Scientific Papers 21 (3/2011)

of the University
of Pardubice
Faculty of Economics
and Administration

Special Edition
Series D

SCIENTIFIC PAPERS OF THE UNIVERSITY OF PARDUBICE

Series D

Faculty of Economics and Administration

Special Edition

No. 21 (3/2011)

Vol. XVI

Registration MK ČR E 19548

ISSN 1211-555X (Print)

ISSN 1804-8048 (Online)

Contribution in the journal have been reviewed and approved by the editorial board. Contributions are not edited.

20th

The 20th Anniversary of the Faculty of Economics and Administration

Scientific Papers of the University of Pardubice, Series D, Faculty of Economics and Administration

Special Edition

ABOUT JOURNAL

Scientific Papers of the University of Pardubice, Series D journal aims to be an open platform for publication of innovative results of theoretical, applied and empirical research across a broad range of disciplines such as economics, management, finance, social sciences, law, computer sciences and system engineering with the intention of publishing research results, primarily academics and students of doctoral study programmes in the Czech Republic and abroad.

The journal is published every year since 1996 and papers are submitted to review. The paper is included in the List of reviewed non-impacted periodicals published in the Czech Republic, it is also monitored by EBSCO Publishing and ProQuest and it is published 3x per year.

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EDITORIAL

Dear reader,

This commemorative volume of the journal has been published on the occasion of the 20th anniversary of the Faculty of Administration and Economics, University of Pardubice. The preceding twenty years have encapsulated extensive experience, effort and productivity in the Faculty's development, and the anniversary is an opportunity to recall and contemplate the milestones that have irrevocably affected its image.

In 1991, the Faculty of Territorial Administration was established when, according to the Statutes of the University of Chemical Technology, two new faculties were to be founded within the University of Pardubice – the Faculty of Chemical Technology and the Faculty of Territorial Administration.

Lectures started in the fall of 1991 when 53 students enrolled. The Faculty was renamed the Faculty of Economics and Administration in 1993, and postgraduate study programmes were introduced with a single specialisation in the area of economics and administration. The first 67 students graduated in 1997. The institution grew in the proceeding years, both in terms of the number of students participating in the Faculty, and especially in terms of the wider range of new study programmes which were made available to them.

In the twenty years of its existence, 6678 students have graduated from undergraduate and postgraduate programmes.

It is important to thank the University management, the City representatives, and the Pardubice Region (formerly East Bohemia Region) for their understanding and cooperation, as all have contributed to the improvement in conditions for education at the Faculty of Economics and Administration. I certainly appreciate the efforts of all those who have worked at the Faculty over the past 20 years. It is not possible to name them all, but none are forgotten. Their work, loyalty to, and cooperation with, the Faculty are the pre-determining factor in its further development and prospects.

Research and development at the Faculty has recently been significantly connected with study programmes, such as Economic policy and administration, System engineering and informatics and the most recent programme of Economics and management, at all study levels, including doctoral studies. The Faculty members have produced numerous interesting analyses, specialized papers and monographs. Our objective is to extend scientific knowledge, and to convey the findings of said studies to the general and expert public, and to students. I hope that you will find interesting topics to read about in this volume and will choose to return to the Scientific Papers of the University of Pardubice, Series D, Faculty of Economics and Administration, in the future.

Assoc. prof. Renáta Myšková, Ph.D.
Dean of the Faculty of Economics and Administration University of Pardubice

MOTIVATION FOR BUYING BRANDED ITEMS: A CROSS COUNTRY APPLICATION OF MASLOWS HIERARCHY OF NEEDS IN CONSUMER DECISION MAKING

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Abstract: *The brand is a pledge to buyers about the quality and prestige of a product or service. The main objective of this study is to analyse the importance of branding in the decision making of buyers and to examine the motives that drive consumer decisions when buying branded items. The conceptual framework of this study groups the hierarchy of needs according to Maslow into two main motives. The motives are risk reduction and social demonstrance. In this study, the non-probability sampling method was used to select respondents from four different countries namely, the Czech Republic, China, Ghana and Sri Lanka and a semi-structured questionnaire was administered. A total of 979 valid responses from the respective countries were used in the analysis. Findings from the study are that, among the selected countries, brands play an important role in consumer buying behaviour and risk reduction, social demonstrance are motives that drive consumer purchases.*

Keywords: *Risk Reduction, Social Demonstrance, Brand, Branding, Motivation, Maslow'sHhierarchy of Need.*

JEL Classification: *M31, M31*

Introduction

Brand represents a consistent and holistic pledge of quality made by a company to its customers. Brands are built from nothing less than the sum of a customer's experiences with a product or service of a company. By opting for particular brands, a consumer demonstrates that he or she embraces particular values; hence, the brand becomes a tool of identity formation. For consumers to shelve out their money to acquire a brand, it is important for the brand to provide a compelling experience that contributes to the self actualization of the consumer. Consumers buy brands because they expect it to provide them with some satisfaction. The total of this satisfaction is known as consumer experience. Consumer experience is an interaction between an organization and a customer as perceived through a customer's conscious and subconscious mind. It is a blend of an organization's physical performance, the senses stimulated and emotions evoked, each intuitively measured against customer expectations across all moments of contact [17].

The essence of branding is to guarantee quality and influence the perception and expectation of consumers in a favourable way. However, when the brand does not provide pleasant experiences (non-performance of brands) for consumers, the effect on the brand image may be detrimental. It is generally believed that consumers buy

product of well known brands to reduce the risk of aggravation after use. In many instances, people buy brands to portray their social status at any given time or to feel accepted in a social group and have a sense of belonging. The study of the factors that motivate consumers to buy branded products are important because, such knowledge enable firms to formulate branding strategies to meet the needs of consumers and provide them with a compelling experience whenever they buy or come into contact with the product.

Motivation is essential in consumer behaviour studies. Maslow [12] explains that, people generally want to feel safe, loved and accepted by others. According to Maslow's theory of needs, safety and security as well as a sense of belongingness is essential in a person's life. Also Maslow indicates that self esteem is essential to consumers. When people buy branded items, they want to boost their self esteem especially if the brand is aligned to a famous celebrity or is associated with the elite in society. People often chose to buy brands which they perceive to meet their expectations (safety and self esteem) or avoid them.

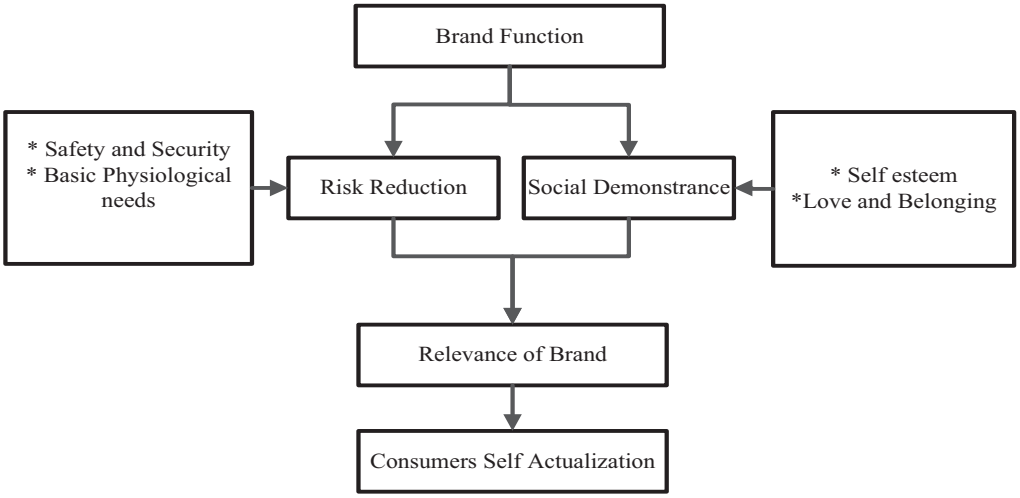
The main objective of this study is analyse the importance of branding in the decision making of buyers and to examine the motives that drive consumer decision making when buying branded items.

1 Conceptual framework

The motivation theory by Maslow [12] has been used in a number of studies. In marketing and consumer research, the theory has helped in understanding consumers' motives and actions. Marketers have historically focused on consumers' needs to define their actions in different markets. If producers design products or brands in such a way that it meets consumer needs and provide them with an inherent compelling experience, consumers will more often choose those products over that of competitors. Whichever product better fills the void created by the need will be chosen more frequently, thereby increasing sales for the company.

The conceptual framework of this study groups the hierarchy of needs according to Maslow into two main motives. This includes risk reduction, which has the concepts of safety and sense of comfort. The basic physiological needs also fall under the risk reduction motive and it is indicated in this study as the sense of survival and contentment from product usage. The other motive is social demonstrance which includes concepts such as self esteem, love and belonging. The framework links the relevance of brands, risk reduction motive and social demonstrance motive in consumer decision making. These factors together contribute to the self actualization of consumers. After becoming self actualized, a consumer tends to be satisfied with a product and service due to the inherent experience it provides, hence, the probability of repurchasing is higher. When a consumer becomes self actualized as a result of a positive experience of brand usage, there is a likelihood of repurchasing the product and the tendency of the consumer to become loyal to the specific brand is higher. The conceptual framework that guides this study is depicted in figure 1:

Fig. 1: The interrelationship between brand functions and consumer self actualization



Source of data: author

2 Theoretical background and hypothesis

The following section provides discussions of the theoretical background that contributes to the formulation of the hypothesis for the study. It includes a review of literature on the importance of brands in consumer purchases as well as the risk reduction and social demonstrance motive for buying brands.

2.1 Importance of brands in consumer purchase

Brands play a role in terms of communication and identification of products of companies. They offer guidance, convey an expectation of quality and so offer help and support to those making purchasing decisions. Brands make it relatively easier for consumers to understand and assimilate information about products. Brands are important especially when consumers are choosing from products from the same category. Product category refers to the specific generic to which a product or service belongs; for example, while Pepsi is a brand name, the product category to which it belongs is soft drinks. Some researchers have shown that when consumers have feelings that brands are important for their buying decision, they do so because of the expectation from the brand to provide (intangible) benefits [8], [13]. We assume that brand are important in consumer decision making, hence, we formulate the following hypothesis:

Hypothesis 1: In the selected countries, brands are important in consumer decision making when buying products and it varies significantly among respondents in the various countries.

2.2 Branding and risk reduction motive

When consumers are buying products of (very) complex and capital intensive in nature, the brand is a determining factor because it enables them to reduce risk

involved in the buying process and increase information efficiency. Therefore the perceived risk in purchasing the product is reduced and this helps in building a trust-based relationship. In a survey by McKinsey in more than 750 deciders in 18 representative German business markets, risk reduction was the most important brand function (45%), closely followed by information efficiency (41%). Image benefits close the group with a minor 14% [10].

Furthermore, brands identify the source or maker of a product. According to Zhang and Sood [18], consumers recognize a brand and activate their knowledge about it. Based on what consumers know about the brand in terms of its overall quality and specific characteristics, consumers are able to make expectations that are reasonable about the practical and other benefits of the brand. Therefore, brands contribute to minimizing the consumer's (subjective) risk of making a purchase mistake [8], [9]. When new products are introduced in the market, the brand name may provide the means to reduce the risk associated with the evaluation of quality and performance. The brand also helps in reducing the costs of information gathering that arise from assessing other alternatives from a larger range of products, especially when the products are in the same category [5]. Brands also present to consumers in advance, an important signal of quality that reduces the perceived risk [4].

From a marketing perspective, products can be classified into three categories, search, experience, and credibility of goods. These categories are reflections on the consumer's ability to assess product quality prior to actual product trial and usage [3], [14]. Because consumers have difficulty in assessing product attributes and quality with experience and credibility of goods, it is hard to determine their quality and thus consumers may perceive high risks in product decisions. An important way in which consumers deal with the perceived uncertainty and risk is that, they buy products of well-known brands, especially those with which consumers have had favourable past experiences [1], [9], [13]. Moreover, brands create trust as they ensure that the performances expected by consumers of the product are realized. The brand further provides as well as guarantees the continuity in the predictability of the benefit of the products. This is because they raise mean perceptions about quality and lower their variance. It follows that brands perform a risk reduction function and we expect risk reduction to be an important determinant of consumer decision making, hence the hypothesis.

Hypothesis 2: In the selected countries, risk reduction motive is important in consumer decision making when buying branded items and it varies significantly among respondents in the various countries.

2.3 Branding and social demonstrance motive

Brands are symbolic tools that enable consumers to express their self-image to their peers [11]. With regards to the symbolic expression, the brand can represent intrinsic values (self-expression) or extrinsic values (prestige) of consumers. However, this depends on whether the consumer is communicating with themselves or with others in the social surroundings [11]. The theories of self-congruity [16] and self-enhancement [15] provide explanations on why and how consumers endeavour to achieve these

symbolic benefits of brands. Consumers on a daily basis try to preserve and enhance their self-concept, and they do this by purchasing certain products [15]. In order to serve as a social symbol that contributes to achieving self-congruity, brands must allow for a personalization of the product. Bradford (2008) explains that, in markets where the customer invests his or her ego in the purchase of a particular brand, the social implications of the brand is priceless.

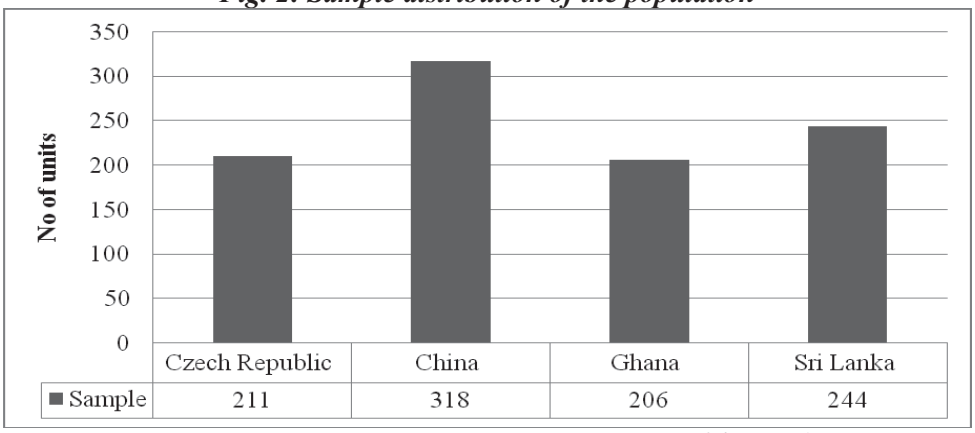
The self of the consumer does not develop in a solitude manner, but rather it evolves within a complex process of social interaction [7]. Individuals mostly take advantage of brands to communicate to other people the type of person he or she is or would like to be [2], [6]. Specifically, consumers use brands as a status symbol or as a means to indicate that they belong to a group in order to raise their self esteem and boost their sense of belonginess. One prerequisite for the use of brands as status symbol is the visibility it has with other brands in the same product category. Based on the issues discussed above, the following hypothesis is formulated

Hypothesis 3: In the selected countries, social demonstrance motive is important in consumer decision making when buying branded items and it varies significantly among respondents in the various countries.

3 Methodology

This study uses the non-probability sampling method. This sampling method enables the researchers to reach the respondents quickly, considering the size of the population. The population was made up of citizens of the respective countries. A semi-structured questionnaire was administered to all the respondents. The questionnaire which was originally in English was translated into Czech and Chinese language for the respondents in Czech Republic and China respectively and this was to ensure that the respondents understood the questions posed to them. However, the questionnaire for Sri Lanka and Ghana were in English. The questionnaires were returned and checked by the researchers to ensure that they were valid and useable and a total of 979 respondents drawn from the respective countries were used in the analysis. The 17 version of the Statistical Package for Social Scientist (SPSS) was used in the analysis and interpretation of data. The sample distribution from the respective countries is shown in figure 2:

Fig. 2: Sample distribution of the population



Source of data: authors' questionnaire

The questionnaire was broadly classified into three main groupings. Each groups had four questions. The groupings and the questions are indicated below. Using a five-point Likert scale with strongly disagree (1) disagree (2), neutral or undecided (3), agree (4) and strongly agree (5) the sample responded to the following questions. The aggregate of the questions in each group were used in the hypothesis testing. The questions are as follows.

The relevance of brand in purchasing a product
When I purchase a product, the brand plays - compared to other things - an important role
When purchasing, I focus mainly on the brand.
To me, it is important to purchase a brand name product.
The brand plays a significant role as to how satisfied I am with the product.
Risk reduction function of branding
I purchase mainly brand name products because that reduces the risk of aggravation later.
I purchase brand name products because I know that I get good quality
I choose brand name products to avoid disappointments.
I purchase brand name products because I know that the performance promised is worth its money.
Social demonstrance function of branding
To me, the brand is indeed important because I believe that other people judge me on the basis of it.
I purchase particular brands because I know that other people notice them.
I purchase particular brands because I have much in common with other buyers of that brand.
I pay attention to the brand because its buyers are just like me.

4 Data analysis and results

This section provides the results of the data analysis. The sections provide discussions of the findings in relation to the hypothesis of the study.

4.1 Important of branding to consumer purchases

Table 1 provides the distribution of the respondents sampled for the study according to the countries. It shows the frequency distribution with regards to the importance of brands in consumer purchasing decision.

Tab. 1: Frequency distribution of the importance of brand

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Czech	211	3.81	.86	.06	3.70	3.93
China	318	3.29	1.02	.06	3.17	3.40
Ghana	206	3.81	.77	.05	3.70	3.92
Sri Lanka	244	3.51	.78	.05	3.41	3.61
Total	979	3.57	.91	.03	3.51	3.62

Source of data: authors' questionnaire

Table 2 provides the results of hypothesis two (H1). The hypothesis sought to find whether there is a significant variation among respondents on whether brands are important in consumer decision making when buying products.

Tab. 2: ANOVA of the importance of brand in consumer purchases

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	50.50	3	16.83	21.76	.000
Within Groups	754.35	975	.77		
Total	804.85	978			

Source of data: authors' questionnaire

The findings from the analysis indicates that, the brand is indeed important in consumer decision making when buying products and it varies significantly among respondents in the various countries. From this, it is seen that the null hypothesis is rejected. This is because the significance level of the study, thus, 0.000 is less than the p-value of 0.05. This finding confirms the assertion by Sterne (2002) that, it is incumbent on firms to build brands that are appealing and form a desire that is strong enough to compel consumers to shell out their hard-earned money to acquire them.

4.2 Risk reduction

Table 3 provides the frequency distribution of the respondents from the selected countries with regards to the risk reduction motive of buying.

Tab. 3: Frequency distribution of risk reduction motive

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Czech	211	3.6943	.73649	.05070	3.5944	3.7943
China	318	3.5967	.78461	.04400	3.5101	3.6833
Ghana	206	3.7870	.73101	.05093	3.6866	3.8874
Sri Lanka	244	3.7398	.59740	.03824	3.6644	3.8151
Total	979	3.6934	.72258	.02309	3.6481	3.7388

Source of data: authors' questionnaire

The second hypothesis (H2) was to find if there is indeed a significant difference among respondents in the selected countries with regards to risk reduction. In order words, it was meant to find whether risk reduction motive is a contributory factor in the purchasing decisions of consumers. The results are indicated in table 4 below:

Tab. 4: ANOVA of the risk reduction function for buying brands

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	5.30	3	1.77	3.41	.017
Within Groups	505.33	975	.52		
Total	510.63	978			

Source of data: authors' questionnaire

From the analysis, the significance level calculated was 0.017 which is less than the p-value of 0.05. Hence the null hypothesis is rejected in support of the alternative hypothesis (H2) indicated above. The findings indicates that, in the four countries selected, risk reduction motive is important in consumer decision making when buying branded items and it varies significantly among respondents in the various countries.

The reduction of risk is an important factor when people are buying products of different brands. From this study, it was found that there is a positive relationship between the risk reduction motives for buying brands among respondents from all the four countries. Buyers want to spend their money on products that will last for a long time and provide them with the necessary gratification. The tendency of buyer's remorse is reduced drastically when they buy products from reputable brands. This is because the brand provides them with an assurance, as it indicates the source of the product and guarantees quality.

The findings of the risk reduction motive of the respondents go to explain that, risk aversion is of importance to consumers irrespective of country of origin. This confirms Maslow's findings that consumers to a large extent will want to feel safe and secure at all times. The findings from this study also confirms the views of Aaker [1]; Mitchell and McGoldrick [13], that brands provide an avenue for consumers to determine product quality and credence to goods and services. Also, Kapferer [8] indicates that, consumers buy brands to reduce their (subjective) risk of making a purchase mistake. This is largely true because of the varied amount of products and services that consumers are constantly exposed to on a daily basis. The consumer is faced with the dilemma of choosing quality products from the same product category. Hence, the brand provides a convenient escape and reduces the probability of making a purchase mistake.

4.3 Social demonstrance

Table 5 provides the frequency distribution of the respondents from the selected countries with regards to the social demonstrance motive of buying branded items.

Tab. 5: Frequency distribution of social demonstrance function

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Czech	211	3.03	.88	.06	2.91	3.15
China	318	2.60	.87	.05	2.50	2.70
Ghana	206	2.79	.84	.06	2.68	2.91
Sri Lanka	244	2.92	.77	.05	2.82	3.02
Total	979	2.81	.86	.03	2.76	2.87

Source of data: authors' questionnaire

The third hypothesis (H3) was tested to find whether there is a significant difference with regards to the social demonstrance motive for buying brands among respondents in the selected countries. The results are indicated in table 6 below.

Tab. 6: ANOVA of the social demonstrance function for buying brands

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	27.21	3	9.07	12.81	.000
Within Groups	690.48	975	.71		
Total	717.70	978			

Source of data: authors' questionnaire

With regards to the social demonstrance function of branding, it was seen among the respondents in the selected countries that, social demonstrance motive is important in consumer decision making when buying branded items and it varies significantly among respondents in the various countries. The result of the hypothesis testing indicated a significance level of 0.000. Therefore the null hypothesis is rejected for the alternative hypothesis because the significance level recorded is less than the p-value of 0.05.

Consumers are constantly seeking for products that will contribute to the enhancement of their self-concept [15] and self-congruity [16] and these are a major determinant factor in the buying decisions irrespective of the country or culture. This finding also confirms the results of the study by Belk [2]; Escalas and Bettman [6] which revealed that consumers use the brand to communicate to others the kind of people they are so as to increase their status and reputation in the society.

5 Practical implications

This is study is significant in branding decision making processes of consumer products. The finding from this study implies that, it is important for managers to understanding the role brands place in consumer decision making process. Such information equips managers with firsthand information on how to strategize to meet customer motives and expectations. Managers with branding responsibilities must understand that, risk reduction and social esteem are essential in consumer markets. Hence, branding strategies must be designed to meet these motives. To do this, there should be constant evaluations and research into what drive consumers on regular basis and also to find whether the needs and expectation of consumers are been met.

Consumer motivations vary and it is important to strategize so that the brand meets the expectations of consumers. When this is done, the brands receive positive evaluations in the market and hence, gains competitive advantage. The strategies of marketing oriented firms, especially those selling fast moving consumer goods must align their branding strategies so as to highlight the risk reduction and social demonstrance values or characteristics of the products they sell.

In this study, in spite of the fact that the respondents are of different cultural orientations, they had similar opinions with regards to their social motives for buying branded items. Consequently, the individualistic or collectivist cultures of the respective countries did not have an influence on whether respondents use brands to portray their social status. Managers of brands must be aware that consumers are usually interested in the symbolic definition of the brand and most importantly how it contributes to their self-identity. Regular shoppers invest their ego in purchasing brands and they expect the brand to satisfy their social esteem need. Consumers usually want to be identified and integrated into a group and that is more important. The groupings are not necessarily formed from the cultural orientation of respondents; rather, they may be formed based on attributes such as financial status, profession and social clubs. Therefore, it is essential for brand managers to align their strategies to meet the social motive that arise from a person's belongingness to specific social groupings.

The findings of the risk reduction motive of the respondents go to explain that, risk aversion is of importance to consumers irrespective of age, gender or level of income. Consumers to a large extend will want to avoid the consequences that come with unpleasant feelings of buying an unknown brand. Marketers must therefore focus on placing their brand as a secured option among others in the same product category. Such a strategy ensures that the brand stays competitive as consumers will be more comfortable buying it. Therefore, it is incumbent on managers of firms to aim at placing their brand as a secured option among others in the same product category at every point of contact with consumers.

The study by Geert Hofstede shows that, Ghana, China and Sri Lanka are highly collectivist countries. Hence, it was expected that social demonstrance will be replaced with characteristics of collectivist societies like group integration and social acceptance, unlike the Czech Republic which is largely individualistic. But that was not so, because the result from these collectivist cultures indicated a motive for social demonstrance when consumers are buying branded items. Therefore, firms must be proactive and have up-to-date knowledge of the dynamics and peculiarity of cultural orientation of customers in different countries. Furthermore, in order for firms to stay competitive in the global market place, branding strategies should take into account the present cultural traits exhibited by consumers, because they may influence purchasing habits.

Conclusion

In conclusion, brand plays an important role when consumers are making purchasing decisions. The gratification of buying quality products motivates and

drives buying behaviour. The findings from this paper indicates that, when buyers have an option to chose, they go for products of brands that are affordable, less risky and a source of self esteem enhancement. The self actualization of a consumer is important and the benefit of buying and using a product is to guarantee self fulfilment. This is achieved when the product or service provides a compelling experience to the consumer. Such an experience contributes to brand loyalty and repeated purchases. Also, the competitiveness of products in a market depends on the building of brands that is consistent with the expectations and the motives of consumers. The consumer motives must not be alienated in the brand building process. This can only be done when the strategy of the brand is developed and constantly evaluated to ensure that it works towards meeting the needs of consumers.

Suggestions for future research

Future research could examine the effect of the constructs in the conceptual framework on specific products or different brands or products in the same category. The conceptual framework of this study could be replicated in a lot more countries to access consumer buying behaviour. A limitation of this study is the relatively small sample size that was selected and used. A large sample size drawn from the selected countries will provide conclusions that will be representative of the population. Also, it will be interesting to extend the study to find out how the variables – risk reduction, social demonstrance and relevance of brand in purchasing decision varies among males and females. The trends and the effect of variations in income levels and age on risk reduction, social demonstrance and relevance of brand in purchasing decision could also be studied in relation to demographic variables.

This study attempted to highlight some cultural traits that explain consumer motivation. However, this is not adequate and the degree of relationship is not strong; hence, it will be useful to conduct a more comprehensive study that will bring out the relationship between various cultural variables and the motivation for buying brands in consumer markets. Such a study will provide strong empirical evidence of the relationship between culture and the variables that predominantly motivate consumers when buying branded items. Finally, though we believe that risk reduction and social demonstrance are fundamental brand functions that motivates consumers and contribute to the competitiveness of firms, there may be other brand functions that can be studied.

Acknowledgement

This research was conducted with the support of the Internal Grand Agency of Tomas Bata University; project number SV-IGA/76/FaME/10/D, 'Brand as a dominant factor in determining the competitiveness of firms'

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Received: 21. 06. 2011
Reviewed: 30. 09. 2011
Approved for publication: 30. 11. 2011

A STUDY ON MEASURING RETURN ON INVESTMENT OF A KEY ACCOUNT MANAGEMENT TRAINING PROGRAM

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Abstract: *Measuring the return on investment (ROI) in training and development and performance improvement has consistently earned a place among the critical issues in the Human Resource Development (HRD) field. HRD plays a significant role in supporting and driving a continuous improvement culture. Training can be a powerful building block in allowing a business to achieve its goals, indicating that it must be seen as a strategy and not an event. The research problem will be evaluating the return on investment of a training program conducted at one of the main garment exporter in Sri Lanka. The study followed a cost-effective conceptual framework of training evaluation developed by Doucouliagos and Sgro [3]. The model is consisted by four sequential steps, commencing with collecting data, pre- and post training exploration of performance, linking performance outcomes to training and, finally, the calculations of return on investment (ROI). The final research findings indicate that the training program has given significantly high ROI and has led to better customer satisfaction and enhancing other key business performance measures. Also it is found that quality of the training program led to better acquisition of the skills relevant to the training program. Major limitations of this study are identified as calculating the monetary value of benefits, Impact of other uncontrollable factors, Time constraints and Availability of data.*

Keywords: *Service Quality, Satisfaction, Attitudes.*

JEL Classification: *M12, M53.*

Introduction

According to Phillips [6] measuring the Return on Investment (ROI) in training and development and performance improvement has consistently earned a place among the critical issues in the Human Resource Development (HRD) field. Although the interest in the topic has heightened and much progress has been made, it is still an issue that challenges even the most sophisticated and progressive HRD departments. While some professionals argue that it is not possible to calculate the ROI, others quietly and deliberately proceed to develop measures and ROI calculations. Regardless of the position taken on the issue, the reasons for measuring the return still exist. Almost all HRD professionals share a concern that they must eventually show a return on their training investment; otherwise, training funds may be reduced or the HRD department may not be able to maintain or enhance its present status and influence in the organization. As Per the Ferketish and Hayden [5] “HRD plays a significant role in supporting and driving a continuous improvement culture”. Further, they argue that training can be a powerful building block in allowing a business to achieve its goals, indicating that it must be seen as a strategy and not an event. There are several

components can be seen in an effective training evaluation program. Among those models Kirkpatrick's [7] model is very comprehensive one and here he adds 5th step and ask to measure monetary value of the results with the costs for the program, usually expressed as a percentage. Stolovitch and Maurice [8] state that less than 20 % of training is actually transferred to performance of the company. In 1997 DTEC study indicated that "the productivity benefits of training would be enhanced, and in many cases can only be achieved, when training is integrated with other aspects of their organizations and/or when the organizations made use of other sustainable competitive advantages."Training represents an investment by firms in their employees. Like other investments undertaken by firms, a cost is incurred in anticipation of a future return to the firm. The future return takes the form of improved productivity, improved workplace performance or improved profitability.

It is important for firms to have accurate measures of ROI in training for this is what determines the level of training that will be conducted. A firm will want to compare the return from investment in training with returns from other forms of investment, and then undertake investments with the best overall rate of return. Under-provision of training may result from a lack of understanding of the benefits of training by firms [1]. Not all training will result in a net benefit. However, there are circumstances where training can be beneficial even if the training has not delivered a net financial return. The training may have produced non-pecuniary benefits. These could include the achievement of a quality assurance rating that will allow a firm to expand into new markets or a safer workplace that will lead to a reduction in staff turnover because of greater job satisfaction. Dockery [2] recommends that the focus of research into the benefits and impacts of training should be to look at training as a purpose-specific input rather than a general input and then evaluate the impact of training against the relevant objectives rather than against general performance measures. A high return from a training program does not imply that the training was fully effective. Doucouliagos and Sgro [3] emphasise that there is a difference between returns from training and effectiveness of training. Although a positive net ROI may have been achieved from a training program, it may have been possible to achieve additional benefits. If an evaluation identifies a divergence between the actual ROI and the potential ROI, then the appropriate type and quality of training may not have been delivered. The firm itself has to set training targets and then determine if they were met. Most firms will have practical constraints on the possible coverage of training that will, by necessity, limit the returns from training. It may not be practicable for all the members of a production team to undergo training, particularly if workers have to be taken off-line to attend. Evaluation is essential, as it will identify if improvements can be made to the scope or delivery of training in the future.

1 Statement of a problem

It is important for firms to have accurate measures of ROI in training for this is what determines the level of training that will be conducted. A firm will want to compare the return from investment in training with returns from other forms of investment, and then undertake investments with the best overall rate of return. Under-provision of training may result from a lack of understanding of the benefits of training

by firms [1]. Key Account Management Program (KAMP) is a major training program conducted by the companies in order to ensure the customers are managed in the most suitable way by Account Managers (AM) which will eventually increase business opportunities. As a significant investment is made to train these managers, there is a greater need to analyze whether this training is effective. Also measuring the return on investment of this training program conducted by the organization will help the top management to understand whether the investments are viable. Under these circumstances, this study is going to identify the level of impact to the ROI through KAMP conducts by the company. Therefore problem of this study is "To what extend KAMP has an impact to the ROI of the training program?"

1.1 Objectives

This research aims to accomplish the following objectives:

- To quantify the net gains derived from a training program.
- To identify whether investment of a training program lead to better organizational performance.
- To use as a feedback to develop better training programs which satisfy job requirements and trainee satisfaction?

1.2 Hypotheses

- Alternative Hypothesis 1: KAMP directly influences to increase positive customer ratings. (Mean of the positive customer ratings have increased during the post-training period compared to pre training period.)
- Alternative Hypothesis 2: KAMP directly influences to increase positive actual sales of each buyer (Mean actual sales of each buyer have increased during the post-training period compared to pre training period.)
- Alternative Hypothesis 3: The training received helped to achieve better acquisition of skills and better application of skills to the business.
- Alternative Hypothesis 4: There is a positive ROI on the KAMP.

2 Significance of the study

As organizations recognize the importance and necessity for training and development, budgets continue to increase annually by organization, industry, and country. Many organizations and countries see training as an investment instead of a cost. Consequently, senior managers are willing to invest because they can anticipate a payoff for their investments. In developing countries, increased training is needed as new jobs are created and new plants and processes are established. Skill upgrading is necessary to develop core competencies needed to maintain a productive labor force. In some countries, the governments require minimum levels of funding for training to ensure that skills are developed. The learning organization concept continues to be implemented in many organizations, requiring additional focus on learning and training. In addition, the concern about intellectual capital and human capital has created a desire to invest more heavily in learning activities and formal training. As expenditures grow, accountability becomes a more critical issue.

A growing budget creates a larger target for internal critics, often prompting the development of an ROI process. The function, department, or process showing the most value will likely receive the largest budget increase.

ROI applications have increased because of the growing interest in a variety of organizational improvement, quality, and change programs, which have dominated in organizations, particularly in North America, Europe, and Asia. Organizations have embraced almost any trend or fad that has appeared on the horizon. Unfortunately, many of these change efforts have not been successful and have turned out to be passing fads embraced in attempts to improve the organizations. The training and development function is often caught in the middle of this activity, either by supporting the process with programs or actually coordinating the new process in these organizations. While the ROI process is an effective way to measure the accountability of training, it has rarely been used in the past. A complete implementation of the process requires thorough needs assessment and significant planning before an ROI program is implemented. If these two elements are in place, unnecessary passing fads, doomed for failure, can be avoided. With the ROI process in place, a new change program that does not produce results will be exposed. Management will be aware of it early so that adjustments can be made. Total Quality Management, Continuous Process Improvement, and Six Sigma have brought increased attention to measurement issues. Today, organizations measure processes and outputs that were not previously measured, monitored, and reported. This focus has placed increased pressure on the training and development function to develop measures of program success. Restructuring and reengineering initiatives and the threat of outsourcing have caused training executives to focus more directly on bottom-line issues. Many training processes have been reengineered to align programs more closely with business needs, and obtain maximum efficiencies in the training cycle. These change processes have brought increased attention to evaluation issues and have resulted in measuring the contribution of specific programs, including ROI.

The business management mindset of many current education and training managers causes them to place more emphasis on economic issues within the function. Today's education and training manager is more aware of bottom-line issues in the organization and more knowledgeable of operational and financial concerns. This new "enlightened" manager often takes a business approach to training and development, with ROI as part of the strategy [9]. ROI is a familiar term and concept for business managers, particularly those with business administration and management degrees. They have studied the ROI process in their academic preparation where ROI is to evaluate the purchase of equipment, building a new facility, or buying a new company. Consequently, they understand and appreciate ROI and are pleased to see the ROI methodology applied to the evaluation of training and performance improvement. There has been a persistent trend of accountability in organizations all over the globe. Every support function is attempting to show its worth by capturing the value that it adds to the organization. From the accountability perspective, the training and development function should be no different from the other functions—it must show its contribution to the organization. This accountability trend has developed a variety of different types of measurement processes, sometimes leaving much

confusion to the potential user of the processes. There is a variety of measurement possibilities developed in recent years and offered to organizations as a recommended measurement of the process or scheme. While this has created much confusion, many organizations have migrated to the proven acceptance of ROI. Used for hundreds of years, and for the reasons outlined in this section, ROI has become a preferred choice for training and development practitioners to show the monetary payoff of training. ROI is now taking on increased interest in the executive suite. Top executives who watched their training budgets continue to grow without the appropriate accountability measures have become frustrated and, in an attempt to respond to the situation, have turned to ROI. Top executives are now demanding return on investment calculations from departments and functions where they were not previously required. For years, training and development managers convinced top executives that training could not be measured, at least at the monetary contribution level. Yet, many of the executives are now aware that it can and is being measured in many organizations. Top executives are subsequently demanding the same accountability from their training and development functions. The payoff of training is becoming a conversation topic in top executive circles.

3 Problem solving

The research is focused on analyzing and evaluating a major training program conducted by a one of the large apparel exporter in Sri Lanka. The aim of the analysis and evaluation is to identify the ROI of the training program and to identify the relationship of performance of the business and the training. Population of the research will be the "Key Account Management" training program conducted by the organization during last two years. As the research is conducted focusing on a specific training program, the whole population is selected as sample for the purpose of conducting an effective study of the program and to increase the accuracy of the results. Firstly, time series analysis was conducted to analyze the mean customer rating and actual sales made during pre and post training period. Then these data was analyzed using statistical methods of Analysis of Variance (ANOVA) and Regression analysis to evaluate how training has intervened on creating a significant change on the customer rating and actual sales for each customer. Secondly, Statistical technique of co-relation co-efficient was used to measure the relationship of the following: quality of training and organization with acquisition of training skills and quality of training and organization on influence on business measures. Finally, the return on investment of the training program was measured. For this calculation, various costs incurred and benefits received from the training program are obtained through questionnaire and through HR and financial databases. The final calculation was made using the following formula suggested by Phillips [6].

$$ROI\ \% = \frac{Net\ program\ Benifits}{Program\ cost} X\ 100 \quad (1)$$

Source of data: [6]

1, 2, 3, 1.

The framework used by Doucouliagos and Sgro [3] for ROI analysis was used to analyze the ROI of training. Originally, this framework has consisted by four steps as step 1: Collection of data, step 2: Pre and post training analysis, step 3: Multivariate analysis, and step 4: Calculates the ROI. However, under this study, it was used three step method due to unavailability of the necessary data.

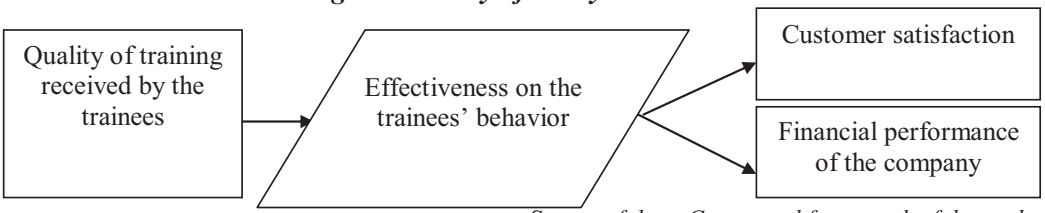
3.1.1 Stage 1: Collection of data

Primary data was obtained by interviewing and through company HR and financial database. Main Primary data, which was obtained from customer survey data collected through the marketing departments, post-training feedback obtained from relevant marketing managers, actual sales information obtained from the finance department and costs of training programs obtained through HR department. Costs of the training program were collected from the HR database. These included man days of the training program, facilitator cost which included facilitation fee and airfare, trainer's hotel accommodation costs, and costs incurred for food and beverage for the participants. To identify the relationship of business results and objectives of the training program financial data were gathered from the finance department. These included customer wise revenue, contribution which will facilitate to determine whether training resulted in a benefit to the company. Customers' feedback was gathered from each marketing department where feedback is evaluated on various categories. In addition to the above, a post training evaluation was carried out among participants to get feedback on training and to identify relationship between quality of training program and acquisition of skills and influence on business measures in perspective of trainees.

3.1.2 Stage 2: Pre and Post-training Analysis

Pre and post-training analysis was used to compare a measured outcome before a training initiative to a measured outcome after a training initiative. Following analysis were carried out in this stage.

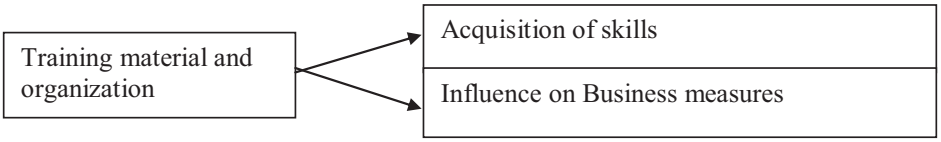
Fig. 1: The way of Analysis – Case 1



Source of data: Conceptual framework of the study

This was for the testing hypothesis 1 and 2. Under this, it was going to evaluate the level of influence come from quality of the training to customer satisfaction and the financial performance of the company.

Fig. 2: The way of Analysis – Case 2



Source of data: Conceptual framework of the study

This was where hypothesis 3 was tested. In this analysis, trainees are evaluated based on two outcomes. The first analysis is focused on identifying how training affected trainee's behavioral outcomes and secondly the application of learning to the business. These two outcomes are analyzed based on trainees' perspective.

3.1.3 Stage 3: Calculating the ROI

At the final stage ROI of the training program was calculated based on the formula suggested by Phillips [6]. This is the ultimate level of training evaluation. This is the level where Hypothesis 4 will be tested.

1, 2, 3, 4, 1.

4 Findings of the study

Version 14 of MINITAB Statistical software was used for all statistical calculations and graphical illustrations to ensure statistical accuracy.

For both hypotheses 1 and 2 the tabulated value for degree of freedom $\nu = 5$ in each case, and a 1-tailed, 95% confidence level is $F_{5,5} = 5.0503$. Based on the results it can be seen that mean customer rating for each customer has increased in post training period compared to pre training period. As F-statistic for each customer is greater than tabulated F value of 5.0503, it can be said that differences of means between pre and post training period are statistically significant. The probability of making a Type I error i.e.: reject the null hypothesis when the null hypothesis is true is eliminated as P is zero for almost all of the customers.

Following table shows the results obtained from One-way ANOVA.

Tab. 1: One-way Analysis of Variance for customer rating

	Pre training Mean Customer rating	Post training Mean Customer rating	F-statistic	P
GAP	3.65	4.40	49.99	0.000
M&S	3.20	3.94	53.69	0.000
LE	3.25	3.76	10.35	0.009
Next	3.38	3.96	46.71	0.000
Total	3.37	4.01	36.11	0.000

Source of data: survey data

The above analysis will be further justified using multiple regression method where pre and post training customer rating trend line slopes are analyzed.

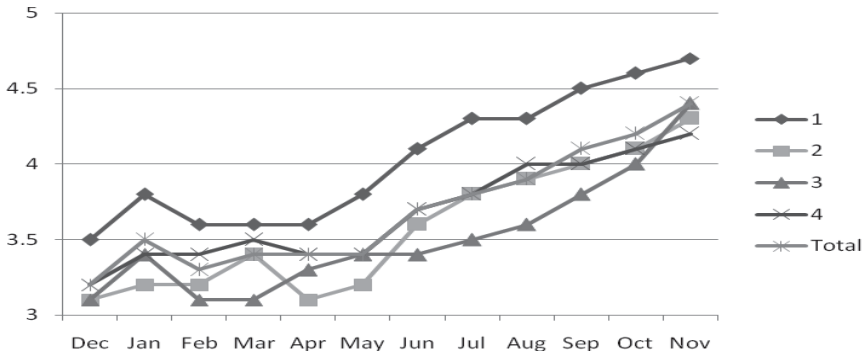
Tab. 2: Regression data for customer rating

Customer	Pre training trend line slope of customer rating (X1)	Post training trend line slope of customer rating (X3)+ (X1)
GAP	0.03061	0.12245
M&S	0.01837	0.12041
LE	0.01837	0.19184
Next	0.01633	0.09592
Total	0.0209	0.1329

Source of data: survey data

Post training trend line slope of customer rating (X3) + (X1) has increased by a greater extent from its pre training period level (X1). Thus, customer rating has increased from smaller rate to a much higher rate. Therefore, based on these findings and analysis it can be statistically justified that while other factors are constant, the training has had made a significant influence on increasing customer rating to a higher rate. The following graph depicts the increase in customer rating for different customers during the pre and post training period.

Fig. 1: Pre and Post training time series plot for actual sales data



Source of data: survey data

The time series graph clearly depicts that after the training in the month of May, the customer rating has increased at a significant level.

1, 2, 3, 4, 4.1, 4.2.

The tabulated value for degree of freedom ν =5 in each case, and a 1-tailed, 95% confidence level is F5, 5 = 5.0503.

Tab. 3: One-way Analysis of Variance for actual sales data

Customer	Pre training Mean Actual Sales ($ '000)	Post training Mean Actual Sales, ($ '000)	F-statistic	P
1	2,463	2,902	5.11	0.047
2	1,693	2,245	9.74	0.011
3	1,576	2,345	14.62	0.003
4	262	377	5.16	0.046
Total	5,994	7,868	11.06	0.008

Source of data: survey data

Based on the results the mean actual sales value for each customer has increased in post training period compared to pre training period. As F-statistic for each customer is greater than tabulated F value of 5.0503, it can be said that differences of means between pre and post training period are statistically significant. The probability of making a Type I error i.e.: reject the null hypothesis when the null hypothesis is true is very low for all of the customers as represented by Probability value which is less than critical value of 0.05.

Tab. 4: Regression data for actual sales data

Customer	Pre training trend line slope of actual sales (X1), $ '000	Post training trend line slope of actual sales (X3)+ (X1) $ '000
4	(90)	213
2	5	196
3	(9)	237
4	(11)	59
Total	(105)	705

Source: survey data

Post training trend line slope of actual $ sales (X3) + (X1) has increased by a greater extent from its pre training period level (X1). Thus, actual sales have increased from smaller rate to a much higher rate. Therefore, based on these findings and analysis it can be statistically justified that while other factors are constant, the training has had made a significant influence on increasing actual sales value to a higher rate.

1, 2, 3, 4, 4.1, 4.2, 4.3.

Hypothesis 3 was analyzed using the statistical method of co-relation co-efficient.

Case 1: Relationship between qualities of training received by the trainees and customer satisfaction / financial performances

Through the application of formula of co-relation co-efficient the answer derived is 0.84. Hence, as per the interpretation of co-relation co-efficient, there is a positive relationship between the two variables, because r takes the form of a positive figure. I.e. in other words the nature of relationship between the quality of the training received and the acquisition of the training skills is positive and Strength. Therefore, Case 1 of hypothesis number 3 is justified through the findings.

Case 2: Relationship between training material, organization, and acquisition of skills and influence to the business measures

Through the application of formula of co-relation co-efficient the answer derived is 0.77. Hence, as per the interpretation of co-relation co-efficient, there is a positive relationship between the two variables, because r takes the form of a positive figure. I.e. in other words the nature of relationship between the Quality of the training received and the Influence on business measures is positive. Therefore, Case 2 of hypothesis number 3 is justified through this analysis. To analyze the hypothesis number 4 data relating to the costs of the training program and monetary benefits of the training program had to be gathered. The types of data gathered were listed as follows. Actually, data were needed in order to evaluate the impact of training on the 'bottom line'. The facilitators cost, costs of materials, cost of refreshments provided and opportunity coast of the time are the costs were added d for this analysis.

Based on trainees feedback it was found that averagely training has resulted contributing to net profit by following percentages on variance on monthly average sales between pre and post training period. This is an average estimate as it is often difficult to clearly identify the impact on net profit due to influence of various variables which are not considered in this study. The contribution is annualized by multiplying by 12.

Tab. 5: Impact of the training program on net profit

Customer	Pre training Mean Actual Sales, $ '000	Post training Mean Actual Sales, $ '000	Variance $ '000	% Impact on Net Profit	Impact on Net Profit $ '000
1	2,463	2,902	439	5%	22
2	1,693	2,245	551	3%	17
3	1,576	2,345	768	4%	31
4	262	377	115	2%	2
Total	5,994	7,868	1,873	4%	72

Source of data: survey data

Over the period studied it is found that training program generated and ROI of 24523%. This is roughly 245 times of the initial investment on training. This is obvious considering the fact that initial investment is smaller compared to the higher profit earned due to the training. Therefore it can be justified that the financial return obtained from this training program is positive and much larger compared to the initial investment.

Discussion and Conclusion

It was identified that customer rating and actual sales have had a significant influence from the KAMP and it is statistically proven and justified. In analyzing hypotheses 1 and 2 it was found that customer rating and actual sales have increased significantly after the training program which was conducted in May 2009. Based on the post training evaluation questionnaire trainees have agreed that quality of the training program is related with both acquisition of skills and contents from the

training program and influence of the training to key business measures. Based on the findings over 82% of trainees agreed that the training program has a very significant influence on enhancing the "communication with customers". This is one of the key findings and an area which the organization has focused heavily on improving. Not only that respondents agree that training had a very significant influence on areas of "improving service quality" "gaining more market share" which had 22% and 14% respondents respectively. Another key finding is that training program only had a moderate level of influence on net profits as per the trainees. Although this is subjective, the company has made an increase of $72,000 on net profit per month after the training period. This may be due to the fact that impact of various factors when determining net profit.

The final ROI figure of 24523% is due to the huge impact of net profit, which can be directly related to the training program. This signifies the fact that investment on training program gives very high return on investment. Nevertheless, this study also identified following intangible measures which cannot be quantified for monetary values. Employee satisfaction is perhaps one of the most important intangible measures. Some HRD programs are designed to improve employee satisfaction. While employee satisfaction has always been an important issue in employee relations, in recent years it has taken on new importance because of the key relationships of job satisfaction to other measures.

These data reflect work climate changes such as communication, openness, trust, and quality of feedback. Climate surveys are more general and often focus on a range of workplace issues and environmental enablers and inhibitors. Climate surveys conducted before and after training may reflect the extent to which training has changed these intangible measures. Perhaps the most difficult measure is leadership, yet leadership can make the difference in the success or failure of an organization. Without the appropriate leadership behaviors throughout the organization, the other resources can be misapplied or wasted. Measuring leadership has been a difficulty in this study.

A variety of measures are often monitored to reflect how well teams are working. Although the output of teams and the quality of their work are often measured as hard data and converted to monetary values, other interpersonal measures have not considered in this study. Other than the above factors, one of the research objectives of developing a simple and practical model of training evaluation has been a success in this study. Introducing some statistical methods helped the organization to identify some meaningful data and relationships between these data which in turn provide some meaningful information. These methods helped the organization to analyze the data in various ways and enhancing ways of capturing data which will give information that is more meaningful. All in all it can be concluded that Investment on training will lead to better business performance and will give better business results. This research confirms the fact that training can be a powerful building block in allowing a business to achieve its goals, indicating that it must be seen as a strategy and not an event.

Acknowledgement

This research was conducted with the financial support of the Internal Grant Agency of Faculty of Management and Economics on Tomas Bata University, Project-No IGA/57/FaME/11/D.

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Received: 24. 05. 2011
Reviewed: 14. 10. 2011
Approved for publication: 30. 11. 2011

EFFICIENCY OF PAST STOCK MOVEMENT SIMULATION IN INTERMITTENT DEMAND STOCK CONTROL

Jakub Dyntar, Eva Kemrová

Abstract: *In this paper we present the efficiency measurement study of past stock movement simulation designed for the stock management of products with intermittent demand. The proposed simulation is able to provide the combination of controlled parameters (reorder stock level + order quantity/order-up-to level) included in two frequently used stock management policies (Q-system, PQ-system) which guarantees the minimal stock holding and ordering costs and the required fill rate. To obtain reorder stock level single exponential smoothing, Croston's method, the modification of Croston's method made up by Syntetos&Boylan and Levén&Segerstedt, the method of Smart and the total enumeration are considered. When tested on 5730 real intermittent demand series from automotive industry we conclude that the total enumeration used in the past stock movement simulation to calculate reorder stock level leads to the lowest stock holding and ordering costs and represents robust approach in intermittent demand stock control in term of increasing intermittence and lumpiness.*

Keywords: *Inventory, Intermittent Demand, Dynamic Simulation.*

JEL Classification: *C61***.**

Introduction

Croston's method is considered to be an appropriate approach for intermittent demand stock control. This method eliminates the drawbacks of single exponential smoothing and leads to the results guaranteeing sufficient stock level during order lead time period. With help of the Croston's approach it is possible to determine the reorder stock level but this method does not solve the problem of reorder size or mechanism of reordering. Therefore it is necessary to combine it with an additional procedure to assess how to reorder and how should be the reordering sizes set to ensure economical efficiency of stock replenishment.

As a perspective way of solving this problem we perceive the application of dynamic simulation. In Ekonomika a Management 3/2010 we suggest a solution, which uses dynamic simulation to determine the basic parameters of a stock management system on the basis of past stock movement (see [3]). This solution is able to provide precise answers for basic questions connected with the problem of effective stock management, which include:

- Reorder stock level assessment.
- Reorder size determination.
- The choice of an appropriate stock management policy.

The results of the suggested stock movement simulation model represent information of how reordering is generated and also a combination of control parameters such as reorder stock level and reorder size, which guarantees minimal stock holding and ordering costs, while maintaining the required service level. Our simulation model is able to work either with average demand provided by a forecasting method, which can be used to determine reorder stock level, or it converts the task of reorder stock level assessment to a combinatory optimization task. The aim of this article is to compare the efficiency of this solution in situations when different forecasting methods for reorder stock level assessment are applied or when reorder stock level is assessed using combinatory optimization. The efficiency measurement is realized with the set of real spare parts demand series coming from automotive industry. The rest of this paper is structured as follows. First, in Section 2, we provide the literature on intermittent demand forecasting and stock management. In Section 3 past stock movement simulation is described. In Section 4 basic features of tested demand series are given and the numerical study to assess the efficiency of past stock movement simulation is described. In Section 5 the outcomes of the simulation are discussed. Finally, the paper is summarised.

1 Intermittent demand forecasting and stock management

Single exponential smoothing is frequently used for forecasting demand in a routine stock management system. This procedure can be described by following equation [1]:

$$y'_t = \alpha \cdot y_t + (1-\alpha) \cdot y'_{t-1}, \tag{1}$$

where y_t is the demand at time t, y'_t the estimate of mean demand per period made at time t and used as a one step ahead predictor of the demand at time $t + 1$, and α is a smoothing constant between zero and one. Reorder stock level r_t is then calculated as:

$$r_t = y'_t + k \cdot m_t, \tag{2}$$

where k is a safety factor dependent on the demand distribution type and m_t is the estimated mean absolute deviation of the errors of the predictor.

Croston pointed out that single exponential smoothing is not appropriate for stock management of products with intermittent demand and suggested a modification (see [2]). His method is focused on the estimation of mean demand size z'_t, and also on the mean interval length between two non-zero demands p'_t:

$$z'_t = \alpha \cdot z_t + (1-\alpha) \cdot z'_{t-1}, \tag{3}$$

$$p'_t = \alpha \cdot p_t + (1-\alpha) \cdot p'_{t-1}, \tag{4}$$

where p_t is the time between consecutive transactions and z_t the magnitude of the individual transactions. These estimates are only updated when demand occurs. Croston's estimate of mean demand per period $y't$ is then described by following equation:

$$y'_t = z'_t / p'_t, \tag{5}$$

Many researchers concluded that Croston's method is robustly superior to traditional methods such as moving average or exponential smoothing and can provide benefits to practitioners forecasting intermittent demand (see for example [12] or [5]).

A disadvantage of Croston's method is that it is positively biased, as it has been proven by Syntetos and Boylan (see [7]). These researchers modified Croston's estimate of mean demand per period y'_t in a way leading to (6):

$$y'_t = (1-\alpha/2) \cdot z'_t / p'_t, \quad (6)$$

Better efficiency of this modification has been proven for example by Syntetos and Boylan (see [8]) or Syntetos, Boylan and Croston (see [9]). However, Teunter and Sani found that the modification of Syntetos and Boylan over-compensates positive bias of Croston's method and leads to a negative bias instead [10]. They also pointed out that Croston´s method provides better results in case of few zero demand periods, while the modification of Syntetos and Boylan performs efficiently in case of many zero demand periods.

Levén and Segerstedt modified Croston's method in an attempt to obtain a universal method for both slow and fast moving items (see [6]). Their estimation of mean demand per period y't is updated as follows:

$$y'_t = \alpha \cdot z'_t / p'_t + (1-\alpha) \cdot y'_{t-1}. \quad (7)$$

However, their modification is even more positively biased than Croston's method [10].

Willemain, Smart and Schwarz introduced a fully new approach in intermittent demand stock management (see [13]). Their bootstrapping method is not aimed at the estimation of average demand, but approximates its distribution function. They compared their method with various forecasting techniques and found that the bootstrapping method outperforms both exponential smoothing and Croston's method.

The performance of methods put forward as particularly suitable for intermittent demand is usually compared using traditional measures of accuracy such as mean absolute deviation or root mean square error. Eaves and Kingsman showed that application of different measure of accuracy for intermittent demand forecasting leads to varying results and no single forecasting method emerges as the best overall [4]. Their research even indicates that in some cases the simpler forecasting methods such as moving average or exponential smoothing can provide the best results for intermittent demand items, while Croston's method and its modifications can provide the best results in case of smooth demand.

Teunter and Duncan used a new performance measure based on service level to compare various forecasting techniques. They showed that Croston's method and its modifications developed by Syntetos and Boylan and by Levén and Segerstedt all outperform moving average and exponential smoothing (see [11]).

2 Past stock movement simulation

Our past stock movement simulation is based on the recapitulation of stock movements under the control of a certain stock management system. The inputs to the simulation model are represented by lead time (*LeadTime*), starting stock of a stored item (*StartingStock*) and historical demand observations of a stored item ($Demand_t$). These observations are collected for $t = 1, 2, .., T$ periods (for example months). In each *t-th* period stock movements are represented by met customer demands (stock

decrease) and the arrival of replenishment orders (stock increase). Let the simulation starts in the period $t = 1$ and let the initial state of the period (IS_t) is represented by a starting stock (*StartingStock*). First, the current stock (*CurrentStock*) is set equal to the initial state of the period (i.e. *for* $t = 1 \rightarrow CurrentStock = IS_1 = StartingStock$). Then, the current stock is increased by the arriving order (AO_t; i.e. for $t = 1 \rightarrow CurrentStock = CurrentStock + AO_1$) if there is some. Because there can be more than one delivery in the pipeline which is possible if lead time is longer than the time between two subsequent orders the total ordered amount (*TOA*) has to be decreased by ordered amount right after its arrival (i.e. *for* $t = 1 \rightarrow TOA = TOA - AO_1$). Then, the current stock is decreased by the demand (i.e. *for* $t = 1 \rightarrow CurrentStock = CurrentStock - Demand_1$). In case of insufficient current stock the demand is fulfilled only partially, missing quantity (MQ_t) is noted as a difference between the demand and the current stock (i.e. *for* $t = 1 \rightarrow MQ_1 = Demand_1 - CurrentStock$) and the current stock is set to zero ($CurrentStock = 0$). The simulation doesn't take into account the backordering which means that if the demand in *t-th* period is greater than the current stock there are the lost sales. In the next step, the simulation checks if it is necessary to place an order and its size. The order is placed whether the current stock increased by the total ordered amount is below or equal to the reorder stock level (r). The arrival of the order placed in the *t-th* period occurs in period $t + LeadTime + 1$ which means that the ordered amount is available in the beginning of the period $t + LeadTime + 1$. The reorder size depends on the selected stock management policy. The simulation works with the two basic stock management policies. If a reorder-point, reorder-quantity policy (Q-system) is employed the reorder size is constant and the order arriving in period $t + LeadTime + 1$(i.e. *for* $t = 1 \rightarrow \mathrm{AO}_{1 + LeadTime + 1}$) equals order quantity (Q). If a reorder-point, order-up-to policy (PQ-system) is employed the size of the order arriving in period $t + LeadTime + 1$(i.e. *for* $t = 1 \rightarrow \mathrm{AO}_{1 + LeadTime + 1}$) is the order-up-to level (x_h) decreased by the current stock and the total ordered amount. After the order is placed the total ordered amount is increased by the generated arriving order (i.e. *for* $t = 1 \rightarrow TOA = TOA + \mathrm{AO}_{1 + LeadTime + 1}$) and the final state of the period (FS_t) is set equal to the current stock ($FS_1 = CurrentStock$). Then the simulation continues with the stock movements in the period t = 2, 3, ..., T. All these periods start from the initial state ($IS_{t>1}$) equal to the final state of the previous period (FS_{t-1}).

The advantage of such simulation structure is the possibility to assess the economical efficiency of storing and ordering as well as the ability to satisfy the demand. To assess the economical efficiency of storing and ordering two types of costs are evaluated at the end of simulation run for each stored item. The total stock holding costs (H) are evaluated with help of the average stock (xavg) as:

$$H = h \cdot x_{avg} \cdot p \cdot T, \tag{8}$$

where h represents the holding costs stated as the percentage of average stock in Euros per one simulated period, p is the price of stored item and T is the number of simulated periods. The average stock is obtained from the final states of all simulated periods as:

$$x_{avg} = \frac{\sum_{=1}^{} \; _t}{T} \tag{9}$$

The total ordering costs (O) are evaluated as:

$$O = o \cdot Number\ of\ Orders, \tag{10}$$

where o represents fixed ordering costs and *Number of Orders* represents the number of orders placed during the simulation run. The total costs (TC) are then evaluated as:

$$TC = H + O. \tag{11}$$

The ability to satisfy the demand is evaluated in the form of the fill rate (FL). The fill rate represents the demand that can be satisfied right from the current stock. To evaluate the fill rate for the stored item the missing quantities obtained during the simulation run are used in a way leading to (12):

$$FL = 1 - \frac{\sum_{t=1}^{T} MQ_t}{\sum_{t=1}^{T} Demand_t} \tag{12}$$

With help of the fill rate it is possible to set different service levels for stored items according to their importance for example for revenue generating in case of the spare parts distribution. In this case ABC analysis is frequently used to set required fill rates. To achieve required service level in the form of the fill rate the past stock movement simulation has to run under the control of an appropriate combination of the control parameters that are available in the selected stock management policy. In the other words if for example the required fill rate for a stored item is 98%, the total demand in T periods is 100 pieces and the selected stock management policy in the simulation is Q-system, the appropriate combination of reorder stock level (r) and order quantity (Q) has to ensure that the total missing quantity in T periods is no more than 2 pieces. The same goes for PQ-system but for the combination of reorder stock level (r) and order-up-to level (xh). For a stored item many combinations of the control parameters available in the stock management policies usually ensure the required fill rate. The question is which combination is the best. It is the one with the lowest total costs.

There are two basic ways how to search for the optimal combination of control parameters in our past stock movement simulation. First way is to calculate reorder stock level (r) with help of a forecasting method or with help of the method of Smart (SM). In the simulation, forecasting methods such as single exponential smoothing (SES), Croston's method (CR), the modification of Croston's method made up by Syntetos and Boylan (SB), the modification of Croston's method made up by Levén and Segerstedt (LS) are considered. All these methods are summarized in Section 2. The second control parameter which is order quantity in case of Q-system and order-up-to level in case of PQ-system is calculated with help of the total enumeration. It means that for a stored items the past stock movement simulation creates all combinations of reorder stock level obtained by a forecasting method or by the method of Smart and order quantity or order-up-to level which is an integer from the interval $\langle 1; \sum_{t=1}^{T} Demand_t \rangle$. Than the simulation runs separately for each combination and the combination with both the lowest total costs and achieved required fill rate is obtained. The second way how to search for the optimal combination of control parameters in our past stock movement simulation is to apply the total enumeration on both reorder

stock level and order quantity or order-up-to level. In this case the simulation creates all combinations of reorder stock level which is an integer from the interval $\langle 0; \sum_{t=1}^{T} Demand_t \rangle$ and order quantity or order-up-to level which is an integer from the interval $\langle 1; \quad \rangle$. Than the simulation runs separately for each combination again and the combination with both the lowest total costs and achieved required fill rate is obtained.

3 Past stock movement simulation efficiency

To assess the past stock movement simulation efficiency we compare 12 different scenarios in a numerical study. These scenarios differ in a way of searching for the optimal control parameter combination used in the stock management policies that are employed in the simulation. As it is pointed out in the previous section there are two stock management policies available in our simulation (Q-system, PQ-system) each with two control parameters (Q – system → reorder stock level + order quantity; PQ – system → reorder stock level + order-up-to level). Each tested scenario consists of one stock management policy whereas reorder stock level common to both employed policies is calculated by one of the forecasting methods available in the simulation (i.e. SES, CR, SB, LS) or by the method of Smart (SM) or by the total enumeration. The second control parameter that determinates the sizes of orders (order quantity or order-up-to level) is than calculated with help of the total enumeration for all scenarios. All tested scenarios are summarized in the following table:

Tab. 1: Scenarios tested in a numerical study

Scenario	Stock management policy	Reorder stock level	Order quantity/ order-up-to level
1	Q-system	SES	total enumeration
2	Q-system	CR	total enumeration
3	Q-system	SB	total enumeration
4	Q-system	LS	total enumeration
5	Q-system	SM	total enumeration
6	Q-system	total enumeration	total enumeration
7	PQ-system	SES	total enumeration
8	PQ-system	CR	total enumeration
9	PQ-system	SB	total enumeration
10	PQ-system	LS	total enumeration
11	PQ-system	SM	total enumeration
12	PQ-system	total enumeration	total enumeration

Source of data: authors

Each scenario is tested on 5730 real intermittent demand series coming from automotive industry. Each demand timeline consists of 63 time periods/months. These timelines are divided into groups according to the probability that non-zero demand occurs and according to the standard deviation of these non-zero demands (see Table 2).

Tab. 2: Non-zero demand probability and variability of available time series

Stdev $Demand_t > 0$ [Pieces]	Probability $Demand_t > 0$ [%]							
	5-15	>15-25	>25-35	>35-45	>45-55	>55-65	>65-75	>75-85
0-1	1309	633	285	93	19	8		
>1-2	423	412	277	166	80	21	6	3
>2-3	129	199	153	81	53	26	6	2
>3-4	136	86	83	46	30	26	7	2
>4-5	59	43	65	36	34	15	7	3
>5-6	31	69	37	21	17	13	9	1
>6-7	55	38	33	17	15	12	9	1
>7-8	29	37	21	19	13	8	4	2
>8-9	21	27	11	9	9	15	1	1
>9-10	10	15	3	9	11	7	7	1

Source of data: authors

The set of the timelines tested in a numerical study contains for example 1309 items with the probability that non-zero demand occurs between 5 and 15% and the standard deviation of these demands between 0 and 1 piece as it is stated in Table 2. The absolute demand size, when demand occurs, ranges from 1 to 57 pieces and the total demanded quantity in all 63 months ranges from 4 to 717 pieces. Each tested item is except its timeline characteristic with its lead time and the price. The lead times range from 1 to 3 months and the prices range from 0.04 € per piece to 4795 € per piece. Based on the agreement with demand time series provider which is the spare parts distributor in the Czech Republic the fixed ordering costs are set to 20 € per order, the holding costs are set to 30% of average stock in € per year and the required fill rate for each item to 98%. The starting stock of each item is set to $\sum_{t=1}^{LeadTime+1} Demand_t$ which ensures for each item that no stock out occurs in the first *LeadTime + 1* periods and that a combination of controlled parameters of the selected stock management policy which achieves required fill rate is always found at least with help of scenarios number 6 and 12.

To initialize the forecasting methods used for reorder stock level calculation in the past stock movement simulation the first 12-period demand data are used. The first SES estimate is taken to be the average demand over the first 12 periods. In a similar way, the initial mean demand size and the mean interval length between two non-zero demands for CR, SB and LS can be based on the average corresponding values over the first 12 periods. If no demand occurs in the first 12 periods, the initial SES estimate is set to zero, the initial mean demand size for CR, SB and LS to 1 and the initial mean interval length between two non-zero demands for CR, SB and LS to 12. Optimization of the smoothing constant is not considered and its value is set to 0.1 according to the recommendations in the literature (see for example [2] or [9]). The safety factor (k) is set equal to 3. The bootstrapping method of Smart (SM) approximates the distribution function of possible demands during the lead time period with help of 10 000 demand evaluations per item.

At the end of the simulation run 12·5730 combinations (i.e. number of scenarios· number of items) of control parameters involved in employed stock management

policies are obtained. Each combination is assessed by the lowest total cost and required (or higher) fill rate. For each combination of control parameters assessed by the lowest total cost and required (or higher) fill rate the time spent on the computation is monitored as well. In case of the scenarios which consist of a forecasting method or of the method of Smart (i.e. the scenarios 1-5 and 7-11 from Table 1) the time spent on computation consists of the time spent on reorder stock level calculation with help of this method and the time spent on past stock movement simulation which is repeated for all possible combinations of reorder stock level and order quantity/order-up-to level. In this case the number of possible combinations for an item equals to the total demanded quantity of this item in all 63 periods. It is because the order quantity/order-up-to level can theoretically be an integer ranges from 1 to $\sum_{t=1}^{T} Demand_t$. In case of the scenarios which consist of the total enumeration method designated for both reorder stock level and order quantity/order-up-to level calculation (i.e. the scenarios 6 and 12 from Table 1) the time spent on computation consists only of the time spent on past stock movement simulation. This simulation is repeated according to a number of possible combinations of reorder stock level and order quantity/order-up-to level which is in this case equal to $(\sum_{t=1}^{T} Demand_t + 1) \cdot \sum_{t=1}^{T} Demand_t$ for an item. It is because the order quantity/order-up-to level possibly ranges from 1 to $\sum_{t=1}^{T} Demand_t$ and reorder stock level possibly ranges from 0 to $\sum_{t=1}^{T} Demand_t$ for an item.

4 Numerical study outcomes

First the total costs that assess 5730 optimal combinations of controlled parameters are summed up for each scenario ($\sum TC$) as well as the time consumptions spent on their computation ($\sum TimeConsumption$). These sums for each scenario are stated in the following table:

Tab. 3: Optimal total costs and time consumptions summed up for each scenario

Scenario	Stock management policy+r+Q/x_h	∑TC [€]	∑TimeConsumption [min]
6	Q_{system}+total enumeration+total enumeration	3 375 184	44.8
12	PQ_{system}+total enumeration+total enumeration	3 498 144	44.8
1	Q_{system}+SES+total enumeration	4 305 157	1.5
3	Q_{system}+SB+total enumeration	4 360 612	1.5
4	Q_{system}+LS+total enumeration	4 369 485	1.5
2	Q_{system}+CR+total enumeration	4 374 842	1.5
9	PQ_{system}+SB+total enumeration	4 394 491	1.5
10	PQ_{system}+LS+total enumeration	4 405 904	1.5
8	PQ_{system}+CR+total enumeration	4 406 942	1.5
11	PQ_{system}+SM+total enumeration	4 425 401	130.0
5	Q_{system}+SM+total enumeration	4 519 666	130.0
7	PQ_{system}+SES+total enumeration	4 531 705	1.5

Source of data: authors

As it is seen in Table 3 the most successful scenario is the one with Q-system stock management policy and with the control parameters (reorder stock level and order quantity) calculation realized by the total enumeration. This scenario as well as the scenario number 12 which is the one with PQ-system stock management policy and with the control parameters (reorder stock level and order-up-to level) calculation realized by the total enumeration highly outperforms all scenarios where a forecasting method (SES, CR, SB, LS) or the method of Smart (SM) is involved. However, when compared to other scenarios the efficiency of scenarios 6 and 12 is at the expense of longer computation time except the scenarios that consist of the method of Smart. It is because the number of repetitions of past stock movement simulation is for these scenarios (i.e. 6, 12) significantly higher. The high time consumption in case of scenarios where the method of Smart (SM) is involved is caused by the time spent on the construction of the distribution function of demands during lead time. This time depends on the number of demands that the distribution function consists of (in our study 10 000) and the lead time of an item. The higher the lead time and the higher the required number of demands involved in the distribution function construction, the longer the time spent on computation. Among the scenarios which consist of a forecasting method or of the method of Smart the scenario number 1 which includes single exponential smoothing is the one with the lowest costs but there are not such the big differences.

The interesting outcomes are summarized in Table 4 and Table 5. These tables are based on the grouping of all tested demand series according to the probability that non-zero demand occurs and according to the standard deviation of these non-zero demands (see Section 4, Table 2). To obtain the values in Table 4 the lowest total costs for each scenario are summed up for all items contained in a group. Then the scenario with the minimal sum of the total costs is placed in the table. For example the value 447 348 represents the minimal sum of the lowest total costs for 1309 tested items with the probability that non-zero demand occurs between 5 and 15% and the standard deviation of these demands between 0 and 1 piece achieved by the scenario number 6.

In accordance to the outcomes stated in Table 3 only scenarios 6 and 12 occur in Table 4. To obtain the values in Table 5 the lowest total costs for each scenario except scenarios 6 and 12 are summed up again for all items contained in a group. Then the scenario with the lowest sum of the total costs is placed in Table 5 and the difference between the minimal sum of the lowest total costs of this scenario and the minimal sum of the lowest total costs of the scenario placed in Table 4 at the same group is calculated. This difference represents how much (in €) is the best scenario 1-5 or 7-11 (i.e. the scenarios with SES, CR, SB, LS and SM) worse than the scenario placed in Table 4 (i.e. 6 or 12) at the same group. When divided by the minimal sum of the lowest total costs of the scenario placed in Table 4 at the same group the difference in € is recalculated to the difference in % (Δ). For example the value 15% achieved by the scenario number 3 in the group that contains 1309 tested items with the probability that non-zero demand occurs between 5 and 15% and the standard deviation of these demands between 0 and 1 piece means that the scenario number 3 reached the minimal sum of the total costs among scenarios 1-5 and 7-11 and that this sum is 15% higher than the sum of the total costs reached by the most effective scenario within the same group (i.e. 447 348 € achieved by the scenario number 6 in Table 4). The outputs stated in Table 5 show that the difference Δ between the scenarios 6 or 12 and the scenarios which consist of a forecasting method or the method of Smart increases with decreasing probability of non-zero demand occurrence. In the other words the more intermittent demand the higher the difference in total costs achieved by past stock movement simulation without application of SES, CR, SB, LS or SM and past stock movement simulation which uses these methods to calculate reorder stock level as a part of selected stock management policy. Similarly, the difference Δ between the scenarios 6 or 12 and the scenarios which consist of a forecasting method or the method of Smart increases with increasing variability of non-zero demands. The outputs stated in Table 5 also show that when applied in past stock movement simulation the forecasting methods considered to be appropriate for intermittent demand forecasting and stock management can achieve the lower total cost in case of the smooth demand as well as the forecasting methods considered to be appropriate for the smooth demand can achieve the lower total cost in case of the intermittent demand. It means that in situation when the past stock movement simulation is applied (for example if the short computation time is available) and the only scenarios used to calculate reorder stock level are SES, CR, SB and LS (i.e. scenarios 1-4 and 7-10) no forecasting method emerges as the best overall.

Conclusion

In a numerical study the past stock movement simulation efficiency was assessed. We proved that the total enumeration used to calculate both reorder stock level and order quantity/order-up-to level in selected stock control policy leads to the lower stock holding and ordering costs than in case of SES, CR, SB, LS and SM application. However, this better performance is at the expense of longer computation time when compared to SES, CR, SB and LS application. This can be a problem mainly if the total demanded quantity in all observed periods for an item is very high because the higher the total demanded quantity the higher the number of possible combinations of reorder stock level and order

quantity/order-up-to level that has to be evaluated by the past stock movement simulation. The advantage of the past stock movement simulation with the application of the total enumeration in both reorder stock level and order quantity/order-up-to level assessment is that no initialize values have to be set as well as no smoothing constant has to be optimized. Another advantage is its robustness in term of demand variability as well as in term of demand intermittence. These properties together with the possibility to change the criteria of the performance assessment (for example the profit) determine the past stock movement simulation with the application of the total enumeration in both reorder stock level and order quantity/order-up-to level assessment to be used as the universal approach in the stock management of a large portfolio of items. It is however possible only if the method is significantly accelerated. Therefore, the acceleration of the past stock movement simulation is the next objective of our research team.

Acknowledgement

This paper is the part of the research plan MSM 6046137306.

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Received: 20. 06. 2011
Reviewed: 06. 10. 2011
Approved for publication: 30. 11. 2011

STUDENT BEHAVIOUR AND STUDENT SATISFACTION – A MARKETING APPROACH

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Abstract: *More and more studies are concerned about the younger generation and their role in the society. The increasing interest about their future and perspectives started to shape the economical and social environment. The educational sector is in the middle of these changes. Having to deal with more demands from students, their parents, the lawmakers and other interested parts the universities are facing strong market forces. Educational marketing, as a branch of social marketing, is able to provide tools and strategies capable to address universities' needs. This article aims to use the customer behaviour and customer satisfaction literature to further develop the understanding of student behaviour and student satisfaction. In order to achieve this goal a theoretical background and a survey among two universities from Czech Republic and Romania is provided.*

Keywords: *Marketing, Social Marketing, Educational Marketing, Student Satisfaction, Student Behaviour.*

JEL Classification: *M31,M39.*

Introduction

A recent study conducted by PriecewaterhouseCoopers [12] and presented by Pouchová [11] showed that the youth belonging to generation Y have different characteristics and expectations than previous generations. This new behaviour started to shape the educational market several years ago. As the number of students increased and the fight between the universities for the best of them became fiercer the demands from the educational sector accumulated. The financial crisis added fuel to the fire. Nowadays the governments are trying to cut unnecessary costs while the students are expecting to be treated as customers and to receive latest information and best education. More students mean more watchful parents, more public interest and more media interest. The public interest is changing the political agenda. In the end the university has to deal with opinions and regulations that are coming from many stakeholders. It is often the case that these stakeholders have divergent opinions about a particular topic [15].

One way to resolve this issue is to apply marketing techniques to the educational market. Using customer satisfaction and customer behaviour theories a university can gather relevant information about its stakeholders and, based on this information, can achieve better understanding of the market, therefore, improving its reactions.

The aim of this paper is to use advanced marketing tools in order to describe and understand the behaviour of students enrolled in two EU universities. A summary of the data will provide the framework for the customer behaviour. Comparisons between

relevant groups will underline the impact of social and demographic factors on student behaviour. The most important factors will be correlated with student satisfaction and additional information regarding customer behaviour will be extracted.

1 Theoretical background

The student satisfaction and student behaviour literature is covering a broad range of issues. One of the first and most important problems addressed by the literature is the relation between the university and the student [4] [7]. The traditional way to assume that the student is no more than the information receiver is being questioned. More and more the student it's considered a customer.

Fuelled by massification, expansion and diversification, heterogeneity and increasing competition [8] the student-as-customer approach is an on-going debate that helped to further understand the role of the student in higher education institutions [13]. It led to the development of traditional marketing concepts (like segmentation, marketing-mix, and customer behaviour) for educational sector. It also changed the understanding of other tools used by higher education institutions. This new optic has to take into account the customer definition from Total Quality Management [5].

Relative to student behaviour and student satisfaction several studies revealed different approaches for this topic:

- From the customer compatibility management point of view the student satisfaction can be enhanced by improving student-to-student interactions [9].
- From the behavioural drivers point of view the soon-to-be students seem to have rational, not emotional drivers [3].
- From the students' performance point of view the student satisfaction is not influenced by student performance [10].
- From the perceived quality and perceived price point of view the student satisfaction is influenced by both quality and price, with perceived quality playing a more important role [14].
- From the service satisfaction point of view it has been discovered that student status, race and year of study are influencing the student satisfaction [1].

In most of the cases the literature is focused on all the students enrolled in the higher education but special cases, like the international students, are also considered [2].

2 Research objectives and methodology

In order to further understand and analyse the student behaviour a survey was conducted so that relevant information can be gathered and analysed. The objectives of the study were:

- To determine what are the priorities of the students in relation with the 7 P's of the educational marketing.
- To understand what are the main factors that are influencing the students' satisfaction.

- To check for differences in student satisfaction and student behaviour between different categories of students.
- To check if there are any connections between the students' characteristics and their choice to start a master program.
- To discover the main channels used by students when they need additional information about educational programs.

A questionnaire was developed in order to achieve these objectives. The questions covered the following topics:

- Students' satisfaction with regard to university and faculty.
- Students' plans for their academic future.
- Students' information seeking behaviour.
- Students' characteristics.

The target population is represented by students enrolled in two economic faculties, one in Pardubice, Czech Republic, and the other one in Brasov, Romania.

For the University of Pardubice the target faculty was Faculty of Economics and Administration. There are 1857 students enrolled in the university from which 120 students were selected to participate. Form those 120 only 101 answered therefore the response rate was 84%. The Faculty of Economics and Administration has 3 study programmes: Economic Policy and Administration, System Engineering and Informatics', Economics and management. Using a stratification method the following programmes were included in the sample: Economic Policy and Administration and Economics and management. The data were gathered in the second and third week of the month of April 2011.

For the "Transilvania" University of Brasov, the target was the Faculty of Economic Sciences and Business Administration. There are 10 934 students enrolled in the university from which 120 students were selected to participate. Form those 120 only 110 answered therefore the response rate was 92%. Faculty of Economic Sciences and Business Administration has 8 study programmes: Marketing, The Economics of Commerce, Tourism and Services, Business Administration, Management, International Business, Finance and Banking, Accounting and Management Informatics, Economic Informatics. Using a stratification method the following programmes were included in the sample: Marketing, The Economics of Commerce, Tourism and Services and International Business. The data were gathered in the third and forth week of the month of June 2011.

The SPSS package was used in order to extract information from the data. The main findings were extracted by using independent samples and paired samples t-tests, one way ANOVA, chi square, Fisher's exact test and ordinal regression.

3 Results

Considering the 7P's from the services marketing (product, price, placement, promotion, people, process, physical evidence) the students were asked to split 100 monetary units between these seven categories. It is obvious that the service marketing

approach is the best suitable here as the educational product has all the characteristics of a service. For this question the results were:

Tab. 1: Summary of students' opinion regarding 7P's importance

	N	Minimum	Maximum	Mean	Std. Deviation
Improuving the study program	206	.00	50.00	19.5340	12.38671
Reducing the tuituion	206	.00	70.00	11.7476	14.35761
Improuving the connection with economic enviroment	206	.00	100.00	14.9029	17.12907
Improuving the image	206	.00	50.00	9.1893	7.47406
Improuving the personnel	206	.00	50.00	16.3447	11.25026
Improuving the procedures	206	.00	100.00	14.4709	11.60431
Improuving the facilities	206	.00	90.00	14.8981	12.38505
Valid N (listwise)	206				

Source of data: author

According to students, the most important marketing mix component when it comes to budget is the study program. This policy should receive 19.54% from the budget. The second priority appears to be improving the personnel (16.34%). The other numbers shows that around 14% should help to improve the connection between the university and the economic environment, the procedures and the facilities. 11.74% of the budget should be spent to reduce the tuition. The survey shows that the image, with 9.18%, is the least important marketing mix policy. It's important to point out that even if the educational sector is a standard example for service sector, still the product policy is considered the most important one to be improved. On the other hand, the add-ons to the 4 P's (personnel, procedures and facilities policies) have an important role in marketing mix strategy.

Next step was designed to quantify each student opinion about their satisfaction in relation with the university and the faculty. On a scale from 1 (lowest grade) to 5 (highest grade) the University rating is slightly better than the faculty rating. Also the standard deviation of the university rating is smaller than the one of faculty rating. The skewness for university rating is more than two times bigger than the statistics therefore we can assume that the university ratings are having a long left tail. The skewness and kurtosis for faculty rating are close to zero thus the distributions of the ratings are close to a normal distribution.

Tab. 2: Summary of students' grades for university and faculty

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
University rating	210	3.6238	.74269	-.398	.168	.326	.334
Faculty rating	210	3.5238	.83115	-.177	.168	-.024	.334
Valid N (listwise)	210						

Source of data: author

Using a one sample t-test the difference between the two means is tested:

Tab. 3: T-test for difference of means between faculty and university ratings

	Test Value = 3.6238					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Faculty rating	-1.743	209	.083	-.09999	-.2131	.0131

Source of data: uthor

Because the sig. (2-tailed) is higher than 0.05 it can be assumed with a confidence coefficient of 95% that the difference between the means is not statistically significant.

In order to understand what are the main factors that impact the faculty rating, the students were asked to rate, on a scale from 1 (lowest grade) to 5 (highest grade), the following characteristics of their study programmes: learning conditions, educational programs, professor capabilities, tuition fee and other fees. The model fitting information confirms that at least one of these characteristics has a significant impact on faculty rating.

Tab. 4: Model fitting information for program characteristics impact on student satisfaction

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	491.483			
Final	465.819	25.664	6	.000

Source of data: author

The only important factor which is statistically significant is the professor capabilities. The other factors, even if they are not statistically significant, can be ordered as follows: other fees, leisure opportunities, tuition fee, educational programs and learning conditions (see table 5).

Tab. 5: Parameter estimates for program characteristics impact on student satisfaction

	Std. Error	Sig.	95% Confidence Interval	
			Lower Bound	Upper Bound
[Faculty_rating = 1.00]	1.005	.012	-4.487	-.545
[Faculty_rating = 2.00]	.766	.796	-1.699	1.303
[Faculty_rating = 3.00]	.771	.004	.725	3.747
[Faculty_rating = 4.00]	.823	.000	2.990	6.216
Score_learning_conditions	.149	.760	-.339	.247
Score_educational_programs	.177	.770	-.296	.399
Score_professor_capabilities	.156	.000	.281	.893
Score_leisure_opportunities	.135	.176	-.447	.082
Score_tuition_fee	.130	.425	-.151	.358
Score_other_fee	.121	.099	-.038	.436

Source of data: author

On the other hand, the rankings declared by the students were: other fees, leisure opportunities, tuition fee, learning conditions, professor capabilities and educational programs. There are differences between the ordered logistic regression and the declared rankings.

Tab. 6: Summary of students' rankings regarding program characteristics

	N	Mean	Std. Deviation
Rank for learning conditions	171	3.2281	1.27903
Rank for educational programs	171	2.2515	1.38943
Rank for professor capabilities	170	2.5412	1.52341
Rank for leisure opportunities	170	4.2235	1.39209
Rank for tuition fee	170	3.9941	1.61903
Rank for other fee	170	4.7353	1.47381
Valid N (listwise)	170		

Source of data: author

Furthermore, by using the characterizations variables it is possible to conclude, with a 95% coefficient of confidence that:

- The faculty rating and the university rating are not influenced by the location.
- The ratings for university and faculty are the same among males and females.
- The parents' level of studies does not influence the university and faculty ratings.
- The students' salary expectations after one year and ten years are not influencing the ratings. The expectations for five years are statistically significant when it comes to university and faculty rating. For this test the mean for each characteristic was used to check if there are differences between the students with answers below the mean and the ones with answers above the mean. All the numbers are in Euro.

Tab. 7: Summary of students' expectations for 1y/5y/10y salary

	Minimum	Maximum	Mean	Std. Deviation
Salary_expectations_1y	.00	1224.99	360.1969	209.74653
Salary_expectations_5y	212.11	3266.64	756.3006	395.45754
Salary_expectations_10y	353.52	7306.15	1235.0675	819.78734

Source of data: author

- The university and faculty ratings are the same for working students and non-working ones.

Regarding their future, the majority (76.8%) of the questioned students are considering a master degree program. More than that, 8.5% are also considering a PhD program. The rest of the students, 14.2%, are not interested in a master program. Statistic tests were used in order to link the master interest to student characteristics. The tests showed that the connection between interest in a master degree and location, gender, work or parents studies is not statistically significant.

The next step was aimed to rank the most important factors that a student considers when he/she is choosing a master degree. Five factors were selected: faculty reputation, faculty location, research and study facilities, tuition and other taxes and graduation requirements. The students were asked to rank these factors. The results were:

Tab. 8: Summary of students' opinion regarding factors of influence in choosing a master program

	N	Mean	Std. Deviation
Faculty reputation importance	149	2.6040	1.32959
Faculty location importance	149	3.0067	1.49095
Facilities importance	149	3.3423	1.28280
Taxes importance	149	3.0470	1.47197
Requirements importance	149	3.0000	1.41898
Valid N (listwise)	149		

Source of data: author

The most important factor is research and study facilities. For the questioned students the second important factor is represented by the taxes and other fees. These two are followed by faculty location, graduation requirements and faculty reputation.

Regarding the way the students are researching for their master degree program, 40.4% of the students (70.9% of responses) prefer the web site of the university. Next way to gather additional information is to ask friends and relatives – 31.2% students mentioned that (54.7% of responses). Other ways to gather information about an university is to visit it directly or to check web 2.0 content.

Tab. 8: Summary of students' ways to search for a master degree program

		Responses		Percent of Cases
		N	Percent	
Master_degree_research	Web site visits	127	40.4%	70.9%
	Forums and blogs visits	20	6.4%	11.2%
	University visits	69	22.0%	38.5%
	Friends and relatives	98	31.2%	54.7%
Total		314	100.0%	175.4%

Source of data: author

Conclusion

Originally developed for business market, the customer behaviour and customer satisfaction concepts can find suitable applications in educational marketing. A vast literature is available and, even if some debates are in progress, it is obvious that the educational marketing field has greatly evolved [15].

Taking advantage of these new findings the survey presented in the article is setting the basis for further student related studies in the two universities. It can be concluded

that the two universities have a student satisfaction above average. This is mainly the result of the professor capabilities. For the questioned students the study programs are the first products that need improvement. This is consistent with other available data [6]. This study also showed that demographic and social differences do not imply differences in student satisfaction. Even if the educational product is a perfect example of a service, the students, when it comes to choosing a master program, are taking into consideration physical and monetary aspects like facilities and fees.

This is the first student satisfaction study developed in the two universities. Therefore there are severe limitations regarding the sample representativeness and number of questions. Further research can be focused on improving these aspects while keeping these results as a starting point.

Acknowledgement

This paper is supported by the Sectorial Operational Programme Human Resources Development (SOP HRD), ID59321 financed from the European Social Fund and by the Romanian Government.

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Received: 31. 07. 2011
Reviewed: 26. 11. 2011
Approved for publication: 30. 11. 2011

Appendix 1

Tab. 4: The scenarios with the minimal sum of the total costs for a group of items according to the non-zero demand probability and non-zero demand variance

Stdev $Demand_t > 0$ [Pieces]	Probability $Demand_t > 0$ [%]															
	5-15		>15-25		>25-35		>35-45		>45-55		>55-65		>65-75		>75-85	
	∑TC[€]	Scenario	∑TC[€]	Scenario	∑TC[€]	Scenario	∑TC[€]	Scenario	∑TC[€]	Scenario	∑TC[€]	Scenario	∑TC[€]	Scenario	∑TC[€]	Scenario
0-1	447 348	6	306 346	6	189 774	12	71 138	12	17 632	6	3 702	12				
>1-2	133 852	6	173 631	6	182 150	6	159 140	12	96 196	12	17 472	12	23 269	12	989	6
>2-3	48 542	6	67 962	6	83 791	6	69 312	6	48 957	12	24 871	6	4 170	6	854	6
>3-4	72 146	6	17 336	6	41 827	6	31 097	6	22 531	6	38 205	12	7 418	12	5 077	12
>4-5	11 223	6	13 274	6	47 395	6	45 757	6	40 789	6	15 658	6	17 800	12	2 101	6
>5-6	6 323	6	18 981	6	37 071	6	35 390	6	23 246	6	16 143	12	9 143	6	7 715	12
>6-7	14 745	6	5 140	6	36 878	12	5 056	6	16 285	6	7 985	6	28 394	6	1 917	12
>7-8	11 206	6	87 531	6	40 527	6	31 295	12	42 060	6	26 540	6	18 385	6	9 665	6
>8-9	4 947	6	4 358	6	11 958	6	49 931	6	14 543	6	20 064	12	7 002	12	41	6
>9-10	737	6	1 896	6	404	12	15 861	6	53 933	12	7 731	6	12 371	6	2 169	12

Source of data: authors

Tab. 5: The scenarios 1-5 and 7-11 with the minimal Δ for a group of items according to the non-zero demand probability and non-zero demand variance

Stdev $Demand_t > 0$ [Pieces]	Probability $Demand_t > 0$ [%]															
	15-25		>15-25		>25-35		>35-45		>45-55		>55-65		>65-75		>75-85	
	Δ[%]	Scenario	Δ[%]	Scenario	Δ[%]	Scenario	Δ[%]	Scenario	Δ[%]	Scenario	Δ[%]	Scenario	Δ[%]	Scenario	Δ[%]	Scenario
0-1	15%	3	15%	1	14%	11	5%	9	5%	1	4%	7				
>1-2	19%	1	24%	1	16%	1	12%	11	16%	9	11%	7	2%	11	34%	3
>2-3	26%	1	21%	1	25%	5	11%	1	9%	8	13%	4	10%	8	0%	3
>3-4	60%	7	32%	1	24%	1	18%	2	12%	1	14%	10	10%	4	14%	8
>4-5	34%	7	26%	3	44%	1	46%	1	19%	1	11%	8	5%	2	13%	1
>5-6	13%	1	32%	1	14%	1	43%	3	14%	1	27%	7	20%	7	5%	7
>6-7	71%	1	26%	1	50%	2	14%	5	14%	4	11%	5	8%	11	4%	1
>7-8	42%	3	37%	3	35%	4	24%	3	97%	9	12%	3	15%	3	0%	1
>8-9	63%	1	18%	1	21%	3	40%	5	15%	3	17%	3	17%	5	29%	1
>9-10	38%	1	53%	2	20%	1	2%	3	9%	10	9%	1	20%	5	20%	7

Source of data: authors

ANALYSIS OF THE PRESENT SITUATION IN TOURISM IN TWO EUROPEAN REGIONS: PARDUBICE AND BRASOV

Delia Fratu, Šárka Brychtová

Abstract: *This paper is aimed at analysing the tendencies in tourism over the past ten years in Pardubice and Brasov Regions, observing the differences and similarities and finding some viable solutions for these two Regions to become successful tourism destinations in the future.*

Keywords: *Tourism Trends, Tourism Indicators, Regional Tourism, Marketing of Tourism.*

JEL Classification*: O12.*

Introduction

Tourism, as an important element of the tertiary sector and industry with huge potential, has an increasingly role in the economy of a country, being a factor which the economic growth is based on. The tourism industry finds itself in times of uncertainty. In the past two years, the tourism industry registered a powerful regression, due to the world wide economic crisis. This is clearly reflected in the decline of tourism figures of the period 2008-2010.

This paper has the purpose to asses the tourism trends of the past ten years in two European Regions: Pardubice and Brasov. As Czech Republic and Romania have in common the fact that were both ex-communist countries liberated by communist occupation in 1989, the authors consider a very interesting study to observe the disparities and similarities of the evolution of two tourism areas belonging to these countries over the last ten years, and also to exchange win-win approaches.

1 The Current Situation of Tourism in Pardubice Region

The Czech economy gets a substantial income from tourism. In 2009, the total earnings from tourism reached 104,293 million CZK, representing 2.9% of the country's GDP.

With an area of 4,519 km^2, Pardubice is the fifth smallest region among the regions of Czech Republic and is located in the East of Bohemia. [8]

Pardubice Region has potential for the development of tourism. There are many places fit for bathing, water sports, hiking, cycling and winter sports. Agrotourism is becoming more popular throughout the Region, especially the estates devoted to traditional horse breeding. Cultural establishments and activities in the Region are concentrated mostly in towns. Among the most important, there can be mentioned: the Puppet Museum in the Chrudim District; state chateau in Slatiňany with its horse museum and the open-air folk museum and adjacent localities of Hlinsko area. In the Pardubice District, the main attractions are: the Castle of Pardubice; the late-Gothic

castle at Kunětická hora mountain and the Museum of Africa in the town of Holice. In the Svitavy District, the main attraction is the Svojanov castle. The National Stud Farm in Kladruby nad Labem attracts more tourists every year because it organizes regular sightseeing tours and also various actions for horse lovers too. [8]

Regarding sports activities, beside the famous ice hockey matches, here is also organized Czech Republic's Tennis Championship for young competitors, which opens professional careers for the talented youth. Regarding cultural events, Pardubice Region is host of many festivals such as classical music or comedy. [8]

In order to have a current overview on tourism in Pardubice Region, the authors decided to analyse the evolution of the following indicators for the period 2000-2009: the occupancy rate, the number of guests and the number of overnight stays in collective accommodation establishments. The occupancy rate is an economic indicator that shows the balance between the offer and the demand in the tourism sector. It is calculated by dividing the number of overnight stays at the number of beds multiplied with the number of days in a year. The sintagm "number of guests" refers to the persons which used the services of an accomodation establishment for their temporary stay. Number of overnight stays refers to the the number of overnight stays of guest at an accommodation establishment in an observed period.[2]

Also, the capacity of collective accommodation establishments will be analyzed by comparing it to the other regions of Czech Republic. A collective accomodation establishment is an establishment with at least five rooms or ten beds used for the purpose of tourism that is offering temporary accommodation to guests.[2]

2 Methodology

The statistical data used for the analysis is collected from the official statistical web-sites corresponding to the two Regions.

For Pardubice Region, according to the Czech Statistical Office, data on guests at collective tourist accommodation establishments are based on the regular sample survey organized by the CZSO. Until 2002 the collective accommodation establishments were included in the survey on the basis of a random 30% selection from the Register of accommodation establishments. A monthly obligation to report was set for the respondents and results were published quarterly. Since 2003 the survey covers all collective establishments on the basis of area sampling. The survey is divided into a monthly survey, which covers selected units and quarterly survey covering the rest of the collective accommodation establishments. Data on guests is the total of processed data from submitted reports and imputed data of accommodation establishments that failed to report. Data on the capacity of accommodation establishments were obtained from the annual statistical survey in collective accommodation establishments serving tourism to 2007. The survey was based on the use of the Register of accommodation establishments; results are then retrospectively used for its actualisation. The survey covered all collective establishments on the basis of area sampling and reported state to 31 December or to the last day they offered accommodation in the given year. Until 2002 the units reported the state to 31 December. Published data is the total of processed data from submitted reports and

data for those accommodation establishments that failed to report. In these cases, information on capacity was taken from the register of accommodation establishments, which is continually updated using the results of the survey and administrative sources available. Since 2008 the sources of information are questionnaires on Guests at collective accommodation establishments.[8]

For Brasov Region, according to the National Institute of Statistics, the statistical research regarding the usage of the accomodation establishments has been done on a monthly basis, starting with January 2002, since that date being developed on a trimestrial basis. Each trimester are realized statistical researches regarding the activity of tourism agencies and all other tourism operators. The methods of collecting the data are the same as presented above for Pardubice Region, and are similar in all the countries of the European Union.[9]

Indicators used in statistics in economy

The authors considered the following two indicators to be used in the analysis.

The average growth rhythm (R) indicates the average level of increase or decrease of the analysed phaenomena from one period to another, during the considered time series. [3] The average growth rhythm (R) is calculated with the following formula:

R= I-1

The dynamics index (I) indicates how many times the level of the analysed phaenomena did modify, from one term to another, during the considered time series.[3]

I= the dynamics index calculated after the formula: I=n-1√yn/y1
n= number of terms within the time series
y1= the first term of the time series
yn= the last term of the time series

The average growth (Δ) shows the number of units with which an analysed indicator has decrease or increased in a period of time.[3]

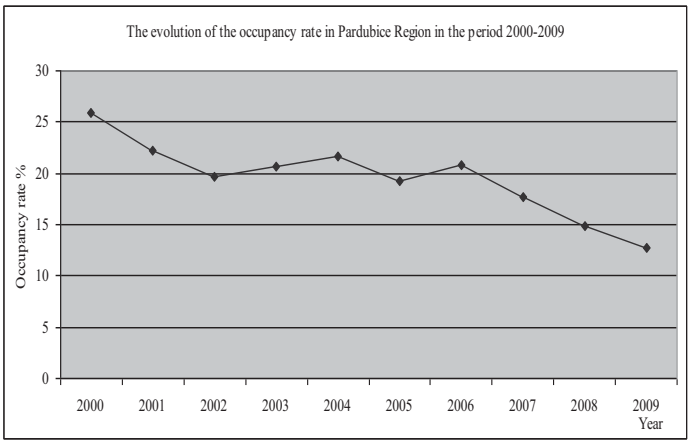
Tab. 1:The occupancy rate in collective accommodation establishments in Pardubice Region between 2000 and 2009

Year	Occupancy rate
2000	25,9
2001	22,2
2002	19,6
2003	20,6
2004	21,6
2005	19,3
2006	20,8
2007	17,7
2008	14,8
2009	12,7
R(%)	-0,076

Source of data: one's own according, data from http://www.czso.cz/eng/redakce.nsf/i/cru_ts

In the period 2000-2009, the occupancy rate in collective accommodation establishments in Pardubice Region has decreased, in average, with 0.07%.

Fig. 1: The evolution of the occupancy rate in collective accommodation establishments in Pardubice Region, between 2000 and 2009



Source of data: one's own according, data from http://www.czso.cz/eng/redakce.nsf/i/cru_ts

Analysing the tendencies in tourism regarding the occupancy rate, we can notice an overall descending trend between 2000 and 2009 in Pardubice Region, although there were some small oscillations. The line's gradient is small proving that the decreasing rhythm is slow. Comparing the initial value- corresponding to year 2000, with the last value-corresponding to year 2009 of the analysed period, we can observe that the occupancy rate in collective accommodation establishments has decreased.

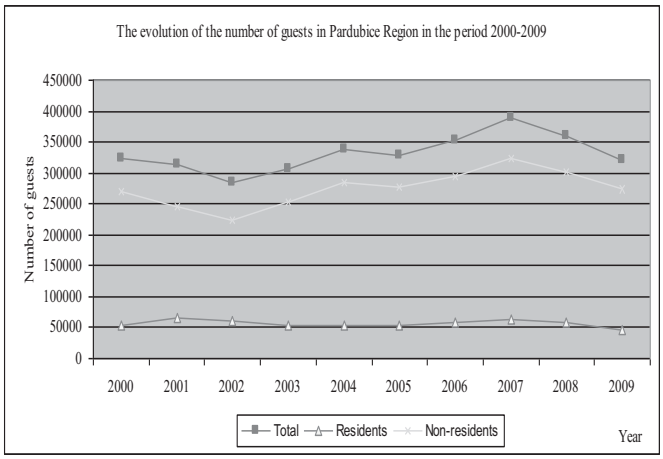
Tab. 2: Number of guests in Pardubice Region between 2000 and 2009

Year	Total	Residents	Non-residents
2000	322987	53060	269927
2001	312970	66544	246426
2002	284249	61308	222941
2003	307180	53535	253645
2004	338289	53012	285277
2005	329395	52749	276646
2006	353089	58586	294503
2007	388240	63724	324516
2008	360903	58742	302161
2009	320972	46503	274469
R (%)	-0,0007	-0,0145	0,0019
Δ (units)	-2015	-6557	4542

Source of data: one's own according, data from http://www.czso.cz/eng/redakce.nsf/i/cru_ts

In the period 2000-2009, the total number of guests has decreased on average with 0.007% per year, representing 2015 guests per year. The number of resident guests has decreased on average with 0.0145% per year representing 6557 guests per year, while the number of non-resident guests has increased with 0.0019% per year representing 4542 guests per year.

Fig. 2: The evolution of the number of guests in Pardubice Region, between 2000 and 2009



Source of data: one's own according, data from http://www.czso.cz/eng/redakce.nsf/i/cru_ts

Analysing the tendencies in tourism regarding the number of guests, we can observe that the trends of the total number of guests and of non-resident guests are very similar. The trends are oscillating, being characterised by both decreases and increases: between 2000 and 2002 the trends are slightly descending, between 2002 and 2007 the trends are overall ascending, and between 2007 and 2009 the trends are descending. All the lines' gradients are small representing, by case, a slow rhythm of decrease or increase. Comparing the first value (year 2000) with the last value of the analysed period (year 2009) we can observe that the number of total guests is at almost the same values and the number of non-resident guests has slightly increased. The trend of the resident guests is almost constant. Comparing the first value corresponding to year 2000 with the last value, corresponding to year 2009, of the analysed period, we can notice that the number of resident guests has slightly decreased.

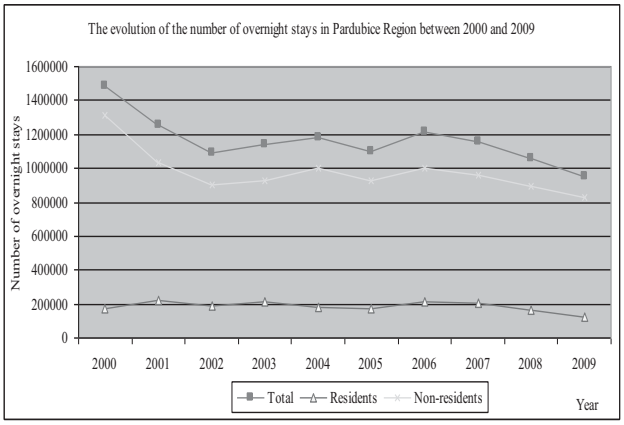
Tab. 3: Number of overnight stays in Pardubice Region between 2000 and 2009

Year	Total	Residents	Non-residents
2000	1482810	169290	1313520
2001	1254794	222919	1031875
2002	1093076	189157	903919
2003	1141537	211343	930194
2004	1183881	183911	999970
2005	1097031	173258	923773
2006	1212023	209987	1002036
2007	1159879	202476	957403
2008	1059064	166844	892220
2009	954211	122057	832154
R (%)	-0,0478	-0,0357	-0,0495
Δ (units)	-528599	-47233	-481366

Source of data: one's own according, data from http://www.czso.cz/eng/redakce.nsf/i/cru_ts

In the period 2000-2009, the total number of overnight stays has decreased on average with 0.047% per year, representing 528599 fewer nights spent per year. The number of overnight stays spent by resident tourists has decreased on average with 0.0357, while the number of overnight stays spent by non-resident tourists has decreased with 0.0495% per year.

Fig. 3: Evolution of overnight stays in Pardubice Region between 2000 and 2009



Source of data: one's own according, data from http://www.czso.cz/eng/redakce.nsf/i/cru_ts

Analysing the tendencies in tourism regarding the evolution of overnight stays, we can observe that although they have different values, the evolutions of the total number of tourists, and of non-resident tourists have very similar evolutions. The trends are oscillating: between 2000 and 2002 the trends are descending, between 2002 and 2006 the trends are slightly increasing, while the period 2006-2009 is characterised by a decrease. All the lines' gradients are small representing, by case, a slow rhythm of decrease or increase.

Comparing the value corresponding to year 2000 with the value corresponding to year 2009 we can observe that the total number of overnight stays and of the number of non-resident tourists' overnight stays has decreased.

The trend of the resident guests is almost constant. Comparing the first value corresponding to year 2000 with the last value, corresponding to year 2009, of the analysed period, we can notice that the number of resident guests has slightly decreased.

Observing the evolution of the three analysed tourism indicators in the period 2000-2009, we can conclude the following:

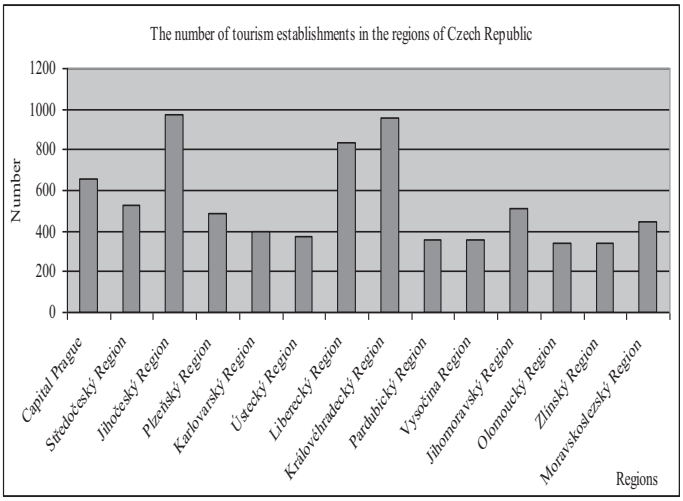
- The occupancy rate in collective accommodation establishments in Pardubice Region has decreased.
- Although having oscillating trends, the total number of guests has reached in 2009 almost the same value as in 2000 and the number of non-resident guests has slightly decreased. The number of non-resident guests had an almost constant trend and it has slightly decreased.

- The number of total overnight stays and the number of non-resident's overnight stays had also oscillating trends, but overall they have decreased. The number of non-resident's overnight stays had an almost constant trend and overall it has slightly decreased.

From the figures presented in the tables above we can notice that the number of tourists that visited Pardubice Region is quite modest. Although Pardubice Region has potential for tourism, the fact that even these modest numbers have decreased is a preoccupying issue. In 2008, the first signs of the worldwide economic crisis began which had devastating effects over the tourism industry, this explaining the decrease from 2008-2009 period. But what about the modest increases and even decreases of tourist numbers from previous years?

One of the facts that explain this region's low attendance is that it has a very low number of accommodation facilities. Figure 4 shows the position of Pardubice Region among the other regions of Czech Republic, regarding the number of tourism establishments.

Fig. 4: The number of tourism establishments in the regions of Czech Republic, in 2009



Source of data: one's own according, data from http://www.czso.cz/eng/redakce.nsf/i/cru_ts

In Figure 4, we can see that number of tourism establishments in Pardubice Region is very low. Pardubice occupies place number 3 in the regions with the lowest number of establishments.

Other reasons for which Pardubice Region has a low number of tourists are that the development of the infrastructure is incomplete, the tourism services have a doubtful quality, promotional materials, although existing, do not have the expected impact and promotional initiatives are missing. The persons working in tourism are not as well prepared as they should be; tourism operators are not very involved nor interested in cooperating to develop the area. Also the Officials are not interested to invest in this area's tourism.

Although belonging to another European country- Romania, in a very similar situation of Pardubice Region find itself Brasov Region. For the following, the authors propose an assessment of tourism in Brasov Region in order to observe differences and similarities, to exchange experience and find some viable solutions.

3 The Current Situation of Tourism in Brasov Region

Romania is a country located at the crossroads of Central and South-eastern Europe, north of the Balkan Peninsula, on the Lower Danube, within and outside the Carpathian arch, bordering on the Black Sea. [1]

Braşov Region is a county of Romania, with the capital city at Braşov. The county has a total area of 5,363 km². Being situated in the centre of the country, in the famous Transylvanian area, Brasov County is one of the most visited Regions of Romania. The multitude of influences that had an impact on the Region's development and culture make of it a very interesting destination for tourists. In Braşov Region, tourists can find some of the most attractive tourist destinations in Romania such as: the city of Braşov- a very beautiful medieval city, probably the most beautiful city of Romania, with a lot of points of interest; Poiana Braşov and Predeal mountain resorts; Bran village with its castle often referred to as Dracula's castle; the Făgăraş Mountains- the highest mountains from Romania; the medieval fortresses of Făgăraş and Râşnov; the Fortified Churches from the Saxon villages and the National Park "Piatra Craiului" which is one of Romania's protected natural reservations. From hiking, walking, animal watching, cycling, playing tennis, swimming, to extreme sports like bungee-jumping, skydiving, paragliding during summer and skiing, snowboarding, ice-skating in winter, Brasov Region is the place for sports activities. Regarding cultural events, Brasov Region is host of many manifestations such as modern music, classical music, opera, theatre, art galleries, and concerts.[1]

In order to assess tourism in Brasov Region and to be able to make a comparison with Pardubice Region, the same indicators will be analysed: occupancy rate, number of guests and number of overnight stays.

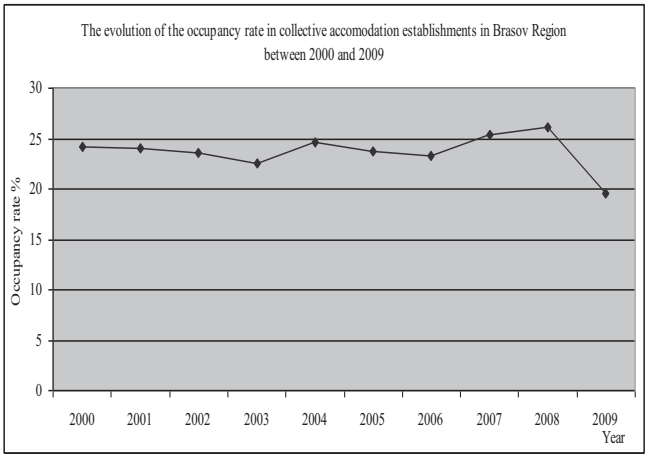
Tab. 4: The occupancy rate in collective accommodation establishments in Brasov Region in the period 2000-2009

Year	Occupancy rate %
2000	24,2
2001	24,1
2002	23,6
2003	22,6
2004	24,6
2005	23,7
2006	23,3
2007	25,3
2008	26,1
2009	19,6
R (%)	-0.023

Source of data: one's own according, data from http://www.brasov.insse.ro/main.php?id=439

In the period 2000-2009, the occupancy rate in collective accommodation establishments in Brasov Region has decreased on average with 0.023% per year.

Fig. 5: The evolution of the occupancy rate in collective accommodation establishments in Brasov Region, between 2000 and 2009



Source: one's own according, data from http://www.brasov.insse.ro/main.php?id=43]

Analysing the tendencies in tourism regarding the occupancy rate, we can notice that the trend is oscillating: between 2000 and 2008 the trend is almost constant overall, only with minor modifications, while in the period 2008-2009 the trend is descending. The line's gradient corresponding to the period 2008-2009 is big representing an accelerating decreasing rhythm. Comparing the value corresponding to year 2000 with the value corresponding to year 2009, we can observe that the occupancy rate has decreased.

Tab. 5: Number of guests in Brasov Region between 2000 and 2009

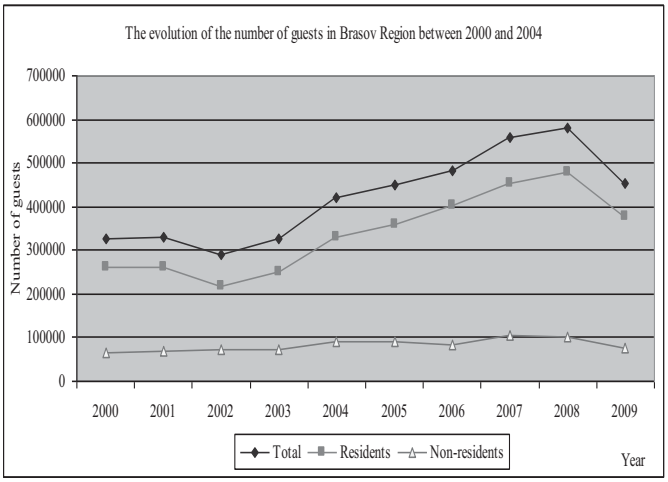
Year	Total	Residents	Non-residents
2000	326400	260038	66328
2001	328300	260014	68289
2002	290300	219145	71175
2003	324800	251070	73746
2004	421800	329511	92254
2005	448100	359259	88888
2006	484000	401307	82737
2007	556800	452586	104230
2008	582000	480422	101561
2009	451700	376716	74967
R (%)	0.0368	0.0420	0.0137
Δ (units)	125300	116678	8639

Source of data: one's own according, data from http://www.brasov.insse.ro/main.php?id=439

The total number of guests has increased on average with 0.036% per year representing 125300 guests per year. Both the number of resident and non-resident

guests have increased, with 0.042%, respectively with 0.013% per year, representing 116678 resident guests per year and 8639 non-resident guests per year.

Fig. 6: The evolution of the number of guests in Brasov Region in the period 2000-2009



Source of data: one's own according, data from http://www.brasov.insse.ro/main.php?id=439

Analysing the graph above, we can observe that although having different values, the total number of guests and the number of residents guests, had very similar evolutions. The trends are oscillating being characterised by both increases and decreases as it follows: between 2000 and 2002 the trends are descending, between 2002 and 2008 the trends are ascending and between 2008 and 2009 the trends are again descending.

The lines' gradients corresponding to the periods 2000-2002 and 2008-2009 are relatively small representing slow decreasing rhythms. The line's gradient corresponding to the period 2002-2008 is big representing an accelerate increasing rhythm.

Comparing the value corresponding to year 2000 with the value corresponding to year 2009, we can observe an increase in the number of total guests and also of resident ones.

The number of non-resident guests had an almost constant evolution during the analysed period. Comparing the value of year 2000 with the value of year 2009, we can observe a slight increase.

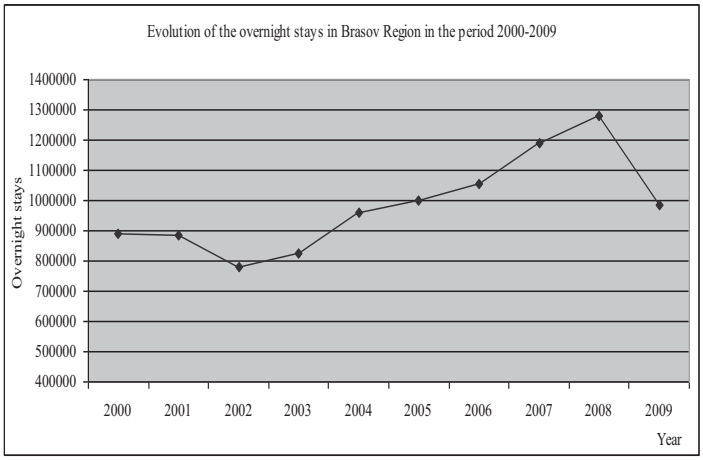
Tab. 6: Number of overnight stays in Brasov Region in the period 2000-2009

Year	Total
2000	890700
2001	884600
2002	779300
2003	823300
2004	960800
2005	1000300
2006	1054900
2007	1191500
2008	1279600
2009	985000
R (%)	0.0112
Δ (units)	94300

Source of data: one's own according, data from http://www.brasov.insse.ro/main.php?id=439

The number of overnight stays has increased in the analysed period, on average with 0.011% per year representing 94300 overnight stays per year.

Fig. 7: Evolution of the number of overnights stays in Brasov Region in the period 2000-2009



Source of data: one's own according, data from http://www.brasov.insse.ro/main.php?id=439

From the above graph, we can observe that the number of overnight stays had an oscillating evolution: between 2000 and 2002 the trend is descending, between 2002 and 2008 the trend is ascending, between 2008 and 2009 the trend is descending.

The line's gradient corresponding to the period 2000-2002 it is small representing a low decrease rhythm, while the lines' gradients corresponding to the periods 2002-2008 and 2008-2009 they are big representing accelerated rhythms of increase, respectively decrease.

From the analysis of the three indicators for the period 2000-2009 for Brasov Region, we can conclude the following:

- The occupancy rate in collective accommodation establishments has decreased.
- Although having oscillating trends, overall the total number of guests has increased and both the number of resident and non-resident guests have increased.
- The number of overnight stays had also an oscillating trend but overall it has increased.

From the above analysis we can observe that the period 2008-2009 was a bad period for tourism, which is due to the worldwide economic crisis.

In the period 2000-2008 we can observe a significant growth in the number of both guests and overnight stays. That is because of the fact that Brasov Region has considerably developed over the past years as a tourism destination. The reconstruction of old buildings, the improvement of the infrastructure within the city, the new indicators for tourism objectives, the parks with lots of flowers, all these contributed to the development of tourism. The presence of the worldwide known Dracula's castle in the Region attracted a lot of tourists. The last tendencies towards nature tourism, rural tourism and agro-tourism made Brasov Region a very popular one. Also the fact that Romania entered the European Union in 2007 was a great opportunity to develop tourism. Many people had access to European funds with the opportunity to develop their own businesses in tourism industry.

Although Brasov Region has a remarkable potential, it is not valued properly. In the past years lots of things were improved but there still is a lot to do. The lacks at the country's infrastructure (the national road from the country's border to Brasov county is awful, the trains are extremely slow and very old, the busses are also very old and uncomfortable), the lack of qualified people working in tourism, the inexistence of a proper promotional campaign and of promotional materials, the very expensive services and their doubtful quality, all these still existing problems keep many tourists away.

4 Similarities and differences between Pardubice Region and Brasov Region

Pardubice Region and Brasov Region are two European Regions with high perspectives for development in the tourism industry. If comparing the figures during the last ten years, we can observe that the occupancy rate, the number of guests and of overnight stays are quite close for the two Regions, maybe Brasov Region has, overall, higher figures.

Brasov Region has a bigger potential, from the tourism perspective, because it has a diversified landscape and it offers the possibility of practicing many forms of tourism. For example, agro tourism and rural tourism are yet unexploited forms of tourism which can have a high success and attract many tourists. Pardubice doesn't have such a potential for developing rural tourism, maybe just at the border of the Region.

Analysing the tendencies in tourism of both Regions over the past ten years we can notice that in Pardubice the figures are decreasing while in Brasov the figures have increased considerably (beside the economic crisis period when in both Regions the figures have decreased). The explanation would be that Brasov Region has developed as a tourism destination in the past years and that is reflected in the increasing figures. Both Regions have yet a lot to improve: the infrastructure, the quality of services, offering value for money, encouraging only trained personnel, motivating operators in tourism to cooperate and participate at the improvement of the Regions, investing in promotion. Brasov Regions has a lot of lacks at promotion. Beside the total lack of promotional materials, promotional initiatives are missing. There have been one or two promotional campaigns which no one heard about, although the ideas were quite good. Pardubice Region has a lot of promotional materials. The problem is that the impact of these promotional materials is not as expected maybe because there are distributed only locally and do not cover a bigger area. In Pardubice Region promotional initiatives are also missing.

Regarding the occupancy rate in collective accommodation establishments, we can notice that in Brasov Region, it has decreased on average with 0.023% per year, with approximately 0.05% less than the occupancy rate in Pardubice Region; comparing the trends we can conclude that the trend corresponding to the occupancy rate for Brasov Region is relatively constant by the level of year 2007 and then it becomes descending, while in Pardubice Region the trend is overall descending.

While in Brasov Region the total number of guests, and both resident and non-resident guest numbers have increased, in medium per year, but with a very modest percent (0.036%), in Pardubice Region the number of total guests and resident guests has decreased, while the number of non-resident guests has very modestly increased.

Comparing the tendencies in tourism regarding the evolution of the total number of overnight stays, in Brasov Region the number of overnight stays has slightly increased on average, while in Pardubice Region it has slightly decreased. Having this overview over the situation in tourism in these two Regions, the authors propose some solutions with the purpose of developing the Regions as tourism destinations.

Conclusion

The existence of a valuable tourism patrimony doesn't automatically lead to a profitable tourism, unless it is accompanied by proper services, in order to make it accessible to tourists and highlight it.

In order to make Pardubice Region and Brasov Region more successful tourism destinations in the future, it should be developed a qualitative destination management. Managers from the main categories of stakeholders (suppliers, public sector, tour operators, investors, and travel agents) should work together towards a qualitative destination management.

In the authors' opinion, this can be achieved first of all with the help of local authorities which could do more in supporting tourism. Investments in infrastructure and helping the small operators (for example pension owners) in order to overcome phenomena such as seasonality is required. We can consider the example of Austria

where the authorities support seasonality in ski resorts by reducing the taxes during summer so the pension owners aren't obliged to practice very high prices during the peak season in order to cover their expenses over the year. Also, the authorities should invest and encourage other investments in promotional materials, in order to be offered for free.

Tourism suppliers, in theses particular cases the small business owners, should concentrate in offering high quality services, in understanding each client's needs and in emphasizing on that, in having long term goals. A satisfied client is very valuable both on short and long term because he will surely come back whenever the occasion will arise and also he will "promote" the destination to his relatives and friends.

Tour operators and travel agents should emphasize more in promoting and selling local tourism packages. They also posses a lot of information about what tourists like and dislike at the area so they can work together in order to come out with some solutions for promotional materials and even campaigns.

Investors should be interested not only in their own benefit but also in helping the durable development of the area. All operators in tourism should work together towards durable tourism, friendly-environment tourism in order to preserve the natural patrimony and the cultural and religious inheritance.

Regarding the marketing mix, tourism suppliers and tour operators should offer value for money, keeping the balance between quality and price. Also they should make sure that the tourism product is as promised. The distribution of the local tourism products should be extended nationally and internationally for both Regions- a good opportunity is represented by tourism fairs. Proper promotion campaigns and materials should be developed. These materials should contain information about the area (access, what to visit, places to stay and eat, a map with the main attractions), about the leisure activities such as sports and about different kinds of events. Also, both Regions should have specialized web-sites where the tourists can find all the information that they need.

Both Pardubice and Brasov Regions have a rich history and culture. A good idea would be to highlight what they have special and unique such as traditions, habits, to find alternative forms of tourism. For example, in Brasov Region agro-tourism and rural tourism are unexploited forms of tourism with high perspectives to develop. Taking into account the last tendencies towards nature tourism, active tourism and discovering new places, Brasov Region has real chances to develop much more in the years to come. Pardubice Region has a tradition in horses and horse races, why not to exploit that? Or the hockey matches? Event tourism! And once tourists come to Pardubice they have the opportunity to discover many other beauties!

Acknowledgment

The authors want to express their gratitude to Pardubice University from Czech Republic and Transylvania University from Romania. The authors are most grateful to Pardubice and Brasov Regional Councils for their opening to collaborative work, in this way, contributing to the future development of tourism in the two Regions. This

paper is supported by the Sectorial Operational Programme Human Resources Development (SOP HRD), ID59321 financed from the European Social Fund and by the Romanian Government.

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Received: 29. 04. 2011
Reviewed: 09. 06. 2011
Approved for publication: 09. 08. 2011

REA VALUE CHAIN AND SUPPLY CHAIN

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Abstract: *Value chain model is a network of business processes that are bound by inflows and outflows resources. Resource Event Agent (REA) is an enterprise domain ontology based on value modeling perspective of business processes. REA value chain is a sequence of REA models (processes) utilizing the REA ontology that are interweaved into the chain by resource flows among them. Contrary to, supply chain is the entire network of enterprises involved in providing a particular product or service to an end customer. The paper focuses on finding common properties between supply chain and value chain, especially REA value chain and possibilities of REA ontology to be used to model supply chain. After describing the basic fundaments of the REA ontology, REA value chain and supply chain, the paper deals with the examining the principal aspects of the REA value chain that would bring closer and stronger bonds between the REA value chain and supply chain. In this way, the REA ontology can be potentially utilized as an integration of a value chain and a supply chain concept. Achieved findings and results are discussed and illustrated in accompanied figures.*

Keywords: *Value Modeling Business Ontology, REA Ontology, Value Chain, Supply Chain.*

JEL Classification: *L15, L23, M11, O22.*

Introduction

Enterprise Resource Planning (ERP) systems, in which data is classified using system of accounts, are rooted in the double-booking entry paradigm. Despite their success, the underlying paradigm they are built upon ensures that they have limitations. Value modeling business ontologies provide a different view on the topic. These ontologies are dealing with business process modeling with a special focus on resource control and value flows. Some of these ontologies may also include property rights modeling. Currently, they are represented by e^3-value ontology [6] and the REA ontology (Resources, Events, Agents) for enterprise processes [4].

The e^3-value ontology stipulates that the actors exchange value objects by means of value activities. The value activity should yield profit for the actor. Deeper insight in e^3-value modeling in e.g. [6] shows that this method only covers exchange and trade processes but leaves out production and conversion processes. The state-of-the-art e^3-value model only focuses on operational level (what has happened) but not on management policies (what could or should happen).

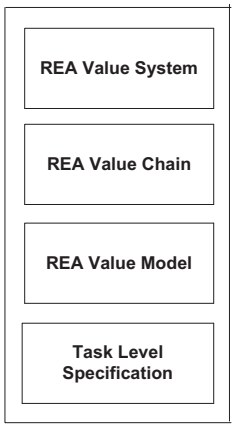
Object of our interest is the REA ontology, because it links together business process modeling with the underlying economic phenomena. REA ontology benefits from the presence of a semantic and application independent data model, an object oriented perspective, and abstraction from technical and implementation details. In addition to other aspects, it offers full traceability of all activities that influence the

value of the enterprise's resources. This enables the possibility to calculate the value of the enterprise's resources on demand. The ontology uses five specific concepts to create a model: *economic resource*, *economic agent*, *economic event*, *commitment* and *contract*. Further more, the REA ontology contains rules for formulating well-formed models of enterprise processes. The goal of economic agent's processes is to increase the value of its economic resources. All well formed REA models obey a fundamental rule, that there is no increase of the resource value for free, that is, every increase of a resource value is for an economic agent always paired with some decrease of the value of some of its resources. This fundamental feature of every REA model is that it answers the question why an enterprise performs a given activity, that is, why the economic events occur.

1 REA Enterprise Ontology

By [4] the REA ontology is described as a three-level architecture consisting of the *REA value chain*, *REA value model* and *Task level specification*. However, in some publications e.g. [8] the REA ontology is presented as a four level architecture, see Fig. 1. The fourth level creates the most upper level that is called *REA value system.* This level focuses on the resources that are exchanged between the enterprise and its various external business partners such as suppliers, creditors/investors, customers, and employees. In this context, the top level (REA value system) is much closer to the supply chain concept.

Fig. 1: REA four-level architecture



Source of data: [8]

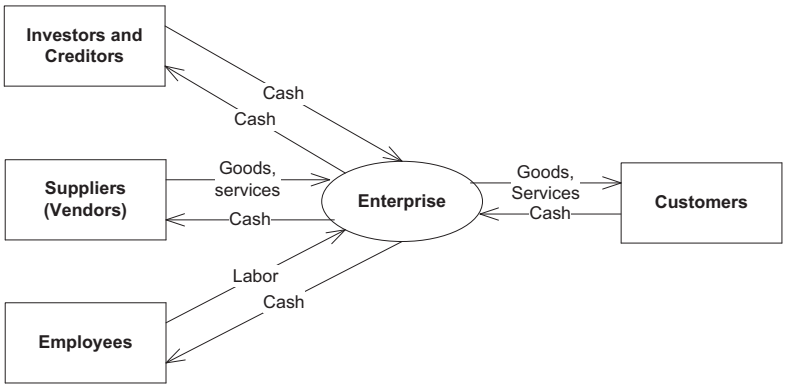
The *REA value chain level* focuses on the resource flows between interconnected business processes and on the economic events that accomplish the resource flows. The *REA value model level* represents a business process level and focuses on one or more transaction cycles in the enterprise's value chain. A *task level* addresses itself to the individual steps involved in accomplishing events in an enterprise. Tasks are

activities that may be changed or eliminated and therefore should not serve as foundational elements in enterprise information systems.

1.1 REA Value System

REA value system clearly identifies external business partners and the resources that are exchanged among them. Fig. 2 describes typical REA value system in an enterprise. As can be seen from the figure, external business partners for the company are: *Investors* and *Creditors*, *Suppliers (Vendors), Employees* and *Customers*. There are resources such as *cash*, *goods* and *services*, *labor* that are exchanged between the enterprise and its business partners. This model level illustrates only exchange processes. Conversion processes remain hidden inside the company. (REA ontology distinguishes only these two kinds of business processes - exchange and conversional process). Between the enterprise and each of its business partners there are two ways of resource flows, inside and outside modeled concepts, in the same way as in supply chain.

Fig. 2: REA value system



Source of data: [8]

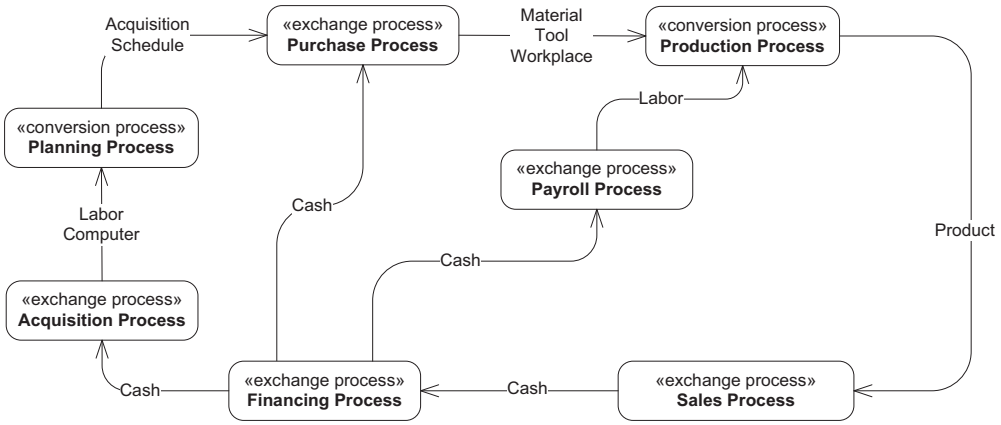
1.2 REA Value Chain Model

A value chain concept, developed and introduced by Michael Porter [10] can be arranged as a series of input-output business processes with resource flows between them, see [8]. A fundamental notion in value chain analysis is that a product gains value as it passes through a stream of production within the chain in an enterprise. If a resource flow is created by REA resources and business processes are modeled by the REA value models, we can speak about REA value chain. REA value chain is a network of business processes whose purpose is to directly or indirectly contribute to the creation of the desired features of the final product or service, and to exchange it with other economic agents for a resource that has a greater value for the enterprise [3]. While the business processes are in the REA ontology stick together by the *duality relationships* (see chapter 2.3), the value chain models are weaved by resource inflow and outflow relationships. Studying a value chain construction in a detail way, we can find out that only the flow of resources is carried out at the operational levels of the

REA process models. The resource flows thus create a firm frame of the REA value chain model. Fig. 3 shows resource value flows in the REA value chain model. The REA value chain provides overall view of the modeling domain. It can be also used for consistency checking. The REA value system depicted in Fig. 2, is transformed into REA value chain, illustrated in Fig. 3, in the following way:

- *Financing Process* expresses relation between *Investors* and *Creditors* and the *Enterprise*.
- *Purchase Process* describes relation between *Suppliers (Vendors)* and *Enterprise.*

Fig. 3: REA value chain model



Source of data: authors

- *Payroll Process represents relation between Employees and the Company.*
- *Sales Process illustrates relation between the Enterprise and Customers.*
- *Production Process is a conversion process inside the company.*

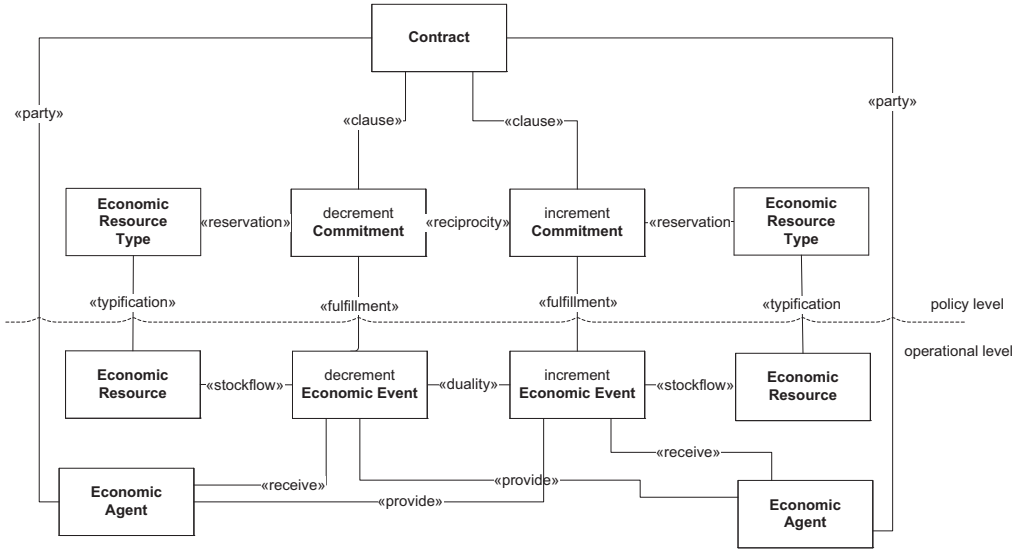
The REA value chain model also describes managing processes e.g. *Planning process* that is closely connected with the *Acquisition process*. The aim of the *Planning process* is to create *Acquisition schedule* that precisely specifies the needs of the *Purchase process* which ensures material, tool and workplace for ensuing *Production process*. *Acquisition process* is needed for arranging skillful labor and computer that are necessary resources for *Planning process*.

1.3 REA Value Model

The REA value model represents a model of a business process and creates a fundamental view provided by the REA ontology. This value model is further specified as an exchange or conversion. While the REA exchange process models exchange property rights of the economic, the REA conversion process models conversion of resources to another kind. The REA value model is basically composed of two levels, the *operational level* which deals with activities within the period of past and near present time and the *policy level* which deals with activities within the period of future time, especially those activities that should, could and must happen.

The operational level creates three kinds of entities, an economic resource, an economic event and an economic agent. An *Economic Resource* is a thing of given value that is scarce, and has utility for economic agents. In business applications, economic resources are changed or converted for another economic resource. Examples of economic resources are products and services, money, raw materials, and labor. An *Economic Agent* is an individual or organization capable of having control over economic resources, and transferring or receiving the control to or from other individuals or organizations. Examples of economic agents are customers, employees, vendors, and enterprises. An *Economic Event* represents either an increment or a decrement in the value of economic resources that are under the control of the enterprise. Some economic events occur instantaneously, such as the sale of goods; some occur over time, such as rentals, labor acquisition, and the provision and use of services. Apart from entities, the REA value model declares relationships between both different entities and between entities of the same type. The most important of these relationships is the duality relationship that links decrement events with an increment event.

Fig. 4: REA value model – exchange process



Source of data: [9]

The policy level of the REA exchange value model is created by a *contract*, *commitment*, *resource type*, *event type* and *agent type*. The *Commitment* is a promise or obligation of economic agents to perform an economic event in the future. Examples of commitments in exchange processes represent obligations of economic agents to provide or receive rights to economic resources. Each commitment is related to an economic event by the fulfillment relationship. Decrement commitments relate to increment commitments by the reciprocity relationship and bear resemblance to the duality relationship among different events. A contract is a series of things or activities that should be done during a given time interval. More specially, a contract is

a collection of increment and decrement commitments. Examples of contracts are sales orders, purchase orders and contracts for providing various services.

Typification semantic abstraction is utilized between the policy and the operational level of the REA model; see [5]. The main use of this semantic abstraction is in defining constraints and guidelines. It may be also used for the categorization of physical entities. The typification relationship that relates category items at the policy level to physical items at the operational level is a very powerful tool for business process modeling. Examples of this relation are links between the resource type and resource.

Reciprocity relationship interconnected with duality relationship creates in this way the transaction pattern described by [7] as a core of business processes. Fig. 4 illustrates general exchange process that corresponds to one of the *exchange processes* in Fig. 3.

2 Supply Chain

Supply chain is the entire network of enterprises (e.g., retailers, wholesalers and transportation firms) involved in providing a particular product or service to an end customer by [8]. Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to the end customer. Supply Chain Management (SCM) emerged in the 1980s as a new integrative philosophy to manage the total flow of goods from suppliers to the ultimate user [2]. The essence of this approach was the management of a chain of supply as though it was a single entity with the primary objective of fixing the suboptimal deployment of inventory and capacity [12].

The value chain, also known as value chain analysis, is a concept from business management that was first described and popularized by Michael Porter. It is a chain of activities for an enterprise operating in a specific industry. That is why it is said that supply chains link value chains. Porter's value chain is a tool and conceptual framework for examining and diagnosing the competitive advantage of a company. Although very useful as a modeling technique for business systems, the original purpose of Porter's value chain was not to design software business applications. This concept divides processes of the enterprise into *core business processes* that add value to the end products of the enterprise, and *support processes* that enable the core processes and add value indirectly. In fact, every process adds value (otherwise a rational enterprise would not have it), and the result of analysis should be a complete model expressing how every process contributes to the complete chain.

3 REA Value Chain and Supply Chain

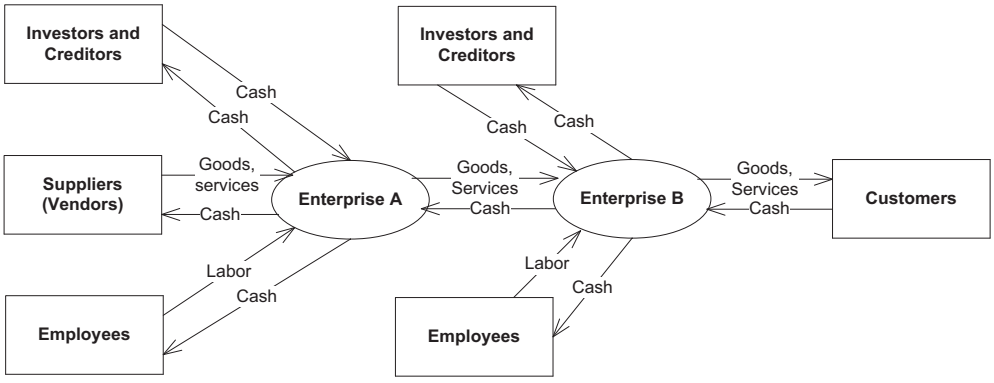
In general, a supply chain and a value chain are complementary views of the extended enterprise with integrated business processes enabling the flows of products and services in one direction, and of value as represented by demand and cash flow in the other [1]. The REA ontology in its essence follows the resource value flows. There

is no explicit general distinction between these individual directions. Each REA value model distinguishes outflow and inflow of resource values.

REA value system, as it is illustrated in Fig. 2, is still delineated for one enterprise only. However, the main purpose of the supply chain model is to cover all enterprises and their business partners that participate in the final product production. Fig. 5 shows possible connection of two enterprises in the REA value system model.

As can be seen in Fig. 5, the diagram can also contain other enterprises in a similar way. We suppose for simplicity that each enterprise would require the same structure of their business partners. During transformation of the *REA value system* into *REA value chain*, we encountered a challenge of dependent and independent views that have their origin in REA value model and are also showed in REA value chain. REA value model traditionally represents the given agent side of view. It can be e.g. customer or entrepreneur side of view. Actually, by the view it is distinguished whether the economic event is either incremental or decremental.

Fig. 5: REA value system for two enterprises



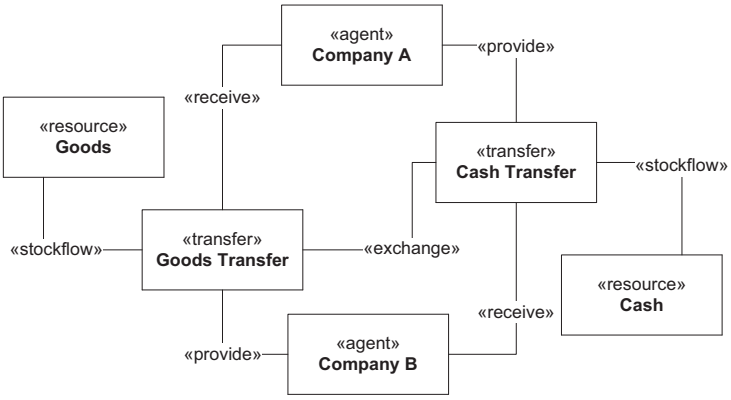
Source of data: authors

If we take the view of another agent, the meaning of the events will be changed. In case, the application model also covers planning (policy level) it is necessary to take into account also commitments and to set proper meaning for incremental and decremental commitment. In this way the same economic events have a different meaning.

However, it is possible, in contrast to the trading partner models, to create the model from the perspective of an independent view. This independent observer is illustrated in Fig. 6. Note that in the independent view, the concepts of increment and decrement do not exists, economic events represent transfer. Likewise, relationships of inflow and outflow do not exist, and are represented by stockflow relationships. For simplicity, Fig. 6 depicts only operational level of the REA value model. Above mentioned solution may typically represent *purchase/sales exchange process*. For one agent it is purchase process while for another it is sales process. This situation will happen when REA value chains of different REA value systems are connected

together, see Fig. 7. In this case, an exchange process (purchase/sales) must be modeled utilizing an independent view.

Fig. 6: REA value model – independent view

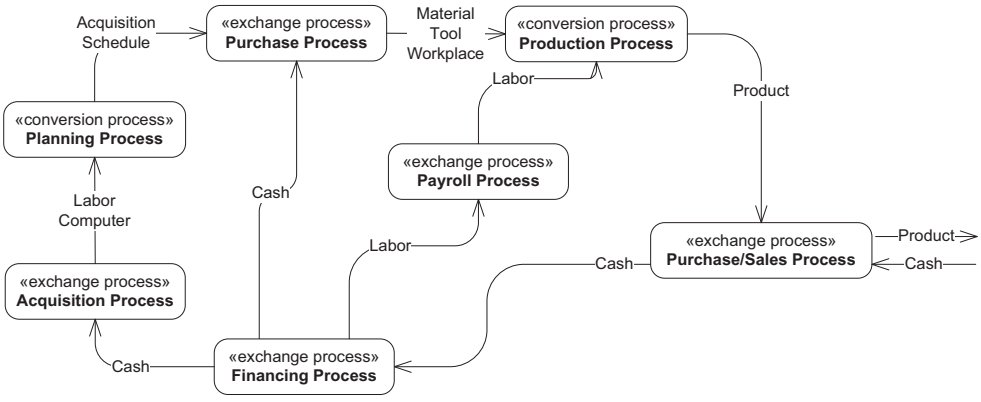


Source of data: [9]

The first conclusion for applying REA ontology in supply chain is utilizing independent view in the bordering of the exchange processes. By border we mean boundary of the individual REA value systems.

The next challenge concerns the core idea of the value chain concept designed by Porter [10]. The value chain concept distinguishes between processes that add value to the final products and those that do not. The current REA value chain is developed on the notion of a resource flows. In this way, the resource flows create a framework of the REA value chain. But there is a growing demand for including managing processes in the standard REA value chain and thus increase modeling possibilities, see [11]. In short, managing process creates managing entities such as a *contract* and a *schedule* and also produce resources containing overhead (indirect) costs.

Fig. 7 REA value chain for one enterprise



Source of data: authors

This is the way, how to include other business processes into a value chain. Some research in this area was performed but there is still some work to be done to completely finish this challenge and prepare for utilization. Fig. 7 illustrates the REA value chain model of an individual enterprise. It is supposed that purchase/sales process in the right hand side of the figure can be used for connection to another REA value chain.

Conclusion

REA ontology provides semantic and application independent data model, uses object oriented perspective and introduces concept of coherence between data of different business events, as well as a means to define future data. From the architectural point of view, it was proven that the two top levels of the REA ontology are semantically very close to the supply chain concept. The essence of Supply Chain Management (SCM) is the management of a chain of supply as though it was a single entity with the primary objective of fixing the suboptimal deployment of inventory and capacity. Utilizing REA ontology in SCM would bring more detail description of the business processes inside supply chain and thus enables more detail modeling of the topic. Modeling itself can start with REA value system and will continue through REA value chain and ends up with the REA value model. In this way, supply chain could use all benefits of the REA ontology approach.

On the other hand, it was illustrated that some adaptations and further research has to be done on the side of the REA ontology. In some cases, it will be necessary to introduce so called independent view for some of the REA value models as it enables easier connection of these models mainly between different enterprises or enterprise and customer. The other challenge concerns the fact that the value chain concept distinguishes between the core processes that add value directly to the final product and support processes that add value indirectly to the final product. On the other hand REA value model can model both core and supportive processes. This area of incompatibility needs further research too. Nevertheless, using REA ontology seems to be useful and beneficial means for integration of both these concepts.

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Received: 23. 06. 2011
Reviewed: 26. 09. 2011
Approved for publication: 30. 11. 2011

THE COMPARISON OF THE PUBLICATION OF REPORTS ON CORPORATE SOCIAL RESPONSIBILITY IN THE AREA OF TELECOMMUNICATIONS SERVICES

Ivana Johnová

Abstract: *This article deals with the social responsibility of companies providing telecommunications services. An assessment is made of quality of these reports in selected areas based on staging of corporate responsibility reports of three Czech telecommunications providers (Vodafone, Telefónica O2 and T – Mobile). These areas were selected on the basis of individual reports and structures for better comparisons were consolidated into seven areas that are scoring. In the final evaluation is then still an area that represents the overall complexity, clarity and accessibility of public reports. In addition, these providers are compared with a foreign company Orange, which has a high quality in the area of corporate social responsibility. Evaluation is done on a scale of 1 to 5 points, 5 points is the highest rating and 1 the lowest rating. Each area is evaluated and points are then summed total for each company. The company, which reaches the most points, has the best level of disclosure reports on social responsibility. The aim is to determine what the level of disclosure reports on corporate responsibility in the provision of telecommunications services and what is the availability of these public reports.*

Keywords: *Corporate Social Responsibility, Vodafone CZ, Telefónica 02, T – Mobile, Orange, Quality of Reports on CSR.*

JEL Classification: *M14.*

Introduction

Voluntary inclusion of environmental and social considerations into daily activities in the companies is called Corporate Social Responsibility (CSR). These factors become important for companies as it tell us about their responsibilities to their surroundings. The surroundings are thinking primarily owners, creditors, customers and suppliers. Nuvan [3]. wrote: "CSR is a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis, contributing to sustainable development goals." The company is primarily important social responsibility to pay attention. The next stage then is the manner of publication of the results achieved in the area of social responsibility. It is desirable that informations were spread over a wide area and were freely accessible. Companies issue reports on CSR, either as part of their annual reports or separately sometimes called the CSR report.

The aim of this article is comparison of published reports on the level of corporate social responsibility for three major telecommunications providers in the Czech Republic (Vodafone, Telefonica 02, T-Mobile) and compared these reports with the report of foreign company operating in France called Orange. The data will be

compared on the basis of information gathered from company websites, which are freely accessible.

The article is written based on the analysis and synthesis scientific findings, comparison and other scientific methods.

1 Corporate Social Responsibility (CSR)

Corporate social responsibility is the term, which is much inflected in last years. Responsible business means a business successfully and also to think of social and environmental interests: to incorporate social and environmental aspects in activities aimed at making profit [9]. The popularity of this concept accelerated in the 80 and 90 the 20th century, when many companies went to the creation of ethical codes and whole programs of responsible business. Causes of increased interest in this subject undoubtedly related to the growing public attention to the negative effects of global functioning global economy [14]. Kuběnka [1, p. 115] wrote in his article: “The term corporate social responsibility began rise up in conjunction with violations of laws, ethics, employee safety, bad behavior toward customers and the environment and more. This increase started above all in relation to large and multinational companies early 20th century in the USA.”

The exact definition of CSR of companies states the European Union. For CSR considered "voluntary integration of social and economic considerations into everyday business operations and interactions with stakeholders." As "stakeholders" are not considered only shareholders of the company, but groups of people who have more broadly affect the operation of the enterprise or large companies or are affected by it. In defining the company's CSR strategy is crucial to take into consideration just their opinions and needs [2]. The wide range of research and analysis suggests that consumers are expressing a growing preference of socially responsible and environmentally friendly products and services. Even so it is for them important to have access relevant information related to CSR. Consumer information is available in different forms from different sources, including claims of the manufacturer, information from consumer organizations and verified by a third party product labeling [12, p.106]. The benefits of CSR include increasing profit, satisfied and loyal employees, gaining competitive advantage, increase customer loyalty, the possibility of opening new business opportunities, attracting investors, improving the performance of supplier-customer relations, and others. [8]

Dramatic economic events, whose onset was recorded in late 2007 triggered a greater interest in corporate social responsibility. The crisis highlighted the many interrelated factors that represent the modern economy and the implementation of CSR can be very difficult. At the same time, however, showed how easy it can be the implementation of CSR. Firstly, CSR is not rocket science. Often it is rather common sense, combined with an enlightened approach to management and decision making.[13]

Stříteská and Kubizňáková [4, p. 278] wrote in their article: “In recent years, an increasing number of companies worldwide established and integrated the CSR policy. Together with this growth has raised a question: how CSR shape or influence

the corporate competitiveness? Lot of researchers have already stated that CSR can contribute to a number of social, environmental and economic policy objectives."

2 Comparison of the publication of reports on CSR

For comparison the publication of reports on CSR and environmental stewardship were selected three largest providers of telecommunications services in the Czech Republic: Vodafone CZ, Telefónica O2 and T-Mobile. Each company publishes these reports in their own way.

Vodafone CZ

Vodafone CZ has published the Corporate Responsibility Report 2008/2009. The report is based primarily on numbers and facts. An integral part of the publication of the report on CSR is prior to data collection. Vodafone has a defined set of quantitative and qualitative key performance indicators. For the individual national companies in the Vodafone Group are set specific goals. [11]

Structure of the report:

- Ethics (suppliers, customers, construction of network).
- Social (employees, stakeholders and neighborhood, the Vodafone Foundation).
- Environment (energy consumption, recycling of waste, mobiles).
- Gals and awards.

Telefónica 02

In addition to providing telecommunications services focuses on its responsible attitude towards society in which it operates. The company aims to involve all stakeholders and seeks to take into account the impacts to its environment. Key pillars of these activities are building trust, partnership and open dialogue with all stakeholders. Telefónica O2 publishes a report on corporate social responsibility in the annual report, data are mainly given in the form of verbal description. The site is already available annual report for 2010. [5]

Structure of the report:

- Business ethics.
- Effects on the market and customer behavior (customer experience, products and services for customers with specific needs).
- Care for employees and work environment.
- Care for environment.
- Support community activities.

T-Mobile

T-Mobile takes the issue of corporate social responsibility very seriously. T–Mobile systematically focuses on the proper conduct of its employees, business partners and the environment. The company publishes only environmental policy objectives. The main objective is "to become a leading telecommunications company in the field of environmental protection". Despite the fact that society considers social responsibility as a very important factor for success, a comprehensive report on social responsibility has not issued. Informations for comparison are therefore taken from information available on the website. [6]

The following tables (Tab. 1 – Tab. 7) compare the quality and level of disclosure reports on corporate responsibility by Vodafone, Telefónica O2, T-Mobile. Each table represents one of the selected area and by comparing the information published in this area. The areas were chosen according to published reports on the structures of social responsibility, so that might be less precise compared to what information within each area.

2.1 The area of ethics

Tab. 1: Ethics

Vodafone	Telefónica 02	T-Mobile
• Supplier management process • Supplier qualification • Supplier evaluation • Supplier optimization • Network construction	• Member of the Coalition for a transparent business • Oportunity for employees to report unethical behavior under anonymity • Brochure of business principles for each employee • Collaboration with the Platform for transparent public procurement	• Not published

Source of data: own composition

Vodafone mentions especially the process of selecting suitable suppliers and the process of expanding the coverage of the signal through out the Czech Republic. Telefónica O2, the report focuses on the ethical behavior of employees who have the opportunity to anonymously report unethical behavior of any employee of the company. They can choose between electronic applications, sending electronic messages, letter by calling the hotline or visiting the office of corporate governance.

2.2 The area of customer care

Tab. 2: Customer care

Vodafone	Telefónica 02	T-Mobile
• Open communication • Navigation system for blind • Children's Profile – blocking sites intended for adults	• The index CSI (Customer Satisfaction Index) showed in 2010 a positive trend in all segments • Improve the quality of care for customers to call centers • Reducing waiting times in stores • Reviewing the causes of high error rates in voices • A new version of the phone for seniors Aligator • A call service for the deaf • Floods 2010 - a free issue of a new SIM card, discounts on new phones • A support actions to protect children	• Child Lock Service-blocking sites intended for adults

Source of data: own composition

Vodafone is committed to open communication with customers. It has built a navigation system for the blind, which allows immediate location and navigation blind to the target area. Another program in the area of customer care is the Child profile, which allows the blocking of sites designed especially for adult customers.

Telefónica O2 recorded the growth of customer satisfaction, improve customer service levels in call centers. The marketing company said mobile phone for seniors Aligator and offered it for a discounted price. It responded flexibly to the situation around flood in 2010. For flood-affected customers to ensure a free issue of a new SIM card and discounted prices for new phones.

T- Mobile offers only child lock, which is the service based on the same principle as the Children's service profile.

2.3 The area of care for employees

Tab. 3: Care for employees

Vodafone	Telefónica 02	T-Mobile
• Casual wear • Familiar form at all levels • Work from home	• Customer experience is an essential key pillar of the strategy Bravo! • Reflect survey- satisfaction and motivation of employees • "One day with a customer"– manager´s direct contact with customers • Adaptation of new employees • Work from home • The Job model • Management training program • Incentive programs and benefits	• Trained staff in the environme ntal

Source of data: own composition

Employees (at all levels relating) can go to work dressed informally and during working hours are welcome parents on maternity leave or pets in the Vodafone. Employees have the option to use the work from home, flexible working hours and work part time.

At Telefónica O2 was based on research Reflect found that satisfaction and motivation of employees is around 90%. Under the "One day the customer" has enabled managers to direct customer contact. Based on this experience and improved knowledge of customer needs. All new employees attended a seminar Welcome Day, where they learned practical information important for orientation in the company.. On the basis of the Job model, employees are classified into six groups, each group is assigned the appropriate salary and possible bonuses.

The T - Mobile is only available information on staff trained in environmental protection.

2.4 The area of importance of stakeholder´s involvement

Tab. 4: Importance of stakeholder´s involvement

Vodafone	Telefónica 02	T-Mobile
• Nonprofit organizations, institutions and communities important in terms of CSR • Media • Sppliers	• Not published	• Not published

Source of data: own composition

This area is distinguished only by Vodafone, which conducted the research found that most reports on the use of CSR organizations and institutions crucial for CSR, as well as media and as the third suppliers.

2.5 The area of environmental care

Tab. 5: Environmental care

Vodafone	Telefónica O2	T-Mobile
• Energy consumption • Reducing energy consumption technology • Technological innovation • Purchasing green energy group ČEZ • Quantification of CO2 saved • Internal campaign for employees about separating waste • Sorting waste in offices and shops • Program of collection, recycling and reuse of old phones	• The Program of Green Company –deeper promote the ideas of environmental • Packaging recycling • ISO 14001 • Reducing negative environmental impacts • "Let your old cell phone to help" – support operations Safety Lines	• Compliance with laws and regulations on environmental

Source of data: own composition

Vodafone focuses on reducing energy consumption, by reducing energy consumption technology, technological innovation and purchasing green energy group CEZ. The company focuses on increasing awareness of the importance of waste separation and thus supports their environmental behavior.

Telefónica O2 joined of his employees to care about the environment through the Green Light Company. The most important activity was socially oriented project “Let your old cell phone help” to support the operation of Safety Lines.

T - Mobile aims for leadership position among telecommunications operators in the Czech Republic in improving the quality of the environment by minimizing waste and emissions, reusing and recycling, reducing use of natural resources and promoting pollution prevention efforts in the community.

2.6 The area of support community projects

Tab. 6: Support community projects

Vodafone	Telefónica O2	T-Mobile
• The Vodafone- 4grant programs: • Vpoho grant program, • Vpohybu grant program, • World of difference • Green Program • Offering employees the opportunity to participate in corporate volunteering	• Foundation O2 • supporting Safety Line • supporting Senior Line • volunteer programs for employees • "Give blood withO2"	• Fund of T - Mobile – supporting projects of nonprofit organizations • Donors SMS • Volunteer project staff, "One day your good deed"

Source of data: own composition

Vodafone is the founder of the Foundation. Vodafone Foundation offers four grant programs, Vpohybu grant program, Vpoho grant program, World of Difference and Green Program. The Foundation received the 2007 Via Bona Award for its innovative approach to giving support to the project for satellite navigation for the blind, as well as special awards from the Donors Forum, an innovative project, a PC game called GhetOut.

Telefónica O2 has been the main tool for transparent and systematic corporate donation nine years longer Foundation O2. Foundation O2 has been a general partner of 16 years only national free anonymous helpline for children who find themselves in difficult situations. Foundation O2 continued to support the lines of seniors. In 2010 the project continued Donate blood with O2, which aims to promote voluntary blood donation in the Czech Republic.

T - Mobile calls for proposals open the T-Mobile supports projects of nonprofit organizations in Hradec Kralove, Louny and in the district Prague 11. The theme for 2010 is in the broadest sense of the word "Healthy Planet".

2.7 The area of goals and awards

Tab. 7: Long – term goals and awards

Vodafone	Telefónica O2	T-Mobile
• Published long-term goals in ethics, environmental and social • The winner of the Czech round of the European CSR Prize 2008 • The 2nd Company of the Year: Equalopportunities for the 2008th • Special awards Donors Forum for Innovative Project (PC game GhettOut)	• Not published in CSR	• Become the leading telecommunications company in the field of environmental protection

Source of data: own composition

Vodafone within the CSR also publishes its long-term goals and rewards. Disclosure of long-term goals should be an integral part of CSR reports. These reports show how companies behave responsibly at the moment of their surroundings,

but should be added also look into the future through long-term goals that they want to achieve.

The tables give an overview of the information published in the CSR and environmental protection. For a very good report on social responsibility we can consider reports of the Vodafone and Telefónica O2. Vodafone has added to its report the numbers and the summary table of environmental protection and responsibility. Telefónica O2 has a governing body a report based only on verbal descriptions. Behind the publication of CSR remains T-Mobile, which publishes only basic information on environmental policy.

As shown, companies can provide very depend on the responsibility towards society. It is more than clear that this information is one of the key factors of competitiveness of companies. It is important that companies disclose this information to the general public and received into the subconscious so customers need to behave responsibly, not only to the environment. In today's rapidly changing markets is not only important to achieve the best financial results, but focus on non-financial results, customers need to know how to explain why just choose your product and what is the advantage of shopping for you.

3 Comparison of levels of CSR disclosure reports with foreign company

For comparison of the publication of reports on CSR in area of telecommunication services in the Czech Republic was analyzed report on the Corporate Social Responsibility of a foreign company Orange.

The company was chosen because it has among other things, coverage in many European countries (Slovakia, Russia, Spain, Austria, etc.), as well as the fact that CSR is one of the key elements of its strategy and is seen as crucial in particular in relation to customers. This company was also chosen because of the availability of information.

Orange

Mobile operator Orange is working on several continents. It is a French operator (France Telecom) and is currently among the largest in the world. It offers mobile voice and Internet services. For the past 15 years, France Telecom-Orange has worked hard to include sustainable development and CSR principles in its corporate strategy. In the digital society, the Group is shouldering its responsabilities to nurture social ties and ensure the greatest possible number of people benefit from the new technologies. Because CSR is important when it comes to creating value both for stakeholders and the Group, Orange has built the question into the heart of its Conquests 2015 strategic plan. The central role confirms the Group's ambition to become a benchmark CSR player in the telecoms sector [7]. On the websites is currently available the Corporate Social Responsibility report for 2010.

Structure of the report:

- Our approach (commitments, ethics, organization, CSR documentation).
- Latest news.
- Employees.

- Quality.
- Access for all.
- Environment.

Tab. 8 shows the contents of the report on CSR´s Orange. Individual areas were chosen to be consistent with areas of previous reports.

Tab. 8: The content of the report on CSR´s Orange

Area	Orange
Ethics	• Developed Code of Ethics • Values, and the principles underlying actions are in line with fundamental principles such as the Universal Declaration of Human Rights • The Group's ethics committee • Network of ethical advisers in each country • Online learning module - simulation exercises for each employee
Customer care	• Transparency, quality and security for all customers • Building customers' loyalty • Communicating with peace of mind • Answering questions about radio waves • Promoting the principles of responsible purchasing
Care for employees	• Rethinking a view of human resources, adopting a new style of management and reasserting common values • The new social contract – a new social model • Combating all forms of discrimination • Gender equality in the workplace • Helping disabled people to find employment and develop in the workplace
Importance of stakeholder´s involvement	• To encourage listening to individual shareholders, employee shareholders, institutional investors, opinion leaders such as journalists and also banking and financial analysts • Making information and communications technologies accessible to as many as possible • Combating the geographic digital divide
Environmental care	• Finding innovative solutions for a greener Word • Reducing the Group's carbon footprint • Reducing the impact of products and services • Contributing to eco-citizen progress
Support community projects	• Ensuring accessibility by elderly and disabled people • Inventing new ways of accessing education and culture • Supporting local development • Meeting the challenges of health and dependency
Long – term goals and awards	• To be recognised by 2015 as one of the favourite employers in the main countries in which the Group operates • To became the "CSR leader" in the telecommunications sector • Recognize and support our employees • Ensure transparency, quality and security for our customers • Share the benefits of the digital world with the greatest possible number of people • Find innovative solutions for a greener world

Note:To complete the comparison is given the same structure as in previous reports.

Source of data: own composition

Orange has the CSR report very well-prepared. This report was issued as a separate document. The message is placed on's website and has 142 pages. One of the goals of this company is to become the "CSR leader" in the telecommunications sector. Reports issued for several years and therefore know that their level is really high.

4 Evaluate the quality of reports

Individual area of reports of corporate social responsibility of each operators are evaluated on a scale of 1 – 5 points in the following table.There are evaluated seven areas in total, eighth area represents complexity of published reports, which mainly reflects whether the report is published separately, even if it is published and how much is extensive. The best ranking is five points, the worst ranking is one point. The final sum then indicates that company has the best published report on social responsibility and that company has a non-quality report and in what areas are its weaknesses. Individual areas are represented in the table following figures:

1. Ethics, 2. Customer care, 3. Care for employees, 4. Importance of stakeholder´s involvement, 5. Environmental care, 6. Support community projects, 7. Long – term goals and awards

Tab. 9: Evaluate the quality of reports

Area	Vodafone	Telefónica O2	T – Mobile	Orange
1.	3	4	1	5
2.	4	5	2	5
3.	3	5	2	5
4.	3	1	1	5
5.	4	4	1	5
6.	4	4	4	5
7.	4	1	3	5
8.	5	3	1	5
total	**30**	**27**	**15**	**40**

Source of data: own composition

The table 9 shows that the best report on CSR can be considered the report of Vodafone in the Czech Republic, just behind its is the report on CSR by Telefónica O2. Remains behind, T-Mobile to complete a report on CSR does not issue, and therefore some information is not available. If we compare the Czech telecommunications providers with a foreign company Orange, is still seeing a big difference as far as the content of the message, and its comprehensiveness and clarity.

Conclusion

Reports on CSR are the voluntary part of the annual reports of companies and are sometimes published completely independently. The aim of these reports is to provide an overview of the behavior of companies to their surroundings, support staff, customer care, environment, etc. In recent years is placed increasing emphasis on the disclosure of such information, because in addition to financial results it is good to point out the results and behavior by non-financial nature.

Based on comparison of published reports of these companies were found that Vodafone and Telefónica O2 have already taken the publication of reports on CSR as

a matter of course. In contrast, T- Mobile has published basic information about the direction of environmental policy and the pursuit of their goals.

The main contribution of this article is the finding that providers of telecommunications services in the Czech Republic aren´t still in publication of reports on CSR at the same level and not at all on such good as providers abroad. It doesn´t say that the level of disclosure of CSR reports reflects the true social responsibility. T-Mobile has issued a comprehensive CSR report, but different from the information available it is clear that CSR does not take lightly. The company would therefore have to work on that in the future global CSR reports began to issue and knew how their attitude to social responsibility publicly to sell.

Acknowledgement

This contribution was supported by the research project SGFES03 „Vědecko-výzkumné aktivity v oblasti Ekonomika a management.“

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Received: 31. 07. 2011
Reviewed: 29. 11. 2011
Approved for publication: 30. 11. 2011

AN ANALYSIS OF THE CONTRIBUTION OF FLIGHT ROUTE AND AIRCRAFT TYPE IN ENVIRONMENTAL PERFORMANCE OF AIRLINES BASED ON LIFE CYCLE ASSESSMENT: THE LUTFHANSA CASE

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Abstract: *In the airlines sector, the reduction of fuel consumption became a major global target due to the recent surge in oil prices. Aircraft emissions have also been gaining importance, particularly in the European Union where apart from the emissions of nitrogen oxides (NO_x) and its concerns related to ground level ozone formation, measurements and reductions of carbon dioxide (CO_2) became a major regional target. This major concern related to CO_2 emissions is reflected on the upcoming inclusion of aviation sector into the EU Emissions Trading Scheme as of 2012 when all intra-community flights will be subject to emission restrictions. The main aim of this paper is to show by means of life cycle assessment how fuel consumption and emissions per passenger can vary significantly between the same origin and destination according to the distance flown and the use of different aircraft models. It illustrates these variations with different real offers of daily flights by Deutsche Lufthansa AG. Besides considerable reductions that can be achieved with the use of fuel-efficient aircrafts, additional improvements can be done by shortening air traffic routes and by developing technology for continuous descent approach landing patterns in collaboration between governments, regulators, airlines, airports and air navigation system providers (ANPs).*

Keywords: *Life Cycle Assessment, Environmental Impacts, Material Flow, Airlines, Air Transport, Greenhouse Gas Emissions, Climate Change.*

JEL Classification*: Q56, M14.*

Introduction

Nowadays there are some factors that affect the global air transport industry. Reza Abdi et al. [23] point out, among others, the national tourism policies, declining yield across airline industry, consumer satisfaction, human resources policies, and technology change. Furthermore, nowadays environmental and social externalities of air transport are recognized as a fundamental aspect of business strategy and therefore are a critical factor to control for the achievement of financial success [7]. Thus air transport companies have the obligation of taking environmental impacts of their activities into account, whether due to a serious social commitment or to a desire to avoid paying fines for not adhering to existing laws. One of the most important externalities generated from commercial flights is fuel consumption and engine emissions [4]; [19] impacting on air quality and greenhouse gases.

The highly competitive global transport market requires companies to be innovative, flexible and develop, and implement adequate management systems to help them deal with these circumstances. In the last few years, the Life Cycle

Assessment (LCA) has become one of the most popular tools of environmental management [27]. LCA can be defined as an information system used to measure the environmental impact caused by a business activity.

This study seeks to extend and deepen the research on the application of LCA to the air transport sector [19]; [10] in order to measure its environmental impact based on the aircraft model. For this purpose an intra-European short-haul[1] route was chosen, comparing three real cases offered by Lufthansa for flying from Prague to Munich (265 km flight distance [9]). This is one of the most popular international air routes departing from Prague's Ruzyne Airport which is the most important international airport in the Czech Republic and the second largest in Central and Eastern Europe, handling every year around 12 million passengers. Currently 50 airlines connect Prague to 134 destinations in 51 countries on direct flights, along with 5 regular cargo carriers and dozens of other companies providing charter transport [22].

In 2010, on average, 31,600 passengers passed through the airport's gates each day. The vast majority of passengers at Prague Airport flew traditional European routes, accounting for 90.5% of total operations. In the same year, the most frequented routes for passengers were Prague to Great Britain (1.2 million) and Prague to Germany (1.1 million) [21]. Prague airport has also observed a trend since 2009 of an increase in airlines aircraft occupancy. Average aircraft capacity (the so-called "load factor") was around 70% for flights into and out of Prague in 2010.

The capacity of the aircrafts is correlated with the frequency of service, i.e., bigger aircrafts means less frequency [2]. The main aim of this study is to show how fuel consumption and emissions per passenger can vary significantly between the same origin and destination according to the distance flown and the use of different aircraft models. It illustrates these variations with different real offers of daily flights by Deutsche Lufthansa AG.

The paper is structured as follows. The next section addresses the fuel burn rates and main emissions during aircraft operations as well as their main impacts on the environment. Subsequently, authors report on how climate change has been faced by commercial aviation sector. Then, previous studies of Life Cycle Assessment involving different environmental aspects and impacts in commercial aviation are highlighted. Further, a description of the methodology adopted for calculating the fuel consumption and emissions is presented. Finally, results are illustrated with charts and commented thereafter. Final conclusions point out the importance of improving the calculation method proposed by refining its input parameters and gives light to further reductions in greenhouse emissions that can be achieved with the use of fuel-efficient aircrafts.

1 Fuel consumption, main emissions and impacts of aviation

Fuel consumption considerations are a priority for airlines because profit margins are narrow and the price of fuel has steadily increased at a time when airfares have been decreasing in response to competition. Fuel burn rates and emissions vary

[1] A short-haul domestic flight is commonly categorized into being no longer than 500 mi (800 km) 1.5 hours in length. A medium-haul flight is a flight between 3 and 6 hours.

according to the different modes of aircraft operation, namely idle, taxi, take-off, approach and landing. The take-off phase requires full engine thrust, and thus incur higher fuel burn rate. As the aircraft ascends to higher altitudes the drag decreases and so does the rate of fuel use. Over very long distances the fuel use per kilometre increases because of the greater amount of fuel that has to be carried during the early stages of flight [6]. Even in short-haul flights, most part of fuel is burned during the cruising stage. However, in these flights, the shares of fuel burned during the landing and take-off phases (LTO) become more significant in proportion to the total amount of fuel burned during the aircraft operations than the shares observed for medium or long-haul flights [24]. As aircraft emissions are directly proportional to fuel used, the bulk of aircraft emissions occur at higher altitudes during the cruise phase. Aircraft engine emissions are roughly composed of about 70% CO_2, a little less than 30 % H_2O, and less than 1% each of NO_x, CO, SO_x, VOC, particulates, and other trace components including hazardous air pollutants (HAPs). Aircraft emissions are considered air quality pollutants or greenhouse gases, depending on whether they occur near the ground or at high altitude, respectively. However, aircraft are not the only source of aviation emissions. Emissions are also originated from vehicles that provide access to airports, shuttle services offered between terminals and to the aircrafts, ground equipment that provide services to aircrafts, stationary airport power sources, and auxiliary power units providing electricity and air conditioning to aircraft parked at airport terminal gates.

The impacts of gases emitted by civil aviation sector are highlighted in Tab. 1. In the subsequent sections, a particular attention is given to carbon dioxide (CO_2) emissions due to its contribution to global warming.

Tab. 1: Impacts on atmosphere caused by gas emissions from aviation

Gas	Impact
CO_2	Long-lived GHG. Contributes to global warming.
O_3	Lifetime weeks to months. Product of NO_x emissions plus photochemistry. The effect of O_3 is high at subsonic cruise levels and causes radio-active reactions at those levels.
CH_4	Lifetime of ~10 years. Aircraft NO_x destroys ambient CH_4.
H_2O	The effect is small because of its small addition to natural hydrological cycle. Triggers contrails, but actual contrail content is from the atmosphere.
Sulphate	Scatters solar radiation to space. Impact is one of cooling.
Soot	Absorbs solar radiation from space. Impact is one of warming.
Contrails	Reflect solar radiation, have cooling effect; but reflect some infrared radiation down to earth, that has a warming effect; but net effect is one of warming.
Cirrus	Contrails can grow to larger cirrus clouds (contrail cirrus), which can be difficult to distinguish from natural cirrus. Generally warming effects.

Source of data: [8]

2 The commercial aviation in the face of climate change

The air transport sector has been increasingly placed in the environmental agenda. Commercial aircraft operate at cruise[2] altitudes of 8 to 13 km, where they release gases and particulates which alter the atmospheric composition and contribute to climate change [16]. Technological progress has been made in reducing greenhouse gas (GHG) emissions through aircraft fuel efficiency by reducing weight, improving aerodynamics performance and engine design [12].

In 2010 the air passenger transport industry has shown a good recovery from the downturn observed in the previous two years and resumed its historical trajectory of impressive growth. Global passenger traffic rose by 6.6% in 2010, topping the 5 billion passenger mark for the first time and registering increases in all continents [1]. Therefore, perceived rapid growth of this sector can turn it into a significant source of greenhouse gas emissions, despite improvements in aircraft fuel efficiency.

According to IPCC [13], aviation currently accounts for about 2% of human-generated global carbon dioxide emissions, the most significant greenhouse gas. This 2 % estimate includes emissions from all global aviation, including both commercial and military. Global commercial aviation, including cargo, accounted for over 80% of this estimate. The sector also contributes to about 3% of the potential warming effect of global emissions that can affect the earth's climate, including carbon dioxide.

The contribution of the aviation sector to climate change resulted in new challenges and pressures imposed by environmentalist campaigns, mainly in the European Union [28] where a directive for the inclusion of the aviation sector into the EU-ETS was published in January 2009. The EU-ETS aims at including the GHG emissions of intra-community flights as well as planes departing or landing in the European Union as of 2012.

When considering the impacts of the inclusion of aviation sector into the EU-ETS, Scheelhaase, Grimme, and Schaefer [28] expect that network carriers based outside the EU and with a moderate growth of emissions between 2006 and 2012 will most likely gain a significant competitive advantage compared to EU network carriers. This prognosis is applicable when comparing the EU network carriers competing with non-EU network carriers on markets for long-haul[3] air services. The disadvantage of EU network carriers relies mainly on the fact that not only all long-haul flights arriving at and departing from airports in the EU will be included into the EU-ETS, but also all short-haul flights, which are less eco-efficient than long-haul flights (calculated on the basis of emissions per RTK[4] or RPK[5]). All feeder services from short-haul flights needed to achieve and surpass the break-even seat load factor on the long-haul flights

[2] Cruise altitude is an altitude or flight level maintained during the part of the flight that occurs between ascent and descent phases and is usually the majority of a journey; this is also the most fuel-efficient phase of the flight.
[3] Long-haul flights are journeys typically made by wide-body aircraft that involve long distances, typically beyond six and a half hours in length, and often are non-stop flights.
[4] Revenue Tonne-kilometre (RTK) is the utilized (sold) capacity for passengers and cargo expressed in metric tonnes, multiplied by the distance flown.
[5] Revenue passenger kilometres (RPK) is a measure of the volume of passengers carried by an airline. A passenger for whose transportation an air carrier receives commercial remuneration is called a revenue passenger.

of EU network carriers are subject to the EU-ETS. On the other hand, non-EU network carriers operate its own feeder network outside the EU and therefore this part of their operations is not included in the EU-ETS.

3 Previous studies of Life Cycle Assessment in commercial aviation

The airlines are showing an increasing awareness on the environmental impacts of their operations by introducing new components related to these impacts in their accounting frameworks [20]. "Life Cycle Assessment was the first, and has been the most frequently adopted approach to environmental information management" [27].

Despite the considerable interest in the application of waste management and LCA in air transport sector [17]; [18]; [3], the environmental management literature has dedicated slight concentration to the study of airline's choice of aircraft size and model on short-haul high density routes. Givoni and Rietveld [10] run an empirical examination that concluded that the service frequency in airlines' competition is key factor that explains the choice of size and frequency.

There has been several publications focused on the estimation and reporting of emissions by aircraft engines in different modes of flight, which in turn can provide a valuable support for the development of benchmarking of airlines within the framework of EU-ETS and can also be used by airlines to find more efficient alternatives to reduce its emissions based on fuel consumption and flight path designs [26]; [5]; [14]; [25].

4 Methodology of the study

This paper analyses the life cycle of air passenger transportation sector. The study aims at identifying the differences in fuel consumption and emissions among different aircraft models and flight routes for the same origin and destination currently offered by a major European airline. This comparison is illustrated by simple real case involving the daily offer of flights from Prague to Munich by Deutsche Lufthansa AG. Two flight routes were considered: a direct flight route from Prague Ruzyne airport to Munich International airport and a flight route with connection in Frankfurt international airport. For the direct flight route (265 km) two different aircraft models are used: AVRO RJ85 and DHC-8 400. For the indirect flight route Lufthansa uses Airbus A321-100 from Prague to Frankfurt (500 km) and from Frankfurt to Munich (374 km). In each case, the fuel consumption and emissions released were estimated in order to identify the most eco-efficient way of transporting the passengers from Prague to Munich.

Tab. 2 provides the main characteristics of aircrafts and routes currently offered by Lufthansa from Prague to Munich. According to Givoni and Rietveld [11] "in general, airlines opt for high frequency and small aircraft rather than lower frequency and larger aircraft when demand is relatively high on short-haul routes".

Tab. 2: Main characteristics of aircrafts and routes analyzed

Aircraft	AVRO RJ85	De Havilland DHC-8 400	Airbus A321-100
Manufacturer	British Aerospace (UK)	De Havilland Aircraft Comp. (UK)	Airbus (France)
Seating capacity	93	70	190
Kerosene cons.[6]	5.73 litres	3.7 litres	2.9 litres
Route	PRG-MNH	PRG-MNH	PRG-FRN, FRN-MNH
Distance	265 Km	265 Km	874 Km
Flight number	LH1697	LH1689	LH1403, LH104
Duration	0h50	1h00	1h15, 0h55

Source of data: authors

Flowcharts processes and calculations in this study were made with the support of software UMBERTO v5.0. However, in order to obtain a more realistically model, more updated information was gathered for UMBERTO's database. For inventory procedure, additional data related to resources used and emissions released was obtained through a research based on the following sources of information:

- Lufthansa environmental reports.
- Technical data brochures of aircraft manufacturers.

In Umberto, transitions are represented by a square symbol and places are represented by circles. The calculation using Umberto software contains a series of simplifications. In particular it assumes that all aircrafts have a load factor of 100 % and does not contain any dependence on special running conditions (e.g., speeds, short-haul flights/long-haul flights) and on holding delays resulting from congestion at airports or weather variations. It is therefore only suitable for rough calculations and should not be used for detailed transport emission calculations. Material pre-inputs, for instance provision of the transport infrastructure or the aircraft are not taken into consideration. On the input side, kerosene is the only energy considered as jet fuel. On the output side, the following emissions were estimated: CO_2, NO_x, SO_2, VOC, particles and CO. As this study focuses on the contribution of aviation sector to global warming, only the levels of CO_2 emissions per passenger are reported in the results. Moreover, as previously noted, most part of aircraft emissions occur at high altitudes. Almost 30% of hydrocarbons and CO are emitted at ground level, while 70% are emitted at higher altitudes. For other gases, 90% of their emissions occur at higher altitudes [8]. Therefore, the calculations performed for the amount of produced emissions (output) of aircraft engines are based in the emission indices (EI) of jet fuel at typical cruise conditions as shown in Tab. 3. The EI represents the mass of a substance in grams per kilogram of fuel burned. The functional unit used in this LCA is 1 passenger with an average of 70kg weight.

[6] Kerosene consumption per 100 passenger – kilometres.

Tab. 3: Emission indices of jet fuel at typical cruise conditions

Substance	Emission Index (g/kg)
Carbon Dioxide, CO_2	3 150
Water, H_2O	1 240
Sum of nitric oxide and nitrogen dioxide (NO_x)	14.0
Carbon Monoxide, CO	1.9
Sum of Hydrocarbons, HC	0.6
Sulphur Dioxide, SO_2	0.6
Soot	0.015

Source of data: [5]

Individual calculations were done for each aircraft used by Lufthansa from Prague to Munich. The kerosene consumption in litres per passenger per 100 km was established as follows:

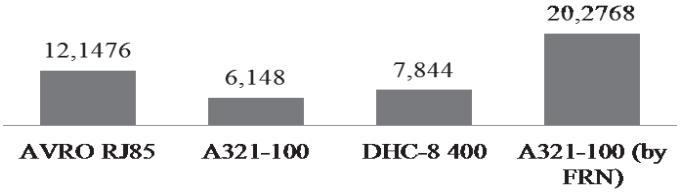
$$\text{Kerosene consumption} = \frac{\text{fuel capacity}}{\text{maximum range} \cdot \text{passenger capacity}} \cdot 100 \quad (1)$$

Considering that 1 litre of kerosene weighs approximately 0.8 kg, fuel consumption is then converted in terms of kg per passenger per 100 km. By knowing the flight distance, it is possible to estimate the fuel consumption and the emissions per passenger for each flight.

5 Results

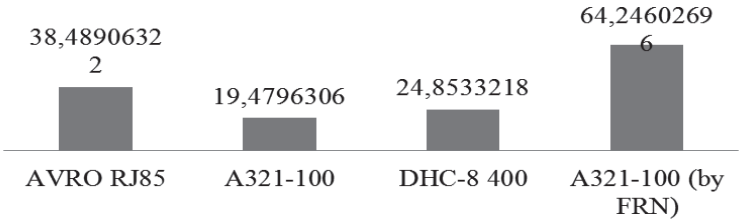
Fig.1 and Fig. 2 present respectively, the differences in fuel consumption and in levels of CO_2 emissions per passenger, both in kg. Additional calculation was done considering the case in which Lufthansa would offer an airbus A321-100 for a direct flight from Prague to Munich. Other emissions were also calculated, such as: NO_x, SO_2, VOC, particles and CO. Although their amounts in Kg are considerably lower in comparison to CO_2, it does not mean, however that these emissions are not of concern and shall not be controlled. As previously explained, this study focuses on the contribution of aviation sector to global warming and therefore, only the levels of CO_2 emissions per passenger are reported.

Fig. 1: Difference in fuel (kerosene) consumption per passenger (kg/pers.)



Source of data: authors

Fig. 2: Difference in levels of CO_2 emissions per passenger (kg/pers.)



Source of data: authors

Results show that when using DHC-8 400 for a direct flight from Prague to Munich, the fuel consumption per passenger is 35% lower than that expected when operating AVRO RJ85. Moreover, when flying from Prague to Munich through Frankfurt with airbus A321-100, the total fuel consumption per passenger is approximately 2.5 times higher than that expected when operating DHC-8 400 in a direct flight. Interestingly, if Lufthansa would use an airbus A321-100 for a direct flight from Prague to Munich, the fuel consumption per passenger would be even 21.6% lower than that expected by DHC-8 400. Total kerosene consumption in Kg per direct flight from Prague to Munich would be roughly: 1 130 Kg (AVRO RJ85), 1168 Kg (A321-100) and 549 Kg (DHC-8400).

Based on the EI provided in Tab. 4, it is expected similar difference in terms of emissions of CO_2 per passenger during the aircraft operations. Considering a possible use of A321 for a direct flight from Prague to Munich and assuming a passenger load capacity of 100% for all direct flights, total CO_2 emissions per flight would be roughly: 3 559 Kg (AVRO RJ85), 3 680 Kg (A321-100), 1730 Kg (DHC-8400). All substances listed in Tab. 3, except water vapour (H_2O) and soot, were calculated using Umberto model. Among those substances, CO_2 and NO_x are most important due to reasons previously stated. The emissions of NO_x calculated were roughly: 15.70 Kg (AVRO RJ85), 16.24 Kg (A321-100), 7.63 Kg (DHC-8400).

6 Discussion

The total fuel consumption of DHC-8400 is about 50% less than that of AVRO RJ85, while the fuel consumption of A321-100 if used for a direct flight would be almost the same of AVRO RJ85.

Ross [25] highlights that the overall weight of a passenger aircraft is determined primarily by the airframe and amount of fuel carried. Therefore the number of passengers on board has a smaller impact on total fuel consumption. On the other hand, aircraft use less fuel per passenger the more passengers there are on board. The use of more fuel-efficient aircraft engines and the introduction of larger aircraft accommodating more seats per aircraft in combination with an increase in the average stage distances[7] have reduced the fuel use per available seat kilometre (ASK). The improvement in the specific fuel consumption has furthermore reduced the necessary amount of fuel that has to be carried on flights of comparable distances leading to

[7] The average distance flown per aircraft departure, measured in statute kilometres. The measure is calculated by dividing total aircraft kilometres flown by the number of total aircraft departures performed.

additional fuel savings. Furthermore, the operation at higher passenger load factors has contributed to reduce the fuel use per revenue passenger kilometre (RPK).

Although the capacity of A321 is almost 100 passengers more than the capacity of AVRO RJ85, the total CO_2 emissions of A321 would be just slightly higher than the emissions of AVRO RJ85 during the same flight route but still would have additional revenues from the sale of flight tickets for 97 passengers. Thus, the RPK would be significantly increased and the fuel use per RPK would be considerably reduced.

The calculations presented in this study are subject to several uncertainties and as previously stated, provide only a rough picture on the differences in terms of fuel consumption and emissions per passenger. Apart from the aircraft model, flight distance, cargo on passenger flights and seat occupancy rate, other important factors may affect the GHGs emissions released by commercial flights on a per person basis, such as flight profile and seating configuration [15].

Conclusion

The air transport companies have to consider not only the maximum efficiency in economic terms, but also if the chosen alternative is the more eco-efficient. One of the most popular tools to evaluate eco-efficiency is the Life Cycle Assessment.

The main aim of this paper is to show how fuel consumption and emissions per passenger can vary significantly for different flight routes between the same origin and destination according to the distance flown and the use of different aircraft models. It illustrates these variations with different real offers of daily flights by Deutsche Lufthansa AG.

For airlines, the reduction of fuel consumption and consequently, CO_2 emissions is a major target due to the major oscillations in oil prices and the inclusion of the aviation sector in the EU Emissions Trading Scheme as of 2012 when all intra-community flights will be subject to emission restrictions. Conventionally, the initiatives taken by airlines to minimize their CO_2 emissions are mainly based on the optimization of fuel consumption (e.g., maximizing efficient use of the cruising speed) and in the renewal of aircraft fleet with more fuel-efficient aircrafts.

Additional operational initiatives are being discussed with government authorities and airport service management in order to ensure optimized air traffic (e.g., Single European Sky), more airport runways (fewer approach manoeuvres) and shorter taxiways. Besides improvements in operational performance, marketing strategies aimed at attracting passengers to more eco-efficient flights can also emerge as noteworthy adaptation measures to the EU-ETS. All these initiatives become essential for short-haul flights in the European Union in the light of the EU-ETS, since they are commonly known as less eco-efficient than long-haul flights due to their higher emissions per RTK or RPK.

A further study will be conducted by authors focused on the alternatives for engaging the passengers in using more eco-efficient flights and on estimating the possible financial gains for airlines from the investment into eco-efficient aircrafts.

Acknowledgement

The article was supported by the "Student Grant Competition" at University of Pardubice - the project "Science and research activities supporting the program Economic Policy and Administration" (SGFES01/2011) and the project "Science and research activities supporting the program Economics and Management" (SGFES03/2011).

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Received: 31. 07. 2011
Reviewed: 16. 10. 2011
Approved for publication: 30. 11. 2011

EQUAL OPPORTUNITIES IN THE CONCEPT OF CORPORATE SOCIAL RESPONSIBILITY

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Abstract: *Corporate Social Responsibility (further „CSR“) is still more using concept, although it does not relate only to companies operating in the private sector but its principles can also apply organizations operating in the public sector. CSR is a very important tool that can help the companies be distinguished from the others. This distinction may be reflected in strengthening competitiveness, improving the image of the company – in relation to customers in the context of increasing in their loyalty, in relation to the employees to improve their retention and in hiring new employees, further reducing costs, improving efficiency etc. The companies increasingly use this tool even though that the application and observance of its principles is based on a purely voluntary basis. In this text, the author focused only on one part of the principles of CSR – equal opportunities in labour relations which belong under social part of CSR*

Keywords: *Corporate Social Responsibility, Equal Opportunities, the Labour Code, the Green Book, Maternity / parental Leave*

JEL Classification: *M14*

Introduction

Corporate Social Responsibility is in the Green Paper, the first comprehensive document about CSR, defined as „a concept whereby companies integrate social and environmental tasks into their business activities and relationships with stakeholders on a voluntary basis." [6] But this is not the only one definition of CSR. A certain freedom is the point by which CSR can be implemented. The idea is that companies behave more responsibly than it is stated by legislative regulations. They go further – beyond economic and legal regulations. This additional aspect is identified as an aspect of corporate social performance. [15] The companies pay attention and invest more in human capital, relations with stakeholders and the environment. This interest which is "in addition" may have a positive impact on increasing productivity and competitiveness, improving the image of the company including making a higher profit. The CSR should reflect a branch, location of the company, its subject and, of course, all kinds of stakeholders who can influence the company or who are influenced by the company. [9]

As it is mentioned above and more, Corporate Social Responsibility has the following features [14]:

- Responsible activities are carried out voluntarily – beyond the obligations arising from legislation.
- Active dialogue with stakeholders (involvement of stakeholders who have significant influence on the company).

It is necessary to have a dialogue with all stakeholders. It is the only way to prevent social and environmental problems which could otherwise influence future competitiveness. [2]

- Long term nature (realization of CSR activities is long and does not end when a company finds itself in a worse economic situation).
- Credibility (CSR activities help to reinforce the credibility of the company. Activities have to be permanent and transparent).

It is possible to divide Corporate Social Responsibility by the pillars which are the part of CSR. It is an economic, social and environmental pillar whose intersection is mentioned „social responsibility".

The substance of the economic pillar is the impact on the economy at a local, national and global level. The indicator can be for example the influence on development in employment, the fight against corruption etc. [14] It can be [1], [12]:

- Transparency of the business.
- Application of principles of good governance.
- Compliance with codes of good conduct, ethics codes.
- Making good relationships with stakeholders etc.

The social pillar includes these issues: [12], [16], [21]:

- Employment policy.
- Education, development of human capital.
- Employees´ benefits.
- Equal opportunities (non-discrimination during recruitment, equality of wages, support career development of women, kindergarten or nursery supported by the employer, using of flexible forms of work,…), balance of personal and work life of employees.
- Support of the others – individuals, organizations that lead to achieve higher quality of life – both individual and then the whole society.

The third pillar is the pillar focused on ecology, environmental area. The substance is the focus of the company on reducing negative impact its activities on the environment. The aim of this pillar of the CSR is reducing of emissions, pollution, protection of natural resources, protection of health of the employees, inhabitants, a support the development of technologies that are friendly to the environment. [1], [12].

The issue of equal opportunities which this article deals with is a part of the social pillar of CSR as it is mentioned above.

1 Equal opportunities

Equal opportunities for women and men are defined as "a state in which both sexes have a freedom to develop their skills and to take advantage of opportunities. It means the same visibility, the equal status and equal participation of both sexes in all spheres of public and private life." [16]

1.1 Equal opportunities and the labour

The Labour Code in the Czech Republic deals with the issue of equal opportunities - with the prohibition of discrimination. It is in the Title III, § 13 – Fundamentals principles of labour relations. Quote from paragraph 2 of this Act [21]: The employer:

- Does not have to transfer the risk of dependent work performance to employees.
- Must ensure equal treatment with employees and observe the prohibition of discrimination of employees.
- Must observe the principles of providing the same wage and other financial payments or the same bonuses for equal work and for work of the equal value,…

The equal treatment and non-discrimination is also in Title IV, § 16 in the Labour Code. For discriminating characters are considered especially [21]:

- Age.
- Marital / family status.
- Nationality.
- Ethnic or social origin.
- Race.
- Color of the skin.
- Gender or sexual orientation.
- Faith and religion.
- Language.
- Property.
- Family line.
- Health.
- Political or other opinion.
- Membership or activity in political parties or movements, trade unions and other associations.

1.2 Violations in the case of Equal opportunities

In the case of violation of the provisions mentioned above, it is called as administrative offenses. An administrative offense is a breach of legal duty which is not a criminal offense. [8]. The State Labour Inspection Office and its organizational components - the regional inspectorates - oversee the obligations that are imposed on the employer by the Labour Code. [8], [20] These violations can be in the field of equal treatment which may be committed by a company or individual [8]:

- Failure to ensure equal treatment with all employees, if it is about working conditions, payments for work and other financial performance and payments, training and opportunity to achieve higher position.
- Discrimination of the employee.
- Penalty or disadvantage of the employee because he legally demanded his rights and claims arising from employment relationship.

- No discussion or at the employee´s request with the representatives his complaint to the exercise of the rights and obligations arising from the employment relationship.

In the case of above mentioned violations, penalties threaten up to CZK 400.000.

If we consider the violations in remuneration of employees, the company or individual, for the fact, that [8]

- Fails to provide to the employee for equal work or work of equal value the same wage as to other employee.
- The penalty threatens at the maximum of CZK 500.000, 1.000.000 and 2.000.000.

2 Equal opportunities in practice

In the case of searching new employee or filling the vacancies among existing employees, it is necessary to see everybody independently and dispassionately, only as a "person". Person who has a certain degree education, working experience for certain time, additional knowledge, skills, abilities,… Those are subsequently compared with specified requirements for mentioned vacancy which we want to fill. It is not possible to consider which the worker has a status (married / unmarried), if he/she has children (and how many),… It is necessary to consider only in professional line (level) – about skills, abilities, potential,… Remuneration is very closed to these issues. It is not possible to make differences. It is necessary for the same work or the work of equal value provide same wage, same financial payments.

2.1 Hot to not discriminate

To support non-discrimination, it is possible to contribute in many ways:

- Do not make the difference between men and women in positions, in payments,.
- Support and assistance in participation of women with children into work by using shorter working hours, agreements on work performed outside the employment relationship.

The origin of this discrimination is in the past seasons when it was common that parental leave remained particularly women – mothers. Because parental leave is possible to draw up to three years of age of the child, so with two children they were out of working environment approximately 6 years. It is obvious that because of this time it could affect the fact that they lost the overview about current working issues. As a result, men were certainly pushing "forward", they were preferred in filling senior positions because they were not supposed to leave the position in few years because of the child care. Currently, however, more men stay with children at home and it is not only because of the financial reasons of the family. If the men ask for taking parental leave, the employer is obliged to comply with his request. Parental leave is provided in the length which it is asked for but not more then three years of age of the child. The legislation here honors the principle of equal treatment – both parents are to care for a child and it is only their decision as they use this right. [4], [21]

But why not to allow a worker (employee) to participate in the activities of the company during the parental leave? It can brings the benefits both to the employer who obtains motivated employees and it is his investment in the future and to the employees who remain in the working environment, they are in contact with other people, colleagues, business partners, but what is more, they do not lose their acquired work experience. The employees welcome the opportunity to be involved in working process according to their requirements and time. And because they manage both private and professional live, they are happier and more relaxed which has a positive effect on their work and results. [7]

The possibilities of cooperation while the employees take their parental leave, is quite enough: cooperation on the basis of agreements on work performed outside the employment relationship (at the current or different employer), work from home via the internet, shorter working hours (for example 15 hours per week instead of 40 hours; beware in this case, the employee is not under the protection according to § 53, paragraph 1, d) of the Labour Code – no dismissal of the employer). We can use again corporate kindergarten:

- Employment for the people aged more than 50 years or who are long-term unemployed.
- Employment for graduates, help them with gain the experience.
- Employment for people from ethnic minorities.
- Employment for people with disabilities, disabled people, etc.

According to the statement of The State Labour Inspection Office these most common violation in the labor occurred in the 1st quarter of 2011 [17]:

- Unequal treatment in remuneration and compensations for unused vacation pay.
- Breaking the obligations in changes and termination of employment.
- Breaking the obligations relating to confirmation of employment, assessment and payments of lower wages than the lowest level of guaranteed wages.
- Failure to pay additional charges for work on Saturdays and Sundays, holidays and work in night.

In the first half of 2011, the authorities of labour inspection made a total of 11.312 inspections at employers. The violation was found in 7.855 cases – employers. Number of fines was in the total number of 1019 and the total amount of CZK 38.206.000 (both in safety and health at work and employment area; statistics do not distinguish these issues). [18]

3 Companies in present

In the present, many companies have already committed to equal opportunities and ban any type of discrimination (because of the age, gender,…). The declaration of the companies we can find in their policies, ethical codes etc. Although the CSR was at the beginning supported especially by large or multinational companies, it is very important for all types of businesses in all sectors, both for large, medium and small companies. Among these companies belong companies focused on manufacturing, financial or business services etc. Many of these companies take into account in their

business relations if the business partners consider the CSR issues as important and if they pay the attention to it. Some examples from different sectors are mentioned below.

Ethic Code of Skanska

„We provide equal opportunities to people regardless of race, color of skin, gender, nationality, religion, ethnicity or other distinctive characteristic. We do not allow discrimination or harassment." [5]

Report on Sustainable Development in ČSOB Group in 2007

„During recruitment new employees and evaluate existing staff we consider the quality of performance and the depth of knowledge and skills… At all levels we observe human rights and respect the opinions of each individual regardless of gender, race, religion and belief…" [22]

Corporate Social Responsibility policy in Metrostav a.s.

„The company is committed to „.. not to practice or not to support any form of discrimination in the labour-law relationship,…" [11]

České aerolinie a.s.

During the season 2006/2007 has been great progress in balancing work and personal lives of the employees of the company České aerolinie a.s. The programs focused on supporting women and men who take their parental leave have been established. Every employee leaving on maternity, respectively parental leave will receive the information in written form about their rights and obligations including possibility to participate in chosen educational programs during this period. [3]

Ikea

A lot of facts, respectively minimum level of requirements that the company takes into account in cooperation with its business partners, is set in the Ethics Code of Ikea Group. It is also set what business partners can expect from the company. Among these requirements is defined the prohibition of any discrimination. [10]

Corporate Social Responsibility of DHL company

CSR of the company is a key element of its corporate strategy. Acting responsibly as a company is to behave with a respect and sustainability to its employees, environment, interests of society and capital, which has been entrusted to it. [13]

Conclusion

Corporate Social Responsibility has become more using tool that helps to companies or organizations to differentiate themselves from the others. And this is despite the fact that there is no pressure from legislative framework because following the principles of CSR is based purely on a voluntary decision.

The fact that the company follows the principles of CSR, it is mentioned in its ethics codes, statements or policies of responsibilities. These documents are at disposal on the websites so everybody can be informed about them.

One of the principles of CSR is the issue of equal opportunities. The companies emphasizes in their statements that they do not support any kind of discrimination. This information is very important both for companies´ employees and business

partners. And very important for future potential employees and business partners too. Everyone can be sure according to these statements, that all are treated equally, everyone "will be measured in the same way." Of course – it should be. As it is stated in Article 1 of the Charter of Fundamental Rights and Freedoms [19]: „People are free in dignity and rights…". Unless this is not in labour issues, it is necessary to inform immediately and ask the Labour Inspectorate for investigation…

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Received: 31. 07. 2011
Reviewed: 05. 10. 2011
Approved for publication: 30. 11. 2011

ECONOMIC TOOLS FOR MANAGING ENVIRONMENTAL ASPECTS OF WATER USE IN POWER PLANTS

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Abstract: *Water use in a power station is an irreplaceable resource due to its physical and chemical properties, good availability and abundance. That is why it is used in large volumes for many purposes. Despite the simplicity of water, it is very comprehensive in energy chemistry. Hence if you evaluate the variables in power plants, the second highest variable cost is water. All other types of variable costs are negligible against water. The largest portion of water in power plants is used for refilling cooling circuits. However the largest portion of water added to the cooling circuits (approximately two thirds) is lost to evaporation and is carried over in cooling towers. There is a concentration of water (evaporation) and carry over (drift of small droplets of cooling water in a stream of cooling air). The concentration of water leads to increased concentrations of impurities in the water. Effect of thickening and loss of water is one of the aspects that are discussed in this work.*

Keywords: *Economic tools, Demineralised Water, Power Plant, Water Management, Ion exchanger, Nuclear Power Plant (NPP).*

JEL Classification: *Q00, Q01.*

Introduction

Water is a common pool resource. As such, it has some specific attributes that make it susceptible to depletion. The overexploitation of a common pool resource leads to the "Tragedy of the Commons" a situation first described by Hardin [6] in 1968 [11]. Water use in the power station is an irreplaceable resource. Despite its simplicity the use of water is very comprehensive in Energy chemistry. This is due to its physical and chemical properties and availability in abundance. That is why it is used in large volumes for many purposes. If you evaluate the variable in power plants, the second highest variable cost is water. All other types of variable costs are negligible against water. The largest portion of this water is used for refilling cooling circuits. The biggest amount of water added to the cooling circuits - approximately two thirds are lost to evaporation and carry over on cooling towers. There is a concentration of water (evaporation) and carry over (drift of small droplets of cooling water in a stream of cooling air). Effect of thickening and loss of water is one of the aspects that are discussed in this work.

To reduce freshwater usage and wastewater discharge has become one of the main targets of design and optimization of process systems. Water system integration treats the water utilization processes in an enterprise as an organic whole, and considers how to allocate the water quantity and quality to each water-using unit, so that water reuse is maximized within the system and simultaneously the wastewater is minimized [1]. Water quality in the River is influenced by bedrock geology, industry on the river, time spent in containment or reservoirs, total flow (dilution waste water) and many

other influences. By the necessity of water treatment it is important to know in detail the composition of water in order to design effective and economical method of treatment, from removal of different groups of materials contained in water, to the production of demineralised water, hence it is necessary to remove all dissolved and suspended substances and close to the ideal of pure H2O..

1 Statement of a problem

The methods of using raw water and water treatment technology leads to the water flow in the source river to:

- Reduce by water evaporation and carrying over in cooling towers. Approximately two thirds of the total water quantity is lost to evaporation or carry-over in power plants cooling towers.
- Thicken by water treatment agents dosed into the water and used in the process of demineralization and subsequently released into the source water. Increase salinity of discharged water and thus the salinity of water in the river due to the use of a number of chemicals for water treatment.

Problem 1

Evaporation and the carrying over of cooling water are given by the cooling tower design, flow and temperature of cooling water, for the most part is almost a linear function of output power. The water removes residual heat, which affects the efficiency of electricity generation process. With organizational arrangements are not solvable.

Problem 2

The second problem is determined by implemented technology of water conditioning and its implementation. It is very realistic reassessment of the deployment of necessary technology to reduce the intensification of waste water salinity and, consequently, the incoming water. It is necessary to create a system that would be able to track trends, values and the joint to eliminate the negative impact of the discharge of wastewater on the quality of raw water in the river. The combination of ecological and economic approach facilitates the creation of this system has not been applied elsewhere.

2 Methods

Objective Defining

The primary objective is to minimize the consumption of demineralised water and by the reduced consumption of demineralised water to optimize the consumption of chemical agents used in water treatment. Secondarily, to bring down the costs of production of demineralised water. It is necessary to elaborate a methodology for calculating the price of demineralised water, which will reflect the cost of raw water, operating materials, methods of operation and maintenance and other costs (as would water be sold). Further to develop a system to manage consumption of demineralised water so that the environmental impacts of manufacturing have been optimized. [5]

Defining the problem areas and necessary data, we must obtain the following information:

- Amount of demineralised water supplied to the production unit.
- Amount of produced electricity.
- Chemical agents used
- Life cycle of ion exchange filter cartridges.
- The effectiveness of ion exchange.
- Self-consumption of demineralised water (for demineralization lines use).

3 Optimization of the production method of demineralised water

3.1 Operating Expense (OPEX):

- The raw water costs are given by contract with the river-basin for the period.
- The cost of pumping energy is advantageous to convert for m^3 of water transported from the river to the deposit of demineralised water. (In case of NPP is in CZK per year = 41/60 kWh X house electricity price per m^3 consumed raw water).
- Operating chemicals needed to produce demineralised water. Here we count pre-treatment of water, regeneration and neutralizing of chemicals (H_2SO_4, HCl, NaOH, coagulants, flocculants,) and ion exchange materials. It should however be the actual count, not projected values. The value in the balance of the operating costs of the materials produced per 1 m^3 of demineralised water.
- Other operating expenses, which are hardly classifiable information, such as compressed air consumption, with operational materials handling, cleaning operations. Again, it is advantageous to find the coefficient of relative demineralised water produced, because these costs are stable, however, difficult to monitor.[7]

3.2 Capital Expenditure (CAPEX)

The larger part of fixed costs, where no matter the amount of demineralised water produced can be termed as a “capital”.

- Depreciation for the operating balance may not be consistent with the statutory depreciation for tax purposes because the objective is to cover as truthfully distribution of values in investment value over time. Depreciation is a function on 1 m^3 of raw water.
- The cost of maintenance, you can establish similar rules as in the previous section. Routine maintenance is included in a given year, but major maintenance interventions, such as replacement of piping, paint, etc. should be reflected in the estimated useful lives.
- Wages of employees involved in the production of demineralised water.
- Supply overhead and administrative overhead. This is the cost of the corporate infrastructure in the price of the product.

The resulting calculation procedure to calculate the price can be very different from case to case, but it must match the locations participating in the benchmarking. The biggest effects of these numbers are not in their absolute value, but in monitoring trends in their changes over time in comparison between the monitored sites and the correct evaluation of changes.

3.3 Optimising ion exchangers lifecycle

Ion exchangers' capacity for the calculations is determined by comparing the counted operating capacity in each cycle (mol trapped ions per liter of resin) with the capacity provided by the manufacturer. Cat ion exchangers Wofatit KPS-DS, followed by Lewatit S-100 have great durability. Since 1985 in the Dukovany NPP, cation was added only about 5% of its capacity annually to offset losses, the operational capacity does not decrease capacity, which would require a total replacement filter cartridges. For anion resins, Wofatit SBK-DS and AD-41 followed by Lewatit M-600 and MP-64 is a loss of strong basic capacity (Hoffman degradation of amines).

Exchangeable capacity of strong basic-anion form quaternary amines, which occur in time to the degradation of functional groups and conversion of lower amines. This reduces the capacity of strongly basic filter replacement for weakly basic. This leads to deterioration in overall employment and productive capacity anion resin. It was found the typical course of ion capacity exchange reduction; capacity-curve is variation in the acceptable tolerance. This data set was used to perform regression analysis and acquisition of capacity decline y = -0.67x, where x-axis is unit for the month and the unit on the y-axis (%) is operating capacity, where 100% capacity of the resin is given by the manufacturer. The annual average loss of total resin capacity is 8.04%. We consider the deployment of the anion filter cartridge in years 1, 2, ... n for any length of deployment enumerate costs and benefits that compare. We will use the following simplifying assumptions

- Production of demineralised water will be 700 000 m3 per year.
- Price of resin regeneration is 10,300CZK.
- Costs or revenues are not discounted.
- Prices of consumables will be considered as stable.
- The price of demineralised water is considered to be stable.

If this simplification is not accepted, each of the simplifying assumptions would change to the variable. The data indicate that the high cost of resin are moved to maximum effect between 8 and 9 year of operation, which decreases the operating capacity of about 50% against the new resin. [4, 8, 9, 10, 12]

4 Discussion

The efficient use and allocation of water is paramount to sustainable development hence Efficient and effective water resources management is as much a political as a scientific challenge, which not only requires a multidisciplinary approach, but also the integration of key stakeholders into multi-objective, multi-criteria decision making processes. The decision making process requires direct access to and ease of use of a shared information basis and decision making support tools that are intuitively understandable for a diverse user group, and that address not only hydrological and environmental engineering but also economic and social components direct.

The aim of this work is to develop tools that can be used as economic indicators of the impacts of technology on the environment. If these instruments are defined, an equally important task is to master these tools and use them. This application requires some experience of the operations. When using these tools it is relatively easy to

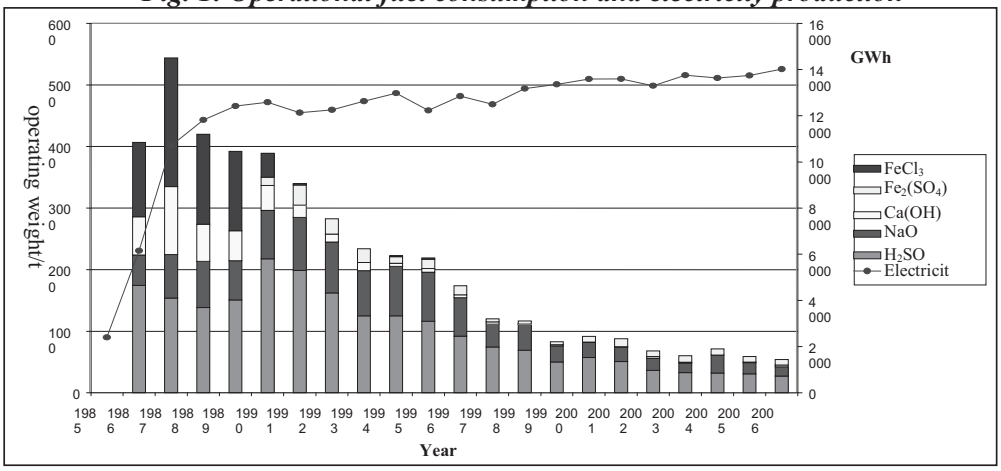
identify problem areas. Then follow a technical audit, which will propose concrete action in the field of technological discipline, work practices or suggestions to changing technology. There is scope for the use of benchmarking, or search for "best practices". This application part is specific to each plant and is outside the scope of this work. On the top of an imaginary pyramid of information are the following criteria:

4.1 Price of demineralised water

Price of demineralised water comprehensively describes the efficiency of production of demineralised water. It is divided into individual components, which can be individually monitored and evaluated. The largest influenced items in price of the demineralised water are operational chemicals.

These account for the major environmental impact. We get a real look at the effectiveness of the use of operational chemicals in a chart based on the production of electricity as the main product. Figure1is based on the production of electricity as the main product. In identifying the unacceptable trends in some of the observed values it is necessary to carry out detailed analysis of the situation and the local knowledge to be able to prepare an improvement.

Fig. 1: Operational fuel consumption and electricity production



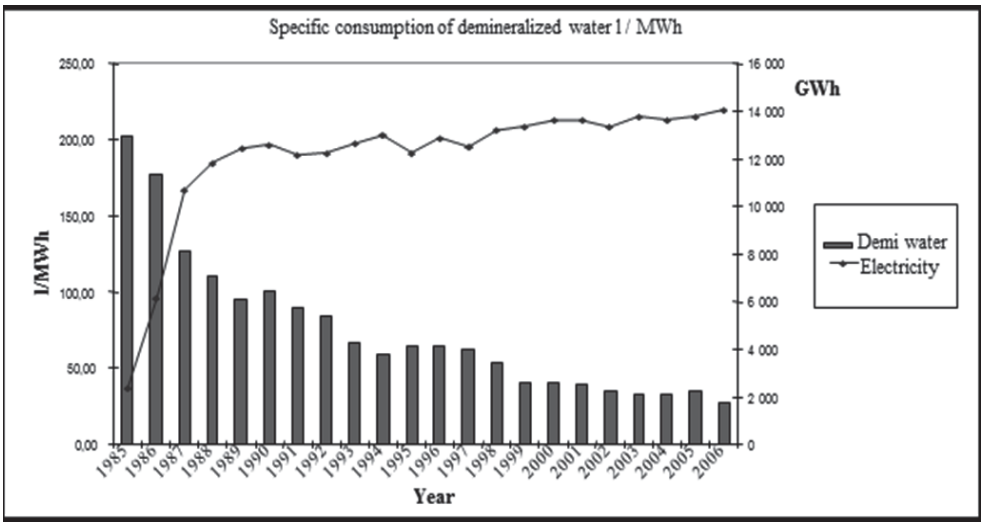
Source of data: author

4.2 Consumption of demineralised water

Is a comprehensive indicator which presents comparatively how economically produced demi water is used? As evidenced in the work, saved demineralised water presents an unused source of raw water, unused chemicals, which are then neutralized, salts discharged into the environment, and unused energy. It is a very convenient factor for benchmarking. To use a comparison of power plants and heating plants may be related to electric energy, but not the heat production. [2, 3] Trends in consumption of demineralised water as the aggregate carry more complex information than would be expected, as seen in figure 2 below. It is interesting to note the failed trend of decreasing consumption of demineralised water in 1990. There was significantly

restructure in the organizational structure, and priorities were set into other areas. A similar effect was observed after 1995 when there was a major change in Dukovany NPP's organizational structure. This confirms that the movement of desired direction in any activity is subject to continuous pressure.

Fig. 2: Specific consumption of demineralized water l / MWh

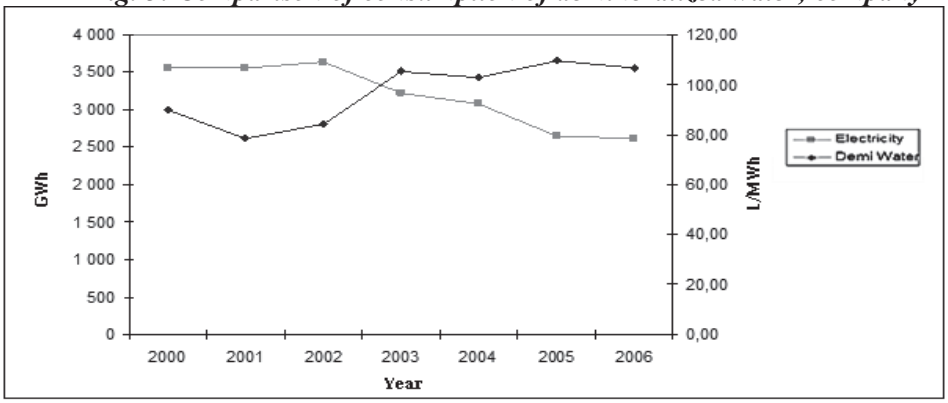


Source of data: author

Conclusion

Effectiveness of this work's defined approach can be illustrated by the comparing data from Dukovany NPP with data which was obtained from plants that have not applied these methods. The origins of data used will not be registered. Company 1 of the figure 3 shows the trend of reporting period justifiable at high absolute demand of demineralised water against the firm 2 in the figure 4 showing an uneven trend and high consumption. This paper publishes a summary of instruments that can be used to manage the impact of chemical processes in water treatment to the environment not only in energy production plants.

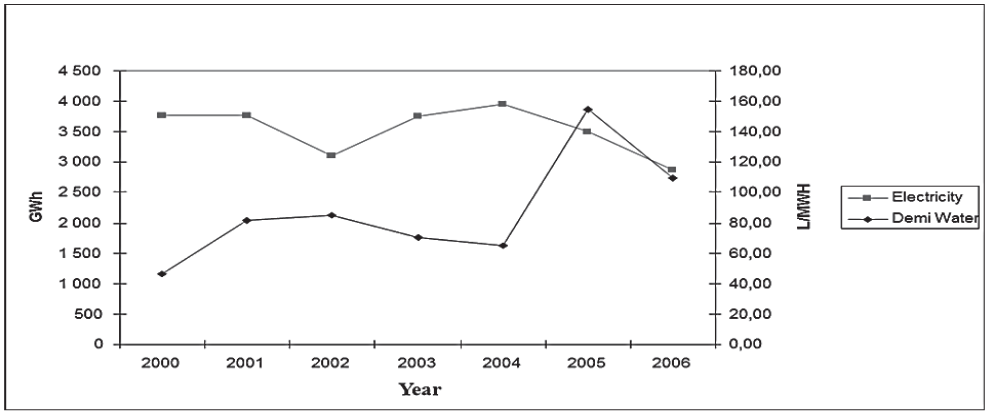
Fig. 3: Comparison of consumption of demineralized water; company 1



Source of data: author

Figure 3 presents specific consumption of demineralised water just about 100 L/MWh. which shows negative dependence of electricity production and demineralised water consumption. It is reasonable, because higher electricity production means higher time share spent in optimal operation level. Trend is acceptable, but total specific consumption of demineralised water is unreasonably high. At present, this value is below 50 L/MWh at the Dukovany NPP. Figure 4 shows a different situation where high specific consumption of demineralised water leads to unreasonable trend, and there is no connection between electricity production and demineralised water consumption. Especially years 2005 and 2006 shows dramatically rising demi water consumption without any visible improvement steps. This gives evidence of profitability of tools described in this paper

Fig.4: Comparison of consumption of demineralized water; company 2



Source of data:author

However, limiting factors in the neighbourhood, in this case it was the assimilative capacity of environment, can over time cause the pressure in the continuity of production rearranging priorities. In addition, this work responds to the absence of an integrated process for monitoring and managing of the impact of chemical processes in relative frequent high volume water treatment. Indicated concentration of the economy and the environment provides for the use of this process good initial condition

Acknowledgement

This research was conducted with the help doc. Ing. CSc Obrsalova Ilona, from the faculty of Economics and administration at University of Pardubice. This work was supported by the scientific research project of Ministry of Environment, Czech Republic under Grant No: SP/4i2/60/07 with the title Indicators for valuation and modeling of interactions among environment, economics and social relations.

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Received: 31. 07. 2011
Reviewed: 27. 10. 2011
Approved for publication: 30. 11. 2011

ANALYSIS OF CHILDHOOD HABITS INFLUENCE ON CONSUMPTION BEHAVIOR IN ADULTHOOD

Dagmar Lesáková

Abstract: *The aim of this paper is to explore the link between habits and pattern of consumer behaviour in childhood and consumption behaviour in adulthood. We investigate the influence of practices in food consumption in childhood age on food consumption behaviour in early adulthood years. Food preferences play an important role in food choices and food consumption both in adults and children. Hence, it is needed to understand the evolution of food preferences and the factors influencing this development in food consumption. A positive relationship was found in our research, indicating that preferences, eating habits and food consumption behaviour in adult years depend on pattern applied in childhood years. Our results demonstrate that children-feeding strategies used by parents can influence children´s food preferences and practices also in their adult years.*

Keywords: *Consumption Behaviour, Food Preferences, Consumption Habits, Childhood / Adulthood Behaviour.*

JEL Classification: *M31.*

Introduction

Behaviour in children´s food consumption and attitudes promoting health and preventing deseases in childhood present an important point which has impact on behaviour in further stages of one´s life. In this sense family and parents behaviour influence behaviour of children in food consumption in next years [6]. Family is one of the most influential factors, especially in school years, while in young-adult years such determinants as media and friends become more important. Parents influence food consumption behaviour and cognitions of their children through persuading and rewarding desired behaviour and by punishing undesirable behaviour [4]. Information provided by parents affect children´s food consumption behaviour and help them to understand and perceive responsibility for their own bevaiour, including the ability to make their own food choices.

Explaining nutrition questions to the children by parents is a factor fostering exploration of nutrition knowledge also in adult years. Families selecting food for their preschool children based on health considerations and not on taste, develop in children attitudes towards more healthy consumption, i.e. lower in fat, sugar, calories and higher in fiber and vitamines [7].

Interactions between parents and children in the feeding context are of importance in developing children´s preferences and consumption patterns for next years. Rewarding and stimulating children for desired behaviours by food could enhance preferences for such food [3]. In contrast, if rewards are offered to children for eating

(rewards are stimulus for food consumption), those foods consumed to obtain rewards become less preferred by children.

Encouraging children to consume „good" foods and restricting them to consume „bad" foods (with high sugar, fat, salt, etc.) does not mean necessarilly that children develop behaviour that avoids their preferences for „bad" foods. Evidence indicates that such restrict access to „bad" foods could make it even more attractive. In situations, where bad foods were free accessible and available to children, they consumed even more of the restricted foods [4].

Food preferences play an important role in food choices and food consumption in adults and children [3]. Hence it is needed to understand the evolution of food preferences and the factors influencing this development in food consumption.

It was documented, that repeated exposures to a certain type of food by infants and children increase consumption and preferences [4]. However, it is not clear if exposure itself is enhancing and contributing to changes in preferences, since food is generally presented in a context, likely to reinforce the effect of exposure [2], [10].

Family behaviour in the feeding context is important in shaping children´s consumption preferences and practices. Especially the children-feeding strategies used by parents can influence children´s food preferences and practices. The main objectice of this paper is to explore the link between current food preferences and practices of university students and their food preferences and practices during their childhood.

1 Food preference and food habits

1.1 Methods

To assess the preferences and habits in food consumption and their evolution from childhood to early adulthood, empirical research was conducted in 2010. The sample was selected randomly from university students and counted 318 respondents. The questionnaire focused on eating habits and food preferences of university students in childhood as compared with eating habits in adult years. 7 questions measured eating practices and 7 questions measured food preferences. Respondents were asked to use Likert-scale of 1-5 points, where 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always. For analyzing data statistical package SPSS was applied.

Pearson´s correlation coefficients were used to assess the correlation between variables. Those correlation coefficients with value greater than 0,3 have been accepted to be meaningfully large enough, considering the sample size. Statistical results were considered to be significant at $p < 0,01$ [9].

Cronbach´s α values were calculated to assess the inter-item reliability of the final scores [1]. The questionnaire delivered good internal consistency reliability with Cronbach´s $\alpha = 0,67$ for food preference and $\alpha = 0,66$ for food consumption habits (eating practice) in the childhood, respectively $\alpha = 0,70$ for food preference and $\alpha = 0,72$ for food habits (eating practice) in early adulthood of university students.

With χ^2 tests relation between current food consumption preferences and practices of university students and their childhood consumption preferences and practices was

analysed. Factor analysis with a Varimax rotation was performed on questions about food preference and practices in childhood and adulthood in order to summarize the results. Those factors with Eigen value greater than 1,0 were considered [5]. Three factors have been extracted, accounting for 59% variance. Items with factor loadings greater than 0,3 were included in the factors.

1.2 Results

Childhood and adulthood food consumption preferences

Frequences of answers to questions regarding childhood and present adulthood food consumption preferencies are presented in Table 1. 64% of respondents indicated eating vegetables often and always in their childhood and 60% do so at present in their adult years. While 66% of university students reported that they used to consume milk and milk products often and always, 45% consume milk and milk products currently. While 36% of the students had cake and sweets often and alwys as the children, the proportion declined to 26% at present.

It is clear from the Table 1 that students present food consumption habits were dependent on childhood food preferencies.

Tab. 1: Childhood and adulthood preference responses

Items	n	Frequences					χ^2
		Never	Rarely	Sometimes	Often	Always	
I used to eat vegetable as a child	318	3 (0,09)	49 (15,4)	63 (19,8)	121 (38,1)	82 (25,8)	
I eat vegetable at present	318	1 (0,03)	64 (20,1)	60 (18,9)	113 (35,5)	80 (25,2)	83,025*
I used to eat fruit as a child	318	2 (0,06)	8 (2,5)	78 (24,5)	139 (43,7)	91 (28,6)	
I eat fruit at present	318	2 (0,06)	9 (2,8)	72 (22,6)	145 (45,6)	90 (28,3)	109,317*
I used to consume milk and milk products as a child	318	10 (3,1)	17 (5,3)	81 (25,5)	108 (34,0)	102 (32,1)	
I consume milk and milk products at present	318	29 (9,1)	59 (18,5)	83 (26,1)	79 (24,8)	68 (21,3)	67,214*
I used to eat fish as a child	318	48 (15,1)	101 (31,8)	51 (16,0)	76 (23,9)	42 (13,2)	
I eat fish at present	318	36 (11,3)	129 (40,6)	75 (23,6)	48 (15,1)	30 (9,4)	98,610*
I used to eat meat and meat products as a child	318	12 (3,8)	44 (13,8)	86 (27,0)	136 (42,8)	40 (12,6)	
I eat meat and meat products at present	318	32 (10,1)	45 (14,1)	103 (32,4)	105 (33,0)	33 (10,4)	89,618*
I used to eat pasta as a child	318	51 (16,0)	101 (31,8)	110 (34,6)	37 (11,6)	19 (6,0)	
I eat pasta at present	318	43 (13,5)	86 (27,0)	80 (25,1)	51 (16,0)	58 (18,2)	74,113*
I used to eat bread as a child	318	1 (0,03)	12 (3,8)	103 (32,4)	113 (35,5)	89 (28,0)	
I eat bread at present	318	10 (3,1)	9 (2,8)	79 (24,8)	116 (36,5)	104 (32,7)	94,317
I used to eat cake and sweets as a child	318	28 (8,8)	81 (25,5)	94 (29,5)	61 (19,2)	54 (17,0)	
I eat cake and sweets at present	318	36 (11,3)	109 (34,3)	90 (28,3)	42 (13,2)	41 (12,9)	79,919*

p<0,001, df=4 *Source of data: own calculation*

Childhood preferences in food consumption ranged from 2,60 ± 0,95 (mean ± standard deviation) for pasta to 3,87 ± 0,86 for bread. Generally, there was a statistically significant increase in preference with age for pasta (2,98 ± 0,91) and bread (3,93 ± 0.84) and decrease in preference with age for milk and milk products (from 3,86 ± 0,95 to 3,31 ± 0,84), fish (from 2,88 ± 0,79 to 2,70 ± 0,82), meat and meat products (from 3,46 ± 0,85 to 3,19 ± 0,84) and cake and sweets (from 3,10 ± 0,73 to 2,82 ± 0,88). Mean preferences for vegetable and fruit were not different between childhood and adulthood.

Relationship between childhood and adulthood food consumption habits (eating practices)

A number of student´s adult food consumption behaviours were dependent on childhood food consumption (Table 2). Those who consumed according to moods were likely to do the same also in adult years ($t = -5,78$, $p < 0,01$). Students eating

more at present, have eaten more also in their childhood (t = -4,35, p < 0,01). Students who currently use food as a reward at present, were likely to be rewarded with food also in their childhood (t = -4,69, p < 0,01). Taking into account nutrition information in adult years proved to be dependent on delivering such information in the childhood (t = -1,89, p < 0,01).

Tab. 2: Childhood and adulthood food habits responses

Items	n	Frequences					χ^2
		Never	Rarely	Sometimes	Often	Always	
I was a picky eater as a child	318	41 (12,8)	104 (32,7)	121 (38,1)	32 (10,1)	20 (6,3)	
I am picky eater at present	318	13 (4,1)	142 (44,6)	89 (27,9)	43 (13,5)	31 (9,7)	129,578*
I used to have snacks between meals as a child	318	15 (4,7)	21 (6,6)	117 (36,8)	91 (28,6)	74 (23,3)	
I have snacks between meals at present	318	19 (5,9)	29 (9,1)	123 (38,7)	94 (29,6)	53 (16,7)	51,421*
My eating depended on moods in the childhood	318	33 (10,4)	86 (27,0)	121 (38,0)	46 (14,5)	32 (10,1)	
My eating depends on moods at present	318	45 (14,2)	78 (24,5)	102 (32,1)	54 (16,9)	39 (12,3)	59,314*
I used to eat more than I should eat as a child	318	29 (9,1)	117 (36,8)	127 (40,0)	28 (8,8)	17 (5,3)	
I eat more than I should eat at present	318	25 (7,9)	97 (30,5)	126 (39,8)	41 (12,9)	29 (9,1)	63,997*
I used to eat less than I should eat as a child	318	18 (5,7)	123 (38,7)	116 (36,5)	39 (12,3)	22 (6,9)	
I eat less than I should eat at present	318	29 (9,2)	133 (41,8)	104 (32,7)	31 (9,7)	21 (6,7)	65,573*
I used to be rewarded with food as a child	318	29 (9,1)	97 (30,5)	98 (30,8)	46 (14,5)	48 (15,1)	
I use food for reward at present	318	26 (8,2)	135 (42,4)	115 (36,2)	22 (6,9)	20 (6,3)	74,309*
Nutrition was considered in my family when I was a child	318	21 (6,6)	28 (8,8)	115 (36,2)	111 (34,9)	43 (13,5)	
I consider nutrition in my food at present	318	15 (4,7)	33 (10,4)	116 (36,2)	105 (33,0)	49 (15,4)	93,414*

p<0,001, df=4 *Source of data: own calculation*

Factor analysis of students´ food consumption habits resulted in a three-factor solution (Table 3). The questions about childhood food consumption habits were matched with present / adult food consumption habits of respondents. Factor 1 is comprised of three items: eating less than they should have to eat, eating dependence on moods and picky eating. Factor 2 included instruction about nutrition in the family and using food for reward. Finaly Factor 3 contained items eating snacks between meals and eating more than they should have to eat.

Tab. 3: Factor loadings of childhood and adulthood food habits

Items	Childhood habits			Adulthood habits		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
Picky eater	0,693			0,651		
Snacks between meals			0,711			0,689
Eating dependent on moods	0,621			0,588		
Eating more			0,619			0,689
Eating less	0,627			0,656		
Food as reward		0,786			0,712	
Nutrition knowledge		0,584			0,565	

p<0,01 *Source of data: own calculation*

Correlations of the childhood food consumption factors with scores of the corresponding sets of related questions about present food consumption habits, and overall childhood and adulthood scores are given in Table 4. All correlations were found significant ($p < 0,01$). The highest correlation (0,529) was found for Factor 1 and the lowest correlation (0,307) was founf for Factor 2.

Tab. 4: Correlations of Factors on childhood and adulthood food consumption

Factor	Correlation coefficient
1	0,529
2	0,307
3	0,362

Source of data: own calculation

Discussion

The main objective of our research was to explore the link between food consumption preferencies and habits in early adulthood of university students and in their childhood years. The findings of the research implies that specific present food consumption habits such as picky eating, eating dependence on the mood, eating more or less then should be eaten, using food for reward, were dependent on similar behaviour in the family during the childhood years of the student. It indicates that childhood food eating habits persist until now. Students who have been picky eaters in the childhood, may be described by their eating habits in the adult years as eating the same thing with little variety, not trying new foods, prefering high calorie choices, etc.

A positive relationship between eating practices in the childhood and eating practices in early adult years was found in this research. Unhealthy food consumption in adult years can be explained by parents overfeeding children, letting them eat too much and too often, encouraging them to eat more than they need through snacking, consuming sweets and cakes, etc.

It was not surprising that fish and meat consumption decreased with time, as a consequence of higher increase in prices. Also the trend towards vegetarianism in the segment of youngsters caused the decline in meat consumption. Additionally, when growing up, children and teenagers are influenced by health and weight concerns. The

vegetable and fruit consumption did not change much during the years, which is a positive outcome of our research. However, it was proven increased preference for pasta and bread, been a popular fast food among students.

Respondents indicated that the most important factors influencing food consumption patterns are price and nutrition concerns [8].

Conclusion

The major findings of this research were positive correlations between childhood and adulthood food consumption preferences and patterns. It seems to be of highest priority the behaviour and food consumption habits and practices in the family since the first years of a child. Eating habits and nutrition behaviour in the family have a long range effects on child feeding practices. Food consumption behaviour in the family must include the development of pattern to impose restrictions on unhealthy foods and to reinforce positive behaviour, which could encourage healthier eating habits.

Acknowledgement

This paper was prepared within the Research Project VEGA 1/0652/10 „Dynamic aspects of buying behavior of the Slovakia´s population under conditions of economic instability“ funded by the Ministry of Education, Youth and Sport of SR.

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Received: 31. 07. 2011
Reviewed: 13. 09. 2011
Approved for publication: 30. 11. 2011

INSURANCE RESERVES ESTIMATION BY BOOTSTRAP

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Abstract: *The claim reserving calculation is one of the basic problems of the successful function of the insurance companies. These reserves can be calculated both classical and simulation way. The second way – use of resampling method is presented in the paper. Application of bootstrap methods in connection with problems solved in insurance theory is described. The parameters of interest are estimated, the ways how to calculate the point and interval estimates are shown.*

Keywords: *Point Estimate, Interval Estimate, Chain Ladder Method, Development Factor, Resampling, Bootstrap Method.*

JEL Classification: *C15, G17.*

Introduction

One of conditions under that the insurance company can be competitive and successful in the insurance market is to dispose of reasonable financial reserves. These reserves are used for insurance benefits payments. Very important question is the amount of money that is reserved for these payments. It must be neither too much nor too little; the first extreme leads to situation that finance are conserved and they can't be exchanged, the second extreme can cause insolvency.

One of the most common methods, how to determine the insurance reserves, is the Chain ladder method, described in [5] or [6].

1 Statement of a problem

1.1 Basis of claim reserving theory

When any accident occurs, it is conventional, that payment of the insurance benefits is not fully realized during the accident year, but certain part of the insurance benefit can be paid during following years – it means that raises any interval between the moment of accident and the moment of total insurance benefit payment. This insurance benefit can be paid off in parts during same years. The car insurance, the accident insurance, the property insurance, the travel insurance are examples of above mentioned kinds of insurances.

Estimate and creation of the optimal claim reserves is the necessary condition for following covering of these claims. In the insurance theory - two basic types of claim reserves for past exposures are distinguished [6]:

- IBNR (Incurred but not reported). The reserve for the insurance benefit for the claims that have occurred but haven't been reported yet corresponds with it.
- RBNS (Reported but not settled). This means not settled insured accident corresponding with the reserve for the insurance benefit from the claims that

have been reported but have not been settled. The payment is expected in the future.

The principle of claim reserving calculation assumes knowledge of the past payments.

The most often applied claim reserving calculation methods are:

- Chain-ladder method.
- Bornhuetter-Ferguson method.
- Poison model for claim counts.

More models based on different mathematical principles were developed for every of above mentioned method. Every of these models can be solved by various processes, starting with exact over approximative and terminating with the simulation methods.

When we want to know accuracy of the estimates, we need to introduce a stochastic model and we can select one of following approaches: bootstrap method, Monte Carlo simulations, Bayesian approach. This paper is devoted to the less known but simple and effective method – bootstrap.

1.2 Description of Chain ladder method

The "Run Off Triangle" is the basic scheme for the Chain ladder method (CL) application. Originally, the scheme (resp. the table) is created by the incremental insurance benefits $X_{i,j}$, that were paid off in the year j for the accidents that happened in the year i. But the CL method doesn't use these incremental data $X_{i,j}$, but the cumulative insurance benefits $C_{i,j}$, which express the total insurance benefits paid for the accident that happened in the year i from the development year 0 till j. The structure of the data is presented in the table 1. The Chain ladder method is based upon the idea that the variable $C_{i,j+1}$ is the function of the variable $C_{i,j}$, which can be described as $C_{i,j+} = f(C_{i,j})$.

The application of the Chain ladder method is conditioned by the following assumptions [5]:

- The cumulative claims $C_{i,j}$ of the different accident years i are independent.
- Both the last accident year and the last development year are given by n.
- Development of the sums of paid insurance benefits is characterized by the "development coefficient of the insurance benefit" λ_j.
- Homogenous portfolio.
- Stability of inflation during development years.

To be able to refund the claims, occurred in the year i, we have to estimate the values $C_{i,j}$ in the grey part of the table 1. Instead of using the common simple deterministic model $C_{i,j+1} = \lambda_j \cdot C_{i,j}$, the other model expressing relation between variables $C_{i,j}$ and $C_{i,j+1}$ and defining the autoregressive process was applied:

$$C_{i,j+1} = \lambda_j \cdot C_{i,j} + \sigma_j \sqrt{C_{i,j}}\, \varepsilon_{i,j+} . \qquad (1)$$

Coefficients λ_j, σ_j, $\varepsilon_{i,j+1}$ can be estimated step by step by the variables

$$\hat{\lambda}_j = \frac{\sum_{i=0}^{n-j-1} C_{i,j+1}}{\sum_{i=0}^{n-j-1} C_{i,j}} \quad ; \quad \sigma_j = \sqrt{\frac{1}{n-j-1} \sum_{i=0}^{n-j-1} C_{i,j} \left(\frac{C_{i,j+1}}{C_{i,j}} - \hat{\lambda}_j \right)^2} \quad ; \tag{2a, 2b}$$

$$\varepsilon_{i,j+1} = \frac{\frac{C_{i,j+1}}{C_{i,j}} - \hat{\lambda}_j}{\sigma_j} \sqrt{C_{i,j}} \qquad j = 0, 1, \ldots, n\text{-}1, \quad i = 0, 1, \ldots, n; \tag{3}$$

Tab. 1: Cumulative insurance benefits

accident year *i*	development year *j*						
	0	**1**	**2**	**...**	***n*-2**	***n*-1**	***n***
0	$C_{0,0}$	$C_{0,1}$	$C_{0,2}$	**...**	$C_{0,n-2}$	$C_{0,n-1}$	$C_{0,n}$
1	$C_{1,0}$	$C_{1,1}$	$C_{1,2}$	**...**	$C_{1,n-2}$	$C_{1,n-1}$	
2	$C_{2,0}$	$C_{2,1}$	$C_{2,2}$	**...**	$C_{2,n-2}$		
...	**...**	**...**	**...**	**...**			
***n* - 1**	$C_{n-1,0}$	$C_{n-1,1}$					
n	$C_{n,0}$						

Source of data: [6]

1.3 Basic idea of bootstrap method

The bootstrap method was elaborated by Bradley Efron in 1977 [1]. The principle is to produce new samples from the original data set with the same size. The original data analysis procedure is repeated many times and the bootstrap replications of the parameter of interest are obtained. The principal advantage of the method is construction of the artificial data sets without making any assumptions about probability distribution [1].

When $\boldsymbol{C} = (C_1, C_2, \ldots, C_n)$ is the random sample from an unknown distribution F, the bootstrap samples can be produced in two ways:

- When an unknown distribution belongs to any family of distributions differing in values of a parameter ψ (it is marked as F_ψ), the parameter ψ is estimated by any suitable statistics $\hat{\psi} = t(C)$. The bootstrap samples $\boldsymbol{C}^* = C_1^*, \ldots, C_n^*$ from the distribution $F_{\hat{\psi}}$ are generated. This process is called the parametric bootstrap.
- When we don´t have any other information about the distribution F, the empirical distribution function $\hat{F}$ is calculated from the random sample $\boldsymbol{C}$**.** The bootstrap samples $\boldsymbol{C}^*$ are then generated from this distribution . This process is called the non-parametric bootstrap.

Let $\lambda = t(F)$ be any parameter of unknown distribution F and $\hat{\lambda} = g(\boldsymbol{C}, F)$ is its estimate. The distribution function of this estimate is marked $G(\boldsymbol{C}, F)$. The statistics $\lambda = g(\boldsymbol{C}^*, \hat{F})$ is called the bootstrap replication of the estimate $\hat{\lambda}$ and its distribution function $G^*(\boldsymbol{C}^*, \ )$ is called the bootstrap estimate of the distribution function $G(\boldsymbol{C}, F)$.

1.4 The bootstrap quantile interval

When $G^*(X^*, \hat{F})$ is the distribution function of the bootstrap replications Θ, the (1 – 2α) percentage confidence interval can be expressed

$$\langle G^{*-}(\alpha);\ G^{*-}(1-\alpha)\rangle \text{ resp. } \langle \Theta_{\_\_} ;\ \Theta_{\_\_\ \ell}\rangle,$$

where $\Theta_{\_}$ is (100·α)-th percentile [4]. This formula is exactly true only when the random sample originates from the distribution *F*.

We can keep at disposal only finite number of replications $\hat{\Theta}^*$ in reality and to obtain only estimates of the interval $\langle \Theta_{\_\_} ;\ \Theta_{\_\ \ell}\rangle$.

R bootstrap samples $X_1^*,\ldots,X_n^*$ are generated and corresponding values of bootstrap replications Θ ,...,Θ are calculated of them. These replications are arranged in order according to size. (100·α)-th percentile $\Theta_{\_}$ is estimated by the help of the value $\Theta_{R,\alpha}$, eg. (*R*·α)-th value in the sequence of all bootstrap replications Θ ,...,Θ arranged in order according to size. The interval

$$\left\langle \Theta_{R,\alpha}\ \ \Theta_{R,1-\ \ell}\right\rangle \tag{4}$$

is then the estimate of the (1 – 2α) ·100% confidence interval $\langle \Theta_{\_\_} ;\ \Theta_{\_\ \ell}\rangle$.

2 Problem solving

2.1 Bootstrap approach to claim reserves estimate

Situation according to the chapter 2.3. paragraph b) is assumed, it means that the distribution of the random variables $C_{i,j}$ is unknown and the non-parametric bootstrap is used. Resampling is done and bootstrap replications of the estimate of the parameter λ_j are calculated. Resampling is performed in a different way - not the original data are bootstrapped, but residuals $\varepsilon_{\_,j}$ mentioned in the model (1) are used and estimated according to the formula (3) [11].

The literature recommends to use adjusted residuals calculated according to the following formula:

$$z_{i,j+} = \varepsilon_{\_,j+}\left\{\frac{}{}\right\}^{\frac{1}{2}}. \tag{5}$$

The process that follows is to get the bootstrap replications $\lambda_{\_}$. By the help of adjusted bootstrap residuals $z_{i,j+}^*$ the bootstrap sample of $C_{i,j}^*$ is gained. The first step is to put $C_{i,0}^* = C_{i,0}$. To calculate the other values $C_{i,j}^*$ (for $i+j<n$) we use the following formula (6).

$$C_{i,j+}^* = \lambda_{\_} C_{i,j}^* + \sigma_{\_}\sqrt{C_{i,j}^*}\, z_{i,j+}^* \tag{6}$$

The formula (7) shows how to calculate the bootstrap replications λ_j^* of the development coefficient $\hat{\lambda}_j$:

$$\lambda_j^* = \left(\sum_{i=1}^{n-j-} C_{i,j+}^* \right) \Big/ \left(\sum_{i=}^{I-j} C_{i,j}^* \right) \quad , j = 0, 1, \ldots, n\text{-}1 \tag{7}$$

The final step of the method is to estimate the missing values $C_{i,j}^*$ of the predicted cumulative claims (lower triangle matrix). The following formula (8) helps us to finish calculations.

$$C_{i,j}^* = C_{i,n-i} \prod_{k=n-i}^{j-1} \lambda_{\cdot}, \qquad j = 1, 2, \ldots, n \tag{8}$$

The bootstrap process is repeated R–times and for each pair of indices i,j ($i+ \; > \;$). The vector of λ_j^* , $j = 0, 1, \ldots, n\text{-}1$, and triangle matrix of the predicted cumulative claims $C_{i,j}^*$ are gained after each repetition. The bootstrap values $C_{i,j}^*$ enables us to estimate the unknown value of cumulative claims $C_{i,j}$ - it is the average from the appropriate $C_{i,j}^*$ bootstrap replications.

2.2 Confidence interval

2.2.1 The quantile confidence interval for λ

The result of R bootstrap replications are R calculated values of λ_j^*, $j = 0, 1, \ldots, n\text{-}1$. According to the formula (4) the limits of the bootstrap confidence interval are the $R{\cdot}\alpha$-th ordered value of R replications of the variable λ and similarly the $R{\cdot}(1\text{-}\alpha)$-th ordered value of R replications of the variable λ .

Approximation of the 1 - 2α quantile interval is then $\langle \lambda_{R,\alpha} ; \lambda_{R,1-} \rangle$.

2.2.2 The quantile confidence interval for cumulative claim reserves

The calculated values of $C_{i,j}^*$ are considered. After R bootstrap simulation the lower and upper limits of the bootstrap confidence interval for the cumulative claim reserves $C_{i,j}$ are $C_{i,j\ R,\alpha}^*$ and $C_{i,j\ R,1-}^*$, where $C_{i,j\ R,\alpha}^*$ is the $R{\cdot}\alpha$-th ordered value and $C_{i,j\ R,1-}^*$ is the $R{\cdot}(1\text{-}\alpha)$-th ordered value of R replications of the variable $C_{i,j}^*$.

Approximation of the 1 - 2α quantile interval is then

$$\langle C_{i,j\ R,\alpha}^* ; C_{i,j\ R,1-}^* \rangle. \tag{9}$$

2.3 Presentation of the bootstrap method – the concrete example

To present the bootstrap process of the claim reserves estimation the data published in Pacáková (2004) were used. Both the incremental data and cumulative data of insurance benefits are stated in the book. For our need only cumulative data are presented in the table 2 – white upper triangle.

2.3.1 Classical and bootstrap Chain ladder method

The missing cumulative claim reserves were estimated by the help of deterministic CL method in the left half of the table and by the help of bootstrap CL method in the

right half of the table 2. The results obtained by the deterministic CL method were calculated according to the simple deterministic model, $C_{i,j+1} = \lambda_j \cdot C_{i,j}$ in which the coefficients λ_j were estimated according to the formula (2a). They are written in the "left grey" part of the table 2.

Tab. 2: Cumulative values of claim reserves calculated by deterministic CL method and bootstrap CL method

		Deterministic Chain ladder method							*Bootstrap Chain ladder method*					
		development year *j*							**development year *j***					
	i	**0**	**1**	**2**	**3**	**4**	**5**	***i***	**0**	**1**	**2**	**3**	**4**	**5**
accident year *i*	**0**	566	1 049	1 270	1 407	1 460	1 483	**0**	566	1 049	1 270	1 407	1 460	1 483
	1	501	993	1 186	1 345	1 409	1 431	**1**	501	993	1 186	1 345	1 409	1 431
	2	543	1 055	1 287	1 471	1 534	1 558	**2**	543	1 055	1 287	1 471	1534	1558
	3	652	1 323	1 633	1 842	1 921	1 951	**3**	652	1 323	1 633	1841	1920	1950
	4	739	1 479	1 799	2 030	2 116	2 149	**4**	739	1 479	1799	2028	2115	2148
	5	752	1 478	1 798	2 028	2 115	2 148	**5**	752	1478	1797	2026	2113	2146
		λ_0	λ_1	λ_2	λ_3	λ_4								
		1.966	**1.216**	**1.128**	**1.043**	**1.016**								

Source of data: [6], author

The bootstrap values were calculated after 1000 bootstrap simulations. The bootstrap algorithm for $C_{i,j}$ values calculation was programmed in the software Matlab. The claim reserves were estimated according to the formula (1) and calculated results are in the "right grey" part of the table 2.

Tab. 3: Difference between incremental values of classical and bootstrap method

	development year *j*						
	i	**0**	**1**	**2**	**3**	**4**	**5**
accident year *i*	**0**	0	0	0	0	0	0
	1	0	0	0	0	0	0
	2	0	0	0	0	0	-0.303
	3	0	0	0	0	0.744	1.003
	4	0	0	0	1.581	0.868	1.200
	5	0	0	0.907	2.470	1.709	2.023

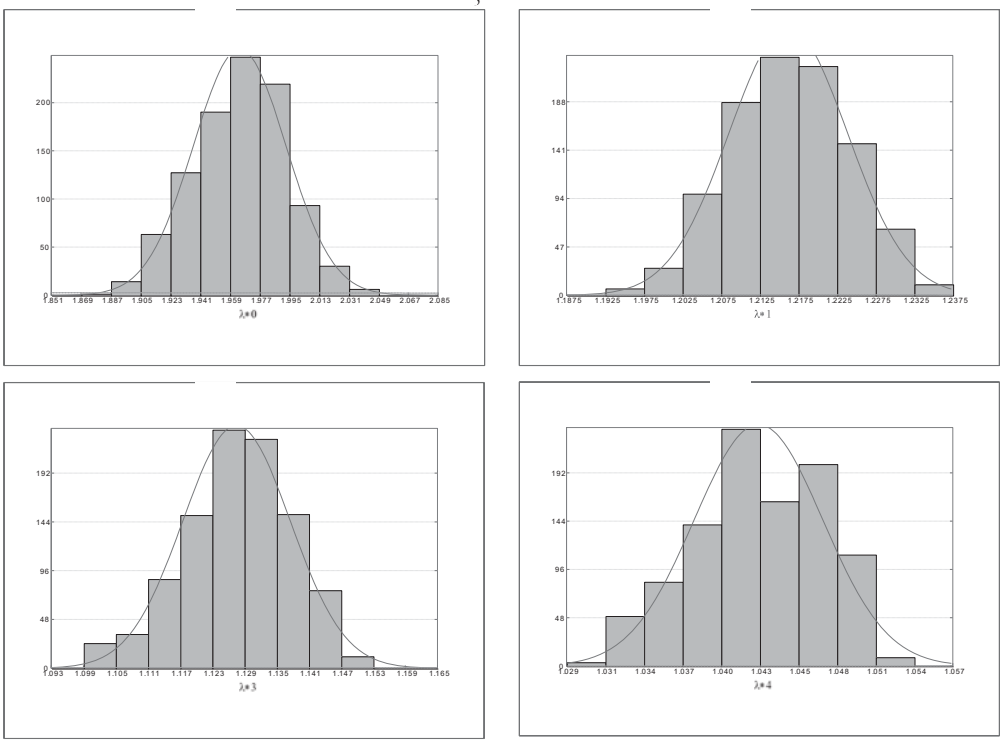
Source of data: authors

Claim reserves presented in the table 2 are in cumulative form. They were transformed to the incremental values and differences between results of two above mentioned methods calculated. These differences are presented in the table 3. It can be stated that almost all differences (except one) are positive, it signifies the reserves estimate by the bootstrap method is lower than the reserves estimate by the classical Chain ladder method. The insurance company should save some money or make some other profitable investments when bootstrap estimate is used.

2.3.2 Probability distribution estimate for λi and Ci,j and convergence

Histogram of 1000 bootstrap replication of development factors λ_0, λ_1, λ_2 and λ_3 were used to estimate the probability distribution of these parameters. We can assume that approximation of this distribution by the normal (Gaussian) probability distribution is adequate. These histograms are illustrated in the figure 1. Probability distribution of the development factor λ_4 is approximated by the uniform distribution.

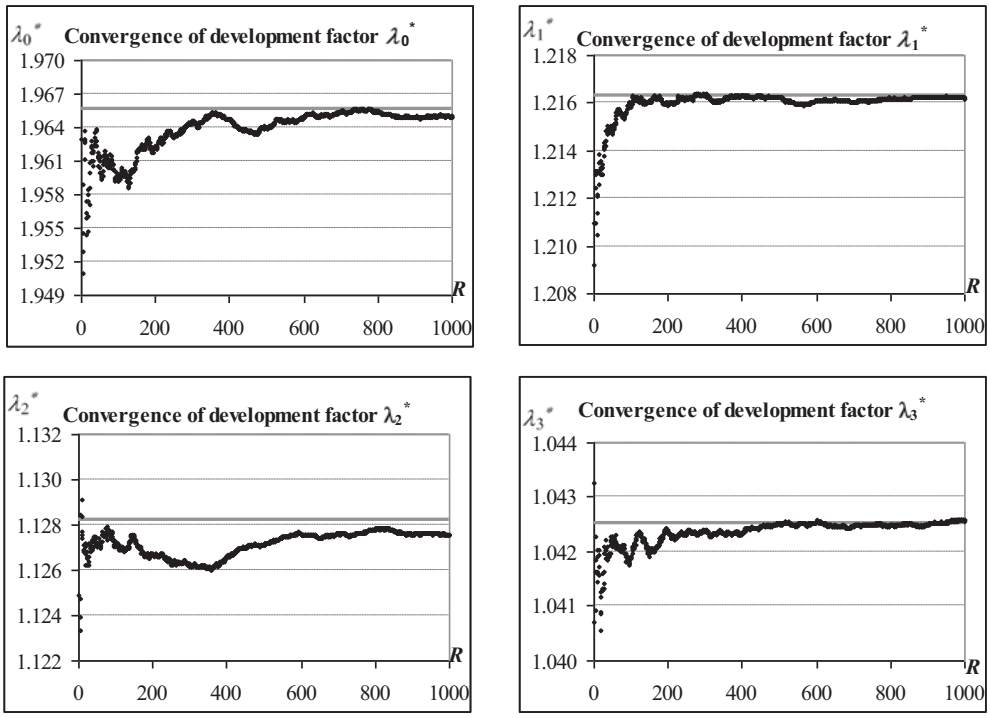
Fig. 1: Histograms of bootstrap replications of the development factor λ_0, λ_1, λ_2, and λ_3 (R = 1000)



Source of data: authors

The question that is asked very often is how many bootstrap simulations are optimal to be done? The answer is not unique, the simulation have to continue until the values start to stabilize. Convergence of the development factors λ_i, (i = 0, 1, 2, 3) when 1000 simulations were made and 1000 replication calculated is presented in the figure 2. The values started to be unchanging after 500 bootstrap replications.

Fig. 2: Convergence for development factors λ_0^*, λ_1^*, λ_2^*, λ_3^*



Source of data: authors

We can now compare the difference between deterministic CL and bootstrap CL methods when the development factor λ ' is estimated.

Tab. 4: Difference between values of development factor

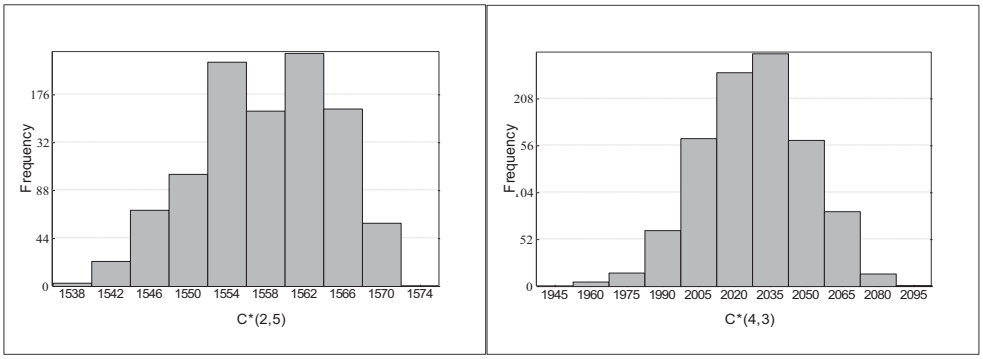
	λ_0	λ_1	λ_2	λ_3	λ_4
deterministic CL(λ)	1.965678	1.21629	1.128239	1.042515	1.01575
bootstrap CL ( )	1.96499	1.21620	1.12754	1.04257	1.01580

Source of data: authors

The second row of the table 4 presents values of the development factor λ_i (i = 0, 1, 2, 3, 4) calculated according to the simple deterministic model, $C_{i,j+1} = \lambda_j \cdot C_{i,j}$ and formula 2a). In the third row we can see values of the development factor obtained after 1000 bootstrap simulations. We are interested in difference between values of development factor, when two above stated methods were used. We can sum up the results and claim, that the difference after application both methods is very small, at the fourth or fifth decimal place.

The probability distribution of the cumulative claim reserves $C^*_{i,j}$ can be displayed by histogram. We selected histogram only of two variables to demonstrate the problem, bootstrap claim reserves $C^*_{2,5}$ and $C^*_{4,3}$, but histogram of the other variables were generally similar. We can claim that it is possible to approximate the distribution of the cumulative claim reserves by the normal (Gaussian) distribution.

Fig. 3: Histograms of bootstrap replications of the $C^*_{2,4}$ $C^*_{4,3}$ after 1000 bootstrap simulations



Source of data: authors

2.3.3 Confidence interval for the development factor and claim reserves

One of the tasks of this paper was to find the 90% confidence interval for the development factor λ_j. The lower and upper limits of this interval are stated in the table 5 (the third row and the fourth row). In the second row (bold) we can see the point estimates of the developing factor for periods j and j+1.

Bootstrap confidence intervals are not symmetrical, the left part of the interval is longer for $\lambda_0, \lambda_2, \lambda_3$ estimates.

Tab. 5: 90% confidence interval for λ

R=1000	λ_0	λ_1	λ_2	λ_3	λ_4
	1.9657	**1.2163**	**1.12824**	**1.04254**	**1.0158**
lower limit $\lambda_{R,\alpha}$	1.9176	1.2037	1.1102	1.0338	1.0158
upper limit $\lambda_{R,1-}$	2.0098	1.229	1.1434	1.0498	1.0158

Source of data: authors

The 90% confidence interval for claim reserves is shown in the table 6. We can observe the original triangle of incremental values (upper triangle) and the lower triangle with three values. The middle one represents the predicted claims, calculated after 1000 bootstrap simulations, lower and upper values represent lower and upper limit of the 90% bootstrap confidence interval, obtained after 1000 bootstrap replications as well.

The table 7 presents how many percentage of the value $X^*_{i,j}$ creates the length of the right part of the 90% confidence interval. It means that the real value of $X_{i,j}$ may vary about stated percentage from the estimate $X^*_{i,j}$. We can see that these values are indispensable. This error is of course the maximal error and we fall into this error with a small probability. We can estimate the dependence between the size of error and reliability coefficient by the help of bootstrap.

Tab. 6: 90% confidence interval for claim reserves – incremental values

	0	*1*	*2*	*3*	*4*	*5*
0	566	483	221	137	53	23
1	501	492	193	159	64	**22.200** 22.200 **22.200**
2	543	512	232	184	**49.700** 62.616 **73.200**	**10.984** 24.161 **34.884**
3	652	671	310	**180.000** 208.276 **234.100**	**47.124** 78.375 **108.724**	**-1.551** 30.240 **61.049**
4	739	740	**301.300** 319.762 **338.700**	**192.338** 229.416 **264.838**	**45.722** 86.326 **125.922**	**-7.904** 33.312 **73.596**
5	752	**690.100** 725.673 **759.400**	**272.027** 319.478 **367.327**	**169.849** 229.208 **291.949**	**25.641** 86.249 **151.541**	**-28.208** 33.280 **99.592**

Source of data: authors

Tab. 7: Percentage of forecasted value

	0	**1**	**2**	**3**	**4**	**5**
0						
1						**0**
2					**17**	**44**
3				**12**	**39**	**102**
4			**6**	**15**	**46**	**121**
5		**5**	**15**	**27**	**76**	**199**

Source of data: authors

2.3.4 Claim reserving estimates

The insurance companies are questing for the most reliable method how to determinate the claim reserves for the following periods. We can see in the table 8 estimates that were calculated in different ways. The claim reserves calculated by the deterministic CL method are stated in the second column of the table. These reserves for the period 6 – 10 result from the data referring from insurance benefits paid during the periods 0–5. Results obtained by the alternative method - the bootstrap Chain ladder method are introduced in the third column. The lower and upper limit of the 90% bootstrap confidence interval for the claim reserves are presented in the fourth and fifth columns. The data in the last column include the information about the difference in the claim reserves estimates between classical and bootstrap Chain ladder method application. We can see that the reserves calculated by bootstrap Chain ladder method are lower than the reserves calculated by the classical Chain ladder method.

This result can evoke the idea that the insurance company needn´t to create so big claim reserve and that it can use some amount of money in a more effective way.

Tab. 8: Claim reserving estimates - comparison

period	CL	Cl-boots	low.limit	up.limit	dif.Cl-Clboot
6	1340.233	1338.526	1243.300	1427.600	1.706
7	652.894	651.430	522.473	775.773	1.464
8	347.107	345.775	214.020	478.920	1.333
9	119.572	119.561	17.736	225.136	0.011
10	33.314	33.280	-28.208	99.592	0.034

Source of data: authors

Conclusion

The goal of the paper was to present some alternative approaches to the solution of the problem of claim reserves estimate and to show applicability of the bootstrap method. The important advantage of the bootstrap method at claim reserves estimates were pointed out – the absence of strict assumptions. Application of the bootstrap method enables us to make not only point estimates of the parameters of interest, but interval estimates as well. The confidence interval for the development coefficients and for the cumulative reserves $C_{i,j}$, resp. incremental reserves $X_{i,j}$, were calculated. Some advantage of interval estimates was accented in the paper, above all in continuity with economy of the insurance companies and determination of the amount of costs for claim reserves.

Acknowledgement

The article was elaborated with the support of the grant GAČR 402/09/1866, Modeling, simulations and management of insurance risk.

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Received: 28. 06. 2011
Reviewed: 08. 11. 2011
Approved for publication: 30. 11. 2011

PRACTICAL APPROACHES OF ISSUERS TO IPO-IMPLEMENTATION ON THE CZECH CAPITAL MARKET

Tomáš Meluzín

Abstract: *Funding of the company development through the „Initial Public Offering" has a large representation in the world and on the developed capital markets it has been one of the traditional ways for raising funds needed for business development. In Anglo-Saxon countries and Western Europe is the method of financing through IPO used by businesses for several decades already. Initial public offering on these markets began in large numbers from the beginning of the sixties of last century. Since then, the importance of IPO in the world scale is increasing and in recent years there are appearing the public offerings of shares even in the countries of Central and Eastern Europe. Also on the Czech capital market can be identified seven companies that joined this form of financing in the years 2004-2010. This article aims to identify the main characteristics of initial public offerings of shares which took place on the Czech capital market in its modern history, and to identify attitudes, opinions and experiences of each practising company.*

Keywords: *IPO, Initial Public Offering, Czech Capital Market, Practical Approaches.*

JEL Classification*: G32****.***

Introduction

Every company is in the course of its existence faced with the need for capital, which is due to non-synchronised flow of income and expenditures. Joint stock companies have theoretically available a wide range of resources that can be used to cover capital needs in connection with the implementation of development investments. It can be stated that long-term financing, particularly in large volume, requires involvement of external sources. An important form in this context represents the issue of securities on public capital markets. Shares and bonds issued on these markets are characterized by their negotiability, which is a great advantage both for the issuers who get by the emissions of long-term securities cash resources, as well as for the investors who can in principle sell them at any time after purchase and thus obtain the desired liquidity. Short-term funds from individual investors are thus converted to long-term resources allowing implementation of large-scale development investments. Due to the fact that the securities are purchased by a large number of investors, the company may raise the capital of such value that an individual investor wouldn't be able, respectively willing to provide.

Acquisition of the basic capital by subscription of shares is associated mainly with the decision between private and public issue. Individual issue represents a direct sale of shares to predetermined number of legal or natural persons. The organized public markets can not trade shares of these companies. The public issue of shares is by contrast associated with their public offering to unlimited number of not predetermined people in order to get the required amount of capital through the primary securities market. The first public issue of shares of a company, which haven't

been publicly traded yet, is often referred in specialised literature with the English term „*Initial Public Offering*“, abbreviated to IPO.

The aim of this paper is to identify the main characteristics of initial public offerings of shares which took place on the Czech capital market in its modern history, and to identify attitudes, opinions and experiences of each practising company. To achieve this goal there was made:

- Secondary research of relevant information sources, i.e. mainly prospectus and annual reports from the issuing companies.
- Primary research in companies that implemented the IPO in the Czech capital market.

During processing of the issue were also used especially logical and empirical methods.

2 Formulation of the problem

2.1 Definition of the term “Initial Public Offering“

When searching for relevant definition of *"Initial Public Offering",* for which is generally used the abbreviation "IPO" I used foreign sources, especially from the United States of America and Western Europe[8]. From the comparative analysis of foreign definitions is obvious that most authors put during definition of IPO emphasis on the fact that ***the company offers its securities for the first-time to public, in the strict sense of the word the shares,*** and also ***enters the public organized securities market***[9] , represented most often by its stock exchange as a top institute. It is essential that the IPO can carry out only the issuer whose securities aren't traded at the given time on the public securities market.

According to the origin of shares offered in IPO can be according to [2, 3, 5] distinguished between:

- ***IPO of primary shares***, where it comes to issue of new shares and their placing on the public primary securities market.
- ***IPO of secondary shares,*** consisting of offering the previously issued shares, which have been still traded only in private secondary securities market.
- ***Combined IPO***, in which the newly issued shares complete the public offering of existing shares.

According to Huyghebaert and Van Hulle [3] the reason for IPO of ***the primary shares*** is especially need for more capital for company development, limited creation of internal financial resources and increasing share of bank loans in the financial structure of the company. On the contrary, stable companies with solid market position and high production of internal financial resources tend to offer ***secondary shares***. This also comes into consideration in case of the privatization of state shares through

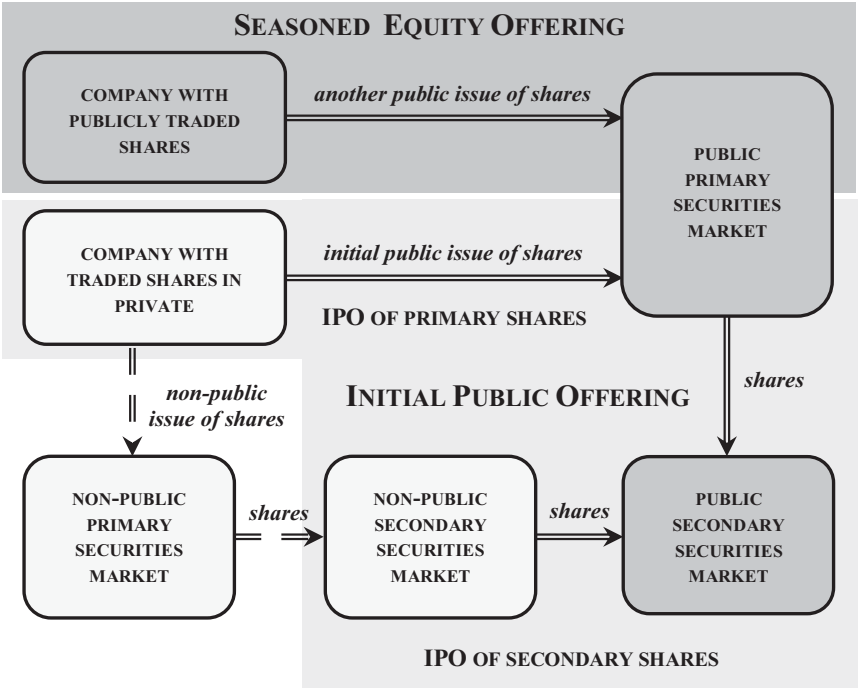
[8] Financing of the company development through IPO has especially in these countries a long tradition and it is well established way of funding business plans of corporations.

[9] Public organized securities market in the Czech Republic is defined according to Act no. 256/2004 on the Capital Market as a regulated market with investment instruments.

the capital market or in the case of exit of an investor from the venture capital company.

From the foregoing is obvious that the decision to offer primary or secondary shares is important for both the company itself and for its shareholders. During IPO of the primary shares the issuer offers newly issued securities and by selling them obtains the necessary funds for its business activities. During IPO of secondary shares acquire funds the existing shareholders whose shares are issued in IPO on the public secondary market for securities for the first time. It can be stated that ***for funding further development of the company by its own external sources is important only IPO of the primary shares***, when the company in order to obtain the necessary financial resources issues new shares, which can be completed to improve their liquidity and attractiveness also with the existing shares.

Fig. 1: Comparison of IPO and SEO shares



Source of data: own processing

In the Czech literature the definition of the term "*Initial Public Offering*" may be found for example in publication from Pavlát [10]: *"IPO is represents underwriting of new securities to the first acquirers*" or in publications from Ježek et al. [6], Liška and Gazda [8], where IPO is called "*primary emission of shares*". Some authors consider as IPO also ***following emission of shares of companies*** whose shares are already publicly traded on the securities market. However, it has to be pointed out that publicly traded companies can not implement an IPO, and that is just because their shares are already traded on the public securities market. Another public subscription of shares of these companies, is according to foreign literature [4, 2] most often referred to as

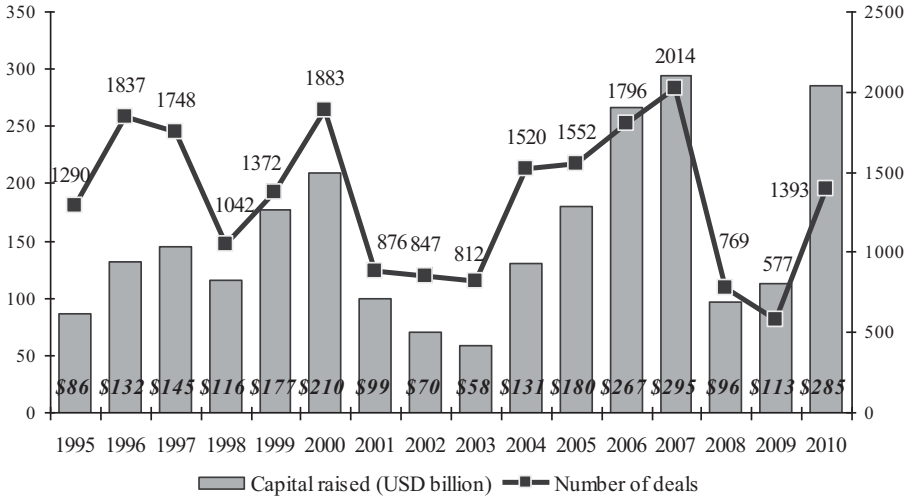
"*Seasoned Equity Offering*" abbreviated as "SEO". The difference between the IPO and SEO of shares can be schematically illustrated in figure 1.

Due to the nature of this work, which is focused on initial public offerings of shares, the term "*Initial Public Offering*" will be used hereinafter ***in the strict sense and the "IPO" will be a shorthand for an initial public offering of shares.***

2.2 Trends of IPO numbers in global markets

This chapter aims to provide an overview of the development of initial public offerings of shares and of value of capital raised through this financing form on world markets. First is analysed global developments in this field and then is described the situation in Central and Eastern Europe.

Fig. 2: Number of IPO and value of the acquired capital in the world in the years 1995-2010



Source of data: [12]

Basic overview of global development of IPO is shown in figure 2. From there it is evident that the activity in IPO-field closely follows the business cycle. The period of sixteen years, shown in the figure, can be divided into several sub-periods. After a period of economic stagnation in the early nineties, particularly in the U.S. and Great Britain, it comes during 1995-1997 to a new growth in the number of initial public offerings of shares. Interest in IPO peaked in 2000 when it was carried out by 1883 companies. In the U.S. markets these were mainly the companies from *high-tech* sector and therefore this period of excessive optimism in the market is often referred to as the "*Internet bubble*". After this period came in 2001-2003 cooling of the interest in initial public offerings of shares and therefore their number does not exceed the value of 900 per year. From the figure 2 is also obvious that in 2004 there is a change in this trend and the number of realised public offerings of shares got back on an upward trajectory. To increase of the number of IPO and also of the value of capital raised

through this financing in 2004-2007 contributed very significantly so-called *emerging markets,* i.e. dynamically developing markets, particularly Brazil, Russia, India and China. In 2007 was made worldwide 2014 of initial public shares offerings with total proceeds worth of USD 295 billion. These values can be considered as historical record. The most significant contributions came from China (259 bids worth USD 66 billion), USA (172 bids worth USD 34.2 billion) and Brazil (64 bids worth USD 27.3 billion).

But in 2008 it came – because of the global economic crisis – in all global stock markets to a cooling of interest in the IPO. In this year was made worldwide a total of 769 initial public offerings of shares worth USD 96 billion, representing in comparison with 2007 decrease of 62% in the number of IPO and decrease of 67 % in the amount of capital raised. The year 2009 was the year with historically the lowest number of IPO, as on the world's stock markets were made only 577 initial public offerings of shares with total proceeds worth USD 113 billion. From figure 2 is obvious that in 2010 there was a revival of business interest in the implementation of the IPO. On world markets were realised 1393 IPO with total proceeds of USD 285 billion. In 2010, the implementation of the IPO obtained the second highest level of capital over the past 16 years. To this value significantly contributed privatization of state enterprises in China through the IPO, which amounted to tens of billions of USD (the number of IPO in China = 509; value of the capital acquired = USD 131 billion).

Development of number of initial public offerings of shares realised on the major stock markets of selected countries in Central and Eastern Europe is given in table 1.

Tab. 1: Development of the IPO number on major markets of selected exchanges in the countries of CEE-region in 1998-2009

EXCHANGE	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
GPW w Warszawie	57	28	13	9	5	6	36	34	35	68	29	10
Burza CP Praha	0	0	0	0	0	0	1	0	2	1	1	0
Budapesti Értéktözsde	3	1	0	0	0	0	1	0	3	0	1	2
Burza CP v Bratislave	0	0	0	0	1	0	0	0	0	0	0	0
Ljubljanska Borza	0	0	0	0	0	0	0	0	2	1	1	0
Total	**60**	**29**	**13**	**9**	**6**	**6**	**38**	**34**	**42**	**70**	**31**	**12**

Source of data: [15, 16, 17]

From the table 1 is obvious that in the CEE countries it is not very common for companies to use capital markets to finance their development yet. The exception is Poland whose stock market is generally regarded as the most developed in this region. This confirms the number of IPO that were carried out on the Polish stock market in recent years. Warsaw Stock Exchange is currently among the exchanges with the highest number of IPO in continental Europe.

3 Solving the problem

3.1 Main characteristics of the IPO on the Czech capital market

In modern history of the Czech capital market, respectively of Prague Stock Exchange was not implemented any initial public offering until 2004.[10] Only from this year on can be identified a few companies that made IPO in the Czech Republic. These companies became the subject of a research aiming to identify the main characteristics of initial public offerings of shares made in the Czech Republic in the years 2004-2010.

For the ***main characteristics of the IPO*** have been selected:

- Number of issued shares before and after implementation of the IPO.
- Structure of the subscribed shares (the share of primary and secondary shares in initial public offering, including over-allotment option).
- Free float (part of basic capital, which can be publicly traded and is not owned by strategic investors).
- Structure of investors (the proportion of institutional and retail investors in subscription of shares in the initial public offering).
- Size of emission (total number of subscribed shares multiplied by their issue price).
- Gross proceeds of the company from the IPO (the number of newly issued shares multiplied by their issue rate).
- IPO costs (broken down the charges to subscribers and other direct costs),
- Company's net income (part of the proceeds from the IPO which the company uses to finance its development).
- Underpricing (underestimate of the issue price of shares).

Overview of the main characteristics of initial public offerings of shares which were took place in the Czech capital market in the years 2004-2010, is shown in Table 2.

The research results show that the IPO on the Czech capital market held solely ***multinational companies of the holding type*** which do business in the Czech Republic, but their parent company is located abroad, in a country in which it is common that companies use capital market to obtain the necessary financial resources. For this reason, the IPO were mostly realized in form of ***dual listing of shares*** on domestic and foreign stock market.

[10] The reasons for low number of IPO in the Czech Republic are described in publications from Liška, Gazda (2001) and Meluzín, Zinecker (2009).

Tab. 2: The main characteristics of the IPO on the Czech capital market in the years 2004-2010

Characteristics of IPO	Issuing Company						
	ZENTIVA	ECM	PEGAS	AAA	VGP	NWR	FORTUNA
Date of the IPO implementation	28.6.2004	7.12.2006	18.12.2006	24.9.2007	7.12.2007	6.5.2008	22.10.2010
Number of shares before the IPO (pc)	33 806 334	2 460 000	7 419 400	50 000 000	15 000 000	250 239 999	50 000 000
Structure of the subscribed shares							
primary shares (pc)	4 329 896	1 275 000	1 810 000	17 757 875	3 278 688	13 500 000	2 000 000
over-allotment option (pc)	0	127 500	0	0	304 362	0	0
secondary shares (pc)	5 670 104	315 030	2 575 000	0	0	69 513 344	13 830 000
over-allotment option (pc)	1 500 000	0	657 750	0	0	12 452 001	1 194 670
Total number of subscribed shares (pc)	11 500 000	1 717 530	5 042 750	17 757 875	3 583 050	95 465 345	17 024 670
Number of shares after the IPO (pc)	38 136 230	3 862 500	9 229 400	67 757 875	18 583 050	263 739 999	52 000 000
Free float	30,16%	44,47%	54,64%	26,21%	3,28%	36,20%	32,74%
Structure of investors							
institutional investors	100,00%	90,00%	90,00%	61,00%	–	90,00%	90,00%
retail investors	0,00%	10,00%	10,00%	39,00%	17,00%	10,00%	10,00%
Issue rate (EUR / share)	15,21	47,00	27,00	2,00	15,25	16,56	4,30
Size of emission (EUR)	174 898 087	80 723 910	136 154 250	35 515 750	54 641 513	1 581 144 777	73 206 081
Gross proceeds (EUR)	65 851 350	65 917 500	48 870 000	35 515 750	54 641 513	223 593 750	8 600 000
IPO costs (% of emission size)							
charges to subscribers	4,00%	5,00%	3,50%	2,96%	–	3,00%	2,50%
other direct costs	2,60%	1,86%	3,78%	3,78%	–	2,61%	–
total	6,60%	6,86%	7,28%	6,76%	9,00%	5,61%	–
Company's net income (EUR)	58 670 430	61 119 875	42 000 000	33 115 750	49 723 777	175 667 489	–
Final rate on 1st day of trading (EUR / share)	15,82	52,50	28,22	2,00	15,60	17,81	4,32
Underpricing	4,02%	11,70%	4,53%	0,05%	2,30%	7,55%	0,47%

Source of data: own processing

Regarding the ***structure of the shares*** offered in IPO, it was found that most initial public offerings of shares were with the nature of the combined IPO, where the investors have been offered both primary and secondary shares. Money obtained by selling newly issued shares were used mainly for further development of the issuing companies and to repay their debts. Offer of secondary shares was mainly associated with withdrawing of venture capital fond from the company and the appreciation of its investment by selling shares on the stock market. The total ***number of shares*** offered in the IPO didn't exceed in most cases 50% of the basic capital of the company.

The main group of investors were institutional investors who came from the European Union. Their interest usually exceeded the number of shares offered to such extent that it allowed the issue manager to exercise an option for subscribe of additional shares. Retail investors were usually getting 10 % of the total number of shares offered in the IPO.

The size of issue was very different, the minimum value was EUR 35.5 million, the maximum value of EUR 1.58 billion and the median was EUR 80.7 million. Based on calculations, it was found that the total direct costs of IPO in the Czech capital market range from 5.6 to 9.0% of the volume of emission. The biggest cost item represents ***fees to the issue manager***. Their size was in the analysed IPO 2.5 to 5.0% of the volume of emission.

Regarding the indirect cost associated with the IPO, so-called undervaluation of issue rate of shares, there can't be made definite conclusion about its size in the Czech conditions. This value varied considerably for individual issues.

3.2 Research on practical approaches of issuers to financing in the form of IPO

In the companies, which realised IPO on the Czech capital market, was also conducted ***qualitative research*** to identify practical approaches to this form of financing. A meeting was held with four issuers who on the basis of semi-structured interview expressed their attitudes, knowledge and experience with this form of financing. Topics of the asked questions were:

Issuing companies, in accordance with the theoretical approaches to the IPO, reported that one of the main reasons for its implementation was acquiring of the capital without having to discharge it. This enabled them to optimize capital structure and reduce the cost for obtaining additional capital, particularly with debt character. Companies give great weight to the fact that successful implementation of the IPO increased their credibility with banking institutions, which offered them more favourable credit terms, including lower interest rates than in the period before implementation of the IPO.

A significant impetus to the realization of the IPO came from the owner of the surveyed firms, particularly from a venture capital fond, who used IPO to termination and improvement of its investment. Companies indicate that in this case admission to public trading with shares on the stock markets was their long-term goal for which they were gradually preparing.

Another reason for implementation of the IPO, which is, however, in the professional literature not so often emphasized, has been reported the fact that

admission of shares to trading on the stock market is one of the attributes for successful activities of the company and its management. The entrance of the company on the capital market is linked to increased publicity and direct or indirect knowledge of the supply of its products and services, which ultimately has a positive impact on its goodwill. The companies with shares traded on the stock exchange are generally regarded as the most successful in the field in which they operate.

With regard to the financial disadvantages of the IPO, surveyed businesses agree that the initial public offering of shares is associated with high costs for external advisers, for internal human resources and new processes in the enterprise that are associated especially with the periodic reporting obligations. Issuers point out that the total costs for IPO, which are usually expressed as a percentage of the issue volume, do not represent unique given reward for obtaining the necessary financial resources, as in the case of loan financing.

Issuing companies do not consider underpricing as a significant expense for IPO, but they perceive it rather as a one of tools to increase the likelihood of IPO success. Issuers agree that underpricing helps to ensure sufficient demand from institutional and private investors for shares offered in the IPO. The possibility of capital gains during the first days of trading shares on the secondary market is attracting media attention and increases the publicity of the issuer.

As access to capital markets requires transparency of current and past information on the activities of the company, the surveyed companies report that their management spent most of his time preparing the IPO, which to some extent reflected in retard of growing business of the company. It should be noted that the IPO represents a retrospective evaluation of the company activities and its in-depth examination by legal and financial auditors. To make initial public offer of shares it is therefore necessary to have legal and financial certainty for all businesses that are part of the issuing company.

Investigated companies indicate that another more demanding activity in the IPO process is creation of a prospectus, which describes both past and present of the issuing company and outlines its future. It should be noted that all data which are presented in the prospectus, should be based on demonstrable facts. After the creation of this document it is necessary to ensure its presentation to investors, what means creation of a new department for relations with investors and implementation of road show, that is a personal meeting with potential investors, especially of institutional character.

Issuing companies stated that the main reasons for implementation the IPO on the Czech capital market was the fact that the Czech Republic is a major market for the implementation of their business and also the market opportunity which related to the low number of IPO in the Czech capital market.

Surveyed companies have agreed that entering the capital market through IPO should be a natural part of business development, and should not be viewed solely as one of sources for obtaining the funds needed for a specific investment. When deciding on the implementation of the IPO it is also not possible to consider only the financial criteria, since entry of the company on the capital market, in comparison with

other forms of financing, is an irreversible process for which the company must be prepared in the long term.

Conclusion

Initial public offering of shares represent in more developed capital markets one of the options how to obtain the necessary capital for company development. This form of financing is important not only for the stock companies themselves, for who it is a particular alternative especially to debt financing, but also for further development of the capital market as a whole. Through the initial public offerings of shares is namely fulfilled one of the basic functions of capital markets, that means the allocation function. In Anglo-Saxon countries and Western Europe is the method of financing through IPO used by businesses for several decades and it is a well established source of corporate financing. Initial public offering on these markets began in large numbers from the beginning of the sixties of last century. Since then, the importance of IPO in the world scale is increasing and in recent years there are appearing the public offerings of shares even in the countries of Central and Eastern Europe. Also in the Czech Republic can be identified since 2004 some companies that have accepted this form of financing. These companies became the subject of a research aiming to identify the main characteristics of initial public offerings of shares made in the Czech Republic in the years 2004-2010.

Regarding the prospects for external financing of corporations through a public share issue, it should be noted that the IPO activity closely follows the development of economic cycles. As that financial and economic systems are closely linked, the development of financial markets is strongly influenced not only by immediate, but also anticipated future development in national and world economies. For this reason it is necessary during issue of shares and other securities to take into account the effects of the business cycle. From a macroeconomic point of view, the most favourable period for implementation of the IPO could be marked the growth phase of the business cycle, i.e. a period of economic boom. Equity capital becomes available in a growing economy, because there are high profit expectations from both the issuers and the investor side. In 2008-2009 there was almost in all world markets due to global economic crisis a significant decrease in the number of IPO and also in the amount of capital raised. In 2010, however, activity in the IPO filed as a consequence of economic recovery in most countries of the world got back on an upward trajectory. So, it can be expected that also in 2011 will gradually enter the capital market additional companies through IPO, both in the developed world and in the CEE region.

Also important for an increase in the number of IPOs in the CR are micro-economic pre-requisites and issue size requirements. One of the reasons for the absence of this type of financing in the CR prior to 2004 was poor performance of Czech companies. At present, problems lie particularly in the area of the fulfilment of corporate governance requirements. One of the requirements the issuer must satisfy is that of the transparency of the company's ownership and organizational structures. Another problem is the requirements for the company presentation to investors. It follows from research the author conducted in 2007 that the unwillingness of Czech companies to implement an IPO is, among other things, connected with their

management's fear of "public supervision" over their operations, which must be completely transparent after companies enter the capital market, and also the unwillingness of companies to agree to a regular disclosure obligation. From the issue-size-requirement point of view, the question is whether capital needs of Czech companies are sufficiently big to make IPOs on the Prague stock exchange a viable proposition. Thirty million EUR is considered an approximate minimum volume of funds for IPO implementation. The Prague stock exchange thus lacks a platform such as the Polish NewConnect market developed for smaller companies.

In spite of that I believe that the number of successful issuers in the Czech Republic will show further growth in the nearest future. In this context it should be noted that in the same way as companies diversify their assets, they should also use multi-source funding. This allows them to offset the disadvantages of debt financing together with limited formation of internal resources against the benefits provided by the IPO.

Acknowledgments

The paper was written with the financial support of the Czech Science Foundation (Grant Agency of the Czech Republic), grant project No. 402/09/P134 “Decision Model of Company Financing via IPO”.

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Received: 08. 07. 2011
Reviewed: 11. 11. 2011
Approved for publication: 30. 11. 2011

WORK MOTIVATION AND SATISFACTION IN THE CONTEXT OF ECONOMIC CRISIS

Lenka Pouchová

Abstract: *Especially in the time of worldwide economic crisis it is necessary for companies to realize the importance of human capital and particularly the significance of work motivation and satisfaction of employees in relation to the performance and competitiveness of a company. The economic slump in 2009 was for examined subjects connected with the for companies positive effects in the form of an increased level of employees' motivation. Of course, these changes can not be ascribed only to successful work with the human resources, it is at the same time a trend specific for the crisis period. People have started to appreciate more their employers, became more loyal, work willingness and engagement have increased, contrariwise the importance of motivation factors just like financial rewards, bonuses and benefits has decreased. Considering a direct link between work motivation and work performance it is possible to designate the human capital as an important factor on a successful way of companies out of economic crisis.*

Keywords: *Work Motivation, Job Satisfaction, Human Capital.*

JEL Classification: *J280, M100.*

Introduction

The turbulent time or also the time of discontinuity – that is how we call the current situation of the world which requires the entirely specific approach of the company management. Characteristic are constant changes, turbulences, chaos or also breaking dynamics of the development [3; 4; 5] which make in fact impossible to make the long-term predictions. The company management including the human resources management becomes significantly complicated. The ability to adapt to continually changing conditions decides about the success of a company. To the key factors range human capital, usage of company's vision, cultivation of corporate culture, team cooperation, knowledge and skills development and ability of continuous learning [10].

Nowadays, the human resources are becoming the most valuable asset of an organization. They have to be nurtured and managed right to achieve the sustainable competitive advantage. Human beings carry knowledge and knowledge is the most important form of the company's capital. Other its' forms – money, land, technologies – critically depend on human capital, they are subordinated to it and they follow the knowledge capital [11]. Without constant deepening of knowledge and broadening of skills is impossible for the company to reach the stable development and to maintaining its' competitiveness. Saving on education in the time of worldwide economic crisis can be considered as a basic strategic mistake. People are the most important resource of the enterprise and the funds invested in their development are very significant and quickly returnable investment. The assignment of human

resources management goes through the rapid development and the same is valid for the forms of treatment of these resources. Only appropriate motivation leads to maximum performance of the employees.

The condition of successfulness of an organization is the awareness of value and importance of human resource, the awareness that people represent the greatest wealth of an organization and that their management decides whether the organization succeeds or not [7]. Organizations caring for the human resources and realizing their significance in relation with the prosperity and competitiveness strive to gain information about their own employees. Especially the knowledge of people gives managers a good opportunity to affect adequately their employees and optimize their work performance.

Synek [9] mentions that according to the 85% of top managers from the sample of almost 500 different companies worldwide is the topic of employees essential for the company's performance and targets fulfilling (research of companies Deloitte and Economist Intelligence Unit, published in the middle of 2007). Preserving of the key employees is right at the second place and is in compliance with 71% of members of top management critically important for success of a company. Moreover, 88% of addressed managers think that human resources will become even more important topic in next three to five years.

Work Motivation

The topic of motivation is of a great value in all fields related to the performance. According to Bedrnová and Nový et al. [1] motivation represents the fact that the human mind is affected by specific, not always conscious or recognized inner driving forces – incentives, motives. They activate in a certain direction the activity of a person (i.e. his behaviour or rather his cognition, action and immersing) and they retain aroused activity. Apparently these forces emerge in the form of motivated activity, motivated action.

As a work motivation the above mentioned authors understand that aspect of motivation of the human behaviour which is connected with the performance of work activity, with holding a specific position and with performing corresponding work role, i.e. with carrying out work duties. Work motivation expresses a particular form of work willingness. Motivation and qualification potential (abilities, knowledge, skills) range among two basic subjective, personality factors determining the efficiency and productivity of an employee.

For the employer the relationship between motivation and long-term work performance is crucial. For the work process it is ideal to reach in the long-term optimal work performance during the whole work process, not only in the short-term. Therefore the stimulation of work motivation as well as increasing qualification and improving work environment belong to the most important areas of the human resources management. In most cases the target is to increase the motivation of employees because it lies under its' optimum or it decreases in time and it is necessary to bring it closer to the optimum frontier. The level of the work motivation is positively influenced by aspiration degree of employees which should be adequate or

rather higher because it leads then to the self-development, higher profit of an organization and higher life quality.

Job Satisfaction

Good familiarity with employees' satisfaction in an organization and especially good knowledge of people give managers an opportunity to influence their motivation. Bedrnová and Nový et al. [1] state, that the job satisfaction can be viewed from three different angles. On one hand the employees' satisfaction can serve as a criterion of the evaluation of the personnel policy of a company and then applies: the higher the satisfaction the better the company cares for the employees. On the other hand the satisfaction is mentioned as a condition of the effective usage of employees' potential. Satisfaction then represents the satisfaction from the meaningful job, feeling of fulfillment, joy from own assertion. But there might occur also a satisfaction based on reaching low targets. Each of the above mentioned interpretations of the notion satisfaction reflects differently in the quality of performance. Whereas in the first case the satisfaction serves as a description of the status, in the second case can be understood as a driving force and in the third case can be even an obstacle to the desired work performance.

In the Herzberg two-factor theory of work motivation the outer factors of satisfaction (so called hygienic factors) and the inner factors of satisfaction (so called motivators) are distinguished. According to Herzberg only the motivators are related directly to the motivation whereas the hygienic factors influence only the level of satisfaction of employees. In relation between job satisfaction and motivation applies that good work conditions (e.g. the possibility of promotion, salary, quality and activity of managers, characters and actions of colleagues, style of work organization and management, actual conditions of work, care for employees) in most cases at least indirectly stimulate the work motivation.

1 Aim and Methodology

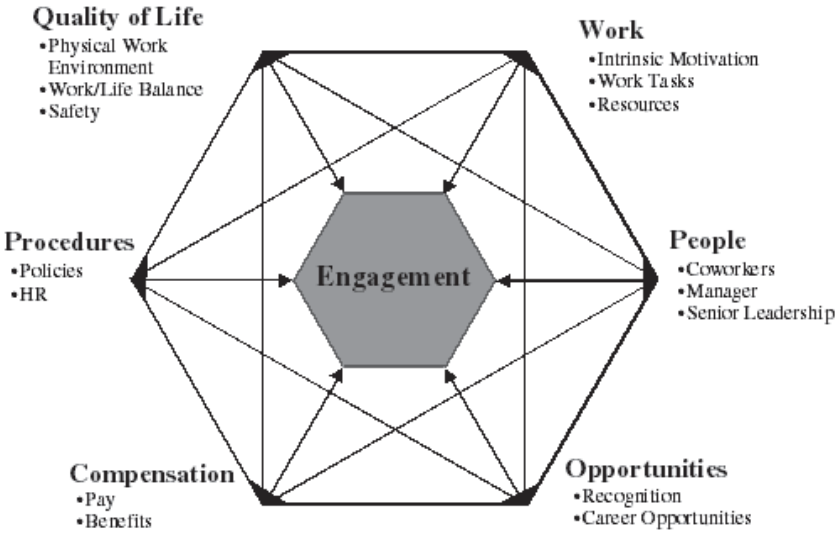
The target of the article is to emphasize the importance of employees' satisfaction and motivation which seem to be one of the key factors to emerge from recession and assure prosperous future. Also the development of satisfaction and motivation during crisis will be examined. For this objective was applied the employees' motivation survey - Best Employers of the Czech Republic - which was conducted across the wide spectrum of sectors by the human resources consulting and outsourcing company Hewitt Associates [6] during the worldwide economic crisis. The survey took place via questionnaires in 2009, the results were published in April 2010. Out of total 58 registered companies only 50 satisfied conditions to be assigned to the ranking. The results of the study represent the opinions of 8042 employees and 197 top managers on their employers. The employers were assessed based on three aspects – opinions of their own employees, personnel policy and view of the top management. The key factor for the ranking is the employees' engagement.

In the surveys of company Hewitt Associates motivation is defined as a state of emotional and intellectual engagement in events within the company which is characterized by three models of behaviour:

- Employees have strong desire to work for the company also in the future.
- Employees express themselves positively about the company in front of their colleagues, friends, potential employees and clients.
- Employees put an extraordinary effort and engagement into work which contributes to the better results of the company.

Factors of motivation are classified into 6 basic groups that are described in Fig. 1.

Fig. 1: Employee engagement



Source of data: [6]

Eventually, a valuable insight into the company Robert Bosch, Ltd. České Budějovice will be intermediated. The survey mentioned above will be enriched by the results of the survey of employees' satisfaction and motivation at company Robert Bosch conducted in the same time period. It will be discussed whether the employees played the meaningful role in overcoming the crisis and contributed to the competitive advantage and higher performance. Both surveys will be compared and will be examined whether their conclusions correspond.

2 Trends in the Czech Republic during the crisis

The survey [6] revealed that the best employers have 25% more motivated employees compared to other companies in the market. 75% of their employees give good references, are proactive and come up with new ideas. Of course, this type of behaviour is related with better business results. The best employers prove 24 % higher return for shareholders against average and they generate higher revenues per employee than average employers.

The study confirmed trends specific for the crisis time. During economic crisis the percentage of motivated employees the Czech companies increased. The average number of motivated people is 52%. Motivation is mainly based on the raised loyalty of employees towards employers. Whilst before crisis 62% of employees had a feeling

they would have found a new job easily, in 2009 this was maintained only by 36 %. People fear for their jobs and they appreciate their employers more than before crisis.

Also other trends have been affirmed. Whereas the employees' satisfaction with financial rewards and other benefits stagnated over the past three years (despite the average wages grew) during the crisis these factors lost their importance and people accept even lower income.

Červinková [2] states that the economic slump makes the need for motivated employees even more significant the limited financial resources, market environment and uncertainty make the securing of motivation more complicated. Practice shows that non-financial tools for motivation encouragement are always cheaper than the financial ones and are also more efficient. The relation between performance assessment and height of the bonuses plays a major role as well. Firms pay attention to pay bonuses truly for the contribution of employees which had the positive impact on firm's results. It is necessary to understand the complexity or the rewarding, particularly its' financial forms and especially intangible forms, e.g. opportunities to professional growth, education and work climate including the management style, corporate culture, work environment, recognition and respect to family commitments.

In 2009 the budget cuts appeared in the larger scale in the area of education and development. The satisfaction with trainings and career opportunities slightly decreases in the long term, on the other hand there is an obvious effort of companies to substitute expensive external trainings for other possibilities of development within the company, e.g. on the job training, mentoring and coaching.

According to Němečková [8] the education of employees belongs to the most costs-demanding items which cancellations bring immediately visible savings. But from the long-run perspective this could be very dangerous approach with the negative impact of professional lag or increased staff turnover because the possibilities of professional growth, further education and raising qualification are the most frequently mentioned motivation factors.

The winning companies also show noticeably higher motivation of managers compared to other participants of the survey. Furthermore, the best employers differ in the aspect of positive assessment of top management by the employees, valued is especially their approach to people, ability to run the company effectively and communicate frankly. In addition to that employees designate their company as a good place to work and believe in its' prosperous future. Their higher satisfaction is clear from all answers to questions regarding the work life.

The motivation of the top management remained 10% higher than in the pre-crisis period. Regardless managers were forced to make more unpopular decisions, reorganize, change processes and so on. They try to inform about the future steps and prepared changes. Similar to other employees even top managers decreased their expectations. They mind less the stress level and despite the higher occupation they are more satisfied with the job content and remuneration for it.

3 Case Study – Robert Bosch, Ltd.

Company Robert Bosch, Ltd. České Budějovice was founded in 1992 as a joint venture of German concern Bosch, Ltd. and Motor Jikov, Inc. In 1995 Bosch became the only owner of the company in České Budějovice. The plant was newly built with state-of-the-art equipment and infrastructure on the concern level with its' own research and development departments including the testing facility. The company operates in the automotive industry. Nowadays, over 2,500 employees participate in production and development of the passenger cars components. Customers are almost all significant European, Asian and American car manufacturers[11].

Several times (2005-2010) Robert Bosch, Ltd. České Budějovice won the competition Employer of the year of the South Bohemian region. The company also usually places highly in the competition Employer of the year of the Czech Republic. Committee assesses the personnel policy including the level of trainings, awarding, perception of company's values and trust in management.

The survey of employees' motivation and satisfaction is conducted worldwide in the whole Bosch Group every two years to notice the development in particular areas. The survey takes place via questionnaires, the appraising scale range from 1 to 5 where value 1 means completely agree and 5 completely disagree. The lower the value the better (more positive) the evaluation of the particular aspect. The questionnaire comprises 65 questions regarding work conditions, tasks and responsibilities, professional development, information and communication, cooperation, improvement and engagement.

In 2007 the survey of employees' satisfaction and motivation at Robert Bosch, Ltd. České Budějovice was conducted in the time of prosperity. It is possible to proclaim that year 2007 was the last successful year. Already in the second half of 2008 the company operating in automotive industry registered the first symptoms of incoming worldwide economic crisis. Year 2009 ran fully under the sign of substantial downturn precipitated by the instability of automotive market. This branch was affected the most. The turnover decreased to the level of 2003. To cushion the crisis impacts management of the company was forced to approach to many cost saving measures in the area of costs, investments, the production of problematic unprofitable products was stopped, the work loads were decreased in a blanket manner, the system of uneven distribution of working hours was introduced, the wage rates stagnated. In this difficult situation of the year 2009 the planned survey of employees' satisfaction and motivation was conducted. The participation in the survey in 2009 in the company Robert Bosch, Ltd. České Budějovice was above-average - 1596 employees out of total number 1776 - which is 90%. Results were published in 2010. The selection of questions including scoring in 2007 and 2009 documents Tab. 1.

[11] More information about company at websites http://www.bosch.cz/content/language1/html/2977.htm

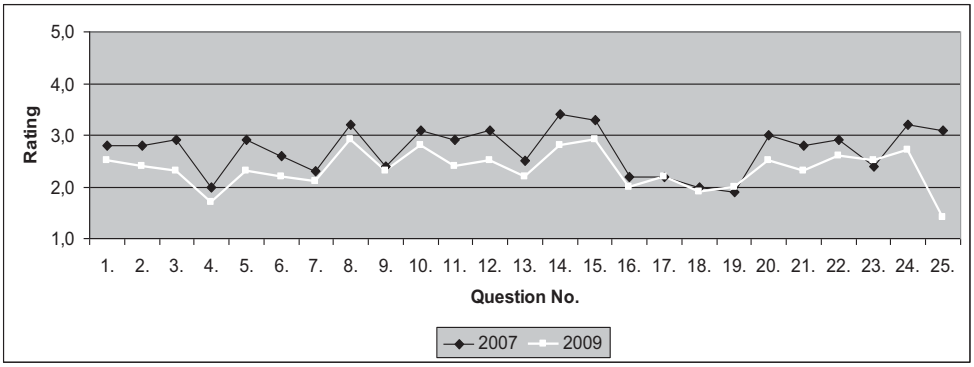
Tab. 1: Satisfaction and motivation in R. Bosch, Ltd. (2007, 2009)

No.	Question	2007	2009
1.	In my team/dept. the work processes are very well organized.	2,8	2,5
2.	I can easily obtain information which I need to fulfill my tasks well.	2,8	2,4
3.	In general I am satisfied with my work conditions.	2,9	2,3
4.	I am aware of the targets of my team/dept.	2,0	1,7
5.	I have sufficient decision-making powers needed to fulfill my tasks.	2,9	2,3
6.	At work I can fully use my knowledge and skills.	2,6	2,2
7.	I enjoy my jog.	2,3	2,1
8.	I am very satisfied with the offer of further education.	3,2	2,9
9.	I am trained enough and trained enough with a new job.	2,4	2,3
10.	On the whole I am satisfied with the possibilities of my further development at Bosch Group.	3,1	2,8
11.	In my team/dept. runs a good exchange of information, knowledge and experience	2,9	2,4
12.	I am up-to-date informed about the reasons of important decisions.	3,1	2,5
13.	In my team/dept. rules a very good team spirit.	2,5	2,2
14.	In my branch cooperation between departments works without problems.	3,4	2,8
15.	Cooperation with other branches works without problems.	3,3	2,9
16.	My superior agrees with me clear targets.	2,2	2,0
17.	My superior gives me a useful feedback about my performance.	2,2	2,2
18.	My colleagues try to perform high-quality work.	2,0	1,9
19.	In my team/dept. the utility for customer is in the centre of attention.	1,9	2,0
20.	The environment in my team/dept. supports the creation of new ideas.	3,0	2,5
21.	In my team/dept. the good ideas are considered and applied.	2,8	2,3
22.	In my team/dept. in case of mistakes we do not seek for culprits but also for good solutions.	2,9	2,6
23.	I am proud to work for Bosch Group.	2,4	2,5
24.	After the last survey we have stated particular measures leading to improvements in my team/dept.	3,2	2,7
25.	Activities after last survey (interviews,workshops,...) lead to improvement.	3,1	1,4

Source of data: author

Data from surveys in 2007 and 2009 were compared to describe the development of satisfaction and motivation. It was proven that despite the unfavourable economic situation the employees were more satisfied on the whole in 2009 than in 2007. Tab. 1 is followed by the Fig. 2 which in general illustrates the higher level of satisfaction and motivation in 2009. In case of this survey it is expressed by the lower rating of particular aspects.

Fig. 2: Level of satisfaction and motivation in the company R. Bosch, Ltd. (2007, 2009)



Source of data: author

In comparison with 2007 employees evaluate better the work conditions (availability of work devices, conditions at workplace such as cleanness, lighting, noise,...). Also, they are more satisfied in the question of sufficient decision-making powers needed to fulfill the work tasks. As well, the knowledgeableness improved in the event of transmission of information, knowledge and experience in the team and from the side of management. The better assessment was reached in the field of smooth cooperation between departments of the surveyed branch. At the same time rules friendly atmosphere which supports the creation of new ideas. These are subsequently evaluated and possibly implemented. The approach of employees to the survey itself shifted essentially, they appreciate more its' contribution – stating and implementing of concrete measures leading to the improvement of the problematic areas.

Despite numerous improvements and positive evaluations there are still fields showing very low satisfaction, actually dissatisfaction (rating >2,5). The following areas are concerned: offer of further education, possibilities of further development at Bosch Group, cooperation with other branches of the Bosch Group, seeking for culprits instead of good solutions in case of mistakes, stating particular measures leading to improvements it the team/department based on the previous survey.

Based on the data stated above it is possible to declare that the conclusions of the survey Best Employers significantly correspond with the results of satisfaction and motivation survey of employees of the company Robert Bosch, Ltd. Generally in both cases the surveys show increased satisfaction and motivation in the time of economic downturn.

Conclusion

Nowadays, when the worldwide economic crisis has been overcome it is possible to evaluate that the worsened economic situation of otherwise very successful companies contributed to the growth of work motivation and job satisfaction of employees. Restricted incomes and benefits did not happen to be the reason for employees to change jobs. On the contrary, they started to appreciate their employers more, the loyalty increased and via the raised willingness to work and above standard

engagement human capital became the principal factor on a successful way of companies out of the economic crisis.

Significant influence on the success of the company has every employee but especially managers play the key role. The personality of manager has essential share on the atmosphere in his team and in the whole company. Manager's targets have to correspond with company's targets and to be able to motivate subordinates he must be motivated himself above all.

Company Robert Bosch, Ltd. České Budějovice can be considered as an example of a company which tries to obtain information about their own employees. The level of employees' satisfaction and motivations is regularly tracked and stimulated. The company is obviously aware of the relation between motivation and performance and can serve as a good model of human resources management.

During economic downturn the important task for human resources management is to retain and motivate qualified key employees who can help overcome the crisis and will represent the competitive advantage in the time of prosperity.

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Received: 20. 07. 2011
Reviewed: 26. 10. 2011
Approved for publication: 30. 11. 2011

THE CYCLICALITY AND DEVELOPMENT OF GOVERNMENT EXPENDITURE IN THE VISEGRAD GROUP

Irena Szarowská

Abstract: *The aim of the article is to provide direct empirical evidence on government expenditure in the Visegrad Group. Government expenditure plays important role in a fiscal policy of each country as a possible automatic stabilizer. Previously published studies are weakly supported by the data particularly in emerging and post-transition economies that's why the analysis is focused on Visegrad countries. The article concentrates on development of total government expenditure, changes in the structure, and also on the cyclicality of government expenditure. We used annual data on government expenditure in compliance with the COFOG international standard during the period 1995 – 2009. GDP time series were cyclically adjusted. The results suggest that government expenditure and their allocation are similar in Visegrad Group despite the existing differences in the size of the public sector. On the other hand the cyclicality of government expenditure differs across the countries. Government expenditure is countercyclical only in the Slovak Republic, it is procyclical in other countries of the Visegrad Group.*

Keywords: *Government expenditure, COFOG classification, Cyclicality, Correlation.*

JEL Classification: *C32, H50, E62.*

Introduction

Current governments often solve a problem how to support economic growth and consolidate public finance. Government expenditure and factors of their growth are a serious problem of many countries. The aim of the article is to analyze development of total government expenditure, changes in the structure and also the cyclicality of government expenditure in the Visegrad Group. Government expenditure plays important role in a fiscal policy of each country as a possible automatic stabilizer. Although the theory implies that government expenditure is countercyclical, recent evidence suggests that it is procyclical. However, previously published studies are weakly supported by the data particularly in emerging and post-transition economies in which results can vary. That's why the analysis is focused on the Visegrad Group.

The Visegrad Group, also called the Visegrad Four or V4, is an alliance of four Central European states – the Czech Republic, Hungary, Poland and Slovakia – for the purposes of cooperation and furthering their European integration. All of the Visegrad countries have relatively developed free market economies and have enjoyed more or less steady economic growth since the revolutions of 1989. In 2009, Slovakia adopted the euro as official currency. The Visegrad Group is the seventh largest economy in Europe and the 13th in the world. Despite the similar history, individual countries of the Visegrad Group have differently structured and oriented economies and social preferences, which are also reflected in the distribution of public expenditure.

We used annual data on GDP and government expenditure in millions of national currency in compliance with the COFOG international standard during the period 1995-2009 from Eurostat. GDP time series were cyclically adjusted. Total government expenditure time series were also cyclically adjusted for correlation and assessment of the cyclicality. Hodrick-Prescott filter is used for isolating the cycle component of time series. Results are mostly calculated in econometric program Eviews 7.

1 Statement of a problem

The economy of the country is greatly influenced by the level and the structure of government expenditure. It is one of the major processes by which the welfare of the people in ensured and it is an important part of government´s budget.

The government expenditure is an important tool for national governments to mitigate the uneven economic development and economic shocks across individual countries. From a Keynesian perspective, there is a view that government expenditure should act as a stabilizing force and move in a countercyclical direction. Procyclical fiscal policy is conversely policy expansionary in booms and contractionary in recessions. It is necessary to point that procyclical fiscal policy is generally regarded as potentially damaging for welfare: it can raise macroeconomic volatility, depress investment in real and human capital, hamper growth, and harm the poor [11]. If expansionary fiscal policies in "good times" are not fully offset in "bad times", they may also produce a large deficit bias and lead to debt unsustainability and eventual default. If a government respect a basic prescription that fiscal tools should function counter-cyclical, the optimal fiscal policy involves a decreasing of government expenditure in "good times" and a increasing of government expenditure in "bad times." Contrary to the theory, a number of recent studies found evidence that government expenditure is procyclical [2], [4], [7], [10], [13]. Analysis of [12] shows that fiscal procyclicality is evident in a much wider sample of countries. Lane [8] finds procyclicality in a single-country time series study of Irish fiscal policy. For G7 countries, the correlation between government consumption and output indeed appears to show no pattern and be clustered around zero [3]. Also [9] shows that the level of cyclicality varies across spending categories and across OECD countries. We followed study of [1], they tested differences in the cyclicality of government spending across functional categories. Their evidence from 20 OECD countries suggests that procyclicality is more likely in smaller functional budgets, but capital spending is more likely to be procyclical for the larger spending categories. Many of researches have focused on Latin America, see [5], [6] for details. We would like to eliminate the literature gap in this field and analyze government expenditure in the Visegrad Group.

2 Methods

The dataset consists of annual data on GDP and government expenditure in compliance with the COFOG international standard during the period 1995 – 2009. Although data from 2009 are available we prefer to work in the part of cyclicality testing with a consistent dataset that excludes observations from a crisis period. When we used data from 2009, time series were non-stationary (even Unit root test of 2nd difference). All the data were collected from the Eurostat database. The series for GDP

and total government expenditure and its subcomponent are adjusted at constant prices. We converted all series into logs and applied the Hodrick-Prescott filter with smoothing parameter 100 to each series with the aim to isolate the cycle component of time series. We apply cross-correlation to all combinations of GDP – category of government expenditure. Johansen cointegration test and the error correction model (ECM) are used to estimate the long-run relationship between output and government spending predicted by, for example, Wagner´s Law. Most of the results are calculated in econometric program Eviews 7.

Many studies point out that using non-stationary macroeconomic variable in time series analysis causes superiority problems in regression. Thus, a unit root test should precede any empirical study employing such variables. We decided to make the decision on the existence of a unit root through Augmented Dickey–Fuller test (ADF test). The equation (1) is formulated for the stationary testing.

$$\Delta = \delta + \delta t + \delta x_{t-1} + \sum_{i=1} \alpha + \quad (1)$$

ADF test is used to determine a unit root x_t at all variables in the time t. Variable Δx_{t-i} expresses the lagged first difference and u_t estimate autocorrelation error. Coefficients δ_0, δ_1, δ_2 and α_i are estimated. Zero and the alternative hypothesis for the existence of a unit root in the x_t variable are specified in (2). The result of ADF test, which confirms the stationary of all time series on the first difference, is available on reguest.

$$H_0: \delta_2 = 0, H_\varepsilon: \delta_2 < 0 \quad (2)$$

The cross-correlation assesses how one reference time series correlates with another time series, or several other series, as a function of time shift (lag). Consider two series x_i and y_i where i = 0, 1, 2, …, N-1. The cross correlation r at delay d is defined as:

$$r = \frac{\sum_i (x_i - m_x) * (y_{i-d} - m_y)}{\sqrt{\sum_i (x_i - m_x)^2 \sqrt{(y_{i-d} - m_y)^2}}} \quad (3)$$

where m_x and m_y are the means of corresponding series.

The Hodrick-Prescott (HP) estimates an unobservable time trend for time series variables. Let y_t denote an observable macroeconomic time series. The HP filter decomposes y_t into a nonstationary trend g_t and a stationary residual component c_t, that is:

$$y_t = g_t + c_t \quad (4)$$

We note that gt and ct are unobservables. Given an adequately chosen, positive value of λ, there is a trend component that will minimize:

$$\min \sum_{t=1}^{T} (y_t - g_t)^2 + \lambda \sum_{t=2}^{T} (g_{t+1} - g_t) - (g_t - g_{t-1}) \quad (5)$$

The first term of the equation is the sum of the squared deviations which penalizes the cyclical component. The second term is a multiple λ of the sum of the squares of the trend component's second differences. This second term penalizes variations in the growth rate of the trend component. The larger the value of λ, the higher is the penalty. Hodrick and Prescott advise that, for annual data, a value of λ = 100 is reasonable.

3 Problem solving and discussion

3.1 Development of government expenditure

Government expenditure can help in overcoming the inefficiencies of the market system in the allocation of economic resources. It also can help in smoothing out cyclical fluctuations in the economy and influences a level of employment and price stability. Thus, government expenditure plays a crucial role in the economic growth of a country. Government expenditure is incurred in the form of purchases of goods and services, transfer payments and lending. Purchase of goods and services is intended to carry out governmental activities by the direct utilization of economic resources. Transfer payments and lending are intended to provide enterprises and households with purchasing power to enable them to buy goods and services in the market. In many developed countries, transfer payments for social welfare constitute a sizeable portion of government budgets. In developing countries, some of the functions of transfer payments are performed by subsidies to below cost sales by state enterprises.

Government expenditure can be classified into four categories: (i) Functional Classification or Budget Classification (ii) Economic Classification (iii) Cross Classification and (iv) Accounting Classification. Each classification of expenditure in government serves one objective or other i.e. financial control, economic growth, price stability etc. We used functional classification in compliance with the COFOG international standard ("Classification of the Functions of Government") in our analysis. Government expenditure is divided into 10 basic divisions:

T: Total function

C10: General public services

C20: Defense

C30: Public order and safety

C40: Economic affairs

C50: Environment protection

C60: Housing and community amenities

C70: Health

C80: Recreation; culture and religion

C90: Education

C100: Social protection

Firstly we analyzed the total value and structure of government expenditure in each county of Visegrad Group in a period 1995-2009. Results in Table 1 show the existing differences in the size of the public sector in V4 countries.

Tab. 1: Total government expenditure in % GDP (1995-2009)

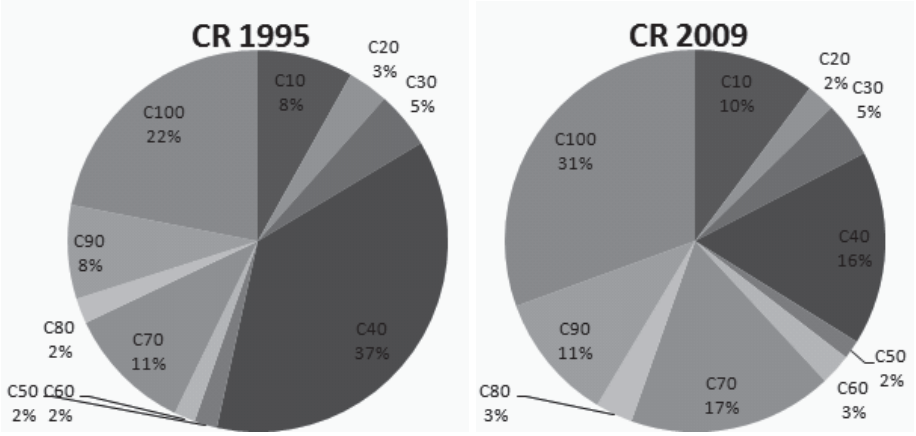
	Czech Republic	Hungary	Poland	Slovak Republic
1995	54.47	55.65	47.71	48.62
1996	42.57	50.61	51.01	53.75
1997	43.20	49.25	46.44	48.93
1998	43.16	50.36	44.34	45.79
1999	42.27	48.39	42.72	48.10
2000	41.82	46.76	41.08	52.14
2001	44.35	47.20	43.8	44.46
2002	46.31	51.18	44.26	45.06
2003	47.32	49.4	44.68	40.13
2004	45.14	48.69	42.62	37.67
2005	44.98	50.21	43.44	37.98
2006	43.75	52.01	43.86	36.62
2007	42.5	49.98	42.19	34.32
2008	42.89	48.82	43.19	34.96
2009	45.95	50.54	44.50	41.54

Source of data: Eurostat

Data confirm the trend of decreasing a weight of government expenditure on GDP. From this point of view, Hungary is a country with the highest role of government redistribution, although its role also decreased. Slovak Republic is a country with the lowest share of government expenditure on GDP and it means the smallest size of the public sector. Government expenditure decreased the most in the Czech Republic during the selected period (-8.52 percentage points). Government expenditure is the most stable in Poland.

We also analyzed the structure of government expenditure. Social protection (C100) has the highest share on total government expenditure in all countries (except in the Czech Republic in the year 1995: share of Economic affairs (C40) were higher, Social protection (C100) was on the 2nd position). As for the Czech Republic, the analysis showed that Social protection (C100) was the largest item of government expenditure from 1996, Economics affairs (C40) were on the second and Health expenditure (C70) on the third place till the year 2004. From 2005 the second and the third position has changed.

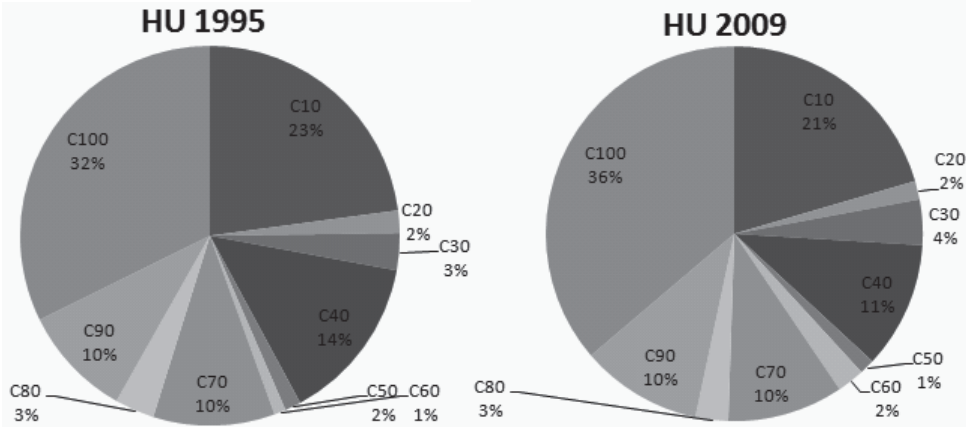
Fig: 1: Structure of government expenditure in the Czech Republic



Source of data: based on the data from Eurostat

Order in the Hungary is following: Social protection (C100), General public services (C10) and Economic affairs (C40). See Figure 2 for details about share of each spending category.

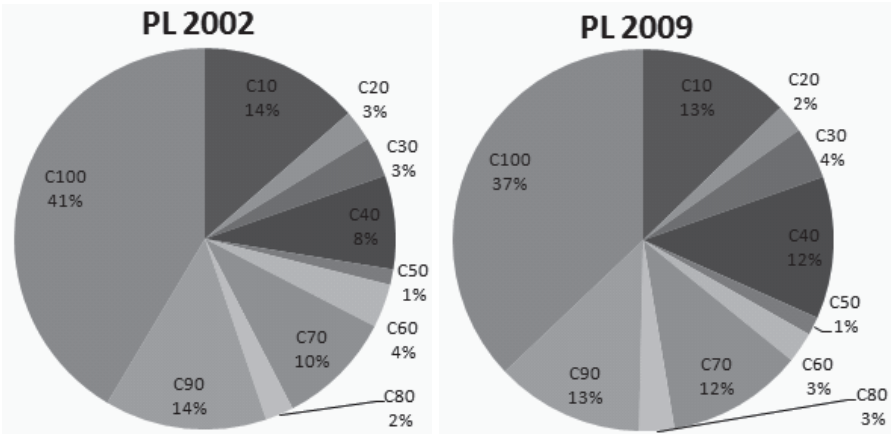
Fig. 2: Structure of government expenditure in Hungary



Source of data: based on the data from Eurostat

As you can see in Figure3, the structure of government expenditure is different in Poland. The first position belongs also to Social protection (C100) and its share is higher than in the Czech Republic, Slovak Republic and Hungary. The second position belongs to General public services (C10) and the third to Education (C90) – but Education (C90) was the second and General public services (C10) were the third in 2007 and 2008.

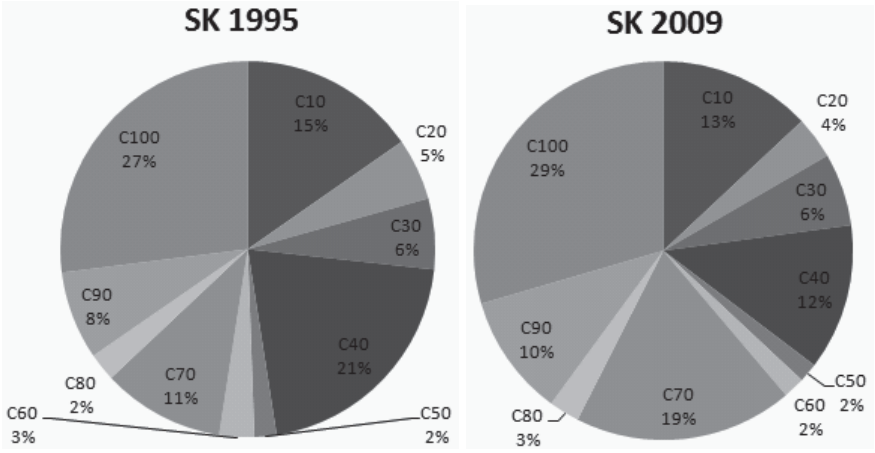
Fig. 3: Structure of government expenditure in Poland



Source of data: based on the data from Eurostat

We found the most varied results in Slovak Republic. As it was already mentioned, Slovak total government expenditure is the lowest of all analysed countries. Social protection (C100) has the highest share on total government expenditure in all years, but its share on total government expenditure is the lowest in the Visegrad Group although its share has slightly increased. General public services (C10), Health (C70) and Economic affairs (C40) alternately placed on the 2nd and the 3rd position.

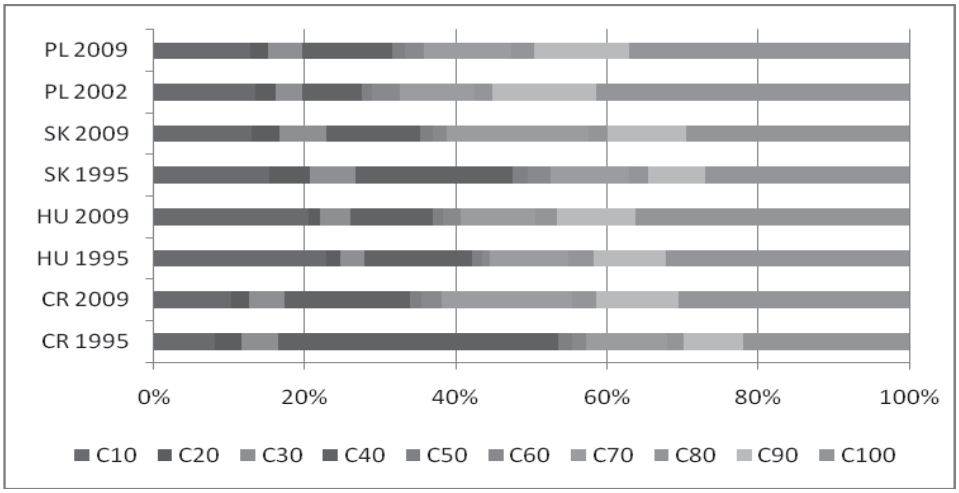
Fig. 4: Structure of government expenditure in the Slovak Republic



Source of data: based on the data from Eurostat

Figure 5 briefly summarizes structure and the changes of government expenditure in the selected period.

Fig. 5: Structure of government expenditure in Visegrad Group



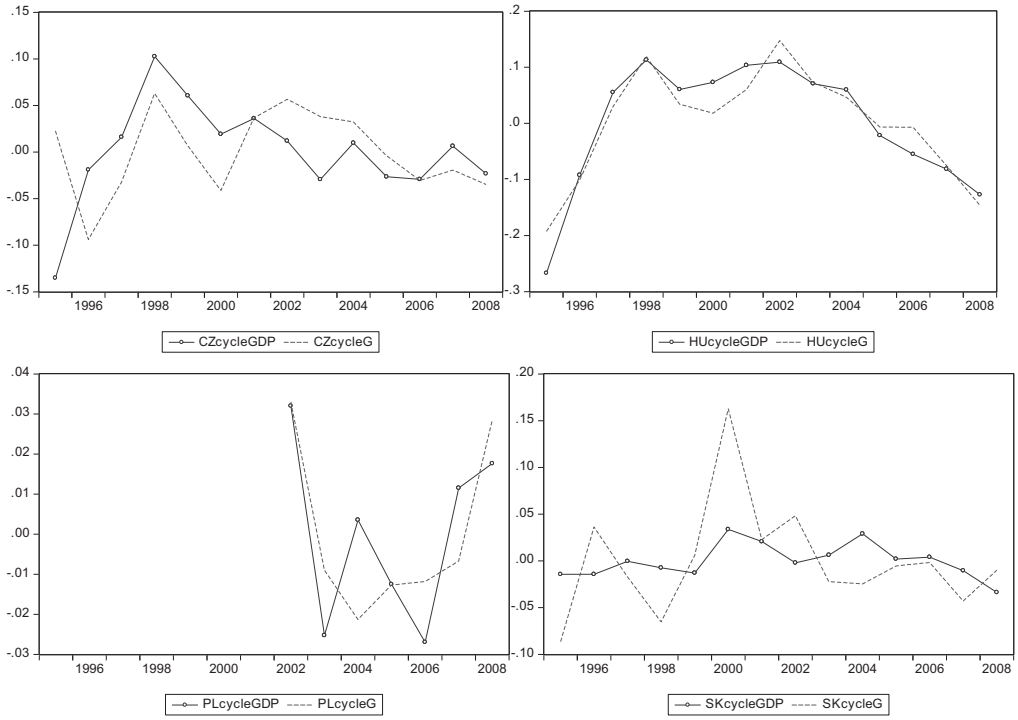
Source of data: based on the data from Eurostat

The results suggest that the structure of government expenditure is similar in the Visegrad Group despite the existing differences in the size of the public sector. Expenditure on Social protection has the highest share on total government expenditure in all countries. Data confirm unstable and cyclical development of total government expenditure on GDP in all countries. Five spending functions, on average, account for more than 80% of the total spending: Social protection, Economic affairs, Health, General public services and Education.

3.2 The cyclicality of government expenditure

Next part of the article is focused on the analysis the cyclicality of government expenditure as it is a very important issue too. As was already noted, government expenditure is a possible automatic stabilizer. From this point of view, government expenditure should move in a countercyclical direction. We decided to assess the relationship between GDP and government expenditure and we analyzed the correlation between cycle components of GDP and total government expenditure. Correlation is a statistical technique that can show whether and how strongly pairs of variables are related. The correlation coefficient can vary from -1 to +1. The correlation coefficient -1 indicates perfect negative correlation, and +1 indicates perfect positive correlation. A positive correlation coefficient indicates the pro-cyclicality of government expenditure, negative value means that variables are counter-cyclical and value close to zero express acyclicality. Time series were cyclical adjusted. Firstly we calculated logarithms of variables and then the cycle components were extracted using the Hodrick-Prescott filter. Next Figure 6 shows cycle component of GDP and government expenditure in each country of the Visegrad Group.

Fig. 6: Cyclically adjusted GDP and government expenditure (V4 countries)



Source of data: author´s calculations based on data from Eurostat

The results indicate significant difference across countries. Only in the Slovak Republic, a correlation coefficient describes a weak negative correlation between government expenditure and GDP and it means that government expenditure is counter-cyclical. Correlation coefficients and the cyclicality of government expenditure are very similar in the Hungary and Poland. Results express strong procyclicality of government expenditure in these countries. Government expenditure is the nearly perfect correlated and procyclical in Hungary. A value of correlation coefficient suggests weak procyclicality of government expenditure in the Czech Republic. Table 2 presents the summary of calculations.

Tab. 2: Cyclicality of government expenditure

Country	Correlation coefficient	Correlation	Cyclicality
CZ	0.23	weak positive	procyclical
HU	0.95	strong positive	procyclical
PL	0.73	strong positive	procyclical
SK	-0.25	weak negative	counter-cyclical

Source of data: author´s calculations

Conclusion

Government expenditure plays important role in a fiscal policy of each country as it impacts on overcoming the inefficiencies of the market system in the allocation of economic resources. It also can help to reduce cyclical fluctuations in the economy and influences a level of employment and price stability. Firstly we analyzed the total value and structure of government expenditure in each county of the Visegrad Group in a period 1995-2009. Results confirm the differences in the size of the public sector in V4 countries. The size of the public sector varies from 41.54% of GDP in the Slovak Republic to 50.54% of GDP in Hungary in 2009. Data also confirm the trend of decreasing a weight of government expenditure on GDP.

The results suggest that the structure of government expenditure is similar in the Visegrad Group despite the existing differences in the size of the public sector. Expenditure on Social protection has the highest share on total government expenditure in all countries. Data confirm unstable and cyclical development of total government expenditure on GDP in all countries. Five spending functions, on average, account for more than 80% of the total spending: Social protection, Economic affairs, Health, General public services and Education.

On the other hand the cyclicality of government expenditure differs across the countries in terms of connections with the economic cycle. Government expenditure is the nearly perfect correlated and procyclical in Hungary, and also strong correlated and procyclical in Poland. Government expenditure is weak procyclical in the Czech Republic. Government expenditure is countercyclical in accordance with the theory suggestion only in the Slovak Republic.

The results of the analysis are only the first step for a complex analysis and interpretation of procyclical behavior of fiscal policy in the Czech Republic and selected European Union countries.

Acknowledgement

This article ensued thanks to the support of the grant GAČR 403/11/2073 "Procyclicality of financial markets, asset price bubbles and macroprudential regulation".

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Received: 31. 07. 2011
Reviewed: 11. 11. 2011
Approved for publication: 30. 11. 2011

INNOVATIVE EDUCATIONAL TECHNOLOGIES IN HIGHER EDUCATION – MARKETING ACTIVITY EFFECTIVENESS MEASUREMENT IN SYSTEM MAPLE

Iveta Šimberová , Zuzana Chvátalová

Abstract: *Increased requirement of the practice for measurement of marketing activity effectiveness leads in higher education to the pressure on applying the methods of quantitative disciplines and on construing own methodologies when processing and evaluating researches of economic and social phenomena. Application of sophisticated methods of marketing measurement activities as the basic marketing tools for measurements enables inter alia creation of the communication harmony between different functional corporate sectors (marketing is thus encouraged to speak "in the same language" which stresses effectiveness of its planned and realized activities). The appropriate and competitive reaction of the companies and other subjects to the challenges of markets seems to be one of the key issues of current managerial decision making. That's why marketing as an area of market challenges solving should be prepared to communicate the problems with own tools and activities effectiveness. The aim of the paper is evaluate present situation in marketing literature regarding to the measurement of marketing activities effectiveness and advice of possibility to use sophisticated methods for their evaluation. The paper highlights certain possibilities of application of mathematical modelling in the Maple system for teaching, practice and research. General lack of the data and appropriate software for the improving level of the higher education in the area of marketing activities and their measurement open the space for deep discussion between theoretical and practical issues and possibilities to use this tool in the tertiary education, research and company managerial decisions. Results of the executed research in the companies in Czech Republic (2010) showed us interesting quantitative information regarding the application of the selected marketing metrics. The key conclusion seems to be turn to more attention into research in this area and deeply verify possibilities of the Maple in all of mentioned highlights in the paper.*

Keywords: *Marketing Activities, Measurement, Effectiveness, Innovative Educational Technologies, Higher Education, System Maple.*

JEL Classification: *C58, C87, I23, M21, M31.*

Introduction

Competitive struggle is nowadays the basic characteristics of each individual market. By the means, which the competitive struggle is realized through, we can perceive competition at the price level (different strategies and policies are mentioned in this respect, let us point out for instance price reduction, increase of purchase volumes and share in the market and/or cost reduction, thus increasing profit), at the non-price level (we are in particular speaking about the issues of quality of production, customer service, advertisement, sales marketing, etc.). The facts above force the

manufacturers and the sellers into effective and controlled behaviour. Consistent market analysis, analysis of real phenomena, measurements of market environment dependences, identification of economic relationship anomalies, impact of changes are understood explicit indicators hereof. Targeted, systematic and sophisticated researches and their assessment are inevitable practices for choice of management policy of each company. Each new approach or concept is important for the practice in particular if it increases corporate performance and is reflected positively in its economic results. Marketing can win a stronger status only provided that it offers transparent quantifiable instruments and tools for measurement of the funds invested into the proposed marketing strategies and programmes. Development and a wide user introduction of ITC and internet networks is considered a real challenge for application of the methods of quantitative disciplines (quick computations. modelling, improved means of visualization, animation and simulation of phenomena), search for the paths leading to optimization, construing own methodologies when processing and assessing researches in the economic and social environment. Especially, implementation of the approach to the higher education at the business and management faculties seems to be important in this educational phase of young people (incoming employees, managers, owners, researchers and so on). On the other side the turbulent environment (growing pressure of competitors, rising demands of the customers and other stakeholders dynamics of development, quick obsolescence of technologies and products, changing perception and behaviour of the customers as well as character of competition, etc) pushes the management and company owners to look for, inter alia, new a more effective managerial, marketing and business approaches enabling not only to develop successful business in the home market, but also penetrate into European, international and global markets. In order to preparation of managers, owners and researchers will be on the suitable level to face to the environmental challenges is necessity to turn over using of sophisticated methods in the managerial and marketing businesses.

1 Theoretical background

Assessment of effectiveness of marketing and marketing activities is a much wider issue than their simple measurement by the financial ratios only. Marketing activities represent a partial tactical and operational output of strategic decision-taking by the top management. Their effectiveness is connected at the general plane mainly with the overall marketing management process, arrangement of the marketing department, further on, with relations with other departments of the entity, with the level of marketing implementation and in particular with assessment and control. Besides measurement of effectiveness by the financial ratios, material level of marketing effectiveness control is inevitable; it consists in monitoring of the five main attributes: customer philosophy; integrated marketing organization; adequate marketing information; strategic orientation and operational effectiveness [14].

It is therefore recommended to apply the following combination for monitoring of marketing effectiveness:

- Financial ratios (e.g. financial analysis tools, marketing performance control - analysis of sales, share in the market, analysis of marketing expenses with respect to the turnover, effectiveness of use of individual marketing mix tools -

operational effectiveness etc., SVA - Shareholder Value Analysis [14], [21], [22].

- Marketing audit assessing degree of effectiveness of the marketing function performed by the company [9], [13], [14].
- And other non-financial ratios (e.g. customer philosophy; integrated marketing organization; adequate marketing information; strategic orientation [14], lifelong customer value [15], stakeholder value analysis; SVA- Stakeholder Value Analysis [18], [25].

Each new approach or concept is significant for the company in particular if it increases the corporate performance and is reflected positively in its economic results. Marketing can thus win a stronger position only provided that if offers transparent quantifiable tools of measurement of the funds invested into the proposed marketing strategies and programmes.

1.1 Quantification in marketing activities measurement

Publications and specialized papers resolving the issue of measurements based for instance on Return on Investment (ROI) appear nowadays [1], [14], [23]. It seems to be the method how marketing can win a more explicit status in the companies. Application of ROI as the basic marketing tool for measurements enables inter alia even creation of the communication harmony between different functional corporate sectors (marketing is thus encouraged to speak "in the same language" which stresses effectiveness of its planned and realized activities). It improves planning, measurement and optimization of the marketing strategies. Another approach to measurement is based on the necessity to monitor marketing costs. Each marketing programme should be subject to calculation of the costs broken down into individual activities (e.g. the method of Activity Based Cost accounting (ABC)), to establish whether these activities will most probably lead to the results justifying the costs. The companies, focused on a high level of customers' satisfaction by offering higher-quality products and services, are aware that this is the way leading to higher customer satisfaction. Repeated purchases, growth of profit and thus satisfaction of other stakeholders, individuals as well as, further investments, etc. is the positive consequence hereof. It is the cycle bringing profits and growth. Focus on profit maximization seems to be a short-sighted approach according to certain authors [3]. In the majority of cases the companies were focused on the shareholders. The marketing approach incorporating creation and building relationships stresses that it is necessary to change this perception even towards other key stakeholders. The Stakeholder approach is wider and responds to the conditions of the current environment, in addition to the profit target it also reflects other objectives, e.g. responsibility to society and partnership, which are included in the strategic goals and in all corporate activities. We are based on the premise:"should the company fail to care for its key stakeholders and fail to create advantageous and long-lasting relations with them, it will never reach adequate and in particular long-time profits"[6], [10], [14], [24]. The issue of the level of focus of the company on the key stakeholder groups is connected with intents and strategies to be realized by the company for development of relations with them. The companies, focused on a high level of customer satisfaction by offering higher-quality products and services, are aware that this is how they increase their satisfaction. Repeated

purchases, rising profits and satisfaction of other participated groups, individuals as well as further investment, etc. is the consequence hereof. It is a cycle bringing profits and growth.

On the other side, value maximization for the shareholders is a quite different approach that will most probably be more and more topical in the future, as it recommends, when selecting the marketing strategy, to apply analysis of the value for shareholders (SVA-Shareholder Value Analysis) [14]. Application of such analysis is based on the premise:"higher corporate value is hidden in its intangible marketing assets - brands, market knowledge, relations with customers and relations with partners". These assets lead to long-time profits. The analysis itself enables to establish, what alternative behaviour and action will maximize the shareholder value, thus guaranteeing that management will understand marketing as the integrated part of the overall process of its activities (and not as a specific function concerned only with increasing turnover or market share).

Incorporation of the prospective long-life customer value [15] into the sector of marketing measurements should lead to understanding of the basic marketing opposites, i.e. that reach of a higher customer value does not necessarily have the profit form. These two approaches indicate that not all marketing activities can be quantified and measured easily in the marketing sector. Finding more sophisticated tools, enabling their measurement and modelling, is the long-time objective even for these types of marketing activities and intentions.

1.2 Mathematic modelling and Maple system

Use of quantitative methods (i.e. the methods based in particular on mathematic discipline outputs) is nowadays supported firmly by introduction of numerous PC software unit. The latest scientific computations are connected with solution of the real problems by applying information and communication technologies (ICT). The requirements, like accuracy of computations, comprehensible visualization and interactive communication, have enforced creation of universal complex programme software, e.g. the Maple[12] system of the company Maplesoft Inc. (Canada), MathCAD[13] of the company PTC Corporate Headquarters (USA), Mathematica[14] of Wolfram Research, Inc. (USA), MuPAD[15] of SciFace Software GmbH & Co. KG (Germany), etc. Outputs of the researches acquired by collection of empirical data are based in particular on modelling of phenomena, dependences, on measurement of parameters and characteristics in the researches of both quantitative and qualitative character [11]. The mathematical model helps to understand behaviour for future planning better. The models approximate the real behaviour. Modelling is a process [5]. Search for new methods and development of algorithms for corporate activities measurement nowadays seems to be the inevitable prerequisite. "Mathematization" is supported by ICT, thus enabling to apply theoretical results in practice within a wider scope [11]. Points of view of researchers, academicians and practitioners regarding application of the methods for economic analyses, search of economic patterns,

[12] http://www.maplesoft.com/
[13] http://www.ptc.com/appserver/mkt/products/home.jsp?k=3901
[14] http://www.wolfram.com/
[15] http://www.mupad.de/products/

possibilities of prediction of economic phenomenon development, etc., vary on this point, though "mathematization" of the issues, application of statistical and other quantitative methods is supported by steeply developing means of information and communication technologies (ICT) and by their more and more easy availability. This way they support possibility of application of results of the theories in practice (underestimated to a certain degree after the revolution in 1989, nowadays again discussed more actively) within a wider scope [12]. Even the economic theories nowadays utilize methods of quantitative disciplines more and more frequently. Creation of quantitative models of economic phenomena, their visualization, animation and simulation can thus set meaningful conditions for decision taking. The researchers are based on the pre-defined means built in the system. Nowadays it is therefore necessary to pay adequate attention to these facts as early as in the process of education. For successful practice and employability of each graduate it is necessary to support not only acquisition of new practices and knowledge from the sector of quantitative disciplines, but also to develop emotion, experience and necessity of control. Natural (not overestimated) development of computer literacy, utilization of information sources and communication networks plays certainly an important role. Solution of a real problem of a specific company can become a suitable opportunity for realization of the knowledge gathered in practice.

Maple commands:

```
restart : with(Statistics) :
X := Vector([2002, 2003, 2004, 2005, 2006]) :
Y := Vector([0.148765·100, 0.093558·100, 0.126174·100, 0.123812·100, 0.111934·100]) :
ROI := LinearFit([1, t, t^2, t^3], X, Y, t); evalf(%, 4)
MROI := diff(ROI, t); evalf(%, 4)
pointROI := [[2002, 0.148765·100], [2003, 0.093558·100], [2004, 0.126174·100],
             [2005, 0.123812·100], [2006, 0.111934·100]] :
with(plot) :
plot([pointROI, pointROI, ROI, MROI], t = 2001..2007, y = -2..14)
```

System response:

The regression model of economical index ROI and its derivative MROI (also shortly), empirical values ROI and the visualization:

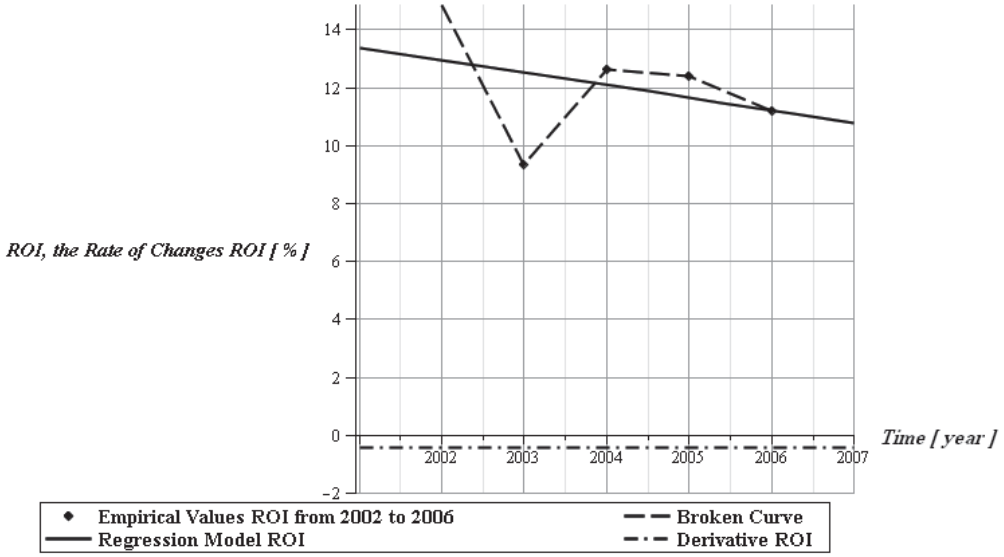
$$ROI := 1.68358708340080398\ 10^{-10} + 2.24927167258199714\ 10^{-7}\ t + \\ + 0.000225376999519890742\ t^2 - 1.10961938957564419\ 10^{-7}\ t^3$$

$$ROI := 1.684\ 10^{-10} + 2.249\ 10^{-7}\ t + 0.0002254\ t^2 - 1.110\ 10^{-7}\ t^3$$

$$MROI := 2.24927167258199714\ 10^{-7} + 0.0004507539990\ t - 3.328858170\ 10^{-7}\ t^2$$

$$MROI := 2.249\ 10^{-7} + 0.0004508\ t - 3.330\ 10^{-7}\ t^2$$

Fig. 1: From Maple Document: ROI - regression model and its derivative from empirical values in the period 2002 to 2006 before change of the marketing strategy



Source of data: own work in Maple[16]

Let us present the Maple document for modelling of one of the profitability ratios as a quick example of work in the working environment: *Return on Investment* (*ROI=profit/invested capital . 100%*) and its percentage development in the period 2002 to 2006 as the regression cubic model (Fig.1). This was the integral part of the analysis focused on identification of performance of a specific company in the process of decision taking concerning change of the marketing strategy. ROI is connected with the overall corporate effectiveness and reflects profit to capital employed ratio. The document also determines rate of changes of ROI development as derivation of the regression model in question. The Maple document utilizes the library Statistics, where the whole process can be managed very simply and/or modified by the built-in regression functions, visualization of models and by possible further statistic diagnostics.

Discussion

Results of the professional sources review [2], [4], [6], [7], [8], [16], [17], [27] and also the latest presented studies [19], [28] stress that capability of measurement of marketing effectiveness and/or marketing activities affects positively the overall corporate performance; on the other side the results also point out inadequate attention paid to elaboration of these approaches, methods and metrics of measurement. Based on this knowledge the sector of approaches, methods and metrics of measurement of marketing effectiveness and marketing activities seems to become a very topical field of scientific investigation, which a targeted attention should be paid to.

[16] Note: In this model case, situation is presented in the form of cubic regression function created in Maple; the visual evaluation in the practice we simply can used the linear regression model.

It is also possible to state that individual approaches, methods and metrics have not been elaborated adequately and systematically and that the status of their application in practice has not been verified yet. The performance managed marketing must have certain mechanisms, through which it can apply continuous improvement. Application of the Six Sigma method is one of the latest discussed complex methods how to improve quality of marketing contribution in the organization. The Six Sigma method identifies and also eliminates different mistakes in the structure, data management, solution of problems connected with utilization of different methods of data collection and statistic analysis [20].

When investigating the fields of approaches for measurement of marketing effectiveness and marketing activities of the companies it is necessary to link individual approaches, methods and metrics with the material side of the current state of marketing concepts and status of their implementation in the companies.

As show us the current review of literature and level of the knowledge the question of the measurement of effectiveness of marketing activities has a several areas of problems:

- Different level of marketing management implementation in the companies Dissimilarity also according to sectors, markets and so on (for example differences between B2B and B2C markets, or between industrial and services sectors).
- Tendency to measure just quantitative phenomena, accent to the usual financial metrics and lack of understanding of the interconnection of qualitative and quantitative side of marketing effectiveness.
- General lack of the data and appropriate software for the improving level of the higher education in this area (in the Czech environment).
- Pressure to competitiveness, innovativeness of market offers and overall corporate effectiveness grows materially are developing the press to use sophisticated methods.
- Using and experiences with work in Maple system in the higher education, modelling of the research data show the way how support and teach students, researchers, managers to be more effective in marketing decision making.
- On the base of the executed research in companies (in 2010) we observed, that just small sample of the companies use for the marketing activities effectiveness measurement self-contained system of the quantitative and qualitative indicators.

Conclusion

In competition of the computer systems an important place has been won deservedly by the Maple system (http://www.maplesoft.com/), product of the Canadian company Maplesoft, Inc. In the Czech Republic its user support is provided by The *Czech Maple User Group* (http://www.maplesoft.cz). From the very beginning of development of the Maple system its core line is created by the: student - teacher - practice and/or research. A number of interactive means during computations and visualizations, clickable calculus, easy modifiability, possibility of animation,

simulation ad virtualization, a number of built-in and pre-defined functions, procedures and libraries directly in the system contribute to deeper understanding of content of the curriculum, to teaching with the time effect, to the possibility to resolve examples of the practice, to support of team and interdisciplinary cooperation, etc. The company Maplesoft, Inc. develops versatile activities as support thereof by operating the following centers at its websites:

- The Student Help Center (http://www.maplesoft.com/studentcenter).
- The Teacher Resource Center (http://www.maplesoft.com/teachercenter).
- The Application Center system (http://www.maplesoft.com/applications/).
- The Applied Research: Financial (http://www.maplesoft.com/applied_research/Financial/index.aspx).

It has to be pointed out that status of ICT cannot be overestimated. Solution of the issue must be supported by logic and meaningful management and control of the process by the man. Quantification has thus a chance to penetrate step by step not only into purely quantifiable sectors or issues, but also into the sectors and problems of qualitative nature.

From analyses of economic sources, specialized publications, analyses and reports of completed research it follows clearly that coordination and effectiveness of business and marketing activities of the company is - besides the sector of strategic management - the key issue of the Czech companies, despite application of different new methods and approaches to marketing management. In the period of the economic crisis, affecting more or less all advanced economies and branches, pressure to competitiveness, innovativeness of market offers and overall corporate effectiveness grows materially.

In connection with the growing pressure in the European and international competitive environment the corporate and business entities in the Czech countries thus face a number of challenges which they have to cope with; these challenges do not affect only the field of marketing activity measurements, but even the fields connected with the status of marketing management and real marketing concept implementation. The Czech economy represents a small and relatively saturated market with a rather high degree of industry specialization. It is therefore necessary to look for new approaches enabling the traditional industrial branches to stand the new conditions. Some of the observations from the executed research in 2010[17] show us selected results in the area of application of marketing metrics by companies in Czech Republic:

- Just small sample of the companies use for the marketing activities effectiveness measurement the indicators as are ROI (19,7% companies), ROS (19,7% companies), ROMI (10% companies).
- The most used indicators of marketing activities effectiveness measurement seems to be:

[17] The research has done in the framework of the specific project "Measurement methods of marketing activities effectiveness and their application" reg. No.FP-S-10-21 (supported by Faculty of Business and Management BUT). The sample was 147 companies in Czech Republic.

a) Financial
   - Number of the customers (68%), profit (47%), net profit (62%), market share (40,8%), profit on customer (43,5%), marketing expenditure (30,6%).

b) Nonfinancial
   - Customer satisfaction (54,4%), level of the product cannibalization (8,2%), loyalty (25,2%), benchmarking (16,3%), Balanced Scorecard (14,29%).

- The most observed marketing activities for the searching of business opportunities in researched companies seems to be: analysis of the needs, observation of marketing goals, customer satisfaction and price strategies.

The question is whether or not the current marketing concepts and the approaches to measurement of marketing activities as above reflect the current reality and situation of our companies and business entities adequately. The theoretical review and practical knowledge form the research creates a base for further research in this field.

Acknowledgments

The paper was supported in the framework of the specific research projects: "Innovative approaches in management and marketing in global European environment" reg. No.FP-S-11-3/1417 and "Measurement methods of marketing activities effectiveness and their application" reg. No.FP-S-10-21 (supported by Faculty of Business and Management BUT).

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Received: 31. 07. 2011
Reviewed: 04. 11. 2011
Approved for publication: 30. 11. 2011

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Title	Scientific Papers of the University of Pardubice, Series D
Publisher	University of Pardubice Faculty of Economics and Administration Studentská 95, 532 10 Pardubice, Czech Republic Registration number IČ 00216275
Editor-in-chief	Ing. Filip Gyenes
Periodicity	3 per year
Volume number	16
Issue number	21 (3/2011) Special Edition
Place	Pardubice
Publication Date	10. 01. 2012
Number of Pages	186
Number of Copies	70
Edition	First
Printed by	Printing Centre of the University of Pardubice

MK ČR E 19548
ISSN 1211-555X (Print)
ISSN 1804-8048 (Online)

ISSN 1211-555X
MK ČR E 19548