would rise. Also the results are of potential interest for other regions in Poland and similar countries, because the problems with the functioning of the public offices and customer service are similar.

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