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Application of Modern Management Concepts by Polish Companies – Analysis of Research Results

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Our article presents the results of research on the use of modern management concepts in companies from the so-called traditional sectors of the economy in Lesser Poland and Silesia Voivodeships. The study group consists of 125 companies operating in metallurgy- and steel-related sectors such as machinery, coke, mining and energy. Studies have confirmed that the companies surveyed utilise modern management concepts in their activities, although such utilisation is highly diverse (only one company pointed out that it does not utilise any such concepts). The most popular management concepts are controlling and outsourcing. In contrast, Balanced Scorecard and Business Process Reengineering belong to the group of rarely used strategies.

Keywords: management concept, controlling, outsourcing, TQM, strategic alliance

1 Introduction

In recent years many new management concepts have been created, e.g. benchmarking, Business Process Reengineering (BPR), lean management, TQM, strategic alliances, network organizations, virtual organizations, and many more. They have been subject to extensive analysis, both theoretical and methodological, in a number of countries. However, relatively little broad empirical research has been devoted to this subject despite the fact that among companies operating in various sectors of the economy we can observe a number of practical examples of entities that have successfully implemented the presented concepts. Such concepts are also increasingly used by Polish companies. It is facilitated by deep relationships between the Polish economy and the global economy, and the presence of global companies in Poland, especially in the central and southern parts of the country.

Therefore, based on the results of aforementioned research, the goal of this article is to show whether and to what extent Polish companies utilise modern management concepts. The study constitutes the second part of the project “The utilization of modern management concepts in the management of selected companies from traditional industries in the Lesser Poland and Silesia Voivodeships”. Part I - a theoretical and methodological approach – concentrated on the idea and classification of these management concepts, as well as the

determination of the methodological formula of the research. This formed the basis upon which these studies were carried out (Lisinski, 2010).

The choice of regions was mainly dictated by their respective economic importance in Poland. Silesian Voivodeship is one of the best performed economic regions in Poland. It produces 13.7 percent of GDP, which puts the voivodship in second place within the country. In 2008, GDP amounted to 167.9 billion zł, (i.e. ca. 40 billion EUR). Gross domestic product per capita was 108.0 percent of the national average, which places it in the second place in Poland (Rocznik Statystyczny, 2010). Based on the existing resources, the country's largest industrial district was established here. The population of the region is 4.64 million. Although the region is mainly characterized by the concentration of heavy industry (mining, metallurgy, engineering, energy), in the last 20 years there has been a significant change in the nature of the region (the liquidation of many coal mines and steel mills) and the expansion of the automotive industry and suppliers of car components (the investment of such companies as FIAT, Opel, Magneti Marelli).

Lesser Poland Voivodeship also has significant socio-economic potential, although not to the same degree as the Silesia region. It produces 7.4 percent of GDP and is inhabited by 3.3 million people. More than 300 thousand businesses operate in Małopolska, mainly small and medium sized firms.

In summary, both regions together constitute over one-fifth of Polish economic capacity. They produce a total of 20.6 percent of Polish GDP, and are inhabited by 7.94 million people (out of a nationwide population of about 38.5 million). Both regions are characterized by high levels of economic growth, and have over 80 universities with about 400 thousand students altogether. This is reflected in the high availability of skilled labor, resulting in a relatively high proportion of foreign investors, including such companies as MAN, Motorola, ArcelorMittal, Pliva, Saint Gobain, Fiat, Opel, CMC amongst others.

2 Review of the literature

Despite the broad popularity of modern management concepts in Poland, up until now there have not been many studies devoted to the knowledge of new management concepts among Polish companies. They were rather the topic of theoretical and methodological deliberations. These papers presented the topic of modern management concepts in different perspectives and industries, focusing also on the various problems arising from their utilisation. Relatively rare, however, they concentrated on the subject of a couple (or even several concepts), while the vast majority have focused their attention on the theoretical approach, describing only a single concept. For example, the monographs of Polish authors such as Sroka (2012), Łacka (2011), Piekarczyk and Zimniewicz (2010) or Cygler (2009) were entirely devoted to the issue of inter-organizational cooperation. They described this topic in a very comprehensive way, concentrating on a variety of aspects of cooperation. In turn, the monograph of Sankowska (2009) is devoted to the virtual organization, whilst Kłos (2009) and Trocki (2001) describe the outsourcing and its basic problems, and Jabłoński (2010) analyses the Balanced Scorecard. The monographs of Zimniewicz (2009), Lisinski et.al (2010) are notable exceptions in Polish literature as they in a comprehensive and orderly fashion present a few selected modern management concepts.

A much wider review of the literature devoted to the modern management concepts is presented in the English-language literature (see e.g. Hammer & Champy, 1993; Boxwell, 1994; Hammer, 1996; Brilman, 2002; Child et al., 2005; Bogan & English, 2006; Gulati, 2007; Soltani et al., 2008, and many others). As in case of Polish literature, they also present rather particular concepts than a wide spectrum of different management concepts. For example, Altinkemer et al. (2011) empirically investigated whether (BPR) is associated with enhanced firm productivity and performance. The analyze firm-level panel data covering the period 1987–2008 using fixed effects and first differencing, standard methods that account for unobservable firm-level effects. They found out that return on assets drops significantly during the project initiation year. According to fixed effects results, the performance and productivity measures improve in a decreasing manner after project initiation, suggesting that BPR indeed positively affects

firm performance on average. In turn, the study of Corredor and Goni (2011) explores the relationship between TQM and company performance. The study uses a sample of Spanish companies that have received TQM prizes at the national or regional level between 1997 and 2003. The findings indicate that TQM pioneers experience performance gains, because of the early implementation of the system; however, late adopters do not experience similar results. The also found out that companies using a TQM system are not necessarily better than their counterparts are, before putting the system into action. Finally, the study of Yang et al. (2011) based on data collected from 309 international manufacturing companies analyzes relationships between lean manufacturing practices, environmental management and business performance outcomes (e.g., market and financial performance). The scholars' findings suggest that previous lean manufacturing experiences are positively related to environmental management practices. The paper also provides empirical evidences that environmental management practices become an important factor to resolve the conflicts between lean manufacturing and environmental performance¹.

However it should be emphasized that the most of the presented items, both Polish and English, present modern management concepts from a theoretical point of view. If one of them focuses on research, it usually relates to one of these concepts, only. There is a lack of a broader and comprehensive perspective on all methods. This study tries to fill a gap in this field.

3 Methodology

This research aims to identify the scale and scope of the use of modern management concepts in selected sectors of the Polish economy. It was conducted in several main areas:

- use of modern management concepts,
- factors inducing companies to apply the management concepts,
- benefits from the application of modern management concepts,
- competences obtained through the use of modern management concepts,
- competences needed for the implementation of modern management concepts,
- measurement of the effectiveness of the concepts.

The research subject included a group of 125 companies operating in five traditional sectors of the Polish economy: metallurgy and steel-related sectors such as machinery, coke, mining and energy. Questionnaires were sent to the companies which, under the Pareto rule, represent a minimum 80 percent (and in some sectors even 100 percent) of the production potential of the given sector. It was assumed that the questionnaires - if possible - should be completed by managers representing at least middle or, where possible, the highest management levels.

1 Presented review of the literature is not exhaustive. However, it presents the latest papers which are devoted to the theme of modern management concepts.

The research was conducted between February and October 2011. Proposed answers were provided in each of the analyzed areas, i.e. respondents were asked to comment on the proposed statement, answering “yes” or “no”; or to indicate the correct answer on a scale of 1 to 5 (1 - minor importance, 5 - very high importance); or finally to submit their own proposals.

After about a month during which the questionnaires were dispatched, all respondents were contacted by telephone to obtain follow-up information. Due to the limited effectiveness of the process, after several months all the questionnaires were re-sent to those entities that had not responded. This stage was followed by telephone contact (in some cases, several times) during the next 2-3 weeks. A total of 90 responses were finally received, representing 72 percent of the research sample, and including 31 completed questionnaires. The responses received allowed us to evaluate the utilisation of modern management concept amongst companies from the traditional sectors of the Polish economy, and to draw interesting conclusions from the aforementioned research.

4 Analysis of the results

The companies surveyed represent various entities in terms of employment, annual sales and markets served.

Employment

up to 100 people - 5 companies; 101-200 people - 4 companies; 201-500 people - 4 companies; more than 500 people - 16 companies.

Markets served

local - 2 companies; regional - 1 company; national - 6 companies; international - 19 companies.

Annual sales in PLN

1 - 10 million - 1 company; 11 - 20 million - 2 companies; 21 - 50 million - 6 companies; 51-100 million - 2 companies; 101-500 million - 6 companies; more than 500 million - 11 companies.

Not all companies responded regarding employment, scope of operations or annual sales. In turn, not all of the surveyed companies indicated the markets on which they were active, from local to international. Notwithstanding these limitations, it should be noted that the vast majority of surveyed companies are very large entities (both in terms of employment size and annual sales) which operate internationally.

4.1 The companies' use of modern management concepts

The vast majority of companies utilise several concepts simultaneously. Only one company indicated that it does not use any of them. The most popular management concepts are controlling and outsourcing (26 and 25 indications respectively). In turn, Balanced Scorecard (BSC) and Business Process Reengineering (BPR) were least popular (5 indications each). Relatively large companies also indicated the use of benchmarking and lean management (20 and 16 indications

respectively), while the use of TQM and inter-organizational cooperation strategies were indicated by 11 and 9 companies.

Some companies responded that they apply only certain elements of some concepts (mainly BSC), or use them in part. On the other hand, some companies, including the relatively small firms, replied that they apply all the management concepts. Such a response may be questionable, especially given that very large companies use selected concepts only.

The popularity of controlling and outsourcing is not surprising, because since the 1990s. they have been shown to be the most commonly utilised strategies. This stems largely from the historical conditions in which companies conducted business, and restructuring activities undertaken by many entities. These consisted mainly of the spinning-off of activities not related directly to the so-called core business, and the creation of separate entities. Such companies often continue to operate in the capital structures of particular entities. Such a situation could be observed in the steel industry and outsourcing processes were related to the activities including, inter alia, protection of property, maintenance, medical services, transportation, accounting, and others. These companies operated in this shape until the privatization of the sector, which mostly took place in the years 2004-2006 (Sroka, 2010).

In turn, the low popularity of BPR may be explained by the difficulty in its implementation.

4.2 Factors inducing companies to use the management concepts

Our research did not provide an unambiguous answer to the question of which factors lead individual companies to apply different management concepts. The vast majority of companies indicated several reasons. The most common indications were: “providing flexibility” (20 responses), “reduction of uncertainty” and “provide greater speed and flexibility” (17 responses each). In turn, the least important factors for the companies were: “providing adequate capacity” (15 responses) and “providing access to the resources not held by the company” (11 responses). This indicates that companies are trying to improve (or maintain) their competitive position through the use of modern management concepts.

Respondents indicated also the following factors: “to enable measurement of the objectives, and deviations”, “cost optimization”, “lower operating costs”.

The individual characteristics of the various companies' application of management concepts will be presented at the later stage of this paper.

Use of benchmarking

Benchmarking was the third most popular management concept used by the aforementioned companies. The vast majority of them indicated utilization of several types of benchmarking (although usually not all). Most companies have used external benchmarking (18), followed by internal (10), whereas only two companies have utilised functional benchmarking. Errors were evident in the responses in that companies which indicated the use of benchmarking, and then subsequently described

the utilisation of a particular type thereof. Companies therefore seem not to use benchmarking in the manner described.

Some very large companies do not apply benchmarking principles, which may indicate that they see no need to compare themselves to the competitors.

Use of controlling

Controlling was the most commonly used concept amongst the surveyed entities. Research has shown that two types of controlling are dominant: financial and operational controlling, which were indicated by 21 and 20 companies respectively. On the other hand, only six companies indicated the use of functional controlling. It is also surprising to note, that strategic controlling was used by 13 companies only, an outcome which is difficult to rationally explain.

As in the case of benchmarking, some errors were made. For example, when a company indicated that it does not apply controlling, and subsequently indicated that it uses one (or even more) of the various types. In turn, one company uses the assumptions of business controlling.

Use of inter-organizational cooperation strategies

Inter-organizational cooperation strategies were among the least popular management concepts utilised by the companies (only nine indications). Respondents were able to choose from the following options:

- bilateral alliances in the form of:
 - partial purchase of shares in the partner company,
 - mutual exchange of shares (cross-sharing),
 - creation of a separate entity (a joint venture company),
 - loose agreements such as the appointment of a task team to work in R&D,
- network organization,
- virtual organization.

Respondents mainly favoured the formation of bilateral alliances, among which "loose agreements ..." were strongly dominant (nine responses). Other forms of bilateral alliances were seemingly utilised only two or three times. It is worth noting that two respondents identified the creation of virtual and network organizations, which means that the respondents mainly use the simplest forms of inter-organizational cooperation. On the other hand, it should be noted that virtual organizations, due to their nature, are rather the domain of other sectors of the economy.

As in the case of benchmarking, or controlling, there were evident errors, because certain companies indicated that they did not apply any of these concepts, and then mentioned the use of one (or even a few) of the various types (at least five companies reported such results). The reverse was also true, which may therefore indicate an inaccurate reading of the text of the questionnaire.

Use of lean management

16 companies indicated that they applied lean management. However, as before, errors were visible, because the company

indicated that it did not apply the concept of lean management, and then when answering specific questions, indicated the use of one (or even some) of the types thereof. Seven additional companies responded this. It seems that the cause of the fault lay in the fact that the company indicated the application of certain principles of activity (e.g., teamwork, continuous improvement, or the decentralization of decision making), not linking them explicitly to the lean management concept.

Companies could indicate the utilisation of lean management based on:

- just in time,
- TQM philosophy - continuous improvement,
- group work,
- decentralization of decision making,
- customer orientation,
- continuous improvement (Kaizen),
- avoidance of extravagance and waste (Muda),
- the immediate elimination of the causes of errors,
- a continuous flow of materials.

The largest number of responses indicated the utilisation of: "customer orientation" (18), "avoidance of extravagance and waste" (14), "TQM philosophy - continuous improvement" (14), "the immediate elimination of the causes of errors" (11). Other responses ranged from three to seven indications.

One company responded that it applies lean management based on the 5S method. Another, in turn, indicated that it partially applies the principles of lean management.

Use of outsourcing

The concept of outsourcing was one of the most commonly used by the companies surveyed (25 responses). Companies could indicate the use of outsourcing by:

- reduction of the company's organizational structure, and reducing the number of management levels,
- employment reduction,
- outsourcing of business processes,
- outsourcing of processing and information management,
- IT outsourcing,
- outsourcing of HR functions,
- payroll,
- staff leasing.

Of these, two concepts were most frequently indicated: "reduction of the company's organizational structure, and reducing the number of management levels" and "employment reduction" – responses of this type were given by 15 and 18 companies respectively. All other proposals were much less popular (less than 10 indications). Relatively little interest in the outsourcing of IT and HR functions is surprising, as they are generally amongst the most commonly used. Nine and four companies indicated the utilisation of these concepts respectively. This is partly consistent with the claims of Andrews and Foley (2004), according to whom, the concept of outsourcing has been used mainly in the IT field in the late twentieth century. However, nowadays we are able to see its dynamic development in other industries, primarily in the area

of human resource management. Responses were also provided by single companies which use all types of outsourcing.

Use of the Balanced Scorecard

Similarly to the concept of Business Process Reengineering, the Balanced Scorecard is among the least popular management concepts used by the companies. Only 5 entities indicated the use of this concept. Moreover, as previously, there were also errors in the responses provided.

The respondents had the opportunity to indicate the use of the Balanced Scorecard as:

- movement of the strategy to lower management levels,
- implementation of the concept of value based management,
- to communicate the main objectives of the organization to their employees,
- operations to achieve a competitive advantage in the market,
- materialize a defined business model,
- to motivate staff to performance management.

Of these applications, most companies indicated utilisation of: „communicating the main objectives of the organization to their employees” and „motivate staff to performance management” - 7 and 6 indications respectively. Other applications were identified by between two to four of the respondent companies. Indeed, one company plans to implement this concept in the future.

Use of Business Process Reengineering

Business Process Reengineering was one of the least popular management concepts utilised by the companies, as only 5

entities indicated the use of this concept. However, as before, respondents made errors in their responses. In this case four companies returned an erroneous questionnaire.

The companies surveyed had the opportunity to indicate the use of Business Process Reengineering for following reasons:

- implementation of a process approach in the organization,
- change to the existing organizational structure,
- improvement of costs, quality, and service.

Four companies indicated the use of BPR for the “implementation of a process approach in the organization”; eight utilized it in order to “change to the existing organizational structure”; and five to “improve their costs, quality, and service”. One company indicated that the organization had been partially re-designed, but the changes could hardly be described as radical (due to legal restrictions). Another one, in turn, pointed to all possible applications of BPR.

Use of Total Quality Management

11 companies indicated for the use of Total Quality Management. However, as before, errors occurred in the responses given (3 indications). The companies were able to indicate the utilisation of Total Quality Management for different purposes (applications), such as:

- to become an organization focused on the client,
- to motivate staff to work effectively,
- the implementation of a process approach in the organization,
- to implement a systemic approach in the organization,
- the implementation of the principles of continuous improvement.

Table 1. Benefits of modern management concepts

No.	Benefits	Importance (1-5 points)*
1.	Access to resources	3,60
2.	Extension of capabilities to better meet customer needs	3,87
3.	Maximizing the value chain synergies and economies of scale	3,27
4.	Improvement of the company's strategic position	3,77
5.	Strengthening relationships with customers and suppliers	4,00
6.	Reduction of risk and uncertainty	3,70
7.	Better coordination and acceleration of activities in the value chain	2,93
8.	Increase flexibility and efficiency	4,07
9.	Distribution of R&D costs	2,53
10.	Reduction of inventories	2,77
11.	Access to the workforce	2,60

* 1- low importance, 5 - high importance

The number of companies which indicated the use of TQM also determines the comparative popularity of its possible applications. Of these possibilities, the most popular were: "the implementation of the principles of continuous improvement" (14 responses), and "implementation of a process approach in the organization" (12 responses). Other applications were indicated by 8 and 9 indications respectively. It is interesting that three companies indicated the utilisation of this concept for all given purposes.

4.3 Benefits of the application of modern management concepts

An analysis of the benefits of modern management concepts leads to two main conclusions. Firstly, the companies indicated the diverse benefits of the use of modern management concepts, although none of them played a dominant role. Secondly, the diversity of these benefits most probably gave rise to a relatively even range of responses in terms of the importance of the concepts (from 2,53 to 4,07 points). This is illustrated in Table 1.

The companies' responses were highly differentiated. For some of them, only one of the factors was very important, while for others its significance was marginal. The greatest benefits according to the respondents were: »increase flexibility and efficiency« - 4,07 points, »strengthening relationships with customers and suppliers« (4,00 points), and the »extension of capabilities to better meet customer needs« (3,87 points). In turn, the least important to respondents were: »distribution of R&D costs« (2,53 points), and »access to the workforce« (2,60 points).

It should be noted that some companies, even those that used different approaches, found only minimal benefits of their use. For two of them, the average assessment of the importance amounted to 2,63 points (out of 5), slightly more than half. One company reported 2,36 points, the other only 1,63 points. Indeed, one company indicated only 0,72 points. A score of less than 2 points relates to those entities that indicated only some of the benefits, which therefore indicates the low benefits achieved through the application of the concept.

On the other hand, among those who claimed to have achieved the greatest benefits, the highest score was 4,72 points (one company).

4.4 Competences gained through the use of modern management concepts

Table 2 presents the competences gained through the use of modern management concepts.

The range of difference amongst the responses is quite small, in that the difference between the highest and lowest score amounts to 0,60 points only. Companies especially indicated the importance of competence related to »better understanding of the needs of customers« (3,97 points), and »access to knowledge and information« (3,80 points). On the other hand, the importance of individual factors were not equally important for all companies. The answers obtained also indicate that the companies are not completely satisfied with the competences that have been gained through the implementation of the concepts, as the highest score was less than 4 points (only two respondents identified the maximum score in each concept). This may also indicate some difficulty in measuring effectiveness.

4.5 Competences necessary for the implementation of modern management concepts

Table 3 presents the competences necessary for the implementation of modern management concepts.

According to the respondents, as many as eight out of 10 competences presented in Table 3 were important in the successful implementation of modern management concepts. Moreover, the differences between them were very small (from 3,71 to 4,13 points). Only two competences were less important, i.e. the »tact and sensitivity« (2,61 points), and »intercultural awareness« (2,74 points). This may raise some doubts, because the implementation of any strategy - including a new management concept - is often associated with radical activity, but should be accompanied by tact and sensitivity. On the other hand, the relatively low importance of intercultural awareness is probably the result of the relatively small internationalization of the entities, which therefore means that there is no need to prioritise this particular competence.

It is also worth noting that two companies gave 5 points to each of these competences, while others emphasized the importance of only certain, selected competences.

Table 2. Competences gained through the use of modern management concepts

No.	Competence	Importance (1-5 points)*
1.	Access to knowledge and information	3,80
2.	Better knowledge of business	3,37
3.	Better understanding of the needs of customers	3,97
4.	Greater awareness of the competence of other companies	3,43
5.	Ability to cooperate with other people	3,53

* 1- low importance, 5 - high importance

Table 3. Competences necessary for the implementation of modern management concepts

No.	Competence	Importance (1-5 points)*
1.	Expert knowledge	3,81
2.	Perspective thinking	4,03
3.	Flexibility	4,06
4.	Ability to simultaneously consider multiple points of view	3,97
5.	Ability to learn from the past	4,13
6.	Creativity and pragmatism	4,03
7.	Credibility and respectability and prestige among employees	3,71
8.	Tact and sensitivity	2,61
9.	Intercultural awareness	2,74
10.	Communication skills	4,06

*1 - low importance, 5 - high importance

4.6 Measuring the efficiency of the application of modern management concepts

As can be expected, the measurement of the effectiveness of the use of modern management concepts usually involves economic aspects (29 responses). The companies surveyed mainly provided several answers simultaneously. Responses related to the measurement of efficiency may give rise to an element of surprise in the context of harmonious relationships between organizational units (16 responses), because harmonious cooperation between the parties is not always the primary measure of cooperation and periodic friction or conflicts may be evidence of beneficial cooperation (Chwistecka-Dudek & Sroka, 2008).

5 Conclusions

Our research has confirmed that companies from traditional sectors of the economy utilise modern management concepts in their operations, although the respective popularity of those concepts is highly differentiated. Only one company pointed out that it does not use any of them. The most popular concepts were controlling and outsourcing. In turn, Balanced Scorecard and Business Process Reengineering are amongst the least popular concepts used by the respondents. The low popularity of inter-organizational cooperation strategies (alliances, and networks), despite their increasing proliferation on a worldwide scale, is surprising². However, the data presented confirms the claim that modern management concepts are not only the domain of high-tech sectors. On the other hand, this implies a need for further research on the presented topics,

especially in times of global economic crisis, which is forcing companies to seek new sources of competitive advantage.

The indications received regarding the use of modern management concepts were seemingly confirmed by the benefits that those companies derive from their use. These benefits were varied, and all the responses seem to have been formed relatively evenly, although there were also entities that are not fully satisfied with the results of implementation and utilisation of the concepts.

It is also necessary to point out some limitations of the study. Although it covered a relatively large research sample (125 companies), and a total of 90 responses were obtained, only 31 completed questionnaires were eventually received. In other words, this data determines the nature of a pilotage study. Secondly, because of the errors observed in the course of carrying out research, further studies should be conducted with more complete participation of representatives from the companies surveyed. However, this may be difficult because of the apparent unwillingness of respondents to participate in the research. It seems that some form of cyclical research, for example, conducted every 5-10 years would allow researchers to obtain more valid data and provide some indications to the direction of the evolution of companies from these sectors.

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2 For example, it is estimated that approximately 10-20 percent of revenues earned by global corporations is generated by their cooperation with other companies (Chaturvedi & Gaur, 2009).

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Uporaba sodobnih konceptov managementa v poljskih podjetjih – analiza rezultatov raziskave

Članek predstavi rezultate raziskave uporabe sodobnih konceptov managementa v podjetjih iz tradicionalnih sektorjev gospodarstva v Spodnji Poljski in Šlezijem vojvodstvu. Študija je bila izvedena na vzorcu 125 podjetjih iz sektorjev, ki so povezani z metalurgijo: strojogradnja, pridobivanje koksa, rudarstvo in energetika. Raziskava je pokazala, da proučevana podjetja pri svojih aktivnostih v splošnem uporabljajo sodobne koncepte managementa, čeprav je njihova uporaba zelo različna; le eno podjetje ne uporablja omenjenih konceptov. Najbolj pogosto uporabljena koncepta sta kontroling in zunanje izvajanje, medtem ko sta sistem uravnoteženih kazalnikov in reinženiring poslovnih procesov le redko uporabljeni strategiji.

Ključne besede: koncept managementa, kontroling, zunanje izvajanje, TQM, strateška povezava

Does the Development of Alternative Energy Technologies Allow for New Forms of Coopetition?

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The article at hand illustrates how new types of coopetition emerge in the transformation of large technical systems. It builds on the latest literature on coopetition and highlights diverse institutional arrangements for coopetition, their effects on the actual innovation and the potential benefits for the firms involved. In contrast to many incremental innovations, the transformation of large technical systems requires the cooperation of many diverse actors as various resources are needed. This does not only open up the opportunity of new private-private or public-private cooperations but also brings about various new forms of commonly performed practices.

Key words: hydrogen and fuel cells, coopetition

1 Introduction

Despite the common understanding that competition among private enterprises fosters productivity and innovation, it is also widely acknowledged that cooperation and competition among one and the same companies do not have to exclude each other. This hybrid and at first glance contradictory type of relationship among firms has often been termed coopetition and constitutes the subject of inquiry of a specific strand of research. Although not all studies in this field employ the term coopetition, they all share the attempt to shed light on 3 key issues of the nature of cooperation among competing firms.

First, several studies have investigated where exactly to draw the line between competition and cooperation. Bengtsson and Kock have for instance argued that simultaneous cooperation and competition between two firms can only be maintained when the firms internalize these conflictive positions and distribute the responsibilities for cooperative and competitive actions among diverse persons (Bengtsson & Kock, 2000, p. 423). Hence, the separation of business unit matters as competitors can compete with each other in one market segment and cooperate in another one if different business units serve those segments (Bengtsson & Kock, 2000, p. 420). Furthermore, it matters whether a product is still at the stage of development or already available at the market as competitors tend to cooperate in research and development

activities that are far away from the customer, while they compete with each other in the launch of new products at the market (Bengtsson & Kock, 2000, p. 418, 424). Dagnino and Padula have specified the intersection between competition and cooperation further and distinguish among three levels of coopetition. On the macro level firms and clusters of firms across industries compete on government research and development spending/funds, access to capital markets and shareholders investments, and activity diversification when entering new markets, while they cooperate on best practice, technology transfer, new market exploration and exploitation. On the meso level firms within an industry compete on product and factor markets, while they cooperate in product design, manufacturing, distribution and the definition of new standards. Finally, Dagnino and Padula also speak of coopetition at the micro level that is to say among functions and divisions and workers within firms. They argue that firms units compete for corporate intrafirm fund allocation, while they cooperate in product and workforce development and interchange (Dagnino & Padula, 2002, p. 19, 20).

A second key objective of the investigations on cooperation among competing firms has been to determine the specific conditions under which coopetition takes place and their impact on a firms innovativeness. While Bengtsson & Kock for example restricted coopetition to the relations among two firms (Bengtsson & Kock, 2000, p. 412), Dagnino and Padula

distinguished between coopetition among diverse units within a firm, coopetition among firms and coopetition among clusters of firms (Dagnino & Padula, 2002, p. 19, 20). Provan et al. add that the nature of the relationship among the cooperating firms varies from rather loose to more tight, but that it is generally characterized by durability and several interactions over time (Provan et al., 2007). Gilsing, Lemmens and Duysters have been more specific in this respect and have underlined the importance of a firm's strategy for the formation of networks and cooperative relationships. Firms with an interest in exploring new business opportunities are in search of novel information and hence open towards new partners, while firms interested in the optimization of a given product will rather seek to stabilize their existing contacts (Gilsing, Lemmens & Duysters, 2007, p. 236-239). Schilling and Phelps shed light on the role of the structure of a network and found that dense networks characterized by many ties among the individual participating organizations enable high information transmission capacity and high quantity and diversity of information and in this way foster the innovativeness of the firms involved (Schilling & Phelps, 2007, p. 1124). This conclusion is supported by Gomez-Casseres, Hagedoorn and Jaffe that more specifically found that the exchange of knowledge within a network is greatest among firms whose relation is characterized by technological, market and geographical proximity (Gomez-Casseres, Hagedoorn & Jaffe, 2006, p. 27). However, Bell argued that informal ties among managers have a higher impact on the innovativeness of a firm than formal relations among firms (Bell, 2005, p. 292).

Finally, various studies aim at illustrating the benefits of coopetition for individual firms. Peng et al. (2011) highlight that coopetition can lead to higher performance levels of the firms involved. Furthermore, the accumulation of knowledge through coopetition appears to be widely recognized in the literature as an added value for individual firms (e.g. Bell, 2005; Gomez-Casseres, Hagedoorn & Jaffe, 2006; Sroka, 2010). Gilsing, Lemmens and Duysters argue further that not only the access to novel information but also the prospect of reducing the costs and the time required for the development of new technologies has led to a competition for cooperation that is to say firms compete with each other for resourceful partners (Gilsing, Lemmens & Duysters, 2007, p. 227, 228, 233). However, it must not be forgotten that mere profit seeking behaviour may also be counterproductive. Sroka stresses this point and argues that the exchange of resources among firms requires at least a minimum level of mutual trust in order to avoid opportunistic behaviour (Sroka, 2011). Ritala and Hurmelinna-Laukkanen (2009) underline that successful coopetition depends upon the feasibility of the collective development of an innovation and the individual exploitation of it. Thus, whether firms can profit from coopetition depends not only upon their own behaviour but also upon external factors such as concrete market and technological conditions around the innovation. Innovations with a high level of novelty can open up diverse new ways of exploitation and allow for a variety of actors to identify appropriate market segments for themselves.

Our aim is to contribute to these findings of the research on coopetition by an empirical investigation of the develop-

ment of hydrogen and fuel cell technologies. The development of alternative energy technologies is driven by various forces that push toward innovation. More specifically, the deployment of novel energy technologies in transport applications is driven by the availability and the price of fossil energy sources, the huge societal relevance of the automobile and the emissions caused by the transport sector and their consequences (Dierkes, Marz & Aigle, 2009, p. 326-330). In other words, maintaining our current level of mobility while simultaneously mitigating its negative consequences such as air pollution and climate change requires the development and deployment of alternative energy technologies in the transport sector. These have to be compatible with renewable energy sources as the essence of the so-called »new industrial revolution« (BMU, 2008) that is to transform the energy system in the 21st century is the shift in the energy-technology paradigm away from fossil energy technologies to renewable ones (WBGU, 2003). Due to these driving forces enterprises invest in the development of hydrogen and fuel cells and various other alternative energy technologies as both doing nothing and betting on the wrong horse could mean to fall behind in the new industrial revolution. Both could result in the disappearance of a company owing to the fundamental shift in the energy-technology paradigm outlined above.

This article sets out to investigate what impact this great transition has on the relationship among the companies involved. Our central research question is: Does the development of alternative energy technologies allow for new forms of coopetition? For this purpose we track the development of hydrogen and fuel cell technologies in the USA, the European Union and in Germany in the years from 2000-2010. In order to provide the reader with a better understanding of our study, chapter two constitutes a brief summary of the technical aspects and the history of hydrogen and fuel cell technologies. In chapter three, we first rather descriptively outline novel organizational patterns of cooperation in this field, before we proceed with a thorough analysis of the specific nature of these new forms of cooperation, their effects on the firms' innovativeness and the potential benefits for individual firms involved. As both authors have a background in Science and Technology Studies, our primary aim is to explore how the literature on coopetition can be enriched by an investigation of the opportunities and requirements that the specific characteristics of the transformation of large technical systems (e.g. Hughes, 1993; Hughes & Mayntz, 1988) feature for the cooperation among competing firms. The main conclusions drawn are summarized in chapter four of this article. Our results were obtained from a rich pool of data generated in various research projects through more than 30 in-depth interviews, direct observations and document analyses.

2 Background

Hydrogen and fuel cell technologies are among the most promising new energy technologies. Their linkage provides the opportunity to deploy renewable energy sources in transportation and electricity and heat generation in CO₂-free energy cycles. Therefore, they target an area currently responsible

for half of the EU's total greenhouse gas emissions (van Vliet et al., 2011, p. 248). However, whether hydrogen and fuel cell technologies actually offer the opportunity to tackle climate change and other policy issues such as the independence from the import of primary energy sources is highly contested. Some see them as key technologies of a new economic revolution that will sustainably change the world (cf. Rifkin, 2003) as they provide the opportunity to lower CO₂ emissions and to reduce modern economies' dependency on crude oil. They can deliver heat and electricity for a wide range of applications from mobile phones to vehicles and industrial buildings. Others, however, deny this potential and argue that hydrogen and fuel cell technologies can neither solve energy supply problems nor contribute to a sustainable energy system (cf. Bossel, 2006; Asendorpf, 2004). Hence it is contested whether or not hydrogen and fuel cell technologies have a potential value and their development has had its ups and downs during the past two centuries.

The basic inventions of hydrogen and fuel cell technologies (hydrogen combustion engine and fuel cell) were made at the beginning of the 19th century and today are closer to commercialization than ever before. But the history of hydrogen and fuel cell technologies clarifies very well that commercialization is no linear process. Their development for the transport sector is illustrated in detail on the website "H2Mobility" of TÜV-SÜD (TÜV-SÜD, 2010), the technical inspectorate for vehicles in Southern Germany, and is briefly summarized in the following.

The first hydrogen driven combustion engine was constructed by Issac de Rivaz in 1806. The invention did not receive much attention in the societal discourse for the next 50 years and it was not until 1863 that the next vehicle driven by a hydrogen powered combustion engine was constructed by Étienne Lenoir. Nevertheless, the technology again disappeared from the scene until the late 1920s when Rudolf Erren constructed a hydrogen-powered two-stroke engine. This development was followed by single concept studies during the following decades but none of them passed beyond the laboratory stage.

The history of fuel cell development is characterized by a similar trajectory. The mechanisms of fuel cell technologies were discovered in 1838 by the German-Swiss chemist Christian Friedrich Schönbein and the British lawyer and natural scientist Sir William Grove, who conducted research independently from one another. The fuel cell gained its actual name in 1889 from Ludwig Mond and Charles Langer who conducted thorough investigations on this technology. Still, it was not until 1932, that the first model of an alkali electrolyte fuel cell was constructed by Francis Thomas Bacon. This development was followed by the construction of the first vehicle with fuel cell propulsion in 1959.

The dynamics of hydrogen powered combustion engines and fuel cell propulsion systems present a similar picture until the late 1960s. Both developments began with basic inventions by a single person, followed by single inventions and wide temporal intervals during which the technologies did not gain any public attention. However, from the end of the 1960s, the initiatives aiming at the commercialization of hydrogen and fuel cell technologies started to increase all over

the world and became even stronger at the end of the 20th century. Automotive manufacturers such as BMW, Mazda and MAN intensified their efforts in the development of hydrogen combustion engines so that several vehicle prototypes were constructed and tested in large demonstration projects. Simultaneously, various enterprises such as Ballard, Daimler, Toyota, General Motors, Honda, and Ford worked on the development of fuel cells as propulsion systems for vehicles. Diverse car and bus prototypes with fuel cell propulsion were constructed and tested in demonstration projects.

This dramatic rise in efforts towards the commercialization of hydrogen and fuel cell technologies at the beginning of the 21st century constitutes the point of departure of this article as it is characterized by the emergence of various networks and amalgamations among diverse enterprises within and across industries.

3 Results

Due to the potential of hydrogen and fuel cell technologies to tackle key issues in energy policy the networks and alliances promoting these technologies are not limited to private companies but also attract public actors such as state ministries and research institutes. In a first step, the partnerships launched in the USA, the European Union and in Germany will be illustrated rather descriptively in the following subchapter. Subsequently, we will analyze the specific nature of these novel forms of cooptation in subchapter 3.2. In particular, we focus on the concrete actions of the cooperating partners in order to determine where cooperation is possible and where it ends. Furthermore, we describe what business units are involved in cooptation and how the overall network structure relates to the activities performed. Finally, we outline the motivations for cooptation and the benefits of cooptation from the perspective of individual firms in subchapter 3.3.

3.1 Cooperation in the promotion of hydrogen and fuel cell technologies

In the USA, the beginning of 2001 constitutes the point of departure, as then the "National Energy Policy Development Group" (NEPDG) was launched (NEPDG, 2001, pp. v, viii). It was composed of high-ranking US-politicians such as the then Vice-president Dick Cheney and the Secretary of State Colin Powell (ibid. p. vi). On behalf of the then President George W. Bush, its aim was to develop a long-term energy policy for the USA leading to the fulfillment of three basic goals: reliability, profitability and environmental friendliness (ibid. p. viii). The NEPDG accomplished its task with the submission of the "National Energy Policy Report" in May 2001 (ibid. v) that presents hydrogen and fuel cell technologies as one among other promising technologies of the future. In the same year, only 6 months after the submission of the report, the "National Hydrogen Vision Meeting" was convened in Washington. More than 40 representatives of energy supplying companies, environmental organizations and US-Federal and State Departments gathered in order to develop a common vision

of a future hydrogen economy, to identify its time frame and the required interim steps towards its realization (DOE, 2001, p. iii). The US Department of Energy (hereinafter DOE), the car manufacturers Daimler, Ford and General Motors as well as the energy providers ExxonMobil and BP were among the participants (ibid. p. 24). The shared vision of a hydrogen economy which was developed on the basis of this discussion was published by the US Department of Energy in its report "A National Vision of America's Transition to a Hydrogen Economy – To 2030 and Beyond" (DOE, 2002). In 2006, the same car manufacturers and energy supplying enterprises together with the DOE formalized their collaboration further and launched the private-public partnership FreedomCAR and Fuel Partnership in order to coordinate the common activities in the development of hydrogen and fuel cell technologies (FCFP, 2006, p. iii).

In the European Union, the launch of a High Level Group by the European Commission in 2002 marks the origin of the common European institutional development of hydrogen and fuel cell technologies (EC, 2002). The High Level Group was comprised of 19 representatives from scientific institutes, industry and public administration (HLG, 2003, p. 5). The research center Jülich, the car manufacturers Daimler, Renault and Rolls-Royce, the energy providers Norsk Hydro, Shell and Sydkraft, as well as the fuel cell producer Ballard, were among them (ibid. p. 32). In 2003, the High Level Group published the report "Hydrogen Energy and Fuel Cells. A vision of our future" (HLG, 2003) that outlines the vision of a hydrogen-based economy established by 2050. On the basis of this report, the European Commission set up the "European *Hydrogen and Fuel Cell Technology Platform*" in the same year (HFP) (EC, 2004) which subsequently developed a European research (HFP, 2005a) and deployment (HFP, 2005b) agenda to exemplify the commercialization process of hydrogen and fuel cell technologies. The majority of the High Level Group members (HLG, 2003, p. 32) took over high-ranking positions in the Executive Group (HFP, 2004a, p. 1) and in the Advisory Council (HFP, 2004b) of the HFP. Building on the initiatives of the HFP, the European Council set up a subsequent agency, the "*Fuel Cell and Hydrogen Joint Undertaking*" (hereinafter FCH JU), on May, 30th 2008 which constitutes a legal body launched under Belgian law in Brussels (Council of the European Union, 2008, pp. 1, 4; FCH JU, 2009, p. 4). It is characterized by a complex organizational structure composed of representatives from industry, science, the European Commission and the European Union member states (FCH JU, 2009, pp. 23, 24). Again, there is an overlap with the HFP whose staff at least partly moved on into the FCH JU (HFP, 2004a, p. 1; HFP, 2004b; FCH JU, 2010).

In Germany, three agencies have been of particular importance for the promotion of hydrogen and fuel cell technologies during the past decade: the "*Transport Energy Strategy*" (hereinafter TES), the "*Clean Energy Partnership*" (hereinafter CEP) and the "*National Organization Hydrogen and Fuel Cell Technology*" (hereinafter NOW). The TES was established by the Federal Government, the original equipment manufacturers (hereinafter OEM) BMW, Daimler, MAN and VW from the automobile sector and the energy suppliers ARAL, RWE and Shell in May 1998 (TES, 2000, p. 3). Later on, it was

joined by Ford, GM/Opel, Total and Vattenfall. The launch of the CEP (Clean Energy Partnership) was already suggested in the second status report of the TES in June 2001 (TES, 2001, p. 5), before the CEP was officially set up in October 2003. The CEP is composed of car manufacturers, energy suppliers and end users such as Aral, BMW, BVG, Daimler, Ford, GM/Opel, Hamburger Hochbahn, Linde, StatoilHydro, Total, Vattenfall and Volkswagen which gathered in order to perform demonstration projects. The Federal Government is represented by the Federal Ministry of Transport, Building and Urban Development. Finally, the National Organization Hydrogen and Fuel Cell Technology (NOW) was set up in 2008 as the central and overarching institution equipped with its own budget to fund all activities concerning hydrogen and fuel cell technologies in Germany such as the demonstration projects performed by the CEP. In legal terms, the NOW is a limited liability company (GmbH) 100% owned by the Federal Government and represented by the Federal Ministry of Transport, Building and Urban Development (NOW, 2011). The NOW has a supervisory board composed of the representatives of the four Federal Ministries involved and an advisory board that also includes representatives from the industry and public research institutes.

This brief overview indicates that actors from diverse societal areas such as politics, industry and science gathered in order to promote hydrogen and fuel cell technologies in common. The key actors from the industry are OEMs from the automobile sector and mineral oil companies. The specific nature of their cooperation will be portrayed more in detail in the following subchapter.

3.2 Novel types of coopetition and their effects on the development of innovations

As the previous subchapter revealed, the cooperative networks are composed of representatives from various ministries and public research institutes. But also private companies within and across certain industries are involved. These enterprises usually have their experts whose task is to represent the companies' activities in alternative technologies and to mobilize political, financial and partly also public support for these activities. Typically, they have a background in engineering or business studies. However, these persons do not belong to the public relations divisions of the companies but rather should be conceived as specialists that thoroughly follow the technological development and research in their own company and represent their companies in the cooperative partnerships. They can be regarded as the key actors in coopetitive relationships among firms as they control the flow of information between their company and the broader technical community and hence they constitute the interface among the diverse companies. This crucial position enables them to perform five practices of coopetition which are to be explained in the following paragraphs: (1) networking, (2) agency creation, (3) agenda setting, (4) problem/solution framing, and (5) vision building.

Networking. Networking refers to the management of existing relations to other companies or public organization

and to the establishment of new ties. This can be done at conferences, workshops or at other official meetings where representatives from various organizations meet in order to exchange views on hydrogen and fuel cells and other alternative technologies. The so-called parliamentary evenings which are held on a regular basis are of particular importance as they provide diverse actors from politics, science and industry with the opportunity to meet and to inform each other about the latest developments in hydrogen and fuel cell technologies (Fuel Cell Alliance, 2006). Thus networking can be conceived as a more informal practice that aims at the exchange of information without obligation.

Agency creation. However, successful networking can result in the formalization of certain relationships. The practice of agency creation refers to the launch of official institutions. Hence agency creation is characterized by more commitment of the persons involved and requires an agreement upon the stage of development in a technology and its potential. This consensus might be as thin as a general commitment to the promising potential of hydrogen and fuel cells and an agreement on the need of further research in these technologies. But as the agencies launched are often equipped with their own budget contributed by all private and public organizations involved, there usually exists a more concrete roadmap for the further proceeding that clarifies the direction of research and the objectives for the years coming. In the development of hydrogen and fuel cell technologies in Germany, the launch of the NOW constitutes a prime example for the creation of an agency. The NOW was implemented on the initiative of other agencies such as the TES and the CEP in order to set up a superordinate authority that would eventually merge all of them into one central organization. The main task of the NOW is to coordinate and steer all demonstration projects in order to push hydrogen and fuel cell technologies towards market entry (NOW, 2010).

Agenda setting. The launch of the NOW was preceded by other practices that established a common view of hydrogen and fuel cell technologies which allowed the allocation of financial resources and common investments. The practice of agenda setting can, for instance, result in agency creation but can also result from it. Agenda setting focuses on the development, promotion and implementation of strategies, programs or plans for the commercialization of certain technologies. In Germany, the TES deployed agenda setting most successfully as it, for example, suggested the launch of the CEP in June 2001 (TES, 2001, p. 5) and the CEP was set up in October 2003 (CEP, 2007, p. 3). The TES has also lobbied towards the establishment of a European institution for the development of hydrogen and fuel cell technologies and has apparently succeeded as the launch of the Fuel Cell and Hydrogen Joint Undertaking by the Council of the European Union indicates (Council of the European Union, 2008, p. 1). Finally, the TES had been successfully lobbying towards the development of a national innovation program for hydrogen and fuel cell technologies as such a program was initiated by three Federal Ministries in 2006 (BMVBS et al., 2006).

Problem/solution framing. However, agenda setting can not only precede agency creation but also results from it as the NOW after its launch became the key actor that determines

the further development of hydrogen and fuel cell technologies in Germany. The same can be said for the two practices of problem/solution framing and vision building which clarifies that all practices do not have to be performed in a specific order but rather should be conceived of as overlapping and simultaneous. Problem/solution framing aims at portraying hydrogen and fuel cell technologies as a feasible solution to serious problems of modern societies. Consequently, the practice always starts with the presentation of a certain problem as, for example, climate change, rising oil prices, transport sector emissions or the dependency of Western economies on the import of crude oil. All these issues are portrayed as urgent problems that endanger our standard of living which then allows to present hydrogen and fuel cell technologies as the ideal solutions that enable an emission-free energy and transport sector on the basis of renewable energies (cf. BMW, 2008, p. 33; CEP, 2009, p. 5, 8, 9-12; NOW, 2009, p. 1).

Vision building. In contrast to problem/solution framing the practice of vision building does not focus on current problems but rather highlights the potential of hydrogen and fuel cell technologies by future visions. Vision building means embedding hydrogen and fuel cell technologies in a future world that reflects the current desires for a sustainable and secure energy system. Successful vision building can bring together various actors and coordinate their further actions as they all pursue the same target of realizing the vision. In this way, vision building contributed to networking and agency creation in particular in the USA and the EU and partly also in Germany (Marz and Krstacic-Galic, 2010, p. 15-25). However, it should be noted that the level of commitment in vision building can vary considerably as countless hydrogen visions have been developed but only few gained actual importance in the sense that several actors accepted them as desirable targets.

This illustrates that the effects of the five practices of coopetition on the development of innovations depend not only on the commitment of the actors to certain practices, but also on the combination and the mutual reinforcement of the individual practices. Successful networking, agenda setting, problem/solution framing and vision building can foster close cooperation and mutual trust and pave the way towards the creation of a central agency that is well equipped with financial resources. This in turn can strengthen the ties among the partners involved and lay a more solid foundation for further networking, agenda setting, problem/solution framing and vision building. In Germany, for instance, networking, agenda setting and problem/solution framing resulted in the launch of the NOW which enables even closer networking and cooperation through funded demonstration projects. In the EU and in the USA, however, problem/solution framing and vision building paved the way for networking and eventually for agency creation. Apparently, at least two practices of coopetition need to be applied successfully in order to have a significant impact on innovation. This impact can range from the exchange of information that can lead to an accelerated internal development of innovations to the alignment of interests and objectives that result in common investments and demonstration projects.

Although the applications of hydrogen and fuel cell technologies are not available on the market, yet, this does

not mean that cooperation is omnipresent while competition does not exist. Of course, following Bengtsson and Kock (Bengtsson & Kock, 2000, p. 418, 424) in general it can be assumed that competition will increase as hydrogen and fuel cell technologies move closer towards commercialization. But a thorough look at the empirical data reveals that cooperation and competition take place simultaneously already at this early stage of development in hydrogen and fuel cell technologies. Thus, our results build on the findings of Gilsing, Lemmens & Duysters who identified a competition for resourceful partners (Gilsing, Lemmens & Duysters, 2007, p. 227, 228, 233). Small and medium size enterprises (hereinafter SME), for instance, compete with each other for resourceful, large partners within and across industries.

Furthermore, we identified competition within and across industries for the setting of technical standards. There is, for instance, a huge schism between automotive manufacturers concerning the deployment of hydrogen as a fuel in automobile applications. While BMW worked from the 1980ies until 2008 on the optimization of the use of hydrogen in an internal combustion engine, Daimler preferred until 2008 the replacement of the internal combustion engine as propulsion system with fuel cells powered by hydrogen and has therefore cooperated with the Canadian fuel cell manufacturer Ballard. Thus both companies focused on the improvement of the internal combustion engine or the fuel cell, respectively, for a long time, but since a few years both also work increasingly on the battery technology. This example illustrates that both companies compete not only within the automotive sector, but also across industries in order to convince other actors to develop those hydrogen and fuel cell applications that suit their concept of a transport sector relying on hydrogen.

Hence, Bengtsson and Kock are not wrong in claiming that competition increases with the proximity to the market. But the development or the transformation of large technical systems requires the construction of a novel technical infrastructure which leads to competition long before the first applications are available on the market. Various actors compete for the establishment of technical standards within and across industries that suit their interests and strategies. Thus competition takes place in all practices of coopetition because diverse actors have differing conceptions of how societal problems should be solved, how a visionary future transport system should look like, what topics should be set on the agenda and what directions of research and development should be pursued by agencies. In a nutshell, the transformation of a large technical system such as the energy or the transport system is accompanied by simultaneous cooperation and competition right from the start.

3.3 Motivations for coopetition and benefits for firms

We have already stressed the significance of the specific circumstances of transitions of large technical systems for coopetition relationships among diverse public and private actors in the preceding subchapter. The development of an infrastructure for a transport system based on hydrogen requires

the cooperation of energy supplying companies and OEMs from the automotive sector as diverse technical applications need to be developed in parallel and adjusted to each other. Often no one can predict what technological application will reach a breakthrough and, therefore, various firms cooperate in order to share risks and financial efforts in the simultaneous development of diverse technological alternatives. The issue of hydrogen storage, for instance, requires the concentrated efforts of companies from diverse industries.

Another benefit from the cooperative relationships described above is mutual observation. One of the largest risks to individual companies in the transition of large technical systems is to miss the stabilization of a new technical system. Stabilization occurs when relevant actors from diverse technical areas agree upon the adjustment of all technical components required for the construction of the entire system. In the case of hydrogen and fuel cell technologies this could, for instance, mean that certain energy supplying companies and automobile manufacturers agree upon a specific level of pressure for compressed hydrogen so that certain technological standards become established. Consequently, energy supplying companies that worked on the development of filling stations with another level of pressure for compressed hydrogen would lose out as well as automobile manufacturers that invested in vehicle propulsion systems that require another level of pressure for compressed hydrogen. Depending on the scale of investment in the wrong direction, bankruptcy could be the result not only for small- and medium-size enterprises.

Thus mutual observation and information exchange become the biggest assets in cooperative relationships in the transformation of large technical systems. Participation in networking, agency creation, agenda setting, problem/solution framing, and vision building enables the firms not only to keep track of the development in other companies, but also provides them with the opportunity to influence the direction of future proceedings according to their own interests. Based on the information on the strategies of other organizations involved, every firm can develop its own strategy, adjust it to other strategies and attempt to convince other actors of their concept of a sustainable mobility. Eventually, that is to say with decreasing proximity to the market, participation in practices of coopetition also means to define who is to serve what segments in the evolving market.

Another motivation for coopetition and a prime example of cooperation and competition in parallel is the quest for public funding. The launch of the NOW in Germany has illustrated that concentrated efforts of diverse private companies are required in order to define the transition towards a sustainable transport system as sort of a national mission. Cooperation among firms is needed to convince policy-makers of the necessity of an agency well equipped with public money. This partly enables cooperation among companies that actually have differing ideas of how the future transport system should look like. BMW, for instance, pursues the strategy of deploying hydrogen in a combustion engine as propulsion system for vehicles, while Daimler bets on hydrogen powered fuel cells. But both companies share an interest in public support for hydrogen which enabled them to lobby for the launch of the NOW in common.

However, as soon as such an agency is launched and the first call for proposals for project funding is published, cooperation turns into competition among individual firms or consortia of firms with an interest in a common project. Furthermore, confirming the results of Bell (Bell, 2005, p. 288, 289), we found that a central network position accompanied by close ties to resourceful partners results in a higher likelihood to receive public funding. Hence not only the common interest to lobby for public funding can serve as a motivation for cooperation, but also the prospect of receiving a certain amount of the available funding through a central network position resulting from close cooperation with resourceful partners.

Finally, we also identified obstacles to cooperation. The most striking issue is the ubiquitous idea that the cooperation will come to an end as soon as the technology comes closer to the market that all actors involved in the practices of cooptition keep at the back of their minds. Successful cooperation results in accelerated technology development which eventually results in a market breakthrough and tough competition. This idea is present right from the start and all actors involved are very aware of the time-limited nature of their cooperation. Consequently, this idea impedes a too close cooperation from its origin to its end.

Furthermore, we found that differing conceptions of how the future transport system should look like can impede cooperation to a certain extent. The example of BMW and Daimler who pursue differing technological pathways towards a transport system based on hydrogen serves as a good illustration of this issue. The common interest in establishing hydrogen as a fuel in the transport sector enables both companies to cooperate in lobbying for public funding and in the exchange of information. However, BMW envisages deploying hydrogen in a combustion engine, while Daimler invests in fuel cells powered by hydrogen. These differing technological pathways impede a closer cooperation in, for instance, demonstration projects.

4 Discussion

Our analysis revealed that the transformation of large technical systems requires and brings about new types of cooptition. The NOW constitutes a prime example of these novel, hybrid institutions. It is a limited so to speak a state-owned liability company by law with an advisory board and a supervisory board. While the supervisory board is only composed of representatives from several Federal Ministries, the advisory board also consists of representatives from private companies and public research institutions. These actors gathered together on the basis of technological requirements such as the transformation of the infrastructure of the transport sector which neither public nor private actors can accomplish on their own. They participate in such new types of cooptition not only in the hope of new market shares in the transport system transformed but also in the fear of missing key developments and lagging behind.

The actors involved in novel types of cooptition develop five specific practices in order to achieve their common objectives: networking, agency creation, agenda setting, vision

building, and problem/solution framing. These practices are not performed independently from one another but rather simultaneously and combined. They are performed in various contexts such as political, economical or ecological ones. Organizations involved in the development of hydrogen and fuel cells attempt, for instance, to link these technologies to renewable energies and argue for a zero-emission and sustainable economy based on hydrogen. The deployment of the practices in specific contexts can be both stabilizing and destabilizing for the cooptition arrangement. Of course, the more all participants agree upon their future objectives in detail, the more stable their cooperation will become. However, technological development is unpredictable and progress in hydrogen and fuel cells or relating technologies might open up new opportunities so that the actors involved have to renegotiate their common objectives if they want to prevent a destabilization of their cooptition arrangement. Furthermore, of course, the stability of the cooptition arrangements decreases with increasing proximity to the market that is to say to the commercialization of hydrogen and fuel cell technologies.

Finally, it should also be noted that the specific form of cooptition in the case of hydrogen and fuel cell technologies has its flaws. The largest deficit is probably the lacking involvement of the end user in the development of these technologies (see for example Canzler & Marz, 2011). More involvement of the end user could not only make these technologies wider known in the broader public but in the end also accelerate their commercialization by suiting them better to the needs of potential customers.

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Ali razvoj alternativnih energetske tehnologije dopušča nove oblike kooperativne konkurence?

Članek obravnava pojav novih oblik kooperativne konkurence (ang. coopetition) pri preoblikovanju velikih tehničnih sistemov. Izhaja iz najnovejše literature o kooperativni konkurenci in podaja pregled institucionalnih oblik kooperativne konkurence, njihovih učinkov na aktualne inovacije in potencialnih koristi za vključena podjetja. V nasprotju z mnogimi postopnimi inovacijami, preoblikovanje velikih tehničnih sistemov zahteva sodelovanje številnih in različnih akterjev in virov. To odpira ne le priložnosti za nova sodelovanja med privatnimi družbami in javno-privatna sodelovanja, ampak tudi prinaša različne nove oblike sicer splošno razširjenih praks.

Glavne besede: vodik in gorivne celice, kooperativna konkurenca

Giving-up Management System Certification: a Potential Early Warning Signal?

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The paper presents the dynamics in number of top management system certificates (ISO 9001, ISO 14001) focusing on the situation in Slovenia in the last two years when a significant increase of cancelled certificates was noticeable. We studied this phenomenon in order to find out its reasons and effects on the performance of the organizations. Some recognized relations between quality management systems and company performance from literature review were used for setting hypotheses which were analytically proved. We assumed that quitting management system certificates was related to decrease in business performance. Empirical part of our research was based on the data of Slovenian certification bodies and on published annual financial reports of Slovenian organizations. In the survey some characteristics and performance of the organizations which gave up certification were analysed. We came to interesting findings that cancelling certificates was related to decrease in business performance and often even to closing of organizations. The downsizing of the business was increasing through the time. So, 2 years after cancelling certificates only 8% of the organizations still present growth in their income and revenue, besides almost 40% of them quit or would have to quit their business. It was also found out that the business performance after cancellation of the certificates was related to the business performance before it and to the reason for cancellation as well. Two years after cancellation there was a 3-times higher proportion of failed organizations (= 45% of previously non-profitable organizations) among the organizations that had operated at a loss before the cancellation of their certificates, compared to those previously having a profit. Among the claimed reasons for certificate cancellation organizational changes (in 35% of all the organizations losing certificates) and cancellation of certificates by certification bodies (in 41% of these organizations) were the most common ones related to the failure of these organizations.

Key words: management system (MS), quality management system (QMS), ISO 9001, ISO 14001, certificate, business performance,

1 Introduction

Organizations can improve their business performance by implementing management systems (MS) according to international or national standards and models. The world's largest developer of voluntary International Standards for business, government and society is International Organization for Standardization (ISO). Its portfolio in September 2008 comprised more than 17 400 standards that provide practical solutions and achieve benefits for almost every sector of economic activity and technology. Of these, ISO 9001:2000 and ISO 14001:2004 are among ISO's most well known and widely implemented standards ever. They give the requirements for, respectively, quality management and environmental management systems. They are used worldwide by businesses and organizations large and small, in public and private sectors, by

manufacturers and service providers, in all sectors of activity. Their number is still increasing year after year. On the global level it exceeded 1.100.000 ISO 9001 certificates and 250.000 ISO 14001 certificates issued to the end of the year 2010 (ISO, 2011).

Many organizations decide to have their MS independently audited and certified as conforming to the standards. Certification is not a requirement of the standards themselves (ISO, 2008). Systems can help organizations to achieve benefits for themselves and for their customers even if they are implemented without certification (Dearing, 2007). Nevertheless, many thousands of organizations have chosen certification because of the perception that an independent conformity confirmation adds value.

However, some organizations decide after a period to give up certification. We tried to analyse this phenomenon in Slovenia in years 2008 to 2011 where total number of ISO

certificates in Slovenia was still slightly rising, but at the same time the number of cancelled certificates was increasing even faster than the number of issued new ones. There were 1886 ISO 9001 certificates and 438 ISO 14001 certificates issued at the end of the year 2007 (ISO, 2008). In the following years certificates were issued and cancelled as follows (ISO, 2011):

- in the year 2008: 182 new issued and 105 cancelled ones;
- in the year 2009: 187 new issued and 142 cancelled ones;
- in the year 2010: 217 new issued and 166 cancelled ones.

A noticeable number of cancelled MS certificates is not only a Slovenian problem. Stagnation or even decline in the ISO 9001 certification has already been noticed in some developed countries in the world as well. Authors have already raised questions about it (Psomas and Fotopoulos, 2009). Besides, there is only a rare research about quitting MS certification. The results from previous empirical research about benefits of the MS certification are ambiguous (Claver et al., 2002; Martinez-Costa and Martinez-Lorete, 2007; Psomas and Fotopoulos, 2009), as well. Some authors claim that there is a low benefit/cost ratio from certification itself. They even state that a certificate is not needed as there is nothing better than having a quality product or service to prove how good your quality system is (Dearing, 2007).

The purpose of our paper is therefore to investigate which kind of organizations decide to give up MS certification¹, why they do it and how it is related to their business performance (one or two years after certificate cancellation).

2 Management system certification and expected effects in business performance of organizations

There is a wide range of empirical research related to implementing the ISO 9001 Standard and its impact on the business performance of organizations. Some research shows a significant relationship between implementation of the QMS and the improved competitiveness and performance of organizations (Claver et al., 2002; Heras et al., 2002; Alič, 2003:107-108; Dimara et al., 2004; Piskar, 2005; Magd, 2008). For instance, Mathews (2005) claims that major benefits of purchasing from the ISO 9000-certified companies include better, assured and consistent product and service quality; prompt and speedy supply (shorter delivery lead time); in this way there are fewer complaints and a better image for the company. Improved response to the customer complaints is seen as the most significant positive change in performance demonstrated by certified companies. On the contrary, other research concludes that the relationship is either weak or non-existent (Abraham et al., 2000; Singels et al., 2001; Chow-Chua et al., 2003; Martinez-Costa and Martinez-Lorete, 2007). A quote in Terziovski et

al., (2003) stated that: "It appears that companies that are at the beginning stages of their quality journeys find that the ISO 9000 series of standards provides them with a guide for implementing a basic quality system. But for companies with good quality systems, the standard often just adds costs, delays and burdensome documentation, rather than providing any competitive advantage."

There is no clear support for the claim that ISO certification alone automatically leads to the better performance of organisations (Singels et al., 2001); instead, certain conditions should be met (Rusjan and Alič, 2010). If the ISO 9001 is well applied it is expected to make a significant improvement in the company's performance (Singels et al., 2001), otherwise the effects of such a system are low and the costs are high.

The impact of quality standards on the competitiveness and business performance of an organization is greater in those organizations that were internally motivated (improvement reasons) for gaining ISO 9001 certification, while this impact is minor in organizations that were forced to introduce the quality standard by external pressures (marketing reasons) (Abraham et al., 2000; Singels et al., 2001; Heras et al., 2002). Motivation is a basis for development of other key MS performance drivers like management commitment and support, relationship between the objectives of the MS and the strategic objectives of an organization etc. (Dimara et al., 2002; Sharma and Gadenne, 2002; Van der Wiele and Brown, 2002).

Organizations can decide whether to certify their MS or not. Certification of the MS is an easy way to signal the commitment of the organization management to maintain and develop the MS. It is a signal to all the stakeholders. As a matter of fact, several companies expect to be "rewarded" by the environment for just gaining a certificate (Fuentez et al., 2003).

Organizations choose certification according to perceived following benefits which directly or indirectly lead to better business performance (Joubert, 1998):

- A certificate as a formal sign of an implemented MS can be used in marketing as a proof of a responsible organization that obeys common business rules. An organization can use it as a promotional tool. Thus such a certificate can help enhancing company image and reputation and improving confidence of the customers, both leading to marketing benefits like expanding the business (e.g. new customers, new orders, entering new markets etc.) (Magd and Curry, 2003; Fuentez et al., 2003; Thawesaengskulthai and Tannock, 2008).
- An external audit as a part of the certification process means an additional pressure to the organization. By focusing on meeting the standard's requirements external audit assures better MS performance and (considering the effects of properly implemented MS) better business performance, as well (Joubert, 1998).

1 The expressions "giving up" or "quitting" certification are used in the paper where the emphasis is on the decision of organizations for not keeping certificates any more. "Withdrawing" a certificate is used for an act of taking a certificate by a certification body to prevent its use if the certified organization doesn't meet the requirements any more. In other cases, a certificate can "expire" (when the date "valid to" is reached) or should be "cancelled" for some other reasons. All these actions end in "cancelling" a certificate by a certification body (no matter what the reasons behind are). The results are "cancelled" or "lost" certificates.

- External audit findings can be a source of improvements, leading to better MS performance and so to better business performance (Joubert, 1998; Corbet et al., (2002).

Organizations can see disadvantages in certification, as well:

- Certification requires money! The costs can be considerable especially for micro and small organizations² (Joubert, 1998; Anderson, Daly and Johnson, 1999; Martinez-Costa and Martinez-Lorete, 2007). However, if the MS is implemented properly, the benefits of the system and its certification should overweight the related costs.
- Certification and preparing for it takes time and some additional workload³ (Joubert, 1998). If an organization only wants to pass the certification audit with as low people engagement as possible, it develops only basic MS procedures, though they aren't really accepted as a management tool and put into use. Processes aren't performed in the way they should be presented to the auditors of the certification body (CB). So there is much more extra work to be done just before the audit to prepare some formal evidence for the auditors to convince them that at least low-level criteria for certification are met. Of course, such activities are stressful, make extra costs and some kind of disturbance to a normal business process (Magd, 2006). Hence, organizations that didn't intend to develop and haven't succeeded in developing an effective MS for managing their everyday operations, perceive MS tasks required by the standard as a burden and unnecessary cost (Dearing, 2007).
- Organizations have other possibilities to persuade their customers and the social community of their quality and responsibility. They understand that quality of their products and services itself is more convincing proof than any MS certificate (Dearing, 2007).

Considering possible disadvantages of MS certification some organizations don't seek certification. Such decision itself wouldn't influence the internal effects of the implemented MS if management commitment and internal control over the MS remained strong and stable. As a matter of fact, if there is no external verification, there is no pressure to obey the rules, meet the MS requirements properly and continuously improve the MS. As a result, omitting certification often leads to decrease in internal interest to keep and further develop an effective MS. With decline in internal interest for the MS, management support for operating it is declined as well.

There is a noticeable difference between not certifying a MS at all and losing an issued certificate. In fact, losing ISO 9001 certification negatively impacts the customer's opinion about the organization's reputation in terms of quality (Joubert, 1998; Van der Wiele et al., 2005). This can significantly affect the revenue. Consequently, losing ISO 9001 certification can be worse than not achieving it at all (Joubert,

1998;). The effects of the MS and its contribution to business performance of a company decreases as well, after some time positive effects of the MS become weak or hardly noticeable, the negative (e.g. lower image) feedback prevails. In addition to this, giving up certification can also be a strong message to employees about weak support to MS by top management. So less effort of the employees for maintaining an effective MS can be expected. As a result some additional decline in MS and business performance can appear. Some empirical research gives support to this claim. For instance Corbet et al. (2002) carried out a research in three business sectors in USA over a 10-year period (1988-1997) including 7598 organizations. The research showed that in this period non-certified organizations experienced substantial deteriorations in return on assets, productivity and sales, while certified ones generally managed to avoid such declines.

Related to the expected positive effects of properly implemented certified MS on business performance (explained above), we can assume that giving up certification would cause a lack of expected positive effects of the MS after a time period. So a decline in business growth and in income could be expected. On this basis we developed the first hypotheses:

H1: Cancellation of ISO certificates is related to a decline in business performance of the organizations.

Authors analysed the relationship between period of having a certificated MS and business performance of the organizations. This relationship is expected while continuous improvement of the MS as a request of a standard should contribute to the MS performance and consequently to the business performance of the organization. Some empirical research supports this relationship (Ferguson et al., 1999), some not (Llopis and Tari, 2003). Similarly, we assumed that giving up certification of MS followed with abandoning the MS step by step would lead to decrease in business performance, which is also gradually increasing through the time. Therefore we suggest the following hypotheses:

H2: A decline in business performance of the organizations is related to the time passed after cancellation of their ISO certificates.

Furthermore we supposed that growth or decline of business performance of the organization after cancellation of the certificates is related to the previous business performance. It was assumed that organizations having good results (profit, growth in revenue and income) should have developed their strengths. The MS could have helped them with it. On the other hand, organizations having poor results (loss, decline in revenue and income) probably haven't developed an effective MS or use it to improve business. However, organizations would probably keep performing their business in the same way, operating with a certificate or without it. Both groups of organizations may still encounter a threat of downsizing the business in the future, but the ones previously successful will probably keep using their strengths and thus gain better results even if they lose their certificates. The advantages from their

2 In the year 2012 ISO certification in USA cost \$3,000 for a micro company and up to \$23,000 for a large company (QualityWorks, 2012). Now in Slovenia these costs can still be up to 4 times lower.
3 Costs for preparing a 250-person plant for a certification audit in USA were assessed to \$26,000 in the year 2012 (The9000Store, 2012).

effective MS can't be lost over night, although abandoning the MS can be related to losing some important performance drivers over time. Hence, we can expect that successful organizations perform better or downsize later after losing a certificate. So our third hypotheses would be:

H3: Business performance of the organization after certificate cancellation is related to the previous business performance.

3 Reasons for cancelling management system certificates and their effects on business performance

Organizations lose certificates for some reason. The causes for losing certificates lie mostly within the certified organizations themselves. However, the decision about cancelling certificates can be taken by a certification body or by certified organization itself.

If an organization doesn't meet the requirements for keeping certificates (e.g. no internal audit and management review performed, no external audit carried out in a required period) the certification body should withdraw the certificates. This is one of the reasons for losing certificates when key MS activities are not performed regularly and in time.

Besides, organizations themselves can decide to quit certification for many reasons. These reasons are often related to barriers to effective implementation of the MS. The previous research (Magd, 2008) showed that the main three barriers are low top management commitment, lack of financial resources, insufficient training and education etc. (Magd, 2008). Consequently, the following three main reasons for quitting the certificates can be expected: low internal interest for maintaining the MS, cost-cutting (skipping costs of external audit and maintaining certificate) or change in organization's status, ownership or top management.

We can expect, that these reasons and decisions for quitting certification are often related to the benefit / cost ratio of such certification as perceived by an organization (Dearing, 2007; Martinez-Costa and Martinez-Lorete, 2007). As stated above, in general, more negative than positive effects on business performance are expected from losing the MS certificates. If the reason for giving up certification is low benefit / cost ratio (having more costs than benefits from certifying MS), general negative effects of cancelling the certificates shouldn't prevail over expected positive ones (for a certificate as a cost-maker would be removed). It means that in this case cancellation shouldn't cause noticeable negative effect on business performance (revenue and income decrease, negative income, business breakdown and closing of organization). Indeed, organizations often don't solve their cost problems by cost-cutting in certification area. In fact, in many cases a cost of certification is not the main cost of the implemented MS and not the real problem of the organization's business. In such cases low benefit / cost ratio of the MS is most likely related to improper and ineffective implementation of the MS or indicates overall business problems of the organization.

Still, there are some other possible reasons for quitting certification, where negative effects of such a decision (as explained above) can be expected, as well. The reasons can be related to barriers to effective implementation of the MS like low internal interest for MS, low management support, low (financial) resources, not enough skilled employees, organizational resistance to change etc. (Magd, 2008).

Low interest of organizations for certifying their MS can be explained by interpreting the certification process as a distinction element. In spite of the international significant growth in the number of ISO 9001 certificates issued (see introduction), some countries are already reaching a market saturation level regarding the number of ISO 9001 certified entities (Sampaio et al., 2009). When the number of certified organizations reaches a certain limit, certification loses its connotation and becomes less attractive for the remaining companies. The "saturation effect" can be reached in those countries which are attaining the so-called "maturity level" (i.e. the level in which no certification growth is registered) (Psomas and Fotopoulos, 2009).

Another reason why organizations quit certification of their MS may be their attitude toward certification. They see it more or less as a good business for certification bodies. With regard to effective audit of the standard Zeng et al. (2007) found that the main problems regarding certification were the lack of commitment from some certifying bodies, the excessive competition between certifying bodies and the offering of a total packaged service from consultancy to certification by certifying bodies (Psomas and Fotopoulos, 2009).

In addition, organizations lose their certificates because of change in their ownership and organizational changes (like acquisitions, reorganizations etc.), which cause closing of this organization.

Considering different possible reasons for cancelling certificates (mentioned above) in relation to business performance of an organization after cancellation we searched for some support from previous research. A similar relationship (between reasons or motives for certification and business performance) has been already proved (Llopis and Tari, 2003). By transferring it to the case of quitting certification, we expected similar relations. Therefore we supposed that a decline in business growth and in income after cancelling certificates would vary depending on the reason for cancellation. Hence we set the fourth hypotheses:

H4: A growth or decline in business performance of the organizations after cancellation of ISO certificates is related to the reasons for that decision.

4 Methodology of the empirical research

The empirical research was carried out as a survey studying a group of organizations in Slovenia that gave up certification in years 2009 and 2010. To limit the research all such clients of only one well-known certification body in Slovenia (having almost 40% market share) were investigated. The analysed period was limited to the last two years (2009 and 2010) when a significant increase in number of cancelled certificates in

Slovenia was noticed (see introduction). This way we investigated 108 organizations which all together cancelled 144 different certificates in these two years.

For the purpose of statistical analysis we grouped the cancelled certificates and the organizations (their owners) upon:

- placing organizations into groups of industries according to European classification NACE (SURS, 2011),
- organization size (BIZI.SI, 2011),
- reasons for cancellation of certificates (Slovenian certification bodies, 2011).

For each organization we gathered data about its business operating status and business performance in years 2008 to 2010. We searched for it in published balance sheets and income statements in publicly Retrieved financial databases (BIZI.SI, 2011; AJPES, 2011) and in annual reports of the organizations. For further statistical analysis (calculation of totals and shares) we classified organizations into groups according to their business results before and after cancelling certificates, especially by:

- positive or negative income (profit or loss) before cancelling certificates (in years 2008 or 2009) and after it (in the year 2010),
- growth or fall in income (and revenue),
- staying in business or closing the organization (till the end of 2010).

The hypothesis H1 to H4 were analytically proved through their development (in sections two and three), where some empirical support from former empirical research was referred to.

In accordance to the hypotheses H1 and H2 we assumed that the results of the survey undertaken in Slovenia would show a decline in business performance (presented in falling proportions of successful organizations or in rising proportions of bad performing and non-operating organizations). For the sample was large enough ($n > 30$) these hypotheses were tested by using one-proportion z-test. So we tested the proportions of unsuccessful organizations in the first and in the second year after cancellation of the certificates. In support of the hypotheses H3 a χ^2 -test was used for statistical test of

relationships between business performance before and after cancellation of the certificates. Likewise, the relationships between the reasons for certificate cancellation and business performance (income and revenue growth, negative or positive income and survival of organizations) were tested using χ^2 -test in support to the hypothesis H4. All the hypotheses were tested including tests on two subsets of data.

The survey results are presented in tables and graphs in the following section. When appropriate, some data cells of the tables are shadowed to show prevailing situation within analysed group of organizations.

5 Results of the empirical research in Slovenia

5.1 Which organizations quit certifying their management systems

As presented in Table 1, we found 108 organizations having their certificates cancelled in years 2009 (48 organizations) and 2010 (60 organizations). In these two years 144 certificates were cancelled: 71 of them in the year 2009 and 73 of them in the year 2010. The results show that the number of cancelled certificates in this survey was similar in both years, though the number of organizations with cancelled certificates increased from the year 2009 to 2010.

Cancelled certificates mostly belonged to the quality management standard ISO 9001 (117 certificates or more than 80% of them all) (Figure 1). In the second place, there were 15 certificates according to the environment management standard ISO 14001. There were still 12 cancelled certificates of other systems like OHSAS (health MS), ISO 13845 (medical devices QMS), QWeb (quality in web service) and some certified national systems. Mostly, organizations had only 1 certificate cancelled. However, there were 7 organizations with 2 different certificates and 1 with 3 different certificates. There was also 1 organization having 12 subsidiaries, each having an ISO 9001 certificate.

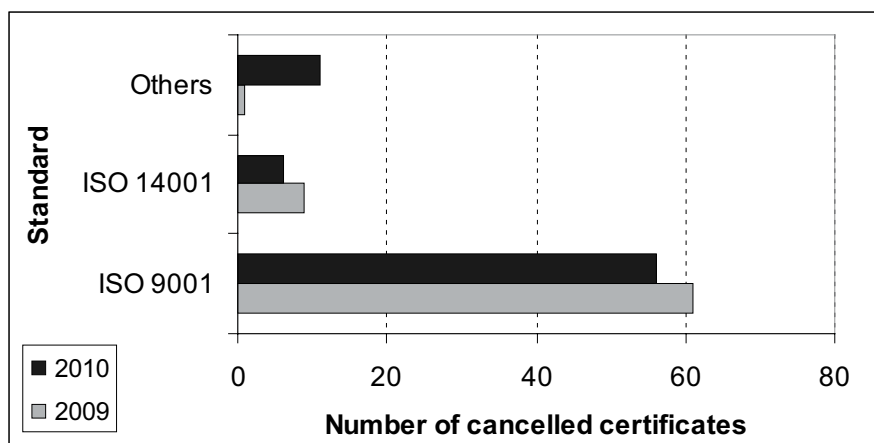


Figure 1: Number of cancelled certificates in years 2009 and 2010

Table 1: Number of organizations and their cancelled certificates in years 2009 and 2010

Industry (NACE classification)	Number of organizations			Number of cancelled certificates								
	2009	2010	TOTAL	ISO 9001		ISO 14001		Others		Total		TOTAL
				2009	2010	2009	2010	2009	2010	2009	2010	both years
C - MANUFACTURING	18	22	40	20	22	4	6	1	3	25	31	56
E - WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	1		1	1		1				2		2
F - CONSTRUCTION	3	8	11	3	8	1				4	8	12
G - WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	4	6	10	4	7				1	4	8	12
H - TRANSPORTATION AND STORAGE	3	1	4	3	1	1				4	1	5
I - ACCOMMODATION AND FOOD SERVICE ACTIVITIES	2		2	2						2		2
J - INFORMATION AND COMMUNICATION	2	3	5	2	4					2	4	6
K - FINANCIAL AND INSURANCE ACTIVITIES	4	1	5	15	1					15	1	16
L - REAL ESTATE ACTIVITIES	1	1	2	1	1					1	1	2
M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	3	8	11	3	7				1	3	8	11
N - ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	4	1	5	4	1	2				6	1	7
O - PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	2	1	3	2	1					2	1	3
P - EDUCATION		6	6		2				5		7	7
Q - HUMAN HEALTH AND SOCIAL WORK ACTIVITIES		1	1		1						1	1
R - ARTS, ENTERTAINMENT AND RECREATION	1		1	1						1		1
S - OTHER SERVICE ACTIVITIES		1	1						1		1	1
Total	48	60	108	61	56	9	6	1	11	71	73	144
Organization size												
Micro	17	21	38	17	22		1		2	17	25	42
Small	10	18	28	11	16	3	1		3	14	20	34
Middle	3	12	15	3	10	1	1		5	4	16	20
Large	3	7	10	14	6		3	1	1	15	10	25
Size not known	15	2	17	16	2	5				21	2	23
Total	48	60	108	61	56	9	6	1	11	71	73	144

As seen from Table 1 quitting certification was more frequent in some industries. To notice it the cells in the table are shadowed where there were 5 or more organizations or cancelled certificates indicated in an industry. In both years the majority of the cancellations referred to manufacturing industry (56 organizations or 37%). In the year 2010 there was a noticeable increase in cancellations in construction, wholesale and retail, professional, scientific and technical activities and in education. In this period some of these industries (like construction) came under strong pressure because of global economic crises which appeared at the end of 2008. It strongly affected the business in these organizations, so it could affect their MS certification as well.

The data shows (Table 1) that organizations of all sizes were involved in quitting certificates. As expected, micro (having up to 10 employees) and small (having 11 to 50 employees) prevailed in both years. So, there were 38 micro organizations (or 35%) and 28 small ones (or 26%) involved in this period (2009 and 2010).

5.2 Reasons for quitting certification

It is noticeable from Table 2 that organizations claimed one of the following reasons which are consistent to those expected from the literature review (see section three):

- benefit/cost ratio,

- economic crises,
- low interest for certification,
- external audit not performed,
- organizational changes.

These reasons are related to activities and decisions within organizations. In general, organizations deciding upon the first four reasons show low internal interest for certification and potential financial problems. However, organizational changes like closing the organization, changing its legal status etc. refer more or less to decisions of the organization owners.

On the other hand a certification body documented one of the following reasons for withdrawal of certificates:

- cancellation by certification body (CB),
- expiration of certificate,
- temporary cancellation.

Where temporary cancellation is the case, often a final cancellation is to be expected.

Among the reasons for cancellation by CB (in 25 organizations which present 23%) prevailed. The number of cancellations because of the organizational changes was high as well (18 organizations or 17%). In the year 2010 economic crises appeared as the most frequently stated internal reason for cancellations (in 15 organizations which represent 25% of the organizations losing certificates in the year 2010 or 14% of them all).

Table 2: Reasons for cancelled certificates in years 2009 and 2010

REASONS FOR CANCELLATION YEAR	Number of organizations with cancelled certificates								TOTAL
	Benefit/ cost ratio	Economic crises	Low interest for certificatio n	Audit not performe d	Organi- zational changes	Cancellati on by CB	Expiration of certificate	Temporary cancellation	
2009	3		5		11	19	2	8	48
2010	8	15	8	11	7	6	4	1	60
Total	11	15	13	11	18	25	6	9	108
Industry (NACE classification)									
C - MANUFACTURING	2	3	6	5	7	1	3	4	40
E - WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES						1			1
F - CONSTRUCTION	2	2	2	2	2		1		11
G - WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES		1	1		2	3		3	10
H - TRANSPORTATION AND STORAGE		1				3			4
I - ACCOMMODATION AND FOOD SERVICE ACTIVITIES	1					1			2
J - INFORMATION AND COMMUNICATION			1	1		1	1	1	5
K - FINANCIAL AND INSURANCE ACTIVITIES	1				2	2			5
L - REAL ESTATE ACTIVITIES		1				1			2
M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	1	3	2	1	1	3			11
N - ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES				1	3			1	5
O - PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	2		1						3
P - EDUCATION		4		1			1		6
Q - HUMAN HEALTH AND SOCIAL WORK ACTIVITIES					1				1
R - ARTS, ENTERTAINMENT AND RECREATION	1								1
S - OTHER SERVICE ACTIVITIES	1								1
Total	11	15	13	11	18	25	6	9	108
Organization size									
Micro	6	7	3	5	2	7	2	6	38
Small	2	5	7	3	3	3	2	3	28
Middle	1	2	1	3	4	3	1		15
Large		1	2		3	3	1		10
Size not known	2				6	9			17
Total	11	15	13	11	18	25	6	9	108
Total - group of reasons	50				18	40			108
	LOW INTEREST IN ORGANIZATION				OWNERS / MANAGE- MENT DECISION	ORGANIZATION'S PERFORMANCE AND EXISTENCE PROBLEMS			

5.3 Effects of quitting certification on future business performance

Table 3 and 4 show survey results about business performance of the organizations which lost certificates in years 2009 and 2010. Tables 5 to 7 show summary from the survey which serves as a basis for testing our hypotheses.

Support for hypothesis H1: "Cancellation of ISO certificates is related to a decline in business performance of the organizations".

The data in table 5 shows that only 41.7% of the organizations were growing their income one year after cancelling their certificates (compared to the income before cancellation). In the group of organizations which lost certificates a year

earlier this percentage was only 22.9% after two year period. Concerning both, growth in income and in revenue at the same time, only 14 organizations (or 23% of all of the 2010 group) met that criterion after one year and 11 organizations met them (or 8% of all of the 2009 group) after two years.

On the other hand 58% of the 2010 group of organizations still operated with profit one year after losing certificates, while this percentage declined to 45.8% in the 2009 group which operated two years without certificates.

Besides, after one year 30% of the companies decreased their income and 16.7% of them encountered survival problems like blocked bank accounts, liquidation and bankruptcy. After two years already 35.4% of the companies decreased their income and 39.6% of them encountered survival problems. Altogether there were documented 46.7% of organiza-

Table 3: Business performance of the organizations with cancelled certificates in the year 2009 – situation two years after cancellation

CANCELLED CERTIFICATES IN YEAR 2009	Nr. of organi- zations	Organization performs normally in year 2010.							In the year 2010 performs no business more or. its performance is threatened.			
		Nr. of organi- zations	Growth / fall of income			income in year 2010			Nr. of organi- zations	Blocked bank account	Liqui- dation	Bank- ruptcy
REASONS FOR GIVING UP CERTIFICATION:			Growth	Fall	Data missing	Profit	Loss	Data missing				
Benefit/cost ratio	3	3	1	1	1	1	1	1				
Low interest for certification	5	5	3	2		4	1					
Organizational changes	11	4	2	2		4			7		4	3
Cancellation by CB	19	8	3	5		6	1	1	11	1	6	4
Expiration of certificate	2	2	1	1		2						
Temporary cancellation	8	7	1	6		5	2		1			1
TOTAL	48	29	11	17	1	22	5	2	19	1	10	8
INCOME IN YEAR 2008												
Profit	31	25	9	16		20	5		6	1	4	1
Loss	8	3	2	1		2		1	5			5
Data missing	9	1			1			1	8		6	2
TOTAL	48	29	11	17	1	22	5	2	19	1	10	8
Percentage of organizations	100.0%	60.4%	22.9%	35.4%	2.1%	45.8%	10.4%	4.2%	39.6%	2.1%	20.8%	16.7%

Table 4: Business performance of the organizations with cancelled certificates in the year 2010 – situation one year after cancellation

CANCELLED CERTIFICATES IN YEAR 2010	Nr. of organi- zations	Organization performs normally in year 2010.							In the year 2010 performs no business more or. its performance is threatened.				Data about organi- zation is missing
REASONS FOR GIVING UP CERTIFICATION:		Nr. of organi- zations	Growth / fall of income			income in year 2010			Nr. of organi- zations	Blocked bank account	Liqui- dation	Bank- ruptcy	
			Growth	Fall	Data missing	Profit	Loss	Data missing					
Benefit/cost ratio	8	6	2	2	2	3	1	2	1			1	1
Economic crises	15	14	7	6	1	11	1	2	1	1			
Low interest for certification	8	7	2	3	2	5		2	1		1		
Audit not performed	11	9	3	5	1	7	2		2			2	
Organizational changes	7	4	4			3	1		3		3		
Cancellation by CB	6	5	4	1		4	1		1	1			
Expiration of certificate	4	4	3	1		2	2						
Temporary cancellation	1	0							1	1			
TOTAL	60	49	25	18	6	35	8	6	10	3	4	3	1
INCOME IN YEAR 2009													
Profit	38	34	18	16		31	3		4	1	2	1	
Loss	14	9	7	2		4	5		5	1	2	2	
Data missing	8	6			6			6	1	1			1
TOTAL	60	49	25	18	6	35	8	6	10	3	4	3	1
Percentage of organizations	100.0%	81.7%	41.7%	30.0%	10.0%	58.3%	13.3%	10.0%	16.7%	5.0%	6.7%	5.0%	1.7%

Table 5: Change in business performance over years after cancellation of the certificates – survey summary

CANCELLED CERTIFICATES IN YEAR NUMBER OF ORGANIZATIONS	Nr. of organi- zations	Organization performs normally in year 2010.							In the year 2010 performs no business more or. its performance is threatened.				Data about organi- zation is missing
		Nr. of organi- zations	Growth / fall of income			income in year 2010			Nr. of organi- zations	Blocked bank account	Liqui- dation	Bank- ruptcy	
			Growth	Fall	Data missing	Profit	Loss	Data missing					
2010 => performance after 1 year	60	49	25	18	6	35	8	6	10	3	4	3	1
2009 => performance after 2	48	29	11	17	1	22	5	2	19	1	10	8	
PERCENTAGE OF ORGANIZATIONS													
2010 => performance after 1 year	100.0%	81.7%	41.7%	30.0%	10.0%	58.3%	13.3%	10.0%	16.7%	5.0%	6.7%	5.0%	1.7%
2009 => performance after 2 years	100.0%	60.4%	22.9%	35.4%	2.1%	45.8%	10.4%	4.2%	39.6%	2.1%	20.8%	16.7%	

Table 6: Results of testing the proportion of bad-performing and non-performing organizations one year after cancellation of the certificates

Hypothesis about survey results		Statistical test								Rejecting the null hypothesis	Conclusion
Test	Assumption	α	n	Π_0	p	SE(p)	z	z_α	$P(z = z_\alpha)$		
H1-1	The percentage of organizations showing decrease in income one year after cancellation of ISO certificates is significantly greater than 21%.	0.050	60	21%	30.0%	0.0526	1.7116	1.6449	0.0435	H1-1 ₀ REJECTED	Decrease in income after certificate cancellation in the first year.
H1-2	The percentage of failed organizations one year after cancellation of ISO certificates is significantly greater than 10%.	0.050	60	10%	16.7%	0.0387	1.7299	1.6449	0.0418	H1-2 ₀ REJECTED	certificate cancellation - business fail in the first year

tions with deteriorated business after one year and already 75 % of such cases after two years.

Two auxiliary hypotheses were developed to test the hypotheses H1 using a z-test:

- H1-1 for testing the proportion of organizations demonstrating a decrease in their income and
- H1-2 for testing the proportion of failed organizations.

Table 6 presents the results of testing H1 null hypotheses which show no significant differences in the proportion of such unsuccessful organizations between the sample and the whole population. So we can reject at 5% level of significance both the H1 null hypotheses and accept hypotheses H1-1 and H1-2. Thus hypothesis H1 can be accepted. Therefore we can conclude that there is a significant relationship in cancellation of ISO certificates and decline in business performance. So we can expect 10% of such organizations to decrease their income and 21% of them to quit their business in one year after cancellation of the certificates.

Two auxiliary hypotheses were developed as well:

- H1-1 for testing relationship between reasons for quitting certification and future growth of income on the basis of the data in Table 9 and
- H1-2 for testing relationship between reasons for quitting certification and future income and survival of the organizations on the basis of the data in Table 10.

Support for hypothesis H2: *A decline in business performance of the organizations is related to the time passed after cancellation of their ISO certificates.*

We can see from the data presented in Table 5 and from the explanation to the hypothesis H1 that the percentage of organizations that show decline in business performance almost doubled in the 2009 group of organizations comparing to the 2010 group.

To get some support to the hypotheses H2 similar tests as for hypothesis H1 were carried out on the sample of organizations where a two-year period passed after cancellation of the certificates (Table 7). It proved the same significant relationship with higher proportions of unsuccessful organizations two years after cancellation of the certificates than in the first year after it. According to the test results we can expect 28% of organizations losing certificates to decrease their income and 25% of them to quit their business in two years after cancellation of the certificates. These two sequential tests in Tables 6 and 7 can lead to the conclusion that the business performance of the organizations is related to the time passed after cancellation of the certificates. Thus they give some support to the hypotheses H2.

Support for hypothesis H3: *Business performance of the organization after cancellation of the certificates is related to the previous business performance.*

Tables 8 and 9 and graphs in Figures 2 and 3 show that majority (51 or 74% of 69 such organizations) of the organizations which operated with profit before losing certificate kept their profit after one or two years. However, 42 (= 32 + 10) or 61% of these organizations decreased their income or didn't survive in this period.

Table 7: Results of testing the proportion of bad-performing and non-performing organizations two years after cancellation of the certificates

Hypothesis about survey results		Statistical test								Rejecting the null hypothesis	Conclusion
Test	Assumption	α	m	Π_0	p	SE(p)	z	z_α	$P(z = z_\alpha)$		
H2-1	The percentage of organizations showing decrease in income two years after cancellation of ISO certificates is significantly greater than 25%.	0.050	48	25%	35.4%	0.0625	1.6640	1.6449	0.0481	H2-1 ₀ REJECTED	certificate cancellation - increased decrease in income in two years
H2-2	The percentage of failed organizations two years after cancellation of ISO certificates is significantly greater than 28%.	0.050	48	28%	39.6%	0.0648	1.7899	1.6449	0.0367	H2-2 ₀ REJECTED	certificate cancellation - increased business fail in two years

Table 8: Number of organizations showing income growth or fall after cancellation of the certificates in relation to previous profit or loss

Nr. of organizations with cancelled certificates					
INCOME BEFORE CERTIFICATE CANCELLATION	Growth	Fall	No perform mance	Data missing	Total
Profit	27	32	10		69
Loss	9	3	10		22
Data missing			9	8	17
Total	36	35	29	8	108

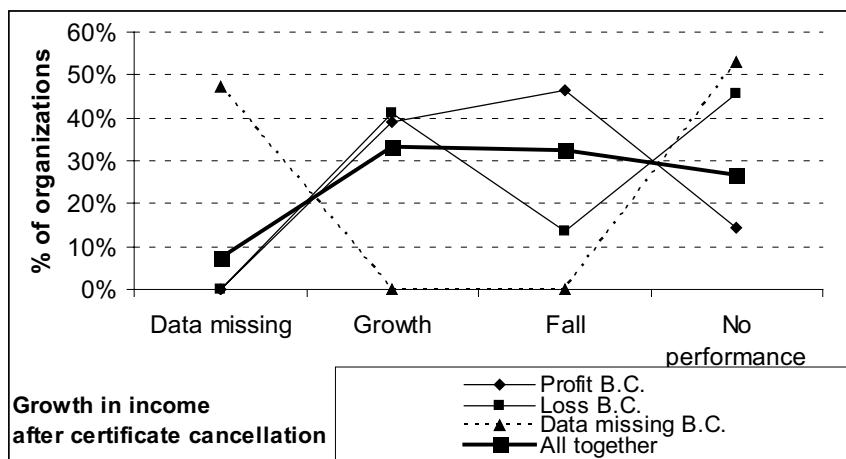


Figure 2: Percentage of organizations showing income growth or fall after cancellation of the certificates in relation to previous profit or loss

Table 9: Number of organizations showing profit, loss or no business performance now (in the end of the year 2010) in relation to profit or loss before cancellation of the certificates

Nr. of organizations with cancelled certificates					
INCOME BEFORE CERTIFICATE CANCELLATION	Profit	Loss	No perform mance	Data missing	Total
Profit	51	8	10		69
Loss	6	5	10	1	22
Data missing			9	8	17
Total	57	13	29	9	108

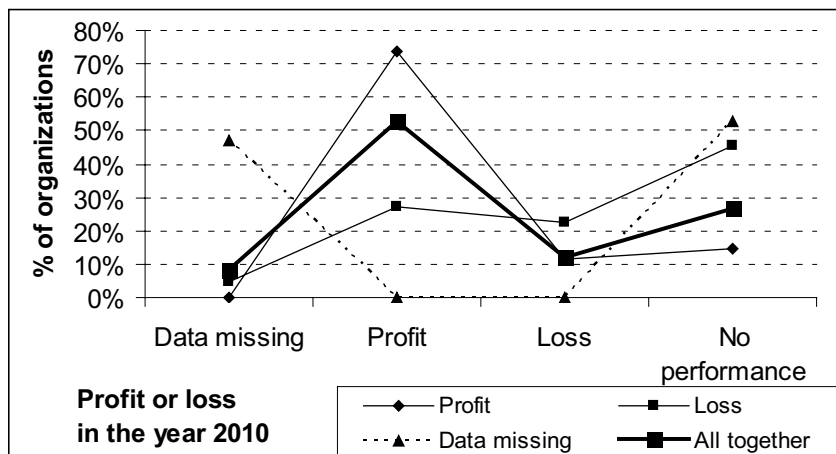


Figure 3: Percentage of organizations showing profit, loss or no business performance now (at the end of the year 2010) in relation to profit or loss before cancellation of the certificates

In the group of the organizations which operated with loss before losing certificate there were 9 (or 41% of 22 such organizations) that indicated growth in their income, but only 6 (or 27% of 22 such organizations) gained profit. The remaining 13 companies of this group (= 3 + 10 or 49% of them all) operated with decline in income or didn't survive in this period.

Hypothesis H3 was tested by testing relationships between two sets of data. Therefore two auxiliary hypotheses were developed:

- H3-1 for testing relationship between income before certificate cancellation and future growth of income on the basis of the data in Table 8 and
- H3-2 for testing relationship between income before certificate cancellation and future income and survival of the organizations on the basis of the data in Table 9.

We tested the differences in dynamics and level of business performance between the two groups of organizations (previously profitable and not profitable ones) using a χ^2 -test. Table 10 presents the results of testing the H3 null hypotheses which show no significant differences between the analysed groups. So we can reject at 0.5% level of significance both the

H3 null hypotheses and accept the hypotheses H3-1 and H3-2. Thus the hypothesis H3 can be accepted.

5.4 Future business performance in relation to reasons for quitting

Support for hypothesis H4: *A growth or decline in business performance of the organizations after cancellation of ISO certificates is related to the reasons for that decision.*

- Tables 11 and 12 and graphs in Figures 4 and 5 show that:
- 36% to 47% of the organizations (=50% or more organizations with Retrieved performance data) quitting certification for the first three reasons ("benefit/cost ratio", "economic crises" or "low interest for certification") experienced a decrease in income or even didn't survive, while 36% to 73% of them (=57% to 85% of the ones with Retrieved performance data) operated with a profit. Similar situation appeared in case of the reason "expiration of certificate".
 - If "audit not performed" was the reason, 63% of the organizations (= 70% of the ones with Retrieved performance data) showed a decrease in income or even didn't

Table 10: Results of testing the dependence of business performance after cancellation of the certificates in relation to previous profit or loss

Hypothesis about survey results		Statistical test				Rejecting the null hypothesis	Conclusion
Test	Assumption	α	m	χ^2	P		Proven relationships
H3-1	There is a significant relationship between positive or negative income (profit or loss) before cancellation of ISO certificates and income growth in the future.	0.005	2	72.6904	0.0000	H3-1 ₀ REJECTED	Income before certificate cancellation - future growth of income
H3-2	There is a significant relationship between positive or negative income (profit or loss) before cancellation of ISO certificates and future income and survival.	0.005	2	69.4616	0.0000	H3-2 ₀ REJECTED	Income before certificate cancellation - future income and survival

Table 11: Number of organizations showing income growth or fall after cancellation of the certificates in relation to reasons for quitting them

Nr. of organizations with cancelled certificates					
REASONS FOR GIVING UP CERTIFICATION (2009 and 2010):	Growth	Fall	No performance	Data missing	Total
Benefit/cost ratio	3	3	1	4	11
Economic crises	7	6	1	1	15
Low interest for certification	5	5	1	2	13
Audit not performed	3	5	2	1	11
Organizational changes	6	2	10		18
Cancellation by CB	7	6	12		25
Expiration of certificate	4	2	0		6
Temporary cancellation	1	6	2		9
Total	36	35	29	8	108

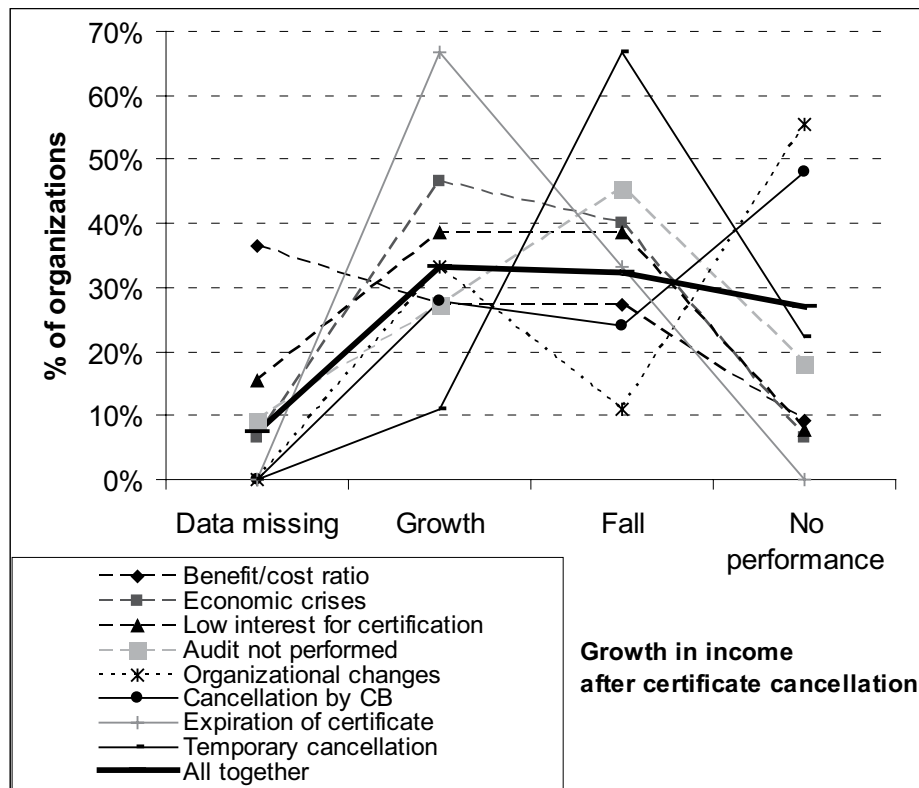


Figure 4: Percentage of organizations showing income growth or fall after cancellation of the certificates in relation to reasons for quitting them

survive, while the same percentage of them still operated with a profit.

- The reasons “organizational changes” and “cancelled by CB” gave worse results, while 48% to 56% of the organizations in this group quitted their business and 11% to 24% of them identified decrease in income. So altogether 66% to 72% of the organizations showed decrease in business performance or business fail. On the other hand, about 40% of them still operated with a profit.
- The worst results appeared at the reason “temporary cancellation”. In this case 89% of the organizations realized decrease in income or they even didn’t survive. However 56% of them still realized a profit.

The hypothesis H4 was tested in the same way as the hypothesis H3. Two auxiliary hypotheses were developed as well:

- H4-1 for testing relationship between reasons for quitting certification and future growth of income on the basis of the data in Table 11 and
- H4-2 for testing relationship between reasons for quitting certification and future income and survival of the organizations on the basis of the data in Table 12.

The results of testing the H4 null hypotheses using the χ^2 -tests are shown in Table 13. They show no significant differences in dynamics and level of business performance among the 8 analysed groups of organizations. So we can

reject at 0.5% level of significance both the H4 null hypotheses and accept the hypotheses H4-1 and H4-2. Thus the hypothesis H4 can be accepted.

6 Discussion

The results of our survey are consistent with the expectations resulting from the literature review and former research explained in the first sections (Psomas and Fotopoulos, 2009). Although almost a half of all the companies in our survey (50 companies or 46% of them all) claimed some internal reasons for quitting certification linked to high costs and low expected benefits of the certificates. This is consistent with the findings of some other authors (Singels et al., 2001; Martinez-Costa and Martinez-Lorete, 2007) who didn’t find the ISO certificates beneficial to the business performance of the organizations. Nevertheless, these 50 analysed organizations didn’t improve their business performance after giving up certification which should have been considered as a burden. On the contrary, only 18 of them (= 36% of this group of 50 organizations) increased their income, all the others indicated a business performance decrease or even fail. Our research can’t give an answer yet if losing a certificate was one of major factors for these declines. However, considering authors who found a significant difference in business performance of certified and non-certified organizations (Corbet et al., 2002; Alič, 2003) and authors claiming that losing ISO 9001

Table 12: Number of organizations showing profit, loss or no business performance now (at the end of the year 2010) in relation to reasons for quitting the certificates

Nr. of organizations with cancelled certificates					
REASONS FOR GIVING UP CERTIFICATION (2009 and 2010):	Profit	Loss	No performance	Data missing	Total
Benefit/cost ratio	4	2	1	4	11
Economic crises	11	1	1	2	15
Low interest for certification	9	1	1	2	13
Audit not performed	7	2	2		11
Organizational changes	7	1	10		18
Cancellation by CB	10	2	12	1	25
Expiration of certificate	4	2	0		6
Temporary cancellation	5	2	2		9
Total	57	13	29	9	108

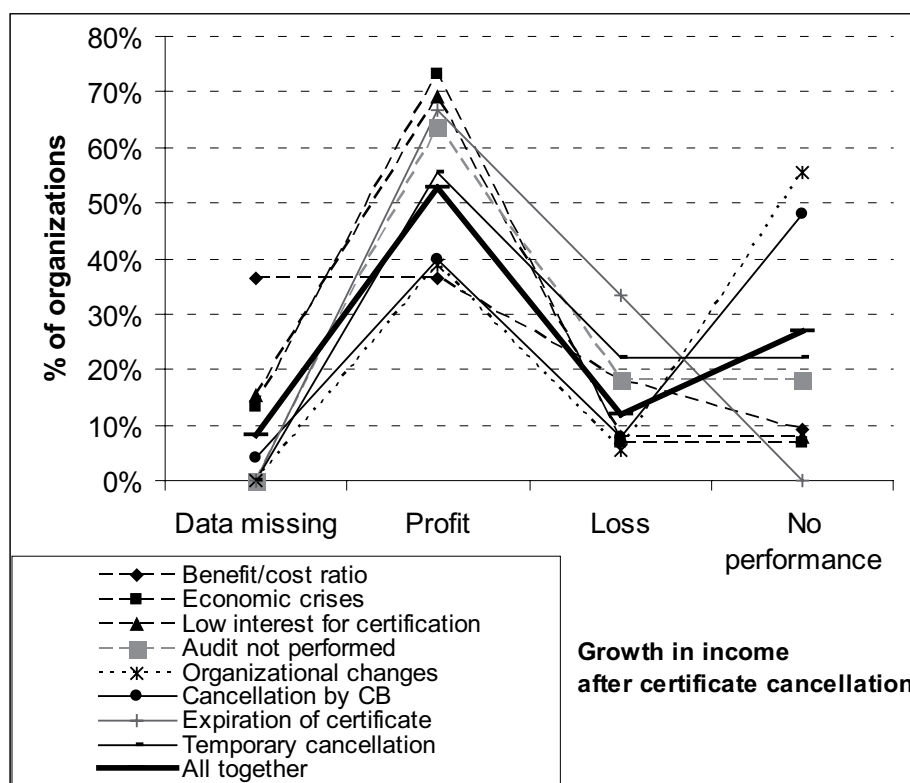


Figure 5: Percentage of organizations showing profit, loss or no business performance now (at the end of the year 2010) in relation to reasons for quitting the certificates

Table 13: Results of testing the dependence of business performance after cancellation of the certificates in relation to the reasons for quitting certification

Hypothesis about survey results		Statistical test				Rejecting the null hypothesis	Conclusion
Test	Assumption	α	m	χ^2	P		Proven relationships
H4-1	There is a significant relationship between reasons for cancellation of ISO certificates and income growth in the future.	0.005	21	47.0391	0.0009	H4-1 ₀ REJECTED	Reasons for certificate cancellation - future growth of income
H4-2	There is a significant relationship between reasons for cancellation of ISO certificates and positive or negative income (profit or loss) or survival of the organization in the future.	0.005	21	43.1889	0.0030	H4-2 ₀ REJECTED	Reasons for certificate cancellation - future income and survival

certification can be worse than not achieving it at all (Joubert, 1998) can partly explain our results. We should emphasise that our survey analysed organizations in Slovenia in a period of an increasing economic crisis. We haven't found any previous research on the impact of a certified MS on performance and survival of an organization in case of an economic crisis. So it is hard to comment our results regarding it.

To correctly interpret the survey results some limitations of this research should be explained:

- It is important to take an appropriate and long enough period to analyse the trends in business performance of organizations after cancellations of their certificates. Just two years is a rather short period for that purpose. As a matter of fact, we didn't and couldn't take a longer period, because economic situation changed a lot after the year 2008. Indeed, we wanted to get an actual picture of the analysed phenomenon.
- The data doesn't cover all the cancellations of certificates in Slovenia since the data of only one certification body was used as a source. This could have influenced the conclusions of the survey if the surveyed group wasn't big enough. We believe that the group of 108 analysed organizations was big enough to generalise conclusions. Of course, it would be interesting to expand the research on more certification bodies.
- The data for the organizations which failed in business and don't exist any more were not Retrieved in public databases. Getting this data probably wouldn't affect conclusions of our survey, but it would help developing a better picture over the situation.
- We wondered whether organizations understood and identified the right reasons for quitting certification. It is not easy to find out the real reason for giving up certification and the background for it when they are not correctly indicated from their source. For instance, it is a little bit surprising that some reasons like economic crisis didn't appear in the year 2009 at all. In addition the some reasons for losing certificates for (like "benefit/cost ratio") have ambiguous effects on business performance. If organizations see more costs than benefits of a certificate, quitting certification shouldn't result in decrease of business performance. Opposite results in some cases might signal that quitting certification is one of cost-cutting when an organization is in deep troubles and keeping certificates probably wouldn't affect the trend of downsizing the business. Of course, if this is the case, organizations probably aren't willing to tell the real reason for quitting certification.

Some further research needs to be done to clarify the above mentioned opened questions from this survey.

7 Conclusion

The use of ISO standards and development of management systems on that basis is still increasing in the world. ISO 9001 is the most widely used standard among them. The literature review and previous empirical research show that a quality

management system if properly implemented provides several benefits and contributes to good business performance of the companies. Companies mostly decide to certify their management systems. A certificate is a formal proof of performing a standard, but at the same time this procedure takes some extra efforts and money. This is one of the reasons which may lead a company to decision about quitting certification.

The results of our survey in Slovenia are not far away from our expectations based on the theory and former research. All four hypotheses were accepted. As a result of the proved hypothesis H1 a significant decline in business performance was identified after quitting certification. It meant a significant decline in income and revenue in 10% of the organizations in the first year already and 21% of them in the second year. A percentage of the organizations in our pattern operating at a profit decreased as well from 63.9% before cancellation of the certificates to 58.3% in the first year and further to 45.8% in the second year. So, two years after cancelling certificates only 8% of the organizations still present growth in their income and revenue, besides almost 40% of them collapsed or encountered survival problems like blocked bank accounts, liquidation and bankruptcy. Testing the hypothesis H2 showed that this decline in business performance was significantly related to the time passed after quitting certificates. Next, a significant relationship between the business performance before and after cancellation was proved by testing the hypothesis H3. Comparing previously profitable or non-profitable organizations there were only 39% to 41% of them that increased their income after cancellation of the certificates in both groups. However, a 3-times higher proportion of failed organizations (= 45% of previously non-profitable organizations) was found among the organizations that previously operated at a loss. According to the proved hypothesis H4 the decline in business performance differed in relation to the reason for quitting as well. Thus, organizational changes (in 35% of all the organizations losing certificates) and cancellation of certificates by certification bodies (in 41% of these organizations) were the most common reasons that led to the failure of these organizations.

Therefore a question appears about the real causes for giving up certification. We still don't know to what extent cancelled certificates contributed to a decline in business performance and to business fail. It is unlikely that only these certificates influenced their business so much. More likely many of these organizations were in trouble before taking decision to give up certification. If this was the case cancelled certificates could be considered as a negative signal – an early external signal of a failing business. To confirm this assumption some further research should be performed investigating causes and a background for quitting certification.

Abbreviations:

QMS – Quality Management System;

MS – Management System;

CB – Certification Body

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Odpoved certificiranja sistemov managementa: morebitno zgodnje opozorilo?

Članek prikazuje dinamiko pridobivanja najbolj razširjenih certifikatov za sisteme managementa (ISO 9001, ISO 14001). Pri tem se osredotoča na situacijo v Sloveniji v zadnjih dveh letih, ko je bila opazna občutna rast števila razveljavljenih certifikatov. Ta pojav smo proučevali z namenom, da bi ugotovili njegove razloge in učinke na poslovanje organizacij. Nekatere povezave med sistemi managementa kakovosti in uspešnostjo poslovanja podjetij, prepoznane iz proučevanja literature, smo uporabili za postavitev hipotez. Predvidevali smo, da je odvzem certifikatov za sisteme managementa povezan s padanjem uspešnosti poslovanja. Hipoteze smo tudi analitično preizkusili. Empirični del raziskave je temeljil na podatkih slovenskih certifikacijskih hiš in na javno objavljenih letnih finančnih poročilih slovenskih organizacij. V analizo so bile zajete organizacije, ki so se odpovedale nadaljnjemu certificiranju. Proučevane so bile nekatere njihove lastnosti in uspešnost poslovanja. Prišli smo do zanimivih ugotovitev, da je ukinitvev certifikatov povezana s padcem uspešnosti poslovanja in pogosto celo z ukinitvijo organizacij. Opazno je bilo, da se padec poslovanja s časom povečuje. Tako je po 2 letih po ukinitvi certifikatov samo 8% organizacij še izkazovalo rast poslovnega izida in dohodkov iz poslovanja, poleg tega je skoraj 40% organizacij prenehalo poslovati oz. so na tem, da to storijo. Prav tako je bilo ugotovljeno, da je uspešnost poslovanja po odpovedi certifikatov povezana z uspešnostjo poslovanja pred tem in z razlogom za odpoved. Med organizacijami, ki so pred tem poslovale z izgubo, je bil v primerjavi s tistimi, ki so prej izkazovale dobiček, v 2 letih po odpovedi certifikatov 3-krat večji delež (= 45% teh organizacij) takih, ki so prenehale poslovati. Najpogostejši razlogi, ki so pripeljali do prenehanja poslovanja, so bile organizacijske spremembe (pri 35% od vseh organizacij, ki so izgubile certifikate) in ukinitvev certifikatov s strani certifikacijske hiše (pri 41% od vseh organizacij, ki so izgubile certifikate).

Ključne besede: sistem managementa (MS), sistem managementa kakovosti (QMS), ISO 9001, ISO 14001, certifikat, uspešnost poslovanja

Asymmetric and Nonlinear Impact of Attribute-Level Performance on Overall Customer Satisfaction in the Context of Car Servicing of Four European Automotive Brands in Slovenia

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The paper examines the nonlinearity and asymmetry between the satisfaction with individual attributes of the service and overall satisfaction in the context of passenger car servicing in Slovenia. The data set that was analysed was acquired from a regular survey on customer satisfaction with vehicle repair and maintenance services of four European automotive brands in Slovenia, carried out in 2005 and 2006 through 12,941 computer-assisted telephone interviews. Specifically, this study utilizes regression analysis in order to test the asymmetry and nonlinearity of the link between the attribute-level performance and overall satisfaction.

The results show that the influence of dissatisfaction is different from the influence of satisfaction, and that the influence of satisfaction on overall satisfaction is greater than the influence of dissatisfaction. The results also show that nonlinearity is applicable to certain attributes of vehicle servicing, but not to all.

We can sum up that precise knowledge of the correlation between the attribute-level performance of vehicle servicing and overall service satisfaction is important. Results show that caution must be employed in the evaluation of the importance of individual attributes on overall satisfaction, since the importance can change depending on the level of satisfaction. It appears that focusing on improving satisfaction is more important than focusing on lessening dissatisfaction. Results also show that the improvement of attribute-level performance offers diminishing returns; therefore, selective investment in activities for increasing customer satisfaction is sensible if satisfaction levels are already relatively high.

Key words: service quality, customer satisfaction, automotive industry, asymmetry, nonlinearity.

1 Introduction

Business systems are facing global competition in a quickly changing business environment, in which the most successful companies are those that know their customers well and constantly adapt to their needs and expectations (Carpinetti, Buosi and Gerólamo, 2003).

The key role of orientation towards customers and the improvement of customer-related processes is underlined by several studies (Terziovski et al., 2002; Abdolazimian and Mansouri, 2008). As reported by Sychovicz (2008), 67% of

companies, among 202 companies from 19 European countries included in a survey, are focused on customer-oriented processes.

The usual measures of customer satisfaction involve a survey with a set of statements related to different dimensions of satisfaction, as well as a statement related to the overall customer satisfaction.

While overall satisfaction is crucial for loyalty and profitability, only questions about individual attributes of service serve as a basis for consideration about necessary changes and improvements. Numerous authors (Anderson and Sullivan,

1993; Mittal et al., 1998; Anderson and Mittal, 2000; Matzler et al., 2004; Chueng and Lee, 2009) found that the correlation between attribute-level performance and overall satisfaction is not necessarily linear and symmetrical. Since the results of these studies are relatively dissimilar, we could assume that the cause lies in the specifics of different industries and that there is no universal connection

This paper, therefore, investigates the nature of the correlation between individual attributes of satisfaction and overall satisfaction in the context of passenger car servicing in Slovenia.

The aim of the study is to determine whether the correlation between attribute-level performance of vehicle service and overall satisfaction (satisfaction with the service as a whole) is nonlinear and asymmetric. This paper also addresses the question whether the influence of satisfaction with an individual attribute on overall satisfaction remains constant or changes depending on the level of satisfaction with said attribute, and whether the satisfaction with an individual attribute influences the overall satisfaction differently than dissatisfaction with the same attribute.

1.1 Service quality and customer satisfaction

Scholarly service management literature provides several concepts regarding customers' reaction to service. Two of the most common concepts are "perceived service quality" and "customer satisfaction". On the most general level both perceived service quality and customer satisfaction are concepts relating to customers' assessment of the received service. Results of empirical studies show that these are two distinct constructs (Oliver, 1997; Taylor and Baker, 1994) and that there exists a causal relationship between them (Cronin and Taylor, 1992; Gotlieb et al., 1994; Spreng and Mackoy, 1996; Salini and Kenett, 2009). Some authors use these two concepts interchangeably (Iacobucci et al., 1994; Mittal et al., 1998; Oliver, 1997; Parasuraman et al., 1994; Taylor and Baker, 1994), even though they are aware of certain differences between them.

Oliver (1997) lists the following differences between the perceived service quality and customer satisfaction:

- Perceived service quality judgments are evaluations of specific cues or attributes, whereas satisfaction judgments are more global.
- Expectations of perceived service quality are based on perceptions of 'excellence', whereas satisfaction judgments include referents such as need and equity or fairness.

- Perceived service quality judgments are more cognitive, whereas satisfaction judgments are more affective and emotional reactions.

When distinguishing both constructs, the time dimension is also important, which shows clearly in the definition of both constructs, as seen by Lovelock and Wright (1999).

Lovelock and Wright (1999) define customer satisfaction as a 'short term emotional reaction to a specific service performance' and perceived service quality as 'customer's long-term, cognitive evaluations of a company's service delivery'.

They postulate that satisfaction depends on the experience, but this is not necessarily true for the perceived service quality, which can also be dependent on marketing and word of mouth. After each experience with the service, the customers evaluate their level of satisfaction or dissatisfaction. This piece of information is used to refresh their image of the perceived service quality. From this, we can see that satisfaction influences the perceived quality and not vice versa.

To a certain extent, this assumption is confirmed by Oliver's (1997) studies on the direction of influence between the constructs of perceived service quality and customer satisfaction. He finds that the direction of influence depends on the level of measurement. On the level of individual transaction he found a strong influence in the direction from quality to satisfaction, whereas on the level of bigger transactions the exact opposite was apparent, that is, the influence of satisfaction on perceived service quality. He claims the reason for longer-term influence on perceived service quality is that satisfaction influences quality expectations in the long term.

Service quality and service satisfaction are therefore related and closely connected, but nevertheless different concepts. They differ mainly in terms of service-related experience, degree of expectation, component efficiency level and the stability of relationship between the customer and service provider (Snoj and Mumel, 2001).

The perceived quality of service is a general overall evaluation relating to service excellence that is created based on the relationship between the customer and service provider, where both parties play an active role, while satisfaction refers to a certain implementation and is shaped by a certain experience. It is an emotional reaction to a service or product (Gabbott and Hogg, 1997).

The dimensions that define assessment of satisfaction can be the same as dimensions defining assessment of quality, but this is not necessary. The assessment is based on ideals or the perception of perfection or excellence, while in the assessment of satisfaction expectations needs and personal norms also play an important role. That is why even very high service quality does not guarantee high customer satisfaction, because



Figure 1: Customer satisfaction model (Source: Anderson, Fornell and Lehmann, 1994)

satisfaction is also influenced by factors that are not controlled by the service provider (Oliver, 1997; Rust and Oliver, 1994).

Satisfaction as defined by Anderson, Fornell and Lehmann (1994) relies on the theory of expectancy (dis)confirmation. According to this theory, satisfaction is the customer's after-sale valuation of the received quality or value of a certain product or service compared to the expected quality or value. Figure 1 shows a simple model of satisfaction with key factors and their causal relationships.

According to this model, satisfaction is the result of the customer's previous and current experiences, which affect expectations or standards. Expectations are an individual's feelings about the possibility of something happening (Lewis, 1995) or an opinion about service performance, which serve as an assessment standard for the performance (Zeithaml and Bitner, 2003). The customer of the services then knowingly or unknowingly compares to these expectations or standards the user's experience with the quality or performance of a product or service. This means that when expectations are low even relatively low service quality can lead to satisfaction, but of course the opposite holds true as well. When customers have very high expectations, it is difficult to achieve total satisfaction even with service of a relatively high quality. Every time service providers exceed customers' expectations, which is a requirement for true satisfaction, they are raising the bar for expectations and quality standards to be achieved in the future (Zeithaml and Bitner, 2003).

The above discussion suggests that customer satisfaction is inherently a somewhat elusive construct, for several separate but related reasons:

- The construct has both cognitive and emotional components;
- its meaning has a relativistic aspect (i.e. people may have different psychological benchmarks in mind against which they compare their level of satisfaction or judgment of quality);
- and people's responses to satisfaction surveys depend on the time frame to which they, and not the survey, are referring (Ograjenšek and Gal, 2012).

It is important to note that while the research literature tries to distinguish between customer satisfaction and perceived service quality, in practice many service organizations do not: When designing customer satisfaction surveys, they often mix dimensions of these two constructs (Ograjenšek and Gal, 2012).

1.2 Measuring perceived service quality and customer satisfaction

Seminal work regarding the conceptualization of these two concepts, and the resulting suggestions for measuring them, was done in the USA by Parasuraman et al. (1985, 1988, 1991, 1994) and in Europe by Grönroos (1990, 2000). The most important results of these studies can be summarized as a recommendation for the use of the so-called gap model and a recommendation regarding the dimension of services that are

important for customers and therefore need to be included in the measurement (Ograjenšek and Gal, 2012).

The gap model, in accordance with the definition of both constructs, measures the perceived service quality and customer satisfaction as a "gap", that is the difference between expectations (what I want) and the perception (what I get). If the perceived exceeds the expected, the perceived service quality is higher and satisfaction is achieved. If, on the other hand, expectations exceed the perceived, the gap model anticipates a (too) low perceived service quality or dissatisfaction. A more thorough presentation of the gap model is described by Zeithaml and Bitner (2003).

As far as the service dimensions that are worth including in the measurement of service quality and consumer satisfaction are concerned, a very useful starting point is the SERVQUAL model (Zeithaml et al., 1990). This is a widely used and thoroughly researched model for the measurement of perceived service quality. It includes the following five key dimensions:

- **Tangibles:** The conditions or appearance of physical facilities, equipment and personnel.
- **Reliability:** The ability to perform the promised service dependably and accurately.
- **Responsiveness:** Willingness to help customers and provide prompt service.
- **Assurance:** Knowledge and courtesy of employees as well as their ability to convey trust and confidence.
- **Empathy:** Individual care and a sense of attention to personal needs that a company provides its individual customers with

The first two dimensions deal with the appearance and the effectiveness of the organization as a whole, while the last three have a pronounced personal component, because they reflect the behaviour and attitude of individual employees in the organization. Zeithaml et al. (1990) report that while all dimensions are important, the reliability dimension is of special importance for customers.

Based on this, Parasuraman et al. (1985, 1988, 1991 and 1994) devised the SERVQUAL questionnaire. The questionnaire includes two sets of 22 questions about individual service attributes, covering the above-mentioned five dimensions. One series of questions relates to expectations, while the other relates to perceptions of individual service dimensions.

Apart from the SERVQUAL concept, there also exist other means of service quality conceptualization. Widely known is the Grönroos concept (Grönroos, 1984), which distinguishes between three components of service quality - technical, functional and reputational quality. Technical quality represents the outcome of the service encounter (what), while functional quality reflects the process of service delivery (how). Reputational quality is a reflection of the corporate image of the service organization. An example of technical quality in the context of passenger car servicing would be a correctly performed service or repaired malfunction on the vehicle, while an example of functional quality would be the friendliness of service personnel and adherence to agreed deadlines.

Similarly, Lehtinen and Lehtinen (1982) also derive from three components of service quality - interactive, physical and corporate quality, while Hedvall and Paltschik (1989) on the other hand identify two dimensions – willingness and ability to serve, and physical and psychological access.

In assessment of consumer satisfaction, it is important that the assessment is not a single event, but that it is a part of a satisfaction measurement programme. It is unlikely that a company will derive much useful information from a single survey, even if it is very well planned and conceptually sound (Hayes, 2008). Only with regular surveys it is possible to monitor customer satisfaction levels and detect trends. However, this of course necessitates a series of comparable surveys, planned in advance.

An important additional piece of information for companies is also the comparison of satisfaction levels with the competition. To achieve this, companies often also include customers of the competition in their surveys. An additional possibility is the cooperation in annual comparative satisfaction analyses, for example the American Customer Satisfaction Index ACSI (Anderson and Fornell, 2000; Matzler et al., 2004), the Swedish Customer Satisfaction Index SCSi (Anderson et al., 1994) or the Chinese Customer Satisfaction Index CCSi (Dong et al., 2011).

Most of the big and medium-sized companies regularly monitor customer satisfaction (Eklöf et al., 1999). Every year, more and more organizations from Slovenia and the wider region are becoming aware of the importance of customer satisfaction and a regular monitoring thereof, and this topic has also risen to prominence in Slovenian academic research circles (Gaber et al., 2008; Jesenko et al., 2009; Ograjenšek and Žabkar, 2010; Litrop and Piskar, 2011; and Čočkaló et al., 2011).

Companies have at their disposal a wide array of methods and tools for measuring customer satisfaction. The choice is of course influenced by the costs of the survey. These costs have to be proportional to the value of acquired data for the company.

Customer satisfaction surveys are also performed regularly in the context of passenger car service, however the method of customer satisfaction measuring is usually prescribed by the vehicle manufacturer.

When measuring customer satisfaction it is important to distinguish between simple and complex dimensions of satisfaction (Johnson and Gustafsson, 2000).

Simple dimensions of customer satisfaction represent basic elements that constitute satisfaction. Simple dimensions of satisfaction in the context of passenger car servicing are for example personnel friendliness, workshop tidiness, explanation of the service work performed or the availability of replacement vehicles. It is characteristic of simple dimensions

that they can be influenced directly and they are relatively simple to directly measure through questionnaires.

Complex dimensions of customer satisfaction are combined from two or more simple dimensions. For example, the complex dimension of “personalized assistance” consists of the simple dimensions “availability of service over telephone”, “inspection of vehicle with a mechanic”, “explanation of work done and service bill”, “friendliness of service personnel” and “responsiveness of personnel to customer’s concerns and wishes”.

Complex dimensions cannot be measured and influenced directly, but indirectly through simple dimensions (Johnson and Gustafsson, 2000).

If we wish to influence overall customer satisfaction, we need to ask ourselves which dimensions are the most important to the customers and which of them influence overall satisfaction the most. According to the influence on overall satisfaction, we distinguish two types of simple dimensions - basic factors (dissatisfiers) and excitement factors (satisfiers) (Anderson and Mittal, 2000). It is characteristic of basic factors that they are a sort of minimum standard, something the customer expects and feels should be self-evident. Alone the fact that the minimum standard is achieved does not necessarily mean that the customer will be satisfied with the overall service. That is why further improvements of satisfaction with basic factors do not contribute considerably to overall satisfaction. Basic factors have a much greater influence on overall satisfaction in a negative way, because customers react with dissatisfaction to service that is below minimum standards. Contrary to basic factors, excitement factors denote something above standard, superior and unexpected. The bare absence of excitement factors therefore does not significantly contribute to lower overall satisfaction, but on the other hand, high levels of satisfaction with excitement factors may very significantly improve overall satisfaction.

1.3 The influence of customer satisfaction on profitability of companies

In an economic sense, customer satisfaction is important mostly because of its indirect influence on profitability of companies. On a theoretical level, the connection between customer satisfaction and financial results of companies is rationalized by the profit service chain, as shown in Figure 2 (Anderson and Mittal, 2000). The concept of the service profit chain envisages that an increase in the quality of individual service attributes can lead to a greater customer satisfaction, which in turn leads to better financial results through increased customer loyalty.

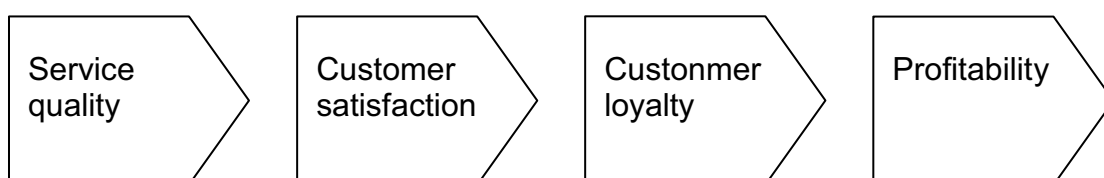


Figure 2: Service profit chain (Anderson and Mittal, 2000)

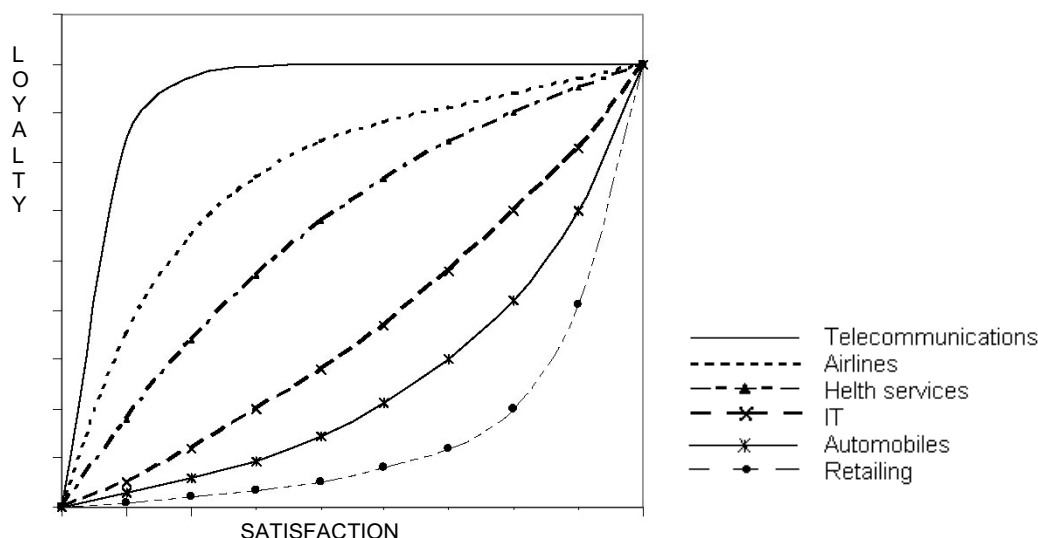


Figure 3: Relationship between satisfaction and loyalty in various industries (Bateson and Hoffman, 1999)

Customer loyalty plays a crucial role in the service profit chain. Customer loyalty is inseparably connected with satisfaction, but the connection is not symmetrical. Satisfaction is a necessary requirement for loyalty; however, satisfaction alone is not enough. Without satisfied customers, a company can hardly count on their loyalty, but loyalty is also influenced by other factors, including some that the company has no direct influence on. Customer satisfaction is only one of the factors influencing loyalty, finds Oliver (1996).

The link between satisfaction and customer loyalty is usually a continuous increasing function, but its shape is very much different for different industries, as shown in Figure 4. The connection between satisfaction and loyalty is influenced predominantly by factors that ease or hinder the switching between service providers (Bateson and Hoffman, 1999):

- Level of competition (stronger competition makes service provider switching easier);
- entry and exit barriers (for example knowledge, strong trademarks, high entry investment and similar make it more difficult to switch service providers);
- information, necessary for buyer decision making or use of products and services (this also makes it service provider switching more difficult, because gained experience and specific knowledge are tied to the existing provider).

Customer satisfaction usually has a greater influence on satisfaction in sectors with a higher level of competition and in segments where price is the key factor in buyer decisions; it has a smaller influence on satisfaction in higher-priced segments, where established trademarks play a more important role (Kristensen, Martensen and Gronholdt, 1999).

Customer satisfaction, however, does not influence profitability only through customer loyalty (Anderson and Mittal, 2000). Increased customer satisfaction also lowers costs related to poor quality products or services, for example costs of

warranty claims, product replacement, additional repairs and customer complaint processing. References from satisfied and loyal customers also lower the costs of new customer acquisition and improve the overall image of the company.

Anderson and Sullivan (1993) proved that higher customer satisfaction lowers the price elasticity and at the same time lowers the possibility of customer defection even in case of poor quality service.

The link between increased customer satisfaction and improved company profitability has been proven by many studies. In an analysis of scientific literature from this field, Eklöf, Hackl and Westlund (1999) found that all analysed articles defend the positive influence of a higher customer satisfaction on (long-term) commercial success. More recent studies (Mittal et al., 2005; Hart, 2007) have come to similar conclusions.

Because cars are durable goods with a long service life that need regular servicing to insure a faultless operation, the quality of vehicle repair and maintenance services strongly influences overall customer satisfaction with a car. Service quality does not only significantly improve the lifetime of a vehicle but also contributes to safety.

From the standpoint of profitability of car dealerships, the after-sales segment is becoming more and more important. The competition in the field of new car retail is getting stronger, which has also been confirmed by the European Commission in the Motor Vehicle Block Exemption Regulation (<http://eur-lex.europa.eu>)¹. The economic crisis has exerted additional pressure upon prices in the past years. The percentage of “hot deals” with minimal profit margins in the sale of new vehicles is growing, while at the same time the promotion of such deals and discounts has increased, which of course raises the expectations of customers regarding sales discounts in the long term. A higher mobility of new car buyers is also evident,

1 Motor Vehicle Block Exemption Regulation European Parliament resolution of 6 May 2010 on the Motor Vehicle Block Exemption Regulation. Retrieved March 4, 2012, from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2011:081:0089:01:EN:HTML>

because they will often buy a car at a dealership that can be 100 or 200 km away from where they live. On the other hand, customers are usually not prepared to drive such distances for vehicle repairs and maintenance, which has a somewhat restrictive effect on the competition intensity. Apart from that, due to price harmonization the hourly rates in the after-sales segment are steadily increasing in all new member states of the European Union. That is why, despite certain pressures upon the prices of spare parts, profits from sales have been shifting to after-sales for more than a decade. This makes after-sales services key for the commercial success of car dealership centres. Most vehicle manufacturers are well aware of this, so they are trying to improve the after-sales services of their sales and service network (Harris, 2002; Kohn, 2002).

2 Study methodology

The study is based on the results of a regular survey of customer satisfaction with vehicle maintenance and repair services in the sales and service networks of four European vehicle manufacturers in Slovenia in the years 2005 and 2006. The data for the survey were collected through computer-aided telephone interviews (CATI).

The survey involved 12.941 interviewed persons, customers of 42 service partners from all Slovenian regions.

The customer satisfaction questionnaire on maintenance and repair service consists of 50 questions, including four main questions:

- overall satisfaction with the service,
- willingness to recommend the service to friends,
- intention of visiting the same service provider again (repurchase intention),
- advantage of having decided for this service provider.

Furthermore, there were 46 questions about the individual aspects of the servicing process, including 17 questions about satisfaction with individual attributes of the service, followed by a question about buying a new car of the same brand and a question about buying a new car at the same car dealership.

The questionnaire also included two questions about the vehicle itself (production year and type of ownership) and two questions about the interviewee (sex and age). A 5-point scale was used, with grades from 1 (very satisfied) to 5 (very dissatisfied).

For our study, we used the data related to the main question about overall satisfaction with the service and the 17 questions related to satisfaction with individual attributes of the maintenance and repair service.

The structure of the pattern is shown in Table 1. The predominant amount of interviewees was male (75.2%), reflecting the actual structure of the customers of the service centre. The majority of customers (67.3%) were aged between 30 and 60 years. Most of the serviced vehicles fell between the A0-segment and B-segment, while the number of the smallest vehicles from the A00-segment and bigger and more expensive vehicles from segments C and D was considerably smaller. Slightly over half of the vehicles (52.6%) were owned by individuals, while the remainder were owned by companies.

Table 1: Pattern structure

Pattern structure		Share in %
Age	up to 30	14.8
	31 - 40	20.9
	41 - 50	24.4
	51 - 60	22.0
	over 60	17.9
Sex	male	75.2
	female	24.8
Vehicle segment	A00	1.0
	A0	23.0
	A	48.0
	B	18.0
	C	4.8
	D	0.1
Type of ownership	individuals	52.6
	companies	47.4

2.2 Hypotheses and statistical methods

Based on these theoretical starting points and considering the goal of the study, we have proposed two hypotheses:

Hypothesis 1:

The negative and positive evaluation of satisfaction with individual attributes of service influence overall satisfaction asymmetrically.

Hypothesis 2:

The relationship between satisfaction with individual attributes of service and overall satisfaction is nonlinear.

Using the model proposed by Anderson and Sullivan (1993), which was slightly modified by Mittal et al. (1998), we tested the asymmetry and nonlinearity of the link between the satisfaction with individual attributes of the service and overall satisfaction with the following regression model:

$$\text{Overall satisfaction} = \text{constant} + \beta_1 \times \text{LN_ELM} + \beta_2 \times \text{LP_ELM}$$

Attribute-level performance is represented by the variable ELM, which is divided into the positive P_ELM and the negative N_ELM. The letter L in the name signifies the natural algorithm. LN_ELM therefore represents the natural algorithm of negative values of satisfaction (dissatisfaction) with individual attributes of the service process, while LP_ELM represents the natural algorithm of the positive values of satisfaction. The natural logarithm represents the nonlinearity of the link with overall satisfaction, that is, the diminishing influence of satisfaction with an individual attribute on overall satisfaction.

For each of the attributes of the service process we performed a linear regression analysis with overall satisfaction serving as the dependant variable, and LN_ELM and LP_ELM (for this attribute) serving as an independent variable. In

this way, we have been able to get two regression coefficients (β_1 and β_2) for each attribute. Based on these regression coefficients we can ascertain the following facts (Anderson and Sullivan, 1993; Mittal et al., 1998):

- The higher the absolute value of a coefficient, the greater the influence of an individual attribute on overall satisfaction.
- The positive or negative sign before a coefficient shows whether the influence of an individual attribute on overall satisfaction is positive or negative.
- Overall satisfaction is marked by grades from 1 to 5, with 1 signifying the greatest satisfaction. That is why the coefficient for LN_ELM should normally be positive (dissatisfaction with an individual attribute lowers overall satisfaction), and negative for LP_ELM (satisfaction with an individual attribute contributes to overall satisfaction).
- In the case of asymmetric influence on overall satisfaction, coefficients β_1 and β_2 will be different.
- Satisfaction values will be subject to transformation with the help of the natural logarithm. Therefore, it is considered that the values of coefficients that are statistically significantly different from zero show a nonlinear connection between the satisfaction with an individual attribute and overall satisfaction.

In order to perform the above-mentioned analysis we needed to transform values from the questionnaire about customer satisfaction with sales and service, which was performed in the following way:

Values from 1 to 5 were divided into positive values (1 and 2), negative values (4 and 5) and a neutral value of 3. We assigned a value of 4 to the most positive and the most negative value, a value of 2 to both less positive and negative values, and a value of 0 to the neutral value. Following that, we calculated the natural logarithm for these values. The transformation process can be seen in Table 2.

Table 2: Transformation of values from the questionnaire about customer satisfaction

ELM	P_ELM	N_ELM	LP_ELM	LN_ELM
1	4	0	1.386294	0
2	2	0	0.693147	0
3	0	0	0	0
4	0	2	0	0.693147
5	0	4	0	1.386294

Hypothesis 1 (The negative and positive evaluation of satisfaction with individual attributes of service influence overall satisfaction asymmetrically) was tested with the comparison of beta coefficients for positive and negative values. When absolute values of β_1 and β_2 are different, the hypothesis is proven.

Hypothesis 2 (The relationship between satisfaction with individual attributes of service and overall satisfaction is nonlinear) was tested with the comparison of the ratio of explained variance between the linear and logarithmic model.

Limitations of the method used

The biggest limitation of the used method is the use of a 5-point scale. The effect of nonlinearity with logarithmic transformation would be more pronounced with the use of a 10-point scale.

Furthermore, relatively old data were used (for years 2005 and 2006). Because our study explores the nature of the relation between satisfaction with an individual attribute of service and overall satisfaction, which should remain constant through years, this should not influence the usability of the results. We will test the hypothesis that the functional form of the above-mentioned relation is temporally stable with a repeat study using results gathered in Slovenia in 2011.

Another limiting factor is the fact that only repair and maintenance centres of certain brands of passenger cars were included in the survey. Despite that, it should be noted that the combined number of registered vehicles of these brands in Slovenia represents more than 20% of the market share (Source: Ministry of the Interior, 2011)². The survey also covered a wide array of car types from all price ranges. In the next phase an expansion of the study into other European countries is planned, which would enable a comparison between different countries and possibly also lead to a generalization of the results regarding the servicing of motor vehicles in Europe.

3 Results

Table 3 shows the results of the calculations for each of the attributes of the repair and maintenance service. The first paired row shows the values of coefficients β_1 (influence of dissatisfaction on overall satisfaction) in β_2 (influence of satisfaction on overall satisfaction). The next paired row shows R^2 for the logarithmically transformed model and then R^2 for the linear model. The last row presents the comparison of both models. Shown is the model that performs better as per the explained variance criterion. For this study we proposed that the model with R^2 greater for at least 0.015 is better.

For example, in the case of "explanation of necessary service work" R^2 of the logarithmic model was 0.351 and R^2 of the linear model was 0.279. The linear model in this case is linear regression, which includes satisfaction and dissatisfaction with the explanation of necessary service work as independent variables, and overall satisfaction as an independent variable.

The logarithmically transformed model is also a linear regression of overall satisfaction with service as an independent variable, but here logarithmically transformed values are

2 Ministry of the Interior. 2011. Registered vehicles status on 31 December 2011, Retrieved January 26, 2012, from http://www.mnz.gov.si/si/mnz_zavaz/evidence_vozil/

Table 3: Results of linear regression in the context of the linear and the logarithmically transformed model

	Negative β_1	Positive β_2	Logarithm. model R^2	Linear model R^2	Compa rison
reachability of dealership by phone	0,118	-0,382	0,176	0,176	equal
flexibility of time of service	0,187	-0,387	0,204	0,188	log
explanation of work to be done	0,361	-0,411	0,351	0,279	log
correctness of repair work	0,276	-0,440	0,315	0,378	lin
minor repairs without appointment	0,274	-0,413	0,300	0,299	equal
quality-price-ratio of service	0,164	-0,386	0,188	0,250	lin
possibility of a replacement car	0,299	-0,356	0,246	0,165	log
duration of repairs	0,200	-0,414	0,235	0,249	equal
flexibility of time for picking up a car after service	0,173	-0,427	0,239	0,240	equal
waiting time after service	0,153	-0,427	0,220	0,223	equal
cleanliness of vehicle after service	0,168	-0,399	0,200	0,176	log
explanation of invoice and work done	0,172	-0,425	0,221	0,213	equal
friendliness of service personnel	0,292	-0,423	0,313	0,262	log
technical ability of service personnel	0,268	-0,449	0,318	0,317	equal
service personnel listened to customer's wishes	0,121	-0,480	0,255	0,300	lin
visual impression of a dealership	0,100	-0,405	0,181	0,180	equal
opening hours	0,103	-0,384	0,162	0,152	log

used with independent variables (satisfaction and dissatisfaction with the explanation of necessary service work).

Since R^2 of the logarithmically transformed model is greater by more than 0.015 from R^2 of the linear model, we assume for the purpose of this study that the logarithmically transformed model is more adequate for the illustration of the influence of satisfaction with the explanation of necessary service work on overall satisfaction.

The logarithmically transformed model proved more suitable in five more attributes of service ("consideration of customer's wishes about the time of service", "possibility of a replacement car", "cleanliness of vehicle after service", "friendliness of service personnel", "opening hours"). For three attributes of service ("fair service", "quality-price-ratio of service work", "service personnel listened to customer's wishes") the linear model proved more suitable, while in the remaining 8 attributes of service there were no significant differences between both models.

Absolute values of the coefficients β_1 and β_2 differ in all attributes of the maintenance and repair service. Hypothesis 1 (The negative and positive evaluation of satisfaction with individual attributes of service influence overall satisfaction asymmetrically) is therefore confirmed for all attributes of the maintenance and repair service.

In the end, we also compared the results on the level of the whole model (Table 4). We compared the logarithmically transformed and the linear models including all independent

variables at the same time. The comparison does not show any significant differences between the models, because R^2 of the logarithmically transformed model is less than 0.015 higher than R^2 of the linear model.

4 Discussion

The results of the study confirm the hypothesis that both negative and positive evaluation of satisfaction with an individual attribute of the service influence overall satisfaction asymmetrically, however the shape of the asymmetry is surprising. Previous (Mittal et al., 1998; Chueng and Lee, 2009) showed a bigger influence of dissatisfaction with individual attributes of service on overall satisfaction, while our study in the context of vehicle servicing of passenger cars and light commercial vehicles shows just the opposite: In all attributes of maintenance and repair services satisfaction has a greater influence on overall satisfaction than dissatisfaction.

One of the possible explanations for such results is that the service quality in the studied service and sales network is still relatively high. That is why the values of satisfaction are relative and the values of "dissatisfied" and "less satisfied" in reality reflect less satisfaction rather than true dissatisfaction. This is also hinted at indirectly by the distribution of answers: More than half of interviewees (56.4%) were satisfied or very satisfied, while the combined percentage of less satisfied and

Table 4: Comparison of R^2 between the logarithmically transformed and linear models for the whole model

Comparison of models	Logarithmically transformed model (R^2)	Linear model (R^2)
Whole model	0,485	0,474

dissatisfied interviewees amounted to only 6.4%. We assume that seriously substandard service work or appalling customer service would have a much more pronounced effect on overall satisfaction than satisfaction in this context. It is however also possible that the different shape of asymmetry is due to the differences in industries, so we suggest additional studies in this field.

The results of the testing of Hypothesis 2 are somewhat less convincing and uniform. The results show that there are considerable differences between the individual attributes of service. The comparison of the ratio of explained variance between the logarithmically transformed and linear model shows that the logarithmically transformed model is more adequate for six attributes of the service. The linear model performs better for three attributes, which means that Hypothesis 2 is not confirmed for these attributes. For eight attributes, there are no significant differences between both models. For a majority of the attributes of maintenance and repair services the logarithmically transformed model is at least as adequate as the linear model (for some it is even better), but on the level of the whole model there are no differences between them.

Mittal et al. (1998) reached the same conclusions when they used data on the satisfaction with physical characteristics of vehicles, while a study on the satisfaction with a web portal from Hong Kong (Chung and Lee, 2009) showed somewhat better results using the logarithmically transformed model.

It is possible that general types of satisfaction determinants exist, for which a linear link is true, and also types of satisfaction determinants that exhibit a nonlinear link with overall satisfaction. We suggest that further research in this field try to establish a new typology of satisfaction determinants (attributes), taking into account the different influence of determinants on overall satisfaction and increasing efficiency of measures for improving service quality and customer satisfaction.

Service centres need to offer such service quality that will entice customers to return. This is the only way to guarantee long-term loyalty. The link between satisfaction with a maintenance and repair service and loyalty can be seen nicely also from the analysis of answers to the questionnaire that were used in the study. We have performed a correlation analysis between the satisfaction with the service, intended loyalty to the service centre for vehicle servicing, intended recommendation of the service centre to friends and acquaintances, intended loyalty to the brand when buying a new car and intended buying of a new car at the service centre. The results are displayed in Table 5. All correlations are statistically significant at the level 0.01.

The results show a moderate correlation between the satisfaction with maintenance and repair services and intended loyalty to service centre for further vehicle servicing (0.528), and an even higher correlation between satisfaction with maintenance and repair services and intended recommendation to friends and acquaintances (0.616). Apart from satisfaction, the decision to continue servicing one's vehicle at a particular service centre (repurchase intention) is influenced by many other factors, such as lack of alternative, while we only usually recommend a provider we are really satisfied with. The results are consistent with the findings of studies on influence of switching barriers on the ratio between customer satisfaction and intended repurchase and willingness to recommend a provider (Vázquez-Casielles et al., 2009) and hint at the presence of negative switching barriers.

Satisfaction with service is also connected to brand satisfaction and loyalty when buying a new car, as confirmed by some prior studies (Bonicalzi, 2004, and Lanza, 2008).

The calculated correlation coefficient between satisfaction with maintenance and repair services and intended purchase of new vehicle of the same brand is 0.205. The correlation coefficient between satisfaction with maintenance and

Table 5: Correlation between satisfaction with service and loyalty in the context of vehicle servicing and new vehicle sales (Pearson coefficients)

	satisfaction with the service	intended loyalty to the service centre	intended recommendation	intended brand loyalty	intended buying of a new car at the service centre
satisfaction with the service	1.000	0.528	0.616	0.205	0.406
intended loyalty to the service centre	0.528	1.000	0.699	0.208	0.499
intended recommendation	0.616	0.699	1.000	0.226	0.496
intended brand loyalty	0.205	0.208	0.226	1.000	0.312
intended buying of a new car at the service centre	0.406	0.499	0.496	0.312	1.000

repair services and intended purchase of new vehicle at the same service centre is 0.406.

The results of the study show that it would be - contrary to general recommendations in the industry of passenger car servicing - wiser to care about improving satisfaction rather than preventing dissatisfaction. The results also show that investments in customer satisfaction should be done selectively and after careful consideration. The diminishing returns of increasing satisfaction with individual attributes of maintenance and repair services on overall satisfaction means that higher and higher investment into further improvement of customer satisfaction is less and less effective. There is probably an upper limit as to where investment into customer satisfaction is still viable, as thoughtless investment into satisfaction improvement does not automatically produce desired financial results.

Results also show that care must be taken in business process remodelling based on linear understanding of the importance of individual attributes of service on overall satisfaction. If we only focus on attributes of satisfaction that currently have the greatest influence, it could happen that a change in the processes would lower the satisfaction with a "less important" attribute, which would in turn suddenly make it important. That is why it seems wise to be careful in the remodelling of processes, so that other, currently less important attributes are not neglected. When it is possible to increase satisfaction with "important" attributes purely by sacrificing satisfaction with "less important" attributes, it is advisable to re-examine the importance of individual attributes after the process remodelling is completed.

Based on our results that diverge in certain segments from the results of prior studies from abroad and other industries, we propose further research in this field in order to gain more insight into differences between different industries.

5 Conclusion

In this paper, we have researched the relation between customer satisfaction and individual attributes of the repair and maintenance services of passenger cars in Slovenia. The analysis was performed on data from almost 13,000 questionnaires from a survey on customer satisfaction in the sales-service network of four European car manufacturers. The questionnaires used, apart from the question about overall satisfaction with service, also include questions about satisfaction with individual attributes of the repair and maintenance services, which allow us to react to this data and think about necessary changes and improvements. In order to effectively increase overall satisfaction by changing individual attributes of the service, it is imperative to understand how changes in satisfaction with individual attributes influence overall satisfaction.

Increased customer satisfaction also guarantees long-term commercial success of a business through customer loyalty. And that is why we measure customer satisfaction - to gain insight into the satisfaction of our customers, their needs, wishes, etc.

Because the link between satisfaction with individual attributes and overall satisfaction is not necessarily linear and

symmetrical, we have tried to determine the nature of this link based on the survey from the years 2005 and 2006.

The results have shown that the link between satisfaction with individual attributes of the service and overall satisfaction with the service is nonlinear and asymmetric.

The results thus show that the impact of satisfaction with individual attributes of service on overall satisfaction is asymmetric and that overall satisfaction is more strongly influenced by positive than negative values of satisfaction in the context of passenger car servicing in Slovenia. Linear regression of individual attributes of satisfaction with overall satisfaction as the independent variable has for all attributes shown higher values of the beta coefficient for positive values than for negative values. The difference between beta coefficients ranged from 0.05 to 0.36, with an average of 0.21.

As far as the nonlinearity of the link between satisfaction with individual attributes of service and overall satisfaction is concerned, the results are less uniform. The results show that the logarithmically transformed model (representing the nonlinearity of the link) describes the influence of individual attributes on overall satisfaction as well if not better than the linear model in most cases. However, on the level of the whole model there are no significant differences between the models in the ratio of explained variance, since R^2 for the linear model has a value of 0.747, while R^2 for the logarithmically transformed model has a value of 0.485.

6 Literature

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Asimetrični in nelinearni vpliv determinant zadovoljstva na skupno zadovoljstvo strank na primeru dejavnosti servisiranja vozil štirih evropskih znamk avtomobilov v Sloveniji

V raziskavi je bila na podlagi rezultatov rednega merjenja zadovoljstva strank s servisnimi storitvami v trgovski in servisni mreži štirih evropskih avtomobilskih znamk v Sloveniji v letih 2005 in 2006 s pomočjo 12.941 računalniško podprtih telefonskih intervjujev izvedena analiza nelinearnosti in asimetričnosti med zadovoljstvom s posameznim elementom storitve in zadovoljstvom s storitvijo v celoti.

Uporabljena je bila metoda, ki vključuje ločitev vrednosti zadovoljstva na zadovoljstvo in nezadovoljstvo, logaritmčno transformacijo posameznih vrednosti, izračun linearnih regresij ter primerjavo linearnega in logaritmčno transformiranega modela. Rezultati kažejo, da nezadovoljstvo vpliva drugače kot zadovoljstvo, ter da je vpliv zadovoljstva na zadovoljstvo s celokupno storitvijo večji od vpliva nezadovoljstva. Izkazalo se je tudi, da je za določene elemente servisne storitve predpostavka nelinearnosti povezave velja, vendar pa ne za vse.

Povzamemo lahko, da je pomembno natančno poznavanje povezave med zadovoljstvom strank s posameznimi elementi servisne storitve in zadovoljstvom s storitvijo v celoti. Rezultati kažejo, da je potrebna previdnost pri vrednotenju pomena posameznih dejavnikov za skupno zadovoljstvo, saj se pomen lahko z ravno zadovoljstva spreminja. Zdi se, da je bolj smiselno osredotočeno usmerjanje ukrepov na povečanje zadovoljstva kot v zmanjševanje nezadovoljstva. Rezultati prav tako kažejo, da je zaradi pojemačjega vpliva povečevanja zadovoljstva s posameznimi elementi storitve ob hkratnem naraščanju stroškov smiselna selektivnost pri investicijah v dejavnosti za dvig zadovoljstva strank, če je to zadovoljstvo že na relativno visokem nivoju.

Ključne besede: kakovost storitev, zadovoljstvo strank, avtomobilska panoga, asimetričnost, nelinearnost

Usage of Information and Communication Technology in Micro Enterprises in the Last Decade

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The paper presents the comparison of Information and Communication Technology (ICT) usage in Slovenian micro enterprises, using data derived from two studies carried out in years 1999 and 2009. Data for the studies were collected via structured interviews with owners or top managers of micro enterprises. We compared hardware and software equipment, business properties, characteristics of the interviewees and their impact on the successful use of ICT. The results show considerable changes in the ICT equipment, but that does not reflect in a better use of software compared to a decade ago. Key factors of successful use of ICT remain the same. The investment in ICT depends on owners' decisions and the most important factors are the owners' formal education and their skills and knowledge in ICT field. It was indicated that in recent years the investment of education in ICT field for both groups, owners and employees, was considerable lowered.

Keywords: Micro enterprises, Information and Communication Technology, Research

1 Introduction

There is no doubt that micro businesses play an important role in modern economy, especially in times of recession, when we can daily see collapsing of large firms that are not able to cope with changed market conditions. In our first study in 1999 we were focusing on small enterprises. Instead of that we got sample mostly with micro enterprises. We cannot generalize that micro enterprise characteristics are similar to small or medium size enterprises. There are not many researchers dealing with micro enterprises characteristics and that is why we are interested in them. The European Union also recognized micro business importance. On 6 May 2003 the Commission of the European Communities (2003) adopted Recommendation 2003/361/EC regarding the definition of micro, small and medium-sized enterprises (SME) in Community policies applied within the Community and the European Economic Area. Within the SME category, a micro enterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million (Neuberger and Rähke, 2009). Slovenia accepted this Recommendation as a Member State of EU.

According to the findings reported by Matek and Butalič (2009) in Slovenia there were 105.272 enterprises registered

in the Standard Classification of Activities (NACE - EU classification of activities) in 2007; 92.8% of them were micro enterprises, 5.7% were small enterprises and 1.5% were medium-sized and large enterprises. The overall share of individual private entrepreneurs was 58.1% and of limited liability companies 35.9%. Enterprises organized in other organizational forms represented only 6.0% of all enterprises. Despite the large difference in the number of enterprises between micro (1-9 total employees), small (10-49 total employees) and medium-sized enterprises (50-249), each of these three size classes generated around one fifth of total turnover. Among them, most persons were employed in micro enterprises (27.4%), followed by medium-sized (20.8%) and small enterprises (18.0%) (Matek and Butalič, 2007).

Based on the results from the investigation in 1999 (Zupančič and Werber, 2002), recent Slovenian statistical data and present legislation, we decided in 2009 to focus our attention on micro enterprises.

2 Background

Micro enterprises cannot be treated as downscaled versions of large companies (Rohde, 2004), due to differences in organization, management style, business practice and information

systems (IS). However, the available evidence on the size–efficiency relation seems to strongly indicate that there is a positive association between firm size and technical efficiency, and there are also substantial and persistent productivity differences between SMEs and large firms (Yang and Chen, 2009).

Micro enterprises are a major component of all economies and are generally considered to be flexible, adaptive organizations. The influence of micro enterprises in the entire economy is increasing. It is generally accepted that e-commerce contributes to the advancement of SME business in developing countries (Kapurubandara and Lawson, 2007). More people than ever are employed by micro enterprises and many more are starting their own businesses. Micro enterprises sometimes act as incubators for future economic giants. The role of small and medium-sized enterprises (SMEs) in economic development and economic growth for both developed and developing countries has been increasingly recognized (Yang and Chen, 2009).

The decision-making process is often more intuitive than based on reliable, precise and unambiguous information. In particular, innovative business ideas require people to make decisions based on very little evidence (Koellinger, 2008; Andersson and Florén, 2008). Small firms generally lag behind medium and large companies in adopting and implementing computerization (Lee et al. 2009; Jungwoo, 2004). This is due to severe constraints on financial resources, lack of in-house expertise, and a short-term management perspective imposed by a volatile competitive environment. Small, young and innovative firms tend to be opaque, because most potential lenders have little information on the managerial capabilities or investment opportunities of such firms. They benefit most from being monitored in a close house bank relationship (Neuberger and Rähke, 2009).

On the other hand, micro enterprises demonstrate a high level of ability to adapt to changes in the environment. They use IT for automation of existing processes, rather than for decision support, or to increase flexibility of the firm and gain competitive advantage. While large firms are typically capital and equipment intensive, labor-intensive micro enterprises may be able to increase productivity and provide value added services through increased computerization and digitization (Lee et al., 2009).

In the research (Burke et al., 2008) we can also find results that confirm personal characteristic of the owner (father) as important for die-hard entrepreneur. For men, inheritance encourages persistence, and facilitates initial self-employment. Having a self-employed father as a role model makes sons persist longer. Similarly, higher levels of education tend to be associated with entrepreneur persistence among both males and females. However, somewhat surprisingly, early experience of unemployment does not affect the probability of self-employment, while reducing persistence.

Slovenia started investing in ICT later than the leading developed countries, just as other new EU member states (NMS). A more dynamic push in ICT investment occurred in 1999, reflecting increased concerns associated with Millennium bug on one hand and the prospects of the introduction of value-added tax in second half of 1999. But while other NMS are increasing their ICT investments in recent years, Slovenia has not followed such dynamics. The share of investments in GDP

in Slovenia is lower than the average in EU 15, as well as lower than in most NMS. Trend performance of Slovenia regarding ICT expenditure in GDP during the period 2001–2004 was also negative (Bučar et al., 2006).

International communications technologies such as the World Wide Web have created an environment that presents advantages to individual firms (Jungwoo, 2004). The Internet is gaining commercial viability and is particularly suited to small businesses, because it enables them to keep doors open 24 hours a day, at minimal cost, to customers all over the world. With access to increasing markets throughout the world, businesses, including those in rural areas, have a unique opportunity to expand from the traditional and local to the global. Whether a firm trades online with customers or not, however, the Internet can give firms the advantage of increased profile, in that it can allow companies to present information to potential customers and provide another channel for the purposes of brand building, advertising, and marketing (Galloway, 2007; Davies et al, 2006).

We tried to determine how ICT was used in Slovenian micro businesses 10 years ago and nowadays. We also compare the factors that have an effect on micro businesses successful use of ICT and their income.

3 Research approach

After having reviewed the literature on small enterprises, a structured interview framework was developed to help address the research objectives.

Implementation and operation of IT in small enterprises was investigated by several authors (e. g. DeLone, 1988; Yap 1992; Verber and Zupančič, 1993; Winston and Dologite, 1999; Seyal et al. 2001; Hunter, 2001; Antlová, 2009, ...). These studies focused on issues related to IT, and considered success factors such as number of PCs, number of programs and/or software tools used by the company, number of users, history of use of IT in the company, security and safety, and computing knowledge and skills of managers and employees.

We expected that successful use of ICT (Chan et al., 2009; Wiklund et al. 2009...) will depend upon characteristic of business (Yang and Chen, 2009; Lee et al. 2009; Rodhe, 2004 ...), characteristics of the owner (Koellinger, 2008; Andersson and Florén; 2008; Jeon, 2006...) and use of Internet (Jungwoo, 2004; Galloway, 2007, ...).

Successful use of ICT was defined as the number of different groups of programs used in enterprises. Enterprises chose among ten groups of programs: sale, purchase, general ledger, salary (leave and illness), business specific programs (e.g. graphics, mechanical engineering, designing), general programs (e.g. text editors, tables and data editors), internet browsers, programming tools, decision support programs, and other types of programs (Zupančič and Werber, 2002). In 2009 successful use of ICT was also measured with the level of internet use (Werber and Žnidaršič, 2010).

Data for first study was collected via structured interviews with owners or top managers in 1999, and represents a sample of 94 businesses. Among them 15 business were defined as

small, because they employed more than 9 employees, therefore final sample has 79 enterprises.

Data for the second study was collected via structured interviews with owners or top managers of micro enterprises between October and December 2009. In total, 134 interviews were conducted.

Interviews took place at the headquarters of enterprises with owners or top managers. Several studies (e. g. Burke et al., 2008; Wiklund et al., 2009; Lee et al., 2009; Koellinger, 2008; Jeon, 2006) emphasized that this group plays a dominant role in decision-making in small enterprises. The duration of an interview was approximately half an hour. Mostly closed-response questions were asked in the interviews. Except for demographic data, respondents either rated statements on scale 1 to 5 or responded to multiple choice questions. During the interview the respondents were asked how previous experience would influence their new purchase of ICT and why, and about proposals for the improvement of use of ICT in small businesses.

The appropriate sample size was calculated with Cochran's sample size formula for continuous data (Bartlett et al., 2001):

$$n = \frac{(t \cdot s)^2}{d^2} = \frac{(1.96 \cdot 1.25)^2}{(5 \cdot 0.05)^2} = 96$$

where an estimate of standard s in the population was calculated as 5 (range of scale) divided by 4 (number of standard deviations that include 95% of possible values in range and is equal to 1.25 according to the 5-point scale. According to the value for selected alpha level of 0.05 t is 1.96 and acceptable margin of error for mean d was estimated as 0.25 (number of points on primary scale times acceptable margin of error). Because the calculated sample sizes do not exceed 5% of population, no correction of sample size is needed.

Sample sizes in comparable international studies are similar to our samples. Chuang et al. (2009) had a sample of 97 enterprises in study of the extent of information technology adoption in SMEs. 126 enterprises were used to measure ERP adoption of small and medium enterprises (Shiau et al., 2009). Gutierrez et al. (2009) used 104 surveys from enterprises around the world in order to find out factors affecting IT and business alignment. Ng & Keasey (2010) studied success and failure of small, closely held firms in Singapore with 45 interviews with board directors, senior and middle managers. Research study in case of Slovenian middle sized and large enterprises about innovations and lifelong learning has 67 complete responses (Žnidaršič & Jereb, 2011). Roblek and Zajec (2011) investigate 24 small family companies in order to establish important differences in success and in organizational culture between family companies in production and service sector in Slovenia. According to the above examples we think that our samples (79 micro enterprises for 1999 and 134 for 2009) used in the study are adequate for our purpose.

Based on this premise, we proposed the following null hypotheses:

H1: There are no differences among micro businesses according to their equipment with ICT in 1999 and 2009.

H2: There are no differences among the key factors of successful use of ICT among the studied micro businesses in 1999 and 2009.

4 Results

4.1 Characteristics of the enterprises in 1999 and 2009

Enterprises organized in other organizational forms represented only 4% of the sample. In the sample from 1999 the overall share of individual private entrepreneurs was 38% and limited liability companies 61%. Among 134 enterprises 44% were family owned. The largest share of enterprises in the research performed in 2009 came from service sector (28%), manufacturing (13.4%), construction (12.7%) and retail (10.4%). Others were from tourism (8.2%), repair and servicing (6.7%), agriculture (6.7%), wholesale (6.0%), transportation (4.5%) and other (2.7%). In 1999 our sample was also represented by micro enterprises from diverse industry sectors (Table 1.).

Table 1. Enterprise by industry sectors in 1999 and 2009

	1999	2009
Manufacturing	16.5%	13.4%
Agriculture	1.3%	6.7%
Tourism	6.3%	8.2%
Construction	5.1%	12.7%
Retail	26.6%	10.4%
Wholesale	15.2%	6.0%
Transportation	1.3%	4.5%
Service	20.3%	28.7%
Repair and servicing	3.8%	6.7%
Other	3.8%	2.7%

Table 2 presents a comparison of enterprise characteristics from our findings in 1999 and 2009. Respondents who supplied data came from a wide variety of business backgrounds and sizes.

Table 2. Enterprise characteristics in 1999 and 2009

Year of research	1999	2009
Sample	79	134
Individual private entrepreneurs	38.0%	56.0%
Limited liability companies	60.7%	40.0%
Joint stock companies	1.3%	0.0%
Other organizational forms	0.0%	4.0%
Average number of total employees	3.8	3.4
Average age of business	7.6	12.33
Average years of computer use	4.6	8.9
Owner IS related training in last three years (percent)	43.0%	28.0%
Owner IS related training in last three years (hours)	30.5	9.3
Employees IS related training in last three years (%)	40.5%	25.0%

Employees IS related training in last three years (hours)	18.5	9.9
Business as cooperation partner	27.8%	21.8%
Outsourced accounting and bookkeeping	67.1%	80.0%

In 2009 the overall share of individual private entrepreneurs was 56% and of limited liability companies 40%. The average number of employees in 1999 was 3.8, while the average number of total employees in 2009 was 3.4, including the owner of the enterprise. The average estimation (in 2009) of total number of employees three years ago was 3.2. From the data we can conclude that micro businesses on average employ more employees than three years ago despite the economic crises. We can confirm our results with the statistical data of employment in micro enterprises in 2008, 2009 and 2010 on the website of Statistical Office of Slovenia under the option "Enterprises by activities" (SI-STAT Data Portal, Economy), where the growth in number of employees among micro business is also evident. In 2008 there were 217874 persons employed in micro businesses. In 2010 the number increased from 226638 in 2009 to 227225. The average existence time of micro enterprises has increased from 7.6 in 1999 to 12.3 years in 2009, and average years of computer use increased from 4.6 (in 1999) to 8.9 years (in 2009) as well. There are evident differences in amount and time spent for IS related training of owner and employees. The number of owners and employees that attended some kind of IS related education in last three years decreased from 43% in 1999 to 28% in 2009 for owners and from 41% to 25% for employees. Similarly, a decrease of spent hours of IS related education is evident. In 1999 the average number of hours spent for owner's IS training in last three years was 30.5 hours, while in 2009 the number decreases to 9.3 hours. We can discuss what the reasons for such differences are. It is true that a decade ago Windows graphic system replaced all sign based computer programs and consequently the emergency for IS education was higher. On the other hand we are witnesses of new releases and novelties in software every year, so we can argue this view. Maybe it is more likely that recent crisis did have an effect on micro business financial capital, and because of that the investment in education was considerably lower.

A lot of big companies collapsed in recent years because of financial and stocks machinations. We detected a decrease of micro businesses that work as a cooperation partner. From 31.1% in 1999 the number of businesses functioning as a cooperation partner reduced to 21.8% in 2009. Of course we can assume that the number also depends on the sample selected in 2009. The majority of enterprises (80%) in 2009 outsourced accounting and bookkeeping to an external partner who specialized in selling accounting services to small companies. The share of such enterprises in 1999 was 70.4%.

4.2 Characteristics of the respondents

The majority of respondents in 2009 (76%) was owner of the business, 10% were executive directors, 7% owner relatives and 7% were other employees. There was a lower proportion

of owners (61%) in study from 1999 and a higher number of directors (20%). The age of most of them (45%) was between 31 and 45 years in 2009, while in 1999 the percentage of the same age group was 50.6%. In 2009 33.6% were between 46 and 55 years of age. The same group was in 1999 represented by 13%, so we can conclude that they became older. In 2009 only 2% were between 21 and 25, 9% between 26 and 30 years and 10% were older than 55 years. There were no owners younger than 21 years in both studies. There were 72% male and 28% female respondents in 2009, while in 1999 we had 20% of female respondents. Formal education (in 2009) in most cases was secondary school (50%), 12% vocational level, 11% higher, 23% graduate and 4% postgraduate. The majority of respondents (40%) self-estimated their computer knowledge (Figure 2) as neither good, neither bad. Twenty-one percent of respondents estimated their computer knowledge as poor and 10% as very poor. We can conclude that respondents estimate their computer knowledge as higher than it was in 1999. When we asked the respondents where they mostly get information for ICT purchase, they answered that they ask friends or relatives in 1999. In 2009 the answer was different, they would mostly ask an ICT seller or service personal. In second place they selected the option "I find the information myself" in both researches.

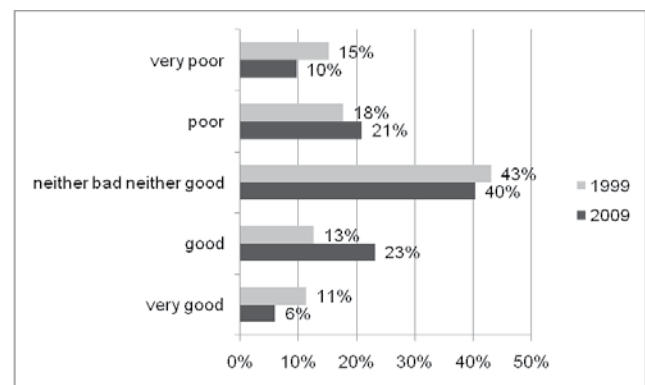


Figure 1: Respondents self-estimation of their computer knowledge

While we were talking with business owners several times, we could conclude that they are unaware of software they have on the computers. Many of them told us that they use PC for e-mail and internet search. Software was preinstalled when they purchased a PC. If we simplify, we can say that they do not care about computer business support, their primary thought is how to survive and earn enough money for the next day. We were especially disappointed while interviewing owners of newsstands that told us their employers forced them to self-employ as private entrepreneurs or to become unemployed. To lower the costs, large newspaper firms managers decided to separate newsstands from their business and consequently also the social payments for employees. On the other hand they dictate the subcontractors what and how to do. The use of ICT in such conditions is irrelevant.

Out of 134 micro-enterprises from the sample in 2009, 38 (28.4%) have expressed the interest in collaboration with our faculty in form of students work developing computer programs for their business support.

4.3 Computer use related issues

It is reasonable to expect that businesses make backup copies of their business data at one time or another. The question now was what type of backup media was used? The results are shown in *Figure 1*. Some businesses used two different backup procedures (backup on external HD and CD). Due to this, the percentage sum in *Figure 2* is greater than a hundred. It is obvious that the famous floppy discs mostly used for business data backup in 1999 (63%) were replaced with CDs and external Hard Drives (35%) in year 2009. In most cases (61%) CD, ZIP, other backup specialized tools were used for backup copies. In third place in both cases backup copies were made on a second hard drive, second computer or server (22% in 1999 and 20% in 2009). Recently also memory sticks are popular as business data backup store (10% in 2009). The most frightening results in 2009 came from the 3% total of businesses where no backup copies were made at all! Luckily the number is lower than in 1999 when 6% of businesses made no copies.

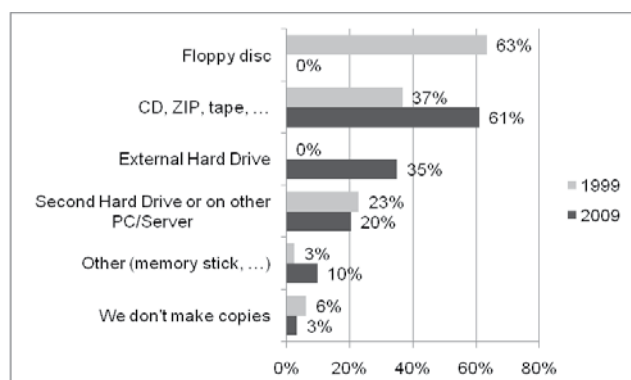


Figure 2: How micro businesses store backup copies of business data

Around forty-eight percent of businesses have not lost any business data yet in 2009 (Table 2). However, 24.1% did lose data at least once, 12.8% lost data twice and 15% three or more times. Data was similar, but smaller, also in year 1999. The main reason for the loss of business data is shown in Table 2. The sum of answers for year 1999 is not 100, because at that time correspondents were able to select different answers at once. However, in year 2009 we did not allow more than one answer. We can conclude that only SW errors were more often a reason for lost data in 1999. In all other possibilities the numbers are bigger in 2009. In 1999 the era of graphic interfaces started and we saw many new SW solutions that were not reliable. In that time also many new SW firms were formed that developed SW for small business support. In large enterprises they had their own computer centers and they developed SW for themselves. Cobol was one of most used computer languages for business support and then the problem of year 2000 raised. That was the time when Visual Basic and other languages with graphic supported interfaces began to replace Cobol. If we were used to robust and reliable operation of Cobol programs, now was the time we recognized the importance of reset button on PC. This could be why the number of SW errors as reason for business data loss in 1999 was higher than employee's mistakes.

If we consider that the number of ICT components was higher in 2009 and that the quality of ICT components is not as good as it was 10 years ago, it is reasonable to expect that there are also more HW failures. It is interesting to see that the number of virus related loss of business data is higher in 2009, although the number of antivirus software used increased. In 1999 only 60.7% of enterprises used antivirus protection. Ten years later ninety-three percent of enterprises used antivirus software. In average they invest 89.6€ per year for computer antivirus protection. On the other hand, 49% of micro businesses in 2009 used some kind of illegal software product (unlicensed, black copy). Alternatives for such businesses are free open source software solutions which are not yet widespread among micro businesses (Werber and Žnidaršič, 2010). The reason for that is unawareness of open software existence among micro business owners.

Employee mistake was listed as the second most important reason for business data lost in 2009. The comparison of average hours used in 2009 for IS related training in last three years (Table 1.) and the fact that almost every year there was a new version of software and computer system can be the reason why so many mistakes were made by employees. Only investments in education of employees can decrease this risk factor.

If almost every second business lost some business data at one time or another, how did they get it back? Results are shown in Table 3. In questionnaire from 1999 we did not offer the first possibility for restoring lost data "They did not (permanently lost)", that is why there is a slash in Table 3 instead of data. We can say "people do not learn others' mistakes". In *Figure 2* we can notice the prospect of business data backup systems from 1999 to 2009. On the other hand in Table 2 we can see that in general number of business data loss is higher than in 1999. At first we can think, of course, that they had more SW and the result is obvious. But when we compare the data in *Figure 3* we can notice that this is not true. The number of different SW for business support did not increase in year 2009, in many cases the number decreased or was similar. Only the number of general packages and Internet use was higher. We think the reason is in carelessness of micro business owners that did not change in recent years. Until they do not experience the problem of business data loss by themselves, they do not care about it.

Table 3. Businesses problems with lost data

Number of times businesses lost their business data	1999	2009
Never	58.2%	48.1%
Once	17.7%	24.1%
Twice	16.5%	12.8%
More than twice	7.6%	15.0%
Reason for the loss of business data*		
SW errors	12.7%	4.2%
Computer virus	6.3%	19.4%
Employee mistake	11.4%	37.5%
HW failure	22.8%	38.9%

Other (stealing of PC, bad floppy,...)	7.7%	0.0%
How enterprises retrieved the lost data		
They did not (permanently lost)	/	27.6%
They re-entered the lost data	36.8%	34.2%
They retrieved the data from the backup copy	63.2%	38.2%

4.4 Computer software

Most enterprises in the study from 2009 (95%) use some version of the Windows system (XP, Vista, NT). From various other operating systems, 5% of the enterprises use Linux. In 93% of all companies (Figure 3) general programs (word processor, spread sheets, databases...) were installed, but only a few of them used them to analyze data from the database or to prepare customized reports.

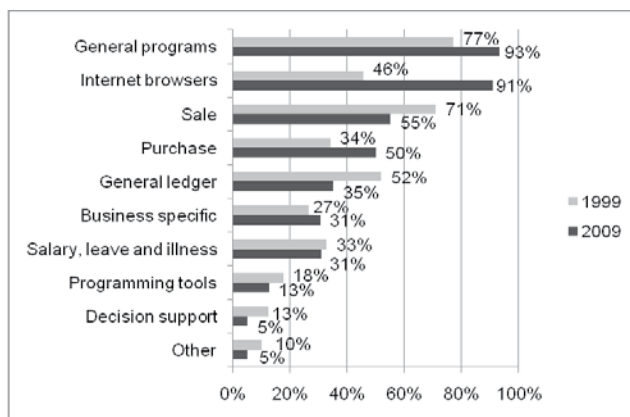


Figure 3: Type of software used by micro enterprises

These tools were mostly bought together with the computers, which may explain why they were not used much. Insufficient computer knowledge and skills of the owners/managers and employees may be a possible explanation for the non-use of software tools. Relatively low self-assessment of computer knowledge and skills, found in our study, supports this assumption. Only 12.7 % of businesses in 2009 used some type of package for application development (MS Access, Visual Basic ...), and 5% had applications for decision support.

The difference in amount of used sale SW between 1999 and 2009 is the result of different sample of micro enterprises. In 1999 the number of retail businesses was larger (27%) compared to 2009 (10%).

We also notice a difference in characteristics of used business software. In 1999 51% of business SW was made specifically for the business needs, while the percentage of such SW was only 29% in 2009. Similar in both samples (33% in 1999/34% in 2009) is the amount of business SW that roughly corresponds to their business needs and they can adjust it if they pay for adjustments. The rest of business SW is general and does not allow any adjustments (26%/37%).

4.5 Computer hardware

Table 4 presents the comparison of ICT equipment of studied micro enterprises between years 1999 and 2009. To test statistical significant differences t-test and χ^2 -test were conducted.

The average number of laptops per company was 2.3, desktops 1.3, workstations 0.2 and network server 0.4. If we sum up, all computer companies from our sample had 4.1 computers per organization (1.6 computers per one employee). In 1999 there were on average 3.6 computers per organization (1.1 PC per employee). Those differences in the number of all computers per employee are statistically significant at 5% significance level ($t=-2.495$, $p=0.013$). There are also significant differences in average number of workstations per enterprise ($t=3.322$, $p=0.001$) and per employee ($t=2.854$, $p=0.005$), where the average number of workstations declines from 1999 to 2009. The reason for the decline is in higher performances of PC and LT in the last years, so there is no need for any more purchasing of expensive high performance workstations mostly used for graphic and engineering industry. Thirty-five (35%) enterprises have local network, 38% used an UPS for emergency power supply in case of power failure, and 13% use a "bar-code" system for product identification in 2009. There is evident growth in the percent of enterprises that use opportunities of the Internet ($\chi^2=42.97$, $p=0.000$), online banking operations ($\chi^2=64.14$, $p=0.000$) and e-business in 2009 ($\chi^2=16.77$, $p=0.000$). On average, micro enterprises invest 1539 € per year in computer hardware or computer hardware services and 880 € in software or software licenses.

4.6 Results of hypothesis test

Based on the analysis of the results (Table 4) hypothesis H1 can be rejected, since statistically significant differences at 5% significance level in use of ICT are only greater in the number of workstations in enterprise and the number of workstations per employee from year 1999. All other compared ICT components are in 2009 presented in similar (not significantly different) or higher (significantly different) amount than in 1999.

Table 4 presents the factors that we studied in 1999 and 2009 in conjunction with the successful use of ICT and micro business success. To test the hypothesis, correlations, analysis of variance and t-test were conducted. Table 4 shows which factors have been confirmed and which not. Slash indicates that listed factor was not studied. Detailed statistical data are published in the publications of both authors with similar subjects from 2000 to 2011. Except where we have not dealt with the same factors in both studies results showed, that the factors of effective use of ICT and business success remain alike. The difference is at factor legal form of company where in 1999 there were no statistically significant differences in the number of programs used among enterprises with different form of organization, while in 2009 limited liability companies were using more programs than private entrepreneurs. Another difference is by factor outsourcing of accounting functions. There were no statistically significant differences in the number of programs used in 1999. The result was different when the entire (original) sample was used before we subtracted

Table 4: Equipment of businesses with ICT and its use

Used ICT and Software	1999	2009	t-test / χ^2 –test
Number of enterprises	79	134/133*	/
All computers – average on business	3.61	4.09	t=-0.940, p=0.348
All computers – average on employees	1.06	1.56	t=-2,495, p=0.013
Personal computer – average on business	2.51	2.31*	t=0.580, p=0.563
Personal computer – average on employees	0.76	0.78*	t=-0.301, p=0.764
Laptop (on business/ employees)	/	1.29* / 0.50*	/
Work station – average on business	0.68	0.15*	t=3.322, p=0.001
Work station – average on employees	0.19	0.06*	t=2.854, p=0.005
Network Server– average on business	0.47	0.41	t=0.414, p=0.679
Network Server- average on employees	0.09	0.12	t=-0.591, p=0.555
Internet connection	67.1%	97.7%	$\chi^2=42.97$, p=0.000
Local area network	40.5%	35.0%	$\chi^2=0.63$, p=0.426
Barcode reader	22.8%	12.7%	$\chi^2=3.69$, p=0.055
UPS (Uninterruptible power supply system)	31.6%	37.6%	$\chi^2=0.75$, p=0.386
Online banking operations	24.1%	80.2%	$\chi^2=64.14$, p=0.000
E-business	35.4%	64.8%	$\chi^2=16.77$, p=0.000
Selling on the Internet	8.9%	13.4%	$\chi^2=1.00$, p=0.317
Antivirus program	60.8%	93.2%	$\chi^2=33.82$, p=0.000
Use of illegal software	/	48.9%	/
DOS	13.8%	0.0%	/
WIN.(3.1 - 2000 or NT) in 1999; NT, XP, Vista in 2009	84%	14.9%, 78.4% 17.2%	/
Other (Linux, Nowell, Netware)	2.2%	6.0%	/

* excluded data of one business that was specialized in IS and IT training (40 PC and 20 LT).

only micro enterprises. Otherwise in 2009 the enterprises that have been outsourced accounting and bookkeeping were on average less successful in use of ICT. Owner's skills and knowledge from computer and information systems fields are important factor in successful use of ICT, while higher number of different programs used is in positive correlation with higher level of computer knowledge. Therefore we can accept hypothesis H2, because there are only a few differences between the studied factors.

5 Conclusion

Comparison of ICT usage and studied success factors of micro businesses success in time between 1999 and 2009 showed that businesses are better equipped with ICT than 10 years ago, but use less business computer programs. Perhaps the reason is in increased percentage (80%) of businesses that outsource accounting and bookkeeping services and so they do not need additional business programs. Instead of that,

most of them use general purpose programs like MS Office and Internet browsers.

If we are pleased that micro enterprises are on average equipped with 1.6 computers per employee, we are disappointed regarding the exploitation of its full potential. As concluded in Lee et al., (2009) our results show that it is imperative for micro enterprises to adopt computerization to achieve improvements in business performance. But is it enough?

As stated by Stevart et al.(2007) thousands of companies have implemented large and small IT investments in software applications, work process, business organization, supply chain management and customer relationship management. Even though technology investments have contributed significantly to output growth in the United States, profitability and productivity have not always emerged as a result of IT investments. We agree that when IT investments, such as new work systems, are coupled with organizational redesign and business process reengineering, these changes are more likely to yield substantial productivity improvements, since many of these changes are likely to lead to a competitive advantage.

Table 5: Analyzed factors of successful use of ICT with summary of tests performed

Factors	1999	2009
Owner IS related knowledge	YES Pearson correlation: $r=0.237^*$, $p=0.025$	YES Pearson correlation: $r=0.295^{**}$, $p=0.001$
Legal form of company (private entrepreneurs, limited liability company, other)	NO t-test: Means: 3.80 (pe), 4.44 (llc). $t=-1.566$, $p=0.112$	YES ANOVA: Means: 3.57(pe), 4.76 (llc), 3.8 (other). $F=9.684$, $p=0.000$
Number of employees	YES Pearson correlation: $r=0.253^*$, $p=0.035$	YES Pearson correlation: $r=0.327^{**}$, $p=0.000$
Number of ICT components	YES Pearson correlation: $r=0.301^{**}$, $p=0.007$	YES Pearson correlation: $r=0.292^{**}$, $p=0.001$
Use of Internet (7 levels from information searching to an internet based business)	YES Pearson correlation: $r=0.345^{**}$, $p=0.000$	YES Pearson correlation: $r=0.327^{**}$, $p=0.000$
Outsourced accounting and bookkeeping	NO t-test: Means: 4.12 (yes), 4.23 (no) $t=-0.099$, $p=0.921$	YES t-test: Means: 3.79 (yes), 5.23 (no) $t=-4.355$, $p=0.000$
Years of ICT use	NO Pearson correlation: $r=0.105$, $p=0.356$	YES Pearson correlation: $r=0.329^{**}$, $p=0.000$
Annual turnover	YES Pearson correlation: $r=0.327^{**}$, $p=0.000$	YES Pearson correlation: $r=0.358^{**}$, $p=0.000$

****.** Correlation is significant at the 0.01 level (2-tailed).

*****. Correlation is significant at the 0.05 level (2-tailed).

Similar to Wiklund et al. (2009) and Jungwoo (2004) our study showed that owners'/ managers' personal attitudes directly and/or indirectly influence business growth and success. Implementation and successful operation of computerized business is strongly related to characteristics of the owner/manager (formal education, gender, computer knowledge and skills). Micro enterprise owners/managers in general recognize and value IT, but they use it mainly to support daily operations of the business rather than to support decision-making (5%), and are mostly not aware of its strategic and organizational impact. Most of them also do not use end-user friendly PC based development tools, such as databases which are readily available to most companies participating in our study. Only a small portion of them (13%) use end-user friendly tools to support their business. This may also indicate the lack of computer knowledge and skills in micro enterprises.

According to our findings and findings reported by Riemenschneider and Mykytyn, (2000) current owners and managers of micro enterprises are aware that in order to take full advantage of the existing technology they should increase the level of their computer skills and knowledge, stay informed about new trends, developments in the IT and

communication area, and acquire technical and managerial competences needed to effectively manage the IS. Training in using of PC based end-user tools and their use for data analyses may also help owners, managers and employees of micro enterprises to gain self-confidence in using IT and better exploit the available technology. Because of that, investments in education and training are unavoidable.

Since majority of enterprises (80%) outsourced accounting and bookkeeping to an external partner, they should also consider outsourcing IT and IS as suggested by Rohde (2004). If they do so then the difference in SW use will be compensated.

Suitable policy interventions from the government and active support from the private sector are needed to address the issue of eOpportunities (Kapurubandara and Lawson, 2007; Jeon et al., 2006). The government needs to take leadership to facilitate a regulatory environment, improve national infrastructure (Bučar et al., 2006) and continue to help with ICT education. The government and Chamber of Commerce and Industry of Slovenia should inform, consult and involve micro enterprise in business and finance opportunities of the EU.

Research limitations

Although many other authors use similar samples for studies of micro and small businesses as we, we can expect that a larger sample of micro businesses would indicate additional factors that were not confirmed this time, because they only showed statistically insignificant differences.

Because the study in 1999 was focusing on small enterprises, and in year 2009 on micro enterprises, the sample from year 1999 was reduced only to businesses that confirm with micro business characteristics.

Micro businesses as private entrepreneurs are not obligated to report financial results to Slovene statistical office according to Slovene legislation. Because of that we offered small business owners to indicate which class of annual turnover corresponds to their business instead of recording real financial data. This could be a potential source of non-significant correlations between the performance of enterprise and successful use of ICT.

Many other factors should be studied in further research (Werber & Zupančič, 2005) to fully understand micro business characteristics and their ICT use, e.g. location of the enterprise, reason for the establishment of enterprise, strength of micro business associations, international collaborations and associations...

International comparisons with other studies are almost impossible, because they use samples of small enterprises (10-50 employees) or SME samples that are on first glance similar to our samples, but do not take into account the specialties of micro business.

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Uporaba informacijske in komunikacijske tehnologije v mikro podjetjih v zadnjem desetletju

Prispevek predstavlja primerjavo uporabe informacijske in komunikacijske tehnologije (IKT) v slovenskih mikro podjetjih na osnovi podatkov pridobljenih v raziskavah izvedenih leta 1999 in 2009. Podatke za raziskavi smo pridobili s pomočjo strukturiranih intervjujev izvedenih z lastniki ali menedžerji mikro podjetij. Primerjali smo opremljenost z računalniško stojno in programsko opremo, lastnosti podjetij, lastnosti intervjuvancev in njihov vpliv na uspešno uporabo IKT. Rezultati so pokazali precejšnje spremembe v opremljenosti s strojno opremo vendar to v primerjavi z rezultati pred desetimi leti ni vplivalo na boljšo uporabo programske opreme. Ključni dejavniki uspešne uporabe IKT so ostali enaki. Investicije v IKT so odvisne od odločitev lastnikov, zato so še vedno najpomembnejši dejavniki lastnikova formalna izobrazba in njegova znanja in spretnosti s področja IKT. Rezultati kažejo, da se je investiranje v izobraževanje za obe skupini, lastnike in zaposlene, bistveno zmanjšalo.

Ključne besede: mikro podjetja, informacijska in komunikacijska tehnologija, raziskava

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Povezanost med velikostjo podjetja in merljivimi atributi zaposlitvenega oglasa

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Raziskujemo povezavo med velikostjo podjetja in merljivimi atributi zaposlitvenega oglasa. Zanima nas na katere attribute velikost podjetja najbolj vpliva in kakšna je povezanost med samimi atributi. Velikost podjetja smo merili glede na število zaposlenih v podjetju. Atributi, katere smo uporabili v raziskavi so: površina, barva, cena zaposlitvenega oglasa, število ponovitev in število prijav na zaposlitveni oglas. S pomočjo raziskave smo ugotavljali tudi medij, katerega podjetja največ uporabljajo pri objavi zaposlitvenih oglasov. Na podlagi rezultatov v članku predstavljamo, teoretična izhodišča, rezultate raziskave in predloge za nadaljnji razvoj.

Ključne besede: zaposlitveni oglas, velikost podjetja, oglaševanje, tržno komuniciranje

1 Uvod

Orodje oglaševanja za vabljenje potencialnih kandidatov na prosto delovno mesto so zaposlitveni oglasi. Njihov cilj je pridobiti pravega kandidata, ki bo prispeval k uspešnosti organizacije. Za uspešna podjetja, ki jih vsi poznajo, je oglaševanje zaposlitvenih oglasov nekoliko lažje, saj bo njihov oglas že zaradi samega ugleda podjetja pritegnil več kandidatov. Majhna, nepoznana podjetja imajo pri tem malo težjo nalogo. Ker je na trgu dela veliko ponudnikov dela, mora zaposlitveni oglas izstopati, da bo dosegel svoj cilj. Tu ima veliko vlogo oblika (barve, velikost...) zaposlitvenega oglasa, saj pritegne pozornost in vpliva na psiho potencialnega kandidata. Vprašanje, katero si bomo v članku zastavili je, kakšen vpliv ima velikost podjetja na merljive attribute zaposlitvenega oglasa. Atributi oglasa, ki smo jih vključili v raziskavo so površina, cena, število barv, število ponovitev in število prijav na zaposlitveni oglas. Velikost podjetij lahko prikažemo na različne načine; glede na število zaposlenih, premoženje podjetja, znanje podjetja, prodajno vrednost proizvodov in storitev, dodano vrednost, itd. Najbolj pogost način, ki smo ga uporabili tudi v naši raziskavi, je izražanje s številom zaposlenih. Čisto iz organizacijskega vidika je to najbolj smotno, saj večje število zaposlenih običajno pomeni tudi večje število medsebojnih razmerij in bolj izdelane organizacijske procese. Cilj članka je torej s pomočjo analize podatkov, pridobljenih s preučevanjem zaposlitvenih oglasov in ankete, predstaviti ugotovitve in rezultate raziskave.

2 Oglaševanje

2.1 Opredelitev oglaševanja

Oglaševanje je oblika neosebne promocije, poslane prek masovnih medijev (Lee in Johnson, 2005). Ob informiranju hoče prepričati in vplivati na spremembo določenih stališč in s tem sprožiti ustrezno akcijo (Urukalo, 2010). Avtorji Florjančič, Ferjan in Bernik (1999) ugotavljajo, da oglaševanje ni le ena od temeljnih oblik marketinškega komuniciranja ampak se uporablja tudi kot oblika vabljenja potencialnih kandidatov za zaposlitev na posameznih delovnih mestih. V zadnjem času je namreč doživela velik razvoj, katerega se lahko opazi zlasti na dveh vidikih oglaševanja: 1. Vedno večjo pozornost se posveča oblikovnemu vidiku, kar ima namen pritegniti pozornost in vplivati na psiho potencialnih kandidatov. 2. Pojavljajo se vedno novi mediji (npr.: teletekst, internet), kar omogoča doseči nove ciljne skupine.

2.2 Program oglaševanja

Oblikovanje oglaševalskega programa temelji na določitvi ciljnega trga in nakupnih motivov. V primeru zaposlitvenih oglasov je ciljni segment aktivno prebivalstvo, nakupni motivi pa ponudbe v obliki materialne in nematerialne spodbude in motivacije na konkretnem delovnem mestu v konkretnem podjetju. Po določitvi teh dveh dejavnikov je nato v okviru kadrovske službe in organizacijske enote, ki išče novega sodelavca, da se začne ukvarjati s poglobitnimi odločitvami pri oblikovanju programa oglaševanja (Pervanje, 2002). Kotler (2004) te odločitve pozna kot »pet M-jev« oglaševanja:

- naloga (angl. »mission«) – Kakšni so cilji oglaševanja?
- denar (angl. »money«) – Koliko denarja lahko porabimo?
- sporočilo (angl. »message«) – Kakšno naj bo sporočilo?
- mediji (angl. »media«) – Katere medije naj uporabimo?
- merjenje (angl. »measurements«) – Kako naj ocenimo rezultate?

2.2.1 Cilji oglaševanja

Oglaševanje in oglasno sporočilo ima tri glavne cilje: obvestiti, prepričati in opomniti (Kurtz in Boone, 2010). Shimp (2003) o ciljih oglaševanja navaja naslednja dejstva: cilji morajo vsebovati natančno razdelitev glede kdo (ciljno občinstvo), kaj (specifičen cilj) in kdaj (določitev časovnega okvira kdaj bo cilj dosežen), cilji morajo biti merljivi, realni, jasni in zapisani, cilji morajo specificirati količino spremembe katero želimo doseči, cilji morajo biti dosledni do ciljev ostalih instrumentov marketinškega komuniciranja.

V primeru zaposlitvenega oglaševanja se prepogosto misli, da je cilj oglaševanja zgolj pridobiti nov kader. Pogosto podjetja oglašujejo zgolj navidezno prosta delovna mesta z namenom, da bi na podlagi prijav in razgovorov pridobili podatke o stanju na trgu delovne sile. Podjetje tako ne zaposli nikogar od prijavljenih ali pa zgolj posameznike, za katere sodijo, da bi glede na strokovno osebnostni profil lahko pripomogli k dosegu ciljev podjetja. Ob tem ne smemo prezreti dejstva, da se tudi iskalci zaposlitve lahko poslužujejo podobne metode. Nekateri se prijavljajo na razpise iz podobnih namenov – da bi ocenili razmere na trgu delovne sile (Florjančič, Ferjan in Bernik, 1999).

2.2.2 Določitev proračuna za oglaševanje

Potočnik (2005) oglaševalski proračun opredeljuje kot del proračuna za tržno komuniciranje, katerega moramo določiti v razmerju do drugih oblik komuniciranja. Napredna trženjsko usmerjena podjetja za načrtovanje proračuna za oglaševanje čedalje pogosteje uporabljajo eno ali kombinacijo naslednjih metod. Prva metoda je *metoda odstotka od vrednosti prodaje* (proračun za oglaševanje se določi v odstotku od pretekle ali pričakovane prodaje), druga metoda je *metoda primerjave s konkurenti* (podjetje določa proračun za oglaševanje na podlagi velikostne primerjave s svojimi konkurenti) in zadnja metoda je *metoda ciljev* (metoda zahteva, da se natančno opredeli trženjske cilje, določi naloge in oceni stroške izvajanja teh nalog. Vsota ocen stroškov je podlaga proračuna za oglaševanje).

Z razliko od naprednih, tržno usmerjenih podjetij se mala podjetja srečujejo s pomanjkanjem finančnih sredstev, kar v veliki meri vpliva na načrtovanje proračuna za oglaševanje. Ker presežka ni, majhna podjetja le redko oglašujejo. Oglaševanje je dojet kot strošek ne pa kot dolgoročna naložba (Vaccaro, Kassaye, 1988).

2.2.3 Kreiranje sporočila

Pri oblikovanju sporočila ni pomembno le kaj, temveč tudi kako sporočamo. Način sporočanja je odvisen od obnašanja porabnikov, katero je povezano z nacionalnim značajem, ki je pogojen s kulturo, donosnimi skupinami in geografsko

lokacijo. Kotler in Scheff (1997) pravita, da je idealno, če sporočilo pritegne pozornost, ohrani zanimanje, spodbudi željo in povzroči dejanje. Pri tem Briggs (1997) predlaga uporabo principa AIDA (model AIDA – angl. »attention, interest, desire, action«).

2.2.4 Izbira medija

Pomembno je, da podjetje pri izbiri medija natančno opredeli prednosti, pomanjkljivosti in omejitve medija za čim boljše ustrežanje in doseganje oglaševalskih ciljev. Pri izbiri medijev si pomagamo z različnimi kriteriji izbire med katerimi so najpomembnejši stroški medija, vplivnost medija, izpostavljenost mediju in čas izvajanja medija (Potočnik, 2005). Za oglaševanje delovnih mest se najbolj uporabljajo: tisk, radio, televizija in internet (Florjančič, Ferjan, Bernik, 1999).

Zaradi finančni omejitve imajo pri izbiri medija največ težav mala podjetja. Raziskava malih podjetij v ZDA, Iowa (Van Auken in Duran, 1992) je pokazala, da mala podjetja izbirajo tiste medije, za katere so se odločila v prvih letih poslovanja. Prvi razlog je, da lastniki malih podjetij nimajo izkušenj z izbiro ustreznih medijev in so ob enem omejeni z njihovo dostopnostjo. Drugi razlog pa naj bi bila preobremenjenost podjetnikov z vsakodnevnimi aktivnostmi. Odločitve o izbiri ustreznih medijev so največkrat oblikovane na podlagi intuicije ali pa glede na pridobljene rezultate.

2.2.5 Merjenje rezultatov

Uspešnost oglaševanja lahko ugotavljamo le posredno, tako da spremljamo povečanje prodaje med izvajanjem reklamne akcije in po njem (Potočnik, 2007). Merkač (2005) poudarja, da je pri oglaševanju zaposlitvenih oglasov zelo pomembno, da organizacija spremlja odziv glede na posamezne medije (z vidika stroškov, vrste dela, iz plena). Uporabnik lahko s stroškovnega vidika vrednoti ustreznost posameznega medija pri doseganju želene publike. Glavna statistika, ki bi jo bilo treba izvajati v namen kontrole uspeha, so »stroški na odziv«, izvaja pa jo lahko referent ali tajnica. Nastavi se lahko preprost obrazec, ki naj zajema: naziv dela, medij, oblika oglasa, stroški, število prijav, stroški na prijavo, število intervjuvanih, število v ožjem izboru (angl. »short list«), število izbranih.

Merjenje uspešnosti oglaševanja se večino poslužujejo velika in uspešna podjetja. Zaradi pomanjkanja sredstev v malih podjetjih le redko zasledimo preverjanje učinkovitosti oglasov. Če se učinkovitost oglasov takoj ne odrazi, jih mala podjetja rada umaknejo, ker so prepričani, da ne delujejo.

3 Podoba, identiteta in ugled podjetja

Iskalci zaposlitev vedno večjo vlogo, poleg ustrezno oblikovanega zaposlitvenega oglasa, postavljajo blagovni znamki delodajalca. Blagovna znamka delodajalca naj bi povzela mnenja zaposlenih v podjetju. Predstavlja osebnost podjetja, njegove vrednote, koristi in prednosti, ki jih lahko nudimo v primerjavi s konkurenco. Vrednost blagovne znamke podjetja kot delodajalca predstavlja ugled podjetja (Zaletel, 2006a).

Ugled podjetja je pojem, ki se nanaša na celosten potrošnikov vtis o podjetju in njegovih izdelkih. Je rezultat procesa, v katerem se ideje, občutki in pretekle izkušnje s podjetjem in njegovimi izdelki/storitvami shranjujejo v spomin in preoblikujejo v mnenja, stališča (Nguyen in LeBlanc, 1998). Lešnik in Prah (2008) trdita, da ima ugled podjetja veliko vlogo pri zaposlovanju novih delavcev. Kandidati se raje odločajo za podjetja, ki jih štejejo za ugledna – pogosto gre celo do skrajnosti, ko bi kandidati raje sprejeli nižjo plačo v podjetju, ki ga štejejo za ugledno, kot obratno. Ugledna podjetja lahko torej pritegnejo kakovostnejše kandidate, marsikdaj pa jih lahko dobijo celo brez napornega iskanja, saj jim ustrezni kandidati sami posredujejo svoje ponudbe.

Temelj za grajenje ugleda podjetja sta identiteta in podoba podjetja. Štorgelj (2008) definira podobo podjetja kot tisto, kar zunanja okolica zaznava o podjetju. Je vse kar se o določenem podjetju misli in občuti. Identiteta podjetja pa predstavlja notranje deležnike, vodstvo in zaposlene. Je tisto kar podjetje misli o sebi in si želi, da bi se videlo navzven.

4 Zaposlitveni oglasi

Namen (Priporočila za oblikovanje dobrega zaposlitvenega oglasa, 2006) zaposlitvenega oglasa je da, pritegne pozornost ljudi in potencialnih kandidatov ter jih spodbudi, da poizvedo več o objavljeni priložnosti. Da zajame želeno poklicno skupino ljudi in jih opozori na priložnost, ki se jim ponuja, ponudi dovolj informacij o želenih lastnostih kandidatov in zagotovi kredibilno bazo ustrezno izobraženih kandidatov, iz katere se lahko izbere primerno osebo za prevzem delovnega mesta.

Če hočemo pritegniti pozornost potencialnih kandidatov, moramo biti pri pripravi zaposlitvenega oglasa pozorni na naslednje elemente: *oblika zaposlitvenega oglasa, naslov zaposlitvenega oglasa, vsebina zaposlitvenega oglasa* (Zaletel, 2006b).

4.1 Oblika zaposlitvenega oglasa

Zaletel (2006b) poudarja, da moramo biti pri izbiri oblike oglasa pozorni na grafični izgled in na postavitev elementov oglasa. Prvi pritegne pozornost kandidata in v njem ustvari prvo mnenje o oglasu, drugi pa odloča o tem, ali ga bo kandidat prebral in kaj od oglasa si bo zapomnil. Kandidat na podlagi investicije v oglas sklepa, kaj lahko od delodajalca pričakuje. Če je oglas neprivlačen, slabo in očitno na hitro sestavljen, potem trgu dela sporočamo, da novi sodelavci niso tako zelo pomembni. Če pa oglas že na prvi pogled prodaja zgodbo o podjetju, ki ceni svoje sodelavce, jim zna ponuditi privlačno delo in z njimi ustvarjati dolgoročen odnos, potem bo pritegnil več usposobljenih kadrov. Kotler (2004) pravi, da oblikovne prvine kot so velikost oglasa, barve in ilustracije, vplivajo na učinek oglasa in njegovo ceno. Že manjša preazporeditev delov oglasa lahko poveča moč oglasa, s katero zbudi pozornost. Večji oglasi sicer bolj pritegnejo pozornost, vendar ne za toliko kolikor so dražji. Štiribarvne ilustracije povečajo tako uspešnost kot ceno oglasa. Številni raziskovalci tiskanih medijev menijo, da si oglasne prvine po pomembnosti sledijo takole: slika, naslov, besedilo.

4.2 Naslov zaposlitvenega oglasa

Naslov je najpomembnejši del oglasa, ponudbe in časopisnega članka (Lisac, 2008). Tudi pri zaposlitvenih oglaševanjih ima naslov pomembno vlogo. Bolj privlačen in zanimiv naslov, bo pritegnil večje število kandidatov. Zaletel (2006c) pravi, da ima ponudnik dela dve možnosti, da prepriča kandidata, da si bo bolj ogledal zaposlitveni oglas. Prva možnost je, da je ponudnik dela znano, ugledno podjetje, v katerem bi kandidat delal že zaradi prestiža ali da ponudnik dela svojemu oglasu da privlačen naslov. Glede prve možnosti v kratkem roku ni mogoče kaj dosti storiti, saj je ugled podjetja dolgoročen proces. Z drugo možnostjo pa lahko dosežemo veliko boljši efekt oglaševanja.

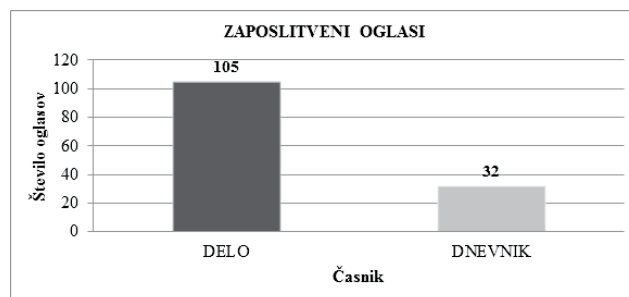
4.3 Vsebina zaposlitvenega oglasa

Priporočena vsebina (Priporočila za oblikovanje dobrega zaposlitvenega oglasa, 2006) zaposlitvenega oglasa je sledeča: 1. odstavek: Delovno mesto – naziv. 2. odstavek: Kaj je privlačnega v zvezi z delovnim mestom v okviru vloge, ki jo ima v podjetju. 3. odstavek: Ključne značilnosti kandidatov, ki jih predvideva podjetje za to delovno mesto. 4. odstavek: O podjetju in/ali organizacijski enoti. 5. odstavek: Naslov za dodatne informacije in zadnji rok prijave na oglas. Besede, ki jih Zaletel (2004) priporoča, da jih vključimo v oglas so: možnost kariernega in osebnega razvoja, strokovno izpopolnjevanje, vodenje, odgovornost za, smo uspešno podjetje, delo s tujimi partnerji, samostojno, delo v timu strokovnjakov.

5 Raziskava

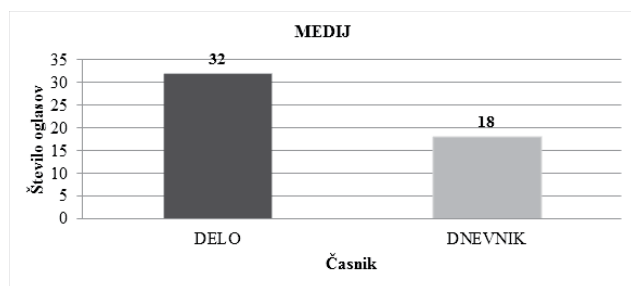
5.1 Metode raziskovanja

Podatke kot so *cena, površina in število uporabljenih barv* smo pridobili s pomočjo proučevanja zaposlitvenih oglaševanj. Pregledali smo 137 naključno izbranih zaposlitvenih oglaševanj, ki so bili objavljeni v časniku Delo in Dnevnik. Analiza vzorca je pokazala, da je bilo 105 oglaševanj objavljenih v časniku Delo, 37 pa v časniku Dnevnik, kar je prikazano v sliki 1. Velikost podjetij, ki so objavljala zaposlitvene oglase je dokaj enakomerna razporejena. 20% podjetij spada v razred mikro podjetij, 23% je bilo majhnih podjetij, 24% srednje velikih podjetij, 33% podjetij pa je spadalo v kategorijo velikih podjetij.



Slika 1: Medij ($n_1=137$)

Z metodo kvantitativnega raziskovanja in sicer s telefonskim anketiranjem in anketiranjem preko e-pošte smo pridobili podatke o številu ponovitev in številu prijav na zaposlitveni oglas in katere medije podjetja največkrat uporabljajo za objavo zaposlitvenih oglasov. Kot inštrument raziskave smo uporabili anketni vprašalnik. Anketni vprašalnik je vseboval štiri vprašanja, ki so bila odprtega in zaprtega tipa. Anketirali smo naključno izbranih 137 podjetij, ki so imela objavljene zaposlitvene oglase v časniku Delo in Dnevnik. Popolno izpolnjenih in vrnjenih anketnih vprašalnikov je bilo 50. Analiza vzorca je pokazala, da je bilo 32 zaposlitvenih oglasov objavljenih v časniku Delo, 18 pa v časniku Dnevnik (slika 2). 30% v vzorec vključenih podjetij spada v razred mikro podjetij, 16% je bilo majhnih podjetij, 26% srednje velikih podjetij, 28% podjetij pa je spadala v kategorijo velikih podjetij.



Slika 2: Medij ($n_2=50$)

Celotna raziskava je potekala od 8. maja do 8. junija 2010. Zbrane podatke smo statistično obdelali s pomočjo računalniškega programa SPSS in Microsoft Excel. Za merjenje povezanosti med spremenljivkami smo uporabili Pearsonov r koeficient korelacije.

5.2 Oblikovanje spremenljivk

Spremenljivke uporabljene v raziskavi delimo na odvisne in neodvisne. Neodvisno spremenljivko v našem primeru predstavlja velikost podjetja. Podatke o velikosti podjetja smo pridobili z anketnim vprašalnikom z vprašanjem »Število zaposlenih v vašem podjetju?« in s pomočjo spletne strani PIRS (Poslovni informator Republike Slovenije). Glede na Zakon o gospodarskih družbah (ZGD-1) smo pridobljene podatke razvrstili v štiri razrede glede na število zaposlenih: mikro podjetja (do 9 zaposlenih); majhna podjetja (od 10 do 49 zaposlenih); srednja (od 50 do 249 zaposlenih); in velika (250 ali več zaposlenih).

Odvisne spremenljivke, ki so uporabljene v raziskavi so naslednje:

- **Površina zaposlitvenega oglasa** – izračunali po formuli: $POVRŠINA = \text{višina (cm)} \times \text{širina (cm)}$. Zbrane podatke smo razdelili v štiri razrede glede na površino: 1 razred (do 50 cm²); 2 razred (50 cm² – 100 cm²); 3 razred (100 cm² – 150 cm²); 4 razred (150 cm² ali več).
- **Število barv zaposlitvenega oglasa** – pridobili s štetjem uporabljenih barv za vsak oglas posebej. Podatke smo razdelili v štiri razrede: 1 razred (enobarvni); 2 razred (dvobarvni); 3 razred (tribarvni); 4 razred (večbarvni).

- **Cena zaposlitvenega oglasa** – izračunali po formuli: $CENA = \text{cena/cm}^2 \times \text{višina (cm)} \times \text{širina (cm)}$. Podatke za izračun cene oglasa smo pridobili na spletni strani časnika Delo in Dnevnik. Za lažjo obdelavo podatkov smo jih razdelili v štiri razrede: do 2000 €; 2000€–4000 €; 4000€–6000 €; in 6000 € ali več.
- **Število ponovitev zaposlitvenega oglasa** – merili s pomočjo ankete, tako da smo anketirancem zastavili vprašanje »Kolikokrat ste objavili zaposlitveni oglas v časopisu Delo/Dnevnik?«. Ponudili smo štiri možne odgovore: 1) do 5-krat, 2) 5–10-krat, 3) 10–15-krat, 4) 15-krat ali več.
- **Število prijav na zaposlitveni oglas** – merili s pomočjo anketnega vprašalnika. Anketirancem smo zastavili vprašanje »Koliko kandidatov se je prijavilo na vaš zaposlitveni oglas?«. Pridobljene podatke smo razdelili v štiri razrede: do 20; od 20 do 40; od 40 do 60; ter 60 ali več.

5.3 Hipoteze

V skladu s pregledom literature postavljamo naslednje hipoteze, katere bomo s pomočjo rezultatov raziskave potrdili ali zavrnili.

- H1:** Med velikostjo podjetja in površino zaposlitvenega oglasa obstaja pozitivna povezava.
- H2:** Med velikostjo podjetja in ceno zaposlitvenega oglasa obstaja pozitivna povezava.
- H3:** Med velikostjo podjetja in številom uporabljenih barv v zaposlitvenem oglasu obstaja pozitivna povezava.
- H4:** Med velikostjo podjetja in številom ponovitev zaposlitvenega oglasa obstaja pozitivna povezava.
- H5:** Med velikostjo podjetja in številom prijavljenih kandidatov na zaposlitveni oglas obstaja pozitivna povezava.

6 Rezultati raziskave

V naši raziskavi je analiza zbranih podatkov pokazala, da ima: 18,2% pregledanih zaposlitvenih oglasov površino do 50 cm²; 27,7% oglasov površino od 50 cm² do 100 cm²; 19,7% oglasov od 100 cm² do 150 cm²; in 34,3% oglasov je imelo površino 150 cm² ali več ($n_1=137$). V raziskavi nas je tudi zanimalo kolikšen je strošek zaposlitvenega oglasa, katerega so podjetja pripravljena plačati. Cena 64,2% oglasov se je gibala do 4000 €, 13,1% oglasov je imelo ceno od 4000 € do 6000 €, 22,6% pa ceno 6000 € ali več ($n_1=137$). Najbolj pogost zaposlitveni oglas je bil dvobarvni zaposlitveni oglas, saj je bilo 38% od vseh pregledanih dvobarvnih. 13,9% oglasov je bilo enobarvnih, 16,1% tribarvnih in 32,1% več kot tribarvnih ($n_1=137$). Raziskali smo tudi kakšna je ponovitev zaposlitvenih oglasov v medijih. Kar 21 od 50 anketiranih podjetij je zaposlitveni oglas ponovilo samo do 5-krat. Redka podjetja, le 4, so se odločila, da bodo zaposlitveni oglas ponovila 15-krat ali več.

V 36% se je na zaposlitveni oglas prijavilo do 20 kandidatov, v 32% primerih se je na oglas prijavilo od 40–60 kandidatov. Samo v 20% primerih se je na zaposlitveni oglas prijavilo 60 ali več kandidatov. 12 % primerov pa se je na oglas odzvalo od 20 – 40 kandidatov ($n_2=50$).

V okviru raziskave smo tudi raziskali v katerih medijih podjetja največ objavljajo zaposlitvene oglase. Anketirali smo

Tabela 1: Medij oglaševanja ($n_2=50$)

	Ne oglašujemo	Malo oglašujemo	Srednje oglašujemo	Veliko oglašujemo	Največ oglašujemo
Radio	36	12	2	0	0
Časopis	0	4	7	5	34
TV	44	0	4	1	1
Internet	0	10	20	9	11

50 podjetij ($n_2=50$). V tabeli 1 so prikazani rezultati anketiranja. Vidimo, da večina podjetij preko radio ne oglašuje oziroma malo oglašuje. 34 podjetij največ oglašujejo preko časopisa le 4 podjetja so odgovorila, da preko časopisa malo oglašujejo. Veliko podjetij se odloča za oglaševanje preko interneta, kar 40 podjetij je odgovorilo, da se oglaševanja poslužujejo srednje, veliko ali največ. Rezultati so nam pokazali, da se kar 44 podjetij ne odloča za oglaševanja preko TV sprejemnika.

6.1 Statistično preverjanje hipotez

Na podlagi rezultatov raziskave smo testirali hipoteze s pomočjo Pearsonovega r koeficienta korelacije. Tabela 2 prikazuje izračune za korelacijo med spremenljivkami. Za raziskavo smo uporabili vzorec 50 anketiranih podjetij ($n_2=50$). Tako smo imeli podatke za vse spremenljivke. Osnovni cilj raziskave je bil ugotoviti ali obstaja povezanost med velikostjo podjetja in merljivimi atributi zaposlitvenega oglasa. V uvodnem delu teoretičnih opredelitev smo ugotovili, da imajo velika podjetja več sredstev za ustrezno pripravljene in kvalitetne oglase. Zato smo raziskali kako je to v praksi. Glede na pridobljene rezultate raziskave smo sprejeli ali zavrgli postavljene hipoteze.

H1: Med velikostjo podjetja in površino zaposlitvenega oglasa obstaja pozitivna povezava ($r=0,392$, $p<0,001$). Hipotezo 1 sprejmemo, saj je koeficient korelacije med spremenljivkama, velikost podjetja in površina zaposlitvenega oglasa 0,392. To pomeni, da večja kot je velikost podjetja večja je površina zaposlitvenega oglasa.

H2: Med velikostjo podjetja in ceno zaposlitvenega oglasa obstaja pozitivna povezava ($r=0,371$, $p<0,001$). Koeficient korelacije med spremenljivkama znaša 0,371.

Kar pomeni, da večja kot je velikost podjetja višja je cena zaposlitvenega oglasa. Hipotezo 2 sprejmemo.

H3: Med velikostjo podjetja in številom barv v zaposlitvenem oglasu obstaja pozitivna povezava ($r=0,698$, $p<0,001$). Koeficient korelacije znaša 0,698, zato lahko trdimo, da večja kot je velikost podjetja večje je število barv v zaposlitvenem oglasu. Hipotezo 3 sprejmemo.

H4: O povezavi med velikostjo podjetja in številom ponovitev zaposlitvenega oglasa ne moremo ne potrditi ne ovreči, saj koeficient ni statistično značilen.

V teoretičnem delu smo tudi omenili, da velika in ugledna podjetja pritegnejo večje število ljudi. Mislimo, da je razlog za tak rezultat tudi v tem, da si mala podjetja težko privoščijo zaposlene s polnim delovnim časom zato raje ponujajo honorarno zaposlitev, ki pa ni najbolj zaželena med iskalci zaposlitve. Mala podjetja prav tako ne morejo ponuditi takšnih ugodnosti in dohodkov, ki jih lahko delavec pričakuje v velikih podjetjih. Z raziskavo smo to tudi potrdili.

H5: Med velikostjo podjetja in številom prijav na zaposlitveni oglas obstaja pozitivna povezava ($r=0,647$, $p<0,001$). Hipotezo 5 sprejmemo, saj je koeficient korelacije 0,647. Zato lahko trdimo, da večja kot je velikost podjetja večje je število prijav na zaposlitveni oglas.

Poleg izračuna korelacij med neodvisno in odvisnimi spremenljivkami smo želeli vedeti kakšna je korelacija med odvisnimi spremenljivkami (atributi). Korelacije so predstavljene v Tabeli 2.

Ugotovili smo, da obstaja močna pozitivna odvisnost med spremenljivkama površina in ceno zaposlitvenega oglasa, saj je koeficient korelacije 0,696. Kar pomeni, večja kot je površina zaposlitvenega oglasa, višja je tudi cena. Podobno

Tabela 2: Pearson r korelacijski koeficienti ($n_2=50$)

	Velikost podjetja	Število ponovitev	Število prijav	Cena	Barve
Število ponovitev	,024				
Število prijav	,647**	,066			
Cena	,371**	-,183	,349*		
Barve	,698**	-,073	,514**	,403**	
Površina oglasa	,392**	-,031	,269	,696**	,349*

*. Korelacija je značilna pri stopnji 0.05 (dvostransko).

**. Korelacija je značilna pri stopnji 0.01 (dvostransko).

je višja cena tudi, če ima oglas večje število barv. Prav tako lahko pozitivno povezavo opazimo tudi med površino oglasa in številom barv uporabljenih v oglasu.

Pri izračunih korelacij odvisnih spremenljivk s številom prijav na zaposlitveni oglas, smo prišli do naslednjega zaključka. Med številom prijav in površino, ceno ter barvami obstaja pozitivna odvisnost, ki pa ni statistično značilna. Iz izračuna pa lahko še vidimo, da sta statistično značilni korelaciji med številom prijav na oglas ter ceno oglasa in številom prijav na oglas ter barvami oglasa. Na podlagi tega lahko sklepamo, da večja kot sta cena ter število barv v zaposlitvenem oglasu višje je tudi število prijav na zaposlitveni oglas.

7 Zaključek

Raziskava potrjuje, da večje kot je podjetje večji je vložek podjetja v oglaševanje. Ugotovili smo, da podjetja prisegajo na velike zaposlitvene oglase. Dvobarvni oglasi se največkrat pojavijo, sledijo jim oglasi s tremi ali več barvami. Najbolj pogosta cena, ki so jo bila podjetja pripravljena odšteti za zaposlitveni oglas, se je gibala 2000–4000 €. Podjetja so največ do 5-krat ponovila svoj zaposlitveni oglas. Podjetja se za manjše število ponovitev oglasa odločajo predvsem zato, ker je cena objave v časopisu draga. Podjetja, ki smo jih anketirali, so imela malo število prijav na zaposlitvenih oglas, največkrat se je pojavljalo število do 20 kandidatov. Kljub vedno manjšemu zanimanju za časopise in vedno bolj popularnejšemu internetu je časopis še vedno najbolj pogost medij za oglaševanje zaposlitvenih oglasov. Oglaševanje preko radia in TV-sprejemnika se podjetja redko poslužujejo.

Moramo se zavedati, da je človek neprecenljiv vir za podjetje. Delavec s svojim znanjem in spretnostmi prispeva, k uspešnosti podjetja. Večina iskalcev zaposlitve nas na podlagi investicije organizacije v oglas sklepa, kaj lahko od delodajalca pričakuje. Podjetja, ki niso pripravljena vložiti v iskanje kandidata, verjetno tudi v izbranega kandidata ne bodo vlagala. Zato mislimo, da je vlaganje v ustrezno oblikovane, vsebinsko dobre in grafično dovršene zaposlitvene oglase, ki bodo privlačili najboljše kandidate, dolgoročno naložba za podjetje.

Svetujemo, da podjetja naprej definirajo ciljno skupino, ki ji je zaposlitveni oglas namenjen. Preučijo naj strukturo bralcev medija, v katerem želijo oglaševati. Neustrezna ciljna skupina je eden izmed glavnih razlogov za slab odziv na zaposlitveni oglas.

Velika podjetja, z več zaposlenimi namenljajo pridobivanju novih zaposlenih več časa in sredstev. Privoščijo si lahko drago, dolgoročno oglaševanje prostega delovnega mesta, ki bo ponudilo širok spekter zainteresiranih in ustreznih kandidatov. Podjetjem, ki imajo manj namenjenim sredstev za oglaševanje, predlagamo, da oglašujejo na internetu. Spletno oglaševanje zaposlitvenih oglasov je najhitreje rastoča oblika kadrovskega oglaševanja. Internet se je izkazal kot odlično orodje za iskanje sodelavcev – je preprosto dostopen medij, omogoča hitro iskanje ustreznih informacij in je cenejši od oglaševanja v časopisu. Internetni zaposlitveni portali nudijo ugodne pakete za oglaševanje, ki vključujejo tudi oglaševanje v časopisih. Tako lahko imajo tudi majhna podjetja možnost

boljših, bolj privlačnih oglasov, ki bodo pritegnili pravega kandidata.

Za konec je še pomembno izpostaviti, da naj pri procesu pridobivanja novih zaposlenih sodelujejo predvsem osebe, ki so za to strokovno usposobljene. Ta problem se pojavi predvsem v majhnih podjetjih, kjer ena oseba pokriva več funkcij v podjetju in nerealno je pričakovati, da bo vsa področja obvladovala enako.

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Relationship Between the Company's Size and Mesurable Attributes of Employment Ads

We explore the relationship between the company's size and measurable attributes of an employment ad. We were interested in which attributes were most affected by the size of a company and what the relationship between these attributes is. Company size was measured by the number of employees of a company. Attributes, which we used in our study, are: size, color, and price of an employment ad, the number of repetitions and number of applications per job ad. Through our research we also determined the medium which most companies used to publish job advertisements. In the paper, we present the theoretical framework, research results and proposals for further development.

Keywords: job ads, company size, advertising, marketing communications

Vplivi neželenih vedenj v organizaciji na absentizem

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Namen opravljene raziskave o vplivu neželenih vedenj na absentizem je ugotoviti, ali katera neželena vedenja vplivajo na absentizem v proučevanih organizacijah in kako. Z anketnim vprašalnikom smo v dveh podjetjih jeklarske industrije v Sloveniji zbrali podatke o prisotnosti neželenih vedenj in percepciji menedžerjev o neželenih vedenjih, podatke o motivatorjih in ovirah neželenih vedenj. Opravljeni sta bili faktorska analiza in analiza linearne odvisnosti; ugotovljeno je bilo, da na absentizem v proučevanih organizacijah vplivajo: strah pred odkritjem pri dejanju, zadovoljstvo z neposrednim nadrejenim, strah pred kaznijo in kazen za slabo delo. Percepcija menedžerjev o resnosti neželenega vedenja »podaljšati si čas malice« vpliva na absentizem v organizaciji. Čeprav izsledkov raziskave ni mogoče posplošiti, pa ti predstavljajo spoznanje, da menedžerji v organizacijah lahko upravljajo absentizem in da je absentizem tudi posledica odsotnosti zaradi nezdravstvenih vzrokov.

Ključne besede: absentizem, anketa, menedžment podjetja, neželena vedenja, raziskava

1 Uvod

Namen prispevka je identificirati pojem neželenih vedenj ter ugotoviti povezavo med neželenimi vedenji na delovnem mestu in absentizmom v izbranih podjetjih jeklarske industrije v Republiki Sloveniji.

Neželeno vedenje opredelimo kot negativno vedenje, ki škoduje posamezniku ali/in organizaciji (Burnes in Pope, 2007: 300). Mills (1997) predlaga, da se vsakršno škodujoče ali ogrožajoče vedenje zaposlenega ali delodajalca – fizično ali psihično –, ki vsebuje elemente ustrahovanja, izolacije in izključevanja, zastraševanja, napada ali zlorabe, opredeli kot nasilje. Robinsonova in Bennettova (1995) opredelita deviantno vedenje kot prostovoljno vedenje, s katerim se krši pomembne organizacijske norme in se s tem ogroža dobrobit organizacije, njenih članov ali obojih skupaj. Izdelali sta model deviantnega vedenja na delovnem mestu, ki temelji na dveh dimenzijah: nevarnosti (resnosti) deviantnega vedenja in usmerjenosti vedenja proti organizaciji ali članom organizacije.

Vzrokov, da se zaposleni vedejo v nasprotju s pričakovanji, je veliko. Avtorji obravnavajo neželeno vedenje z različnih vidikov in so oblikovali veliko ugotovitev o vzrokih neželenega vedenja, nekatere ugotovitve pa so prikazane tudi v nadaljevanju.

Zaposleni so aktivni opazovalci v organizaciji in vidijo, kako so nagrade in kazni razdeljene. Delitev dojemajo kot pošteno ali nepošteno glede na to, ali jo je dobil tisti, ki si jo je zaslužil (*distributive justice*) ali je proces delitve pošten (*procedural justice*) in ali se ravna s posameznikom spoštljivo

(*interactional justice*) (Colquitt et al., 2001). Nekatere študije so tudi pokazale, da percepcija nepravilnosti lahko sproži resne oblike neetičnega vedenja na delovnem mestu (na primer Aquino et al., 1999; Baron et al., 1999). Aquino et al. (2006) so z raziskavo potrdili teze, da percepcija nepravilnosti lahko motivira posameznike, da postavijo lastne interese pred organizacijske, celo takrat, ko so v konfliktu z njihovim dojemanjem morale.

Morrison in Robinson (1997) menita, da je vzrok za nastanek neželenega vedenja na delovnem mestu lahko tudi kršitev psihološke pogodbe oziroma razlike v pričakovanjih med delavcem in delodajalcem.

Menedžerji s svojim vedenjem vplivajo na pojav neželenih vedenj v organizaciji. Organizaciji dajejo ton, definirajo vrednote in norme ter ustvarjajo osebnost organizacije (Van Fleet in Griffin, 2006: 704), imajo dominantno vlogo in nadzor nad delitvijo virov v organizaciji (Brotheridge in Keup, 2005: 127). Menedžerji, ki se vedejo neetično, pogosto ustvarijo vzdušje v organizaciji, ki dopušča podobna deviantna vedenja menedžerjevim (Trevino in Brown, 2005). Slaba menedžerska praksa predstavlja dober vzrok za neželena vedenja (Bradly et al., 2006: 386); s tem s strinja tudi Smith (2000), ki meni, da se disfunkcionalna organizacijska kultura raje pojavi, če menedžerji ne posedujejo veščin za delo z zaposlenimi.

Vodje morajo razumeti, da imajo oblike neželenega/agresivnega vedenja negativen vpliv na organizacijo (Bradly et al., 2006: 385). Menedžerji lahko vplivajo na pojav neželenih vedenj s formalnimi ali z neformalnimi nadzori, s krepitevijo zaupanja v organizacijo in socialno podporo (Bradly et al., 2006). Lim (1996) meni, da socialna podpora, ki je je posame-

znik deležen prek drugih, preprečuje zmanjšanje zadovoljstva z delom, zamujanje in absentizem.

Sankcije so lahko tudi pomemben vzvod pri obvladovanju vedenja zaposlenih v organizaciji. Zaposleni, ki so soočeni z grožnjo sankcije, tehtajo med koristmi neželenega vedenja in posledicami vedenja – grozečo kaznijo. Če pretehta kazen, jih strah pred kaznijo odvrne od neželenega vedenja (Molm, 1994).

Vsi navedeni vzroki pa se ne nazadnje lahko odražajo v (ne)zadovoljstvu zaposlenih in posledično v absentizmu. Vsakodnevno so zaposleni odsotni z dela zaradi različnih vzrokov, na primer: letnega dopusta, študijskega dopusta, bolniške odsotnosti (bolezni, poškodbe pri delu, nege), in zaradi drugih vzrokov, tudi neupravičene odsotnosti z dela. Vsakršna odsotnost, predvsem tista nenapovedana, nenačrtovana, predstavlja veliko težavo za organizacije, produktivnost organizacij, prerazporejanja zaposlenih, preobremenitve prisotnih zaposlenih itn.

Absentizem se pojavlja kot posledico neželenih vedenj in kot samo neželjeno vedenje. Kot prvo se pojavi, ko je vzrok absentizma neželjeno vedenje v organizaciji (na primer spolno nadlegovanje ali mobing nadrejenega) in se zaposleni umakne iz sovražnega okolja. Kot samo neželjeno vedenje pa je absentizem v primerih neupravičene odsotnosti, v primerih zlorabe odsotnosti (na primer izmišljene bolezni zaradi opravljanja drugih pridobitnih dejavnosti, podaljševanja časa malic zaradi lenobe, izmišljene poškodbe).

Briner (1996: 874) je opredelil absentizem kot odsotnost z dela zaposlenega, ko je delodajalec prisotnost pričakuje. V organizaciji so predvsem pereč problem nepredvidljivi izostanki, kot je zdravstveni absentizem (zdravstveni izostanki zaradi bolezni in izostanki zaradi poškodb pri delu, nege družinskega člana itn.), ki pa ga moramo ločiti od invalidnosti, ki je trajna zadržanost od dela zaradi poškodbe oziroma bolezni.

Pri absentizmu merimo frekvenco (IF faktor - število primerov odsotnosti z dela zaradi bolniškega staža na 100 zaposlenih v enem letu) in pogostost odsotnosti (% BS - odstotek bolniškega staža je odstotek izgubljenih koledarskih dni na enega zaposlenega delavca). Za organizacijo je največji problem, če imajo veliko frekvenco nenapovedanih oz. nepredvidljivih izostankov.

Vzrokov, da so zaposleni odsotni, kako pogosto so odsotni in koliko časa so odsotni, ni mogoče iskati samo v vzrokih, kot je bolezen ali poškodba, saj gre za zapleten pojav, na katerega vplivajo različni dejavniki. Čeprav je veliko odsotnosti posledica bolezni, pa razpoložljive evidence kažejo, da to ni vedno res (Briner, 1996: 873).

V raziskavah, ki proučujejo absentizem z vidika hipoteze umika (*withdrawal hypothesis*), je absentizem običajno interpretiran kot pobeg od sovražnega okolja, kompenzacija za sovražno okolje in celo kot protest proti sovražnemu delovnem okolju ali demoralizaciji v njem (Chadwick - Jones et al., 1982). Johns (1997) meni, da absentizem ni preprosto reakcija na nezadovoljstvo, ampak je lahko tudi reakcija na stres na delovnem mestu, ko se zaposleni ne more soočiti s stresom in ga odpraviti. Avtorici (Bryant in Wolfram Cox, 2003) sta ugotovili, da so zaposleni, ko je bilo nasilnega vedenja preveč in ko ga niso mogli več prenašati, zapustili organizacijo. Storms in Spector (1987) sta ugotovila, da so zaposleni, ki dojemajo

organizacijo kot mesto frustracije, pogosteje nagnjeni k dejanjem, kot je bolniška odsotnost (čeprav se počutijo v redu), zamujanju v službo in drugim podobnim dejanjem.

Savery et al. (1998), Blau (1986), Farrell in Petersen (1984) so pri raziskovanju vzrokov absentizma ugotovili negativno povezavo med zavezanostjo organizaciji in absentizmom; višja kot je zavezanost organizaciji, nižja je stopnja absentizma. Angle in Perry (1981), Ivanchevich (1985), Jamal (1984) pa povezave niso ugotovili.

Hausknecht et al. (2008: 1235) so ugotovili povezavo ($r = -0,24$) med zadovoljstvom z delom in absentizmom, ki kaže na to, da je bilo višje zadovoljstvo z delom povezano z manjšo stopnjo absentizma, negativno povezavo ($r = -0,27$) so ugotovili tudi med zavezanostjo organizaciji in absentizmom, ki kaže, da je večja zavezanost organizaciji povezana z manjšo stopnjo absentizma. Značilnosti klime v enoti (npr. organizaciji, skupini, oddelku, službi itn.), razmere na trgu dela in velikost organizacijske enote so povezani z absentizmom v enoti (Dineen et al., 2007). Gimeno et al. (2004) so ugotovili višji absentizem pri zaposlenih, ki so izpostavljeni višjim zahtevam na delovnem mestu ali imajo manj samostojnosti na delovnem mestu. Bakker et al. (2001) so ugotovili pozitivno in signifikantno povezavo med zahtevnostjo delovnega mesta in izgorelostjo na absentizem; višja kot je bila zahtevnost delovnega mesta, višja je bila stopnja izgorelosti in daljši je bil absentizem. Ugotovili so tudi, da trajanje absentizma in pogostost absentizma vplivata drug na drugega, in sicer močneje vpliva pogostost absentizma na trajanje absentizma kot nasprotno.

2 Metodologija

Opis postopka pridobivanja podatkov

Za namen raziskave smo na osnovi literature in že v raziskavah uporabljenih vprašalnikov (Lobnikar, 2003; Smej, 2009) sestavili anketni vprašalnik. Vseboval je vprašanja zaprtega tipa, zasnovana na osnovi Likertove petstopenjske lestvice. V prvem delu so vprašanja, s katerimi smo pridobili informacije o prisotnosti neželenih vedenj v izbranih organizacijah in kako resna se zdijo ta dejanja menedžerjem v organizacijah. V drugem delu so vprašanja, s katerimi smo pridobili mnenje menedžerjev o tem, koliko ovire preprečujejo pojave neželenih vedenj, in ugotovili prisotnost motivatorjev neželenih vedenj v organizacijah. Izmerili smo tudi zadovoljstvo menedžerjev v organizacijah. Z vprašalnikom smo pridobili tudi podatke o anketiranih glede na spol, starost, delovno dobo, delovne izkušnje, stopnjo izobrazbe in o organizaciji.

Opis vzorca

Po predhodni pilotski raziskavi je bilo anketiranje izvedeno v času od 30. 3. 2009 do 10. 4. 2009 v dveh slovenskih podjetjih industrije jekla. Po javno dostopni bazi na strani gospodarske zbornice (<http://www.gzs.si/register/zadetki.asp>, dne 10. 2. 2009) so po SKD-klasifikaciji 24.10 – Proizv. surov. železa, jekla, ferozlitin štiri podjetja: Acroni, d. o. o., Metal Ravne, d. o. o., Štore Steel, d. o. o., in Valji Group, d. o. o. Po pridobitvi soglasja smo menedžerjem razdelili vprašalni-

ke, in sicer od nižje do višje ravni. Pričakovali smo, da se bo odzvalo 20–40 % zaprošenih menedžerjev. V podjetji, ki smo ju vključili v nadaljnjo raziskavo, je bilo poslanih 314 anketnih vprašalnikov, kolikor je bilo med anketiranjem tudi vseh menedžerjev v obeh podjetjih, vrnjenih pa je bilo 83 anketnih vprašalnikov, kar je 26,43 %.

Med anketiranimi je bilo 73,5 % moških (61) in 26,5 % žensk (22), starost anketiranih pa je bila od 29 do 63 let; povprečna starost moških je bila 46,31 leta, žensk pa 43,5 leta. Povprečna delovna doba je bila 26,5 leta, povprečna delovna doba v podjetju 22,1 leta in povprečna delovna doba na delovnem mestu 8,9 leta. 6,0 % anketiranih je imelo IV. stopnjo izobrazbe, 24,1 % anketiranih je imelo V. stopnjo izobrazbe, 14,5 % anketiranih je imelo VI. stopnjo izobrazbe, s VII. stopnjo – visoka strokovna izobrazba – je bilo 18,1 % anketiranih, 33,7 % anketiranih pa je imelo univerzitetno ali višjo izobrazbo. Delovne izkušnje v proizvodnji je imelo 85,7 % anketiranih, 14,3 % pa delovnih izkušenj iz proizvodnje ni imelo.

V podjetju A je bila povprečna stopnja IF-faktorja v letu 2008 10,10, v podjetju B pa 17,2. V podjetju A je v letu 2008 znašal faktor BS % 5,85 in v podjetju B 5,74 (faktor BS % oz. odstotek bolniškega staža je odstotek izgubljenih koledarskih dni na enega zaposlenega delavca; indeks frekvenca oz. IF-faktor je število primerov odsotnosti z dela zaradi bolniškega staža na 100 zaposlenih v enem letu.)

Absentizem smo merili tudi s štirimi vprašanji z vprašalnikom in ugotovili, da je najmanj prisotno izmišljanje poškodb pri delu, najpogostejša pa sta zamujanje v službo in predčasno odhajanje z dela.

Opis instrumenta

Prisotnost neželenih vedenj. V anketnem vprašalniku smo zastavili 46 vprašanj, s katerimi smo merili prisotnost neželenih vedenj v podjetjih. Anketirane smo spraševali, koliko so prisotna vedenja v podjetju, in so imeli možnost obkrožiti 1 – niso, 2 – zgodi se enkrat v šestih mesecih, 3 – vsaj enkrat mesečno, 4 – vsaj enkrat tedensko in 5 – vsakodnevno.

Resnost neželenih vedenj. V anketnem vprašalniku smo zastavili 46 vprašanj, s katerimi smo merili resnost neželenih vedenj v podjetjih. Za vsako neželeno vedenje so podali oceno, kako resna se jim zdijo na lestvici od 1 – sploh ni resno do 5 – zelo resno.

Absentizem. V raziskavi smo uporabili sekundarne podatke o absentizmu, ki sta nam jih posredovali podjetji. V raziskavi smo uporabili podatke o stopnji faktorja BS % (čas odsotnosti) in indeks frekvenc (IF – pogostost odsotnosti) absentizma.

Ovire neželenih vedenj. V anketnem vprašalniku smo merili ovire neželenih vedenj s šestimi vprašanji. Anketirani so podali lastno mnenje, koliko ovire v njihovem podjetju vplivajo na prisotnost neželenih vedenj – dejanj z uporabo lestvice od 1 (sploh ne vpliva/ni, ni prisotna, ni verjetno) do 5 (zelo prisotna, zelo vpliva).

Motivatorji neželenih vedenj. Motivatorje neželenih vedenj smo merili z dvema sklopoma vprašanj. V prvem sklopu je bilo 18 vprašanj, s katerimi smo merili pravičnost v organizaciji. Anketiranim smo postavili trditve in jih prosili, da izrazijo strinjanje s posameznimi trditvami, pri čemer so lahko odgovorili na lestvici od 1 – ne strinjam se do 5 – popol-

noma se strinjam. V drugem sklopu pa smo merili zadovoljstvo zaposlenih v organizaciji. Anketirani so izrazili tudi svoje zadovoljstvo, in sicer na lestvici od 1 – zelo nezadovoljen do 5 – zelo zadovoljen.

Od anketiranih smo zbrali tudi demografske podatke: o spolu, starosti, skupni delovni dobi, delovni dobi v podjetju, delovni dobi na zdajšnjem delovnem mestu, stopnji izobrazbe, organizaciji in o delovnih izkušnjah v proizvodnji. Podatke o delovnih izkušnjah, ki smo jih delili na izkušnje v preteklosti in trenutno, smo združili v en dejavnik, tj. delovne izkušnje v proizvodjanju.

Z raziskavo smo skušali potrditi oziroma ovreči naslednje hipoteze:

H₁: Odnos menedžerjev do neželenih vedenj na delovnem mestu ima signifikantno pozitiven vpliv na stopnjo absentizma v organizaciji.

H₂: Ovire neželenih vedenj imajo signifikantno pozitiven vpliv, motivatorji neželenih vedenj pa signifikantno negativen vpliv na stopnjo absentizma v organizaciji.

Za potrditev oziroma zavrnitev hipotez smo sprva opravili faktorsko analizo z metodo Principal Component Analysis, s poševno rotacijo Varimax, saj so bili tako pridobljeni najboljše izsledki, da smo zmanjšali število spremenljivk, nato pa je bila opravljena analiza linearne odvisnosti.

Omejitve raziskave

V raziskavo sta bili vključeni dve podjetji jeklarske industrije, zato izidov raziskave ne moremo v celoti posploševati na druga podjetja v drugih podobnih industrijskih panogah ali izven njih. Merjenje pojava je temeljilo na podlagi subjektivnega mnenja anketiranih o resnosti neželenih vedenj. Izidov raziskave ne moremo posploševati na vse zaposlene v proučevanih ali drugih organizacijah, saj so bili v raziskavo vključeni le menedžerji v organizacijah. V raziskavi smo upoštevali pravočasno prispele anketne vprašalnike in smo predpostavili, da so pridobljeni odgovori anketirancev verodostojni in odražajo pravo stanje.

3 Rezultati

Tabela 3.1 prikazuje prisotnost neželenih vedenj v proučevanih organizacijah.

Ugotovili smo, da je najpogostejše prisotno neželeno vedenje uporaba interneta v službi v zasebne namene; kar 93 % anketiranih (77) je zaznalo to neželeno vedenje; med temi jih je 21 % (18) navedlo, da so dejanje zaznali enkrat v šestih mesecih, 38 % (31) vsaj enkrat mesečno, vsaj enkrat tedensko je to zaznalo 26 % anketiranih (22) in 6 % (5) dejanje zaznava vsakodnevno; sledi širjenje govoric o posamezniku; 87 % anketiranih (72) je zaznalo to vedenje, to vedenje anketirani najpogostejše zaznavajo vsakodnevno, 13 % anketiranih (11), enkrat v šestih mesecih ga je zaznalo 30 % anketiranih, enak odstotek anketiranih je to vedenje zaznalo vsaj enkrat mesečno in 13 % vsaj enkrat tedensko; sledijo nenehno opozarjanje na napake, obrekovanje, zadrževanje pomembnih informacij, ki vplivajo na delovno uspešnost posameznika, zamujanje v službo, podaljševanje časa za malico, neupoštevanje navodil

Tabela 1: Prisotnost neželenih vedenj

Neželeno vedenje	N	Srednja vrednost	Std. odklon
Uporabljati internet v službi v zasebne namene	82	3,02	1,02
Širiti govorice posamezniku	83	2,83	1,22
Nenehno opozarjati posameznika na napake in zmote	82	2,79	0,94
Obrekovati, opravljati nekoga	83	2,65	1,17
Zadrževati pomembne informacije, ki vplivajo na delovno uspešnost posameznika	81	2,48	1,04
Zamujati v službo	83	2,37	1,09
Podaljšati si čas malice	83	2,35	1,23
Ne upoštevati navodil nadrejenega	83	2,28	1,10
Predčasno oditi iz službe	83	2,27	1,14
Širiti žaljive in grobe opazke o posamezniku, njegovih stališčih ali o zasebnem življenju	83	2,20	1,07
Pretirano nadzorovati posameznikovo delo	83	2,16	1,03
Opravljati zasebne zadeve v delovnem času	82	2,13	0,98
Namenoma delati počasi	83	2,12	1,05
Zahtevati, da nekdo opravi nerealne ali neizvedljive naloge oz. da opravi naloge v neizvedljivem časovnem roku	83	2,12	1,13
Izključevati, ignorirati posameznika pri aktivnostih, povezanih z delom	83	2,10	1,11
Vpiti na posameznika, ga izpostavljati spontani jezi, besu	83	2,05	0,81
Zasmehovati posameznika zaradi tega, kar dela	83	2,02	0,98
Ignorirati predloge in mnenja posameznika	81	1,96	0,87
Naložiti posamezniku veliko več dela, kot ga je sposoben opraviti	83	1,95	1,07
Intenzivno iskati napake pri posameznikovem delu	83	1,86	0,93
Namenoma delati drugače, kot je določeno z navodili	83	1,80	0,93
Biti izpostavljen situacijam, v katerih se drugi norčujejo iz posameznika	83	1,75	0,82
Norčevati se iz posameznika, ga zbadati, se mu rogati	83	1,75	0,90
Vzeti bolniško, čeprav ni upravičena (izmisliti si bolezen)	83	1,75	0,97
Priti pijan v službo, uživati alkohol v službi	83	1,70	0,93
Zahtevati, da nekdo opravi delo, ki sploh ne sodi v delovno obveznost oz. med delovne naloge (npr. opravljanje zasebnih opravkov za druge)	83	1,69	1,02
Odvzeti posamezniku pomembne naloge in zadolžitve ter mu odrediti druge nepomembne naloge	83	1,67	0,87
Verbalno (besedno) neželeno spolno nadlegovanje (pripombe glede videza posameznika, spolno obarvani komentarji itn.)	83	1,66	0,80
Biti izpostavljen nezaželeni vizualni spolni vsebini (npr. koledarji, prek e pošte itn.)	83	1,61	1,00
Izpostavljati posameznika zastraševalnemu vedenju, kot je na primer žuganje, vdiranje v zasebni prostor, odrivanje	83	1,52	0,77
Izogibati se, ignorirati posameznika v določeni družbeni situaciji (npr. zabavi, pri športnih aktivnostih)	83	1,51	0,80
Odstraniti posameznika z dela oz. ga premestiti proti njegovi volji	82	1,48	0,59
Priti v službo pod vplivom mamil, uživati mamila v službi	83	1,46	0,89
Od posameznika zahtevati, da se odpove nečemu, do česar je sicer upravičen (npr. bolniškemu dopustu, povračilu potnih stroškov, prostemu dnevu)	83	1,45	0,75
Naročiti posamezniku, da naj dela manj, kot je dejansko sposoben	81	1,44	0,84
Namigniti posamezniku, da bi bilo bolje, če bi dal odpoved oz. prosil za premestitev	83	1,41	0,61
Namenoma delati slabo	83	1,39	0,76
Izmisliti si poškodbo pri delu	83	1,37	0,68
Groziti posamezniku, da mu bodo zagrenili življenje, npr. da mu bodo odredili delo prek polnega delovnega časa, nočno delo, izvajanje neprijetnih delovnih nalog itn.	83	1,37	0,62
Groziti posamezniku z nasiljem ali s telesnim napadom	83	1,23	0,48
Pošiljati žaljivo pošto	83	1,16	0,48
Neželeno fizično spolno nadlegovanje (otipavanje, prijemanje itn.)	83	1,14	0,42
Obrekovati posameznika, da je istospolno usmerjen	83	1,10	0,34
Trden prijem, fizično odrivanje oz. udarec od nadrejenega	82	1,09	0,39
Neželeno spolno nadlegovanje – od posameznika zahtevati spolne aktivnosti	83	1,02	0,15

Tabela 2: Resnost neželenih vedenj

Neželeno vedenje	N	Srednja vrednost	Std. odklon
Priti v službo pod vplivom mamil, uživati mamila v službi	83	4,76	0,84
Priti pijan v službo, uživati alkohol v službi	82	4,7	0,86
Neželeno spolno nadlegovanje – od posameznika zahtevati spolne aktivnosti	83	4,61	0,92
Zasmehovati posameznika zaradi tega, kar dela	83	4,47	4,39
Izmisliti si poškodbo pri delu	83	4,46	1,02
Namenoma delati slabo	83	4,43	1,12
Trden prijem, fizično odrivanje oz. udarec od nadrejenega	82	4,4	1,09
Groziti posamezniku z nasiljem ali s telesnim napadom	83	4,39	1,06
Namenoma delati drugače, kot je določeno z navodili	83	4,37	0,98
Zadrževati pomembne informacije, ki vplivajo na delovno uspešnost posameznika	82	4,33	0,63
Neupoštevati navodil nadrejenega	83	4,31	0,94
Vzeti bolniško, čeprav ni upravičeno (izmisliti si bolezen)	83	4,28	0,98
Izpostavljati posameznika zastraševalnemu vedenju, kot je na primer žuganje, vdiranje v zasebni prostor, odrivanje	83	4,27	1,05
Od posameznika zahtevati, da se odpove nečemu, do česar je sicer upravičen (npr. bolniškemu dopustu, povračilu potnih stroškov, prostemu dnevu)	83	4,19	0,99
Verbalno (besedno) neželeno spolno nadlegovanje (pripombe glede videza posameznika, spolno obarvani komentarji itn.)	83	4,18	0,84
Groziti posamezniku, da mu bodo zagrenili življenje, npr. da mu bodo odredili delo prek polnega delovnega časa, nočno delo, izvajanje neprijetnih delovnih nalog itn.	83	4,17	1
Pošiljati žaljivo pošto	83	4,16	0,97
Namenoma delati počasi	83	4,14	0,89
Širiti žaljive in grobe žaljivke o posamezniku, njegovih stališčih ali o zasebnem življenju	83	4,1	1,02
Biti izpostavljen situacijam, v katerih se drugi norčujejo iz posameznika	83	4,1	0,96
Neželeno fizično spolno nadlegovanje (otipavanje, prijemanje itn.)	83	4,08	1,31
Izključevati, ignorirati posameznika pri aktivnostih, povezanih z delom	83	4,07	0,99
Namigniti posamezniku, da bi bilo bolje, če bi dal odpoved oz. prosil za premestitev	83	4,05	1,08
Norčevati se iz posameznika, ga zbadati, se mu rogati	83	4,02	1,05
Širiti govorice posamezniku	83	3,98	0,87
Vpiti na posameznika, ga izpostavljati spontani jezi, besu	83	3,98	0,9
Zahtevati, da nekdo opravi nerealne ali neizvedljive naloge oz. da opravi naloge v neizvedljivem časovnem roku	83	3,96	0,93
Neprestano kritizirati delo in delovne napore posameznika	83	3,93	0,81
Intenzivno iskati napake pri posameznikovem delu	83	3,93	0,95
Odvzeti posamezniku pomembne naloge in zadolžitve ter mu odrediti druge nepomembne naloge	83	3,9	0,98
Odstraniti posameznika z dela oz. ga premestiti proti njegovi volji	83	3,88	1,04
Ignorirati predloge in mnenja posameznika	82	3,88	0,82
Obrekovati posameznika, da je istospolno usmerjen	83	3,82	1,25
Naročiti posamezniku, da naj dela manj, kot je dejansko sposoben	81	3,8	1,13
Zamujati v službo	83	3,78	0,98
Nenehno opozarjati posameznika na napake in zmore	83	3,76	0,81
Naložiti posamezniku veliko več dela, kot ga je sposoben opraviti	83	3,75	0,94
Zahtevati, da nekdo opravi delo, ki sploh ne sodi v delovno obveznost oz. med delovne naloge (npr. opravljanje zasebnih opravkov za druge)	83	3,75	0,95
Obrekovati, opravljati nekoga	83	3,75	0,84
Opravljati zasebne zadeve v delovnem času	82	3,7	0,98
Pretirano nadzorovati posameznikovo delo	83	3,69	0,83
Predčasno oditi iz službe	83	3,67	1,01
Podaljšati si čas malice	83	3,67	1,33
Izogibati se, ignorirati posameznika v določeni družbeni situaciji (npr. zabavi, pri športnih aktivnostih)	83	3,45	1,04
Biti izpostavljen nezaželeni vizualni spolni vsebini (npr. koledarji, prek e pošte itn.)	83	3,34	1,34
Uporabljati internet v službi v zasebne namene	82	3,18	1,01

nadrejenega, predčasni odhodi iz službe itn. Najmanj prisotno vedenje je neželeno spolno nadlegovanje – od posameznika zahtevati spolne aktivnosti; dva (2 %) anketirana sta zaznala »neželeno spolno nadlegovanje – od posameznika zahtevati spolne aktivnosti, sledijo trden prijem, fizično odrivanje oz. udarec od nadrejenega, obrekovanje posameznika, da je istospolno usmerjen, neželeno fizično spolno nadlegovanje (otipavanje, prijemanje), pošiljanje žaljive pošte, grožnje posamezniku z nasiljem ali s telesnim napadom in drugo.

Anketirane menedžerje smo prosili, da ocenijo resnost neželenih vedenj. Anketirani so kot najresnejše vedenje ocenili prihode v službo pod vplivom mamil oz. uživanje mamil v službi s povprečno oceno resnosti 4,76, sledijo prihod v službo pijan oz. uživanje alkohola v službi s povprečno oceno resnosti 4,70, neželeno spolno nadlegovanje – od posameznika zahtevati spolne aktivnosti – s povprečno oceno resnosti 4,61. Najmanj resno so ocenili uporabo interneta v službi v zasebne namene s povprečno oceno resnosti 3,18, ki pa je najpogostejše vedenje, ki so ga zaznali anketirani menedžerji. Pri nobenem izmed opisanih neželenih vedenj srednja vrednost ni nižja od 3 (najnižja 3,18), kar kaže na to, da menedžerji opisana neželena vedenja dojemajo kot resna (nevarna) vedenja. Ocenjeno resnost neželenih vedenj prikazuje spodnja tabela 3.2.

Anketiranim menedžerjem smo zastavili trditve o ovirah neželenih vedenj in jih prosili, da podajo mnenje (ocenijo), koliko ovire vplivajo na neželena vedenja. Izsledki so razvidni iz tabele 3.3. Z vprašalnikom smo izmerili tudi motivatorje neželenih vedenj, izidi pa so razvidni iz tabele 3.4.

Tabela 3: Ovire neželenih vedenj

Ovira	N	Srednja vrednost	Std. odklon
Kazni za kršitve so prestroge	83	2,35	1,11
Verjetnost, da bo/bom pri dejanju odkrit, je ...	83	2,99	1,33
Kazni so pravične	83	3,12	1,25
Boji/m se da bo/m pri dejanju odkrit	82	3,17	1,42
Verjetnost da bo/bom pri dejanju odkrit je	82	3,34	1,06
Da dejanja ne naredi/m vpliva pripadnost podjetju	83	3,47	1,36

Tabela 4: Motivatorji neželenih vedenj

Motivatorji	N	Srednja vrednost	Std. odklon
Sistem napredovanja omogoča, da najboljši zasedejo najboljše položaje	83	2,11	1,07
Plače so pravično razdeljene glede na delovni prispevek posameznika	83	2,11	1,00
Razmerja med plačami zaposlenih v podjetju so ustrezna	83	2,28	1,07
Tisti, ki so bolj obremenjeni z delom, so tudi ustrezno stimulirani	83	2,28	1,05
Če bi imel možnost, bi takoj zamenjal službo	83	2,47	1,13
Dober delovni izid se v naši organizaciji hitro opazi in je pohvaljen	83	2,60	1,05
Zaposlitev je varna oz. zagotovljena	83	2,77	1,02
Nagrade za delovno uspešnost dobijo tisti, ki si jih zaslužijo	83	2,86	1,17
Uspešnost se navadno vrednoti po dogovorjenih merilih	83	2,94	1,18
Napredujejo tisti, ki so v boljših odnosih z nadrejenimi	83	2,96	1,19
Zaposleni prejemamo plačo, ki je vsaj enakovredna ravni plač na trgu	83	3,27	1,21
Odnosi med zaposlenimi so dobri	83	3,39	0,99
Medsebojno si zaupamo	83	3,54	0,85
Vodje in zaposleni se pogovarjamo sproščeno, prijateljsko, enakopravno	83	3,63	1,04
Cenimo delo svojih sodelavcev	83	3,66	0,98
Če bi se zaradi poslovnih težav znižala plača, ne bi zapustil organizacije	83	4,13	0,95
Ponosen sem, da sem zaposlen v organizaciji	83	4,23	0,85

Nadalje smo merili tudi zadovoljstvo menedžerjev v organizaciji. Kot prikazuje tabela 3.5, so anketirani najbolj nezadovoljni z možnostjo napredovanja ter najbolj zadovoljni z delom in neposredno nadrejenim.

Od sodelujočih podjetij smo pridobili podatke o stopnji absentizma v letu 2008. Srednja vrednost faktorja BS % je bila 5,8, IF-faktorja pa 13,65, najnižja vrednost BS je bila 4,8, najvišja pa 7,2, najnižja vrednost IF-faktorja je bila 7,8, najvišja pa 21,2. Absentizem smo merili tudi s štirimi vprašanji z vprašalnikom in ugotovili, da je najmanj prisotno izmišljeva-

nje poškodb pri delu, najpogostejša pa sta zamujanje v službo in predčasno odhajanje z dela.

Preverjanje hipoteze 1

Postavljena je bila naslednja hipoteza:

H₁: Odnos menedžerjev do neželenih vedenj na delovnem mestu ima signifikantno pozitiven vpliv na stopnjo absentizma v organizaciji.

Z namenom zmanjšanja spremenljivk je bila opravljena faktorska analiza za percepcijo resnosti neželenih vedenj.

Tabela 5: Zadovoljstvo menedžerjev

Zadovoljstvo	N	Srednja vrednost	Std. odklon
z možnostjo napredovanja	83	3,08	1,06
s plačo	83	3,17	0,93
z vodstvom organizacije	83	3,35	0,80
z delovnim časom	83	3,48	1,16
s poštenostjo nadrejenih	83	3,60	0,81
s podrejenimi	81	3,72	0,73
s statusom v organizaciji	83	3,72	0,75
z delovnimi pogoji	83	3,84	0,76
s stalnostjo zaposlitve	83	4,07	0,66
s sodelavci	83	4,08	0,72
z neposredno nadrejenim	83	4,10	0,95
z delom	83	4,10	0,60

Primernost podatkov je preverjena s testom KMO and Bartlett's; ugotovili smo, da so podatki primerni za faktorsko analizo.

Za resnost neželenih vedenj je bila faktorska analiza izvedena z metodo Principal Component Analysis, s poševno rotacijo Varimax, saj so bili tako pridobljeni najboljši izidi. Glede na osnovno analizo smo se odločili za 5 faktorjev, ker s petim faktorjem pojasnimo prek 4 % variabilnosti. Tako s prvim faktorjem pojasnimo 25,53 % variabilnosti, z drugim 17,22 % variabilnosti, s tretjim 13,61 %, četrtem 9,43 % in s petim 4,15 % variabilnosti. S petimi skupnimi faktorji pojasnimo 69,87 % variabilnosti pri percepciji resnosti neželenih vedenj.

Z analizo linearne odvisnosti odnosa (percepcijo) menedžerjev do neželenih vedenj smo preverjali linearno odvisnost absentizma od odnosa menedžerjev do neželenih vedenj. Multiplo linearno regresijsko analizo smo izvedli za odvisne spremenljivke: prisotnost neupravičene bolniške odsotnosti (NEUP_BOLNISKA_PRIS), prisotnost izmišljenih poškodb pri delu (LAZ_POSKODBA_PRIS), BS- in IF-faktorja, z vsemi petimi faktorji percepcije resnosti menedžerjev neželenih vedenj. Pojasnjena varianca odvisne spremenljivke z linearnim vplivom neodvisnih spremenljivk PER_RES_1, PER_RES_2, PER_RES_3, PER_RES_4 in PER_RES_5 je nizka in znaša 16,6 %, multipli korelacijski koeficient 0,468 pa kaže na srednje močno linearno povezanost odvisne spremenljivke NEUP_BOLNISKA_PRIS od neodvisnih, povezanost pa je signifikantna (0,002). Statistično značilen linearni vpliv neodvisnih faktorjev je bil ugotovljen za odvisno

spremenljivko NEUP_BOLNISKA_PRIS, za neodvisno spremenljivko PER_RES_5 (sig. 0,000, β 0,452).

Z opravljeno faktorsko analizo smo v peti faktor PER_RES_5 uvrstili »Podaljšati si čas malice«. Izid nam pove, da bolj kot menedžerji resno predvidevajo neželeno vedenje »Podaljšati si čas malice«, višja je neupravičena odsotnost z dela. To si lahko razložimo s tem, da je podaljševanje malice sprejeto kot normalno, običajno vedenje; o tem govorita tudi povprečna ocena resnosti vedenja 1,33 in povprečna ocena prisotnosti podaljševanja časa malic 2,35 vedenja (med najvišjimi povprečnimi ocenami prisotnosti neželenih vedenj). Sklepamo lahko, da »pritisk« menedžerjev zaradi podaljševanja malic vodi v višjo neupravičeno odsotnost zaradi bolezni zaposlenih.

Z multiplo linearno regresijsko analizo odvisnosti signifikantnih vplivov faktorjev percepcije resnosti menedžerjev na BS- in IF-faktor nismo ugotovili.

Na osnovi analize hipoteze H₁ »Odnos menedžerjev do neželenih vedenj na delovnem mestu ima signifikantno pozitiven vpliv na stopnjo absentizma v organizaciji« ne moremo potrditi, zato jo zavrnamo.

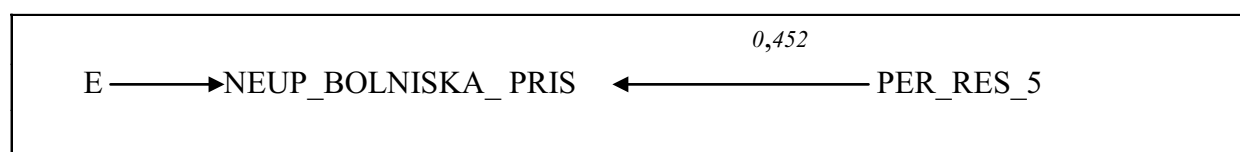
Preverjanje hipoteze 2

Postavljena je bila naslednja hipoteza:

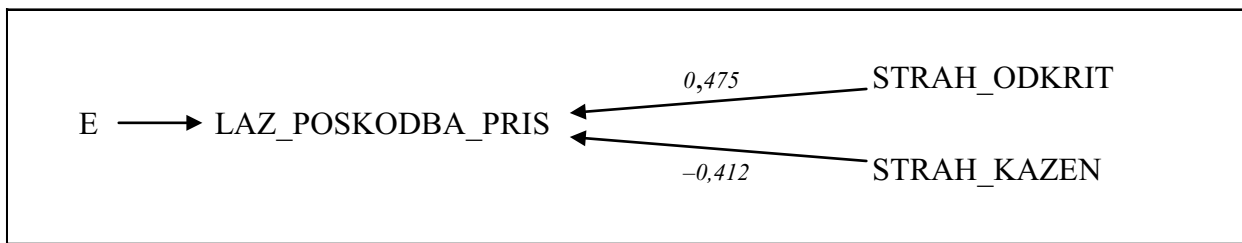
H₂: Ovire neželenih vedenj imajo signifikantno pozitiven vpliv, motivatorji neželenih vedenj pa signifikantno negativen vpliv na stopnjo absentizma v organizaciji.

Z namenom zmanjšanja spremenljivk je bila opravljena faktorska analiza na prisotnost neželenih vedenj in za percepcijo resnosti neželenih vedenj. Primernost podatkov je preverjena s testom KMO and Bartlett's; ugotovili smo, da so podatki primerni za faktorsko analizo. Za prisotnost neželenih vedenj je bila faktorska analiza izvedena z metodo Principal Component Analysis, s poševno rotacijo Varimax, saj so bili tako pridobljeni najboljši izidi. Glede na osnovno analizo smo se odločili za pet faktorjev, ker s petim faktorjem pojasnimo prek 5 % variabilnosti. Tako s prvim faktorjem pojasnimo 20,265 % variabilnosti, z drugim 15,386 %, s tretjim 11,219 %, četrtem 9,896 % in s petim 5,661 % variabilnosti. S petimi skupnimi faktorji pojasnimo 62,41 % variabilnosti pri zaznavanju prisotnosti neželenih vedenj. Pri vedenjih smo poiskali skupne imenovalce in faktorje poimenovali: prvi faktor – produkcijska deviantna vedenja (PROD_DEV), drugi faktor politična deviantnost (POL_DEV), tretji faktor zmanjšanje delovnih kompetenc (ZMAN_DEL_KOMP), četrti faktor agresivno vedenje od nadrejenega (AGRES_VED_NAD) in peti faktor odkrito agresivno vedenje (ODKRI_AGRES_VED).

Z analizo linearne odvisnosti smo nadalje preverjali: linearno odvisnost absentizma od ovir neželenih vedenj in motiva-



Slika 1: Vpliv percepcije menedžerjev resnosti neželenih vedenj na absentizmu



Slika 2: Vpliv ovir na absentizem

torjev neželenih vedenj. Multiplo linearno regresijsko analizo smo izvedli za odvisne spremenljivke: prisotnost neupravičene bolniške odsotnosti (NEUP_BOLNISKA_PRIS), prisotnost izmišljenih poškodb pri delu (LAZ_POSKODBA_PRIS), BS- in IF-faktorja, s proučevanimi ovirami in z motivatorji neželenih vedenj, in sicer smo izvedli z metodo Backward. Z izključevanjem statistično nesignifikantnih neodvisnih spremenljivk (ovir) smo prišli do modela, ki je statistično značilen (sig. 0,033), vpliv neodvisnih spremenljivk pa je šibek ($R = 0,290$), z linearnim vplivom neodvisnih spremenljivk pa lahko pojasnimo le 6 % variance odvisne spremenljivke, 94 % linearnega vpliva pa imajo drugi neznani dejavniki.

Z analizo lahko ugotovimo, da je linearni vpliv neodvisnih spremenljivk na odvisno spremenljivko LAZ_POSKODBA_PRIS signifikanten za STRAH_ODKRIT (sig. 0,010, $\beta = 0,449$) in STRAH_KAZEN (sig. 0,025, $\beta = -0,389$).

Strah pred kaznijo signifikantno vpliva na prisotnost izmišljenih poškodb pri delu, višji kot je strah pred kaznijo, manj je lažnih poškodb pri delu. Presenetljiva pa je ugotovitev, da strah, da bo zaposleni pri dejanju odkrit, ne zmanjšuje, ampak nasprotno – povečuje stopnjo absentizma – izmišljenih poškodb pri delu. To si lahko razložimo z vplivom nadzora nad zaposlenimi. Bolj kot so zaposleni podvrženi nadzoru, bolj kot so pod »pritiskom«, višja je stopnja absentizma, odsotnosti zaradi izmišljenih poškodb pri delu (najverjetneje manjših poškodb, kot so na primer: manjše ureznine, poškodbe na poti na delo, kot so zvini).

V analizo smo nadalje kot odvisni dejavnik vključili BS- in IF-faktor, kot neodvisne pa smo vključili zadovoljstvo menedžerjev. Pri analizi odvisnega dejavnika BS smo z izključevanjem statistično nesignifikantnih neodvisnih spremenljivk (motivatorjev) po metodi Backward prišli do modela, ki je statistično značilen (sig. 0,031), vpliv neodvisnih spremenljivk je srednje močen ($R = 0,542$), z linearnim vplivom neodvisnih spremenljivk pa lahko pojasnimo 22,4 % variance odvisne spremenljivke. Ugotovimo lahko, da je linearni vpliv neodvisnih spremenljivk na odvisno spremenljivko BS signifikanten

za ZAD_NEP_NADREJENIM (sig. 0,009, $\beta = -0,775$), in ZAD_POSTEN_NADREJENI (sig. 0,033, $\beta = 0,619$).

Ugotovimo lahko, da ima zadovoljstvo z neposrednim nadrejenim signifikantno pozitiven vpliv na stopnjo absentizma (BS), čas odsotnosti. Bolj kot so zaposleni zadovoljni z neposrednim nadrejenim, manj časa so odsotni in velja tudi nasprotno, bolj kot so nezadovoljni z neposredno nadrejenim, dlje časa so odsotni.

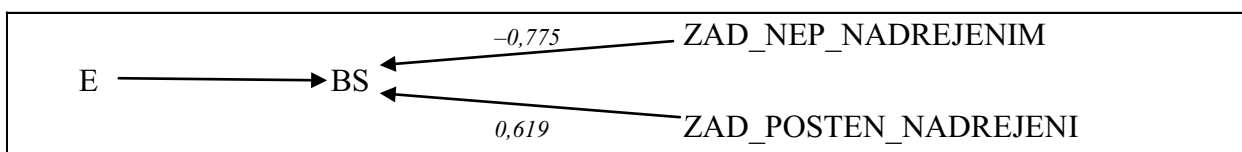
V analizo smo nato kot odvisni dejavnik vključili NEUP_BOLNISKA_PRIS, nato LAZ_POSKODBA_PRIS, BS- in nazadnje IF-faktor, kot neodvisne pa smo vključili motivatorje neželenih vedenj.

Pri analizi odvisnega IF-faktorja smo z izključevanjem statistično nesignifikantnih neodvisnih spremenljivk (motivatorjev) po metodi Backward prišli do modela, ki je statistično značilen (sig. 0,035), vpliv neodvisnih spremenljivk pa je srednje močen ($R = 0,523$), z linearnim vplivom neodvisnih spremenljivk pa lahko pojasnimo 20,4 % variance odvisne spremenljivke. Ugotovimo lahko, da je linearni vpliv neodvisnih spremenljivk na odvisno spremenljivko IF signifikanten za ODNOS_ZAPOSLENI (sig. 0,033, $\beta = -0,438$) in SLABO_DELO_KAZEN (sig. 0,033, $\beta = 0,443$).

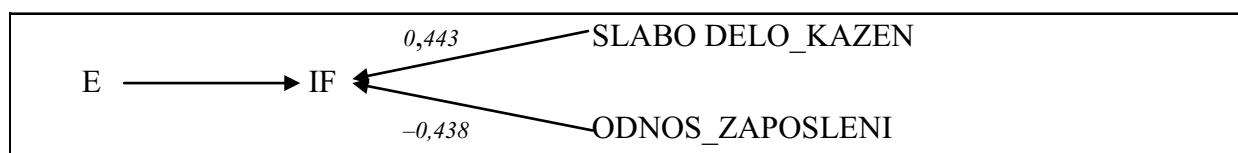
Ugotovimo lahko, da ima odnos med zaposlenimi signifikantno negativen vpliv na stopnjo absentizma, kar pomeni, da boljši kot so odnosi med zaposlenimi, manj je absentizma, pogostosti bolniške odsotnosti (IF); velja tudi nasprotno – slabši kot so odnosi, višja je stopnja absentizma.

Na pogostost odsotnosti (IF) signifikantno vpliva tudi kazni za slabo delo. Kot lahko ugotovimo, velja, da več kot je kazni za slabo delo, višja je stopnja pogostosti absentizma.

Na osnovi analize lahko H_2 : »Ovire neželenih vedenj imajo signifikantno pozitiven vpliv, motivatorji neželenih vedenj pa signifikantno negativen vpliv na stopnjo absentizma v organizaciji« potrdimo v drugem delu, v katerem trdimo, da imajo motivatorji neželenih vedenj signifikantno negativen vpliv na stopnjo absentizma, prvega dela, v katerem trdimo, da imajo ovire neželenih vedenj signifikantno pozitiven vpliv na stopnjo absentizma, pa ne moremo ne potrditi ne ovreči.



Slika 3: Vpliv zadovoljstva na absentizem



Slika 4: Vpliv motivatorjev neželenih vedenj na pogostost absentizma

4 Razprava

Ugotovili smo, da strah pred kaznijo signifikantno vpliva na prisotnost izmišljenih poškodb pri delu; višji kot je strah pred kaznijo, manj je lažnih poškodb pri delu. S to ugotovitvijo smo potrdili tudi Molma (1994), ki meni, da so sankcije lahko tudi pomemben vzvod pri obvladovanju vedenja zaposlenih v organizaciji, saj zaposleni, ki so soočeni z grožnjo sankcije, tehtajo med koristmi neželenega vedenja in posledicami vedenja – grozečo kaznijo, če pretehta kazen, jih strah pred kaznijo odvrne od neželenega vedenja.

Presenetljiva pa je bila ugotovitev, da strah, da bo zaposleni pri dejanju odkrit, ne zmanjšuje, ampak nasprotno – povečuje stopnjo absentizma, lažnih poškodb pri delu, kar smo razložili z vplivom nadzora nad zaposlenimi. Bolj kot so zaposleni podvrženi nadzoru, bolj kot so pod »pritiskom«, višja je stopnja absentizma, odsotnosti zaradi izmišljenih poškodb pri delu (najverjetneje manjših poškodb, kot so na primer: manjše ureznine, poškodbe na poti na delo, kot so zvini).

Ugotovili smo, da ima zadovoljstvo z neposrednim nadrejenim signifikantno pozitiven vpliv na stopnjo absentizma (BS), na čas odsotnosti. Bolj kot so zaposleni zadovoljni z neposrednim nadrejenim, manj časa so odsotni in velja tudi nasprotno, bolj kot so nezadovoljni z neposredno nadrejenim, dlje časa so odsotni. Ugotovili smo tudi, da ima odnos med zaposlenimi signifikantno negativen vpliv na stopnjo absentizma, kar pomeni, da boljši kot so odnosi med zaposlenimi, manj je absentizma, pogostosti bolniške odsotnosti (IF), velja pa tudi nasprotno – slabši kot so odnosi, višja je stopnja absentizma. Odnosi se povezujejo tudi s socialno podporo, ki jo je zaposleni deležen od sodelavcev; tako lahko na osnovi izidov potrdimo Limu (1996), ki meni, da socialna podpora, ki jo je posameznik deležen prek drugih, preprečuje zamujanje in absentizem.

Na pogostost odsotnosti (IF) signifikantno vpliva tudi kazen za slabo delo. Kot smo ugotovili – več kot je kazni za slabo delo, višja je stopnja pogostosti absentizma. Prav tako smo ugotovili, da zadovoljstvo s poštenostjo nadrejenih vpliva signifikantno na čas odsotnosti. Vendar pa je vpliv drugačen od pričakovanj, saj bolj kot so zaposleni zadovoljni z poštenostjo nadrejenih, dlje časa so odsotni in velja tudi nasprotno – bolj kot so nezadovoljni s poštenostjo nadrejenih, manj časa so odsotni. To lahko razložimo s tem, da zaposleni od poštenih nadrejenih pričakujejo višje razumevanje in pošteno ravnanje ob vrnitvi na delo in nasprotno – od manj poštenih nadrejenih, od katerih razumevanja zaradi bolniške odsotnosti ne pričakujejo, bojijo pa se »povračilnih ukrepov« in nepoštenega ravnanja, kar lahko vodi tudi v to, da se zaposleni vrnejo na delo predčasno. S tem je povezan tudi prezentizem, prisotnost

delavca na delovnem mestu, ko bi zaradi zdravstvenih razlogov moral biti odsoten. To pa ima tudi negativne posledice na strani delavca (na primer: iz manjšega prehlada se lahko razvije hujša oblika bolezni) in tudi organizacije (na primer: bolni delavec lahko okuži druge, vprašljivi sta storilnost in tudi kakovost dela).

Ugotovili smo statistično značilen linearni vpliv percepcije menedžerjev neželenega vedenja »Podaljšati si čas malice« na neupravičeno izmišljeno bolniško odsotnost. Izid nam pove, da bolj kot imajo menedžerji za resno neželeno vedenje, višja je neupravičena odsotnost z dela. To lahko obrazložimo s tem, da je podaljševanje časa malice v organizacijah sprejeto kot normalno vedenje. Če menedžerji zaposlene opozarjajo na nesprejemljivost takšnega vedenja, to zaposleni lahko dojemajo kot pritisk, sovražno delovno okolje in je njihov odziv odhod na izmišljeno (neupravičeno) bolniško odsotnost.

Kot lahko ugotovimo, se pri vseh dejavnikih (razen pri dejavniku odnosi med zaposlenimi) kot ključen dejavnik pojavlja menedžer. Tako se lahko pridružimo mnenju nekaterih avtorjev (na primer Van Fleet in Griffin, 2006; Brotheridge in Keup, 2005; Trevino in Brown, 2005), da imajo menedžerji velik vpliv na zaposlene v organizaciji, njihovo vedenje in ne nazadnje tudi na absentizem v organizaciji. Menedžerji se morajo zavedati, da so zaposleni aktivni opazovalci v organizaciji; če dojemajo dogajanje okrog sebe kot neupravičeno, to lahko sproži resne oblike neetičnega vedenja na delovnem mestu, kot navajajo Aquino et al. (1999), Baron et al. (1999). Tudi sami smo v raziskavi ugotovili vpliv zadovoljstva s poštenostjo nadrejenih na absentizem, podobno kot so Aquino Lime et al. (2006), ki so z raziskavo potrdili teze, da percepcija neupravičnosti lahko motivira posameznike, da postavijo lastne interese pred organizacijske, celo takrat, ko so v konfliktu z njihovim dojemanjem morale.

Prispevek dopolnjuje znanja in spoznanja o pojavu neželenih vedenj na delovnem mestu in njihov vpliv na absentizem ter že obstoječe vedenje o tem, predvsem z vidika vpliva menedžerjev na absentizem. Izsledki raziskave so lahko v pomoč menedžerjem pri snovanju politike ravnanja s kadri in upravljanja organizacij, saj med drugim kažejo na »občutljivost« zaposlenih pri menedžeriranju; nepremišljeni ukrepi ali način izvajanja/uvajanja ukrepov lahko vodi v povečanje absentizma. V raziskavo sta bili vključeni dve podjetji jeklarke industrije, zato izsledkov raziskave ne moremo v celoti posploševati na druga podjetja v isti ali drugih podobnih industrijskih panogah kakor tudi ne na druge organizacije.

V raziskavo nismo zajeli na primer vplivov kulturnega okolja v organizaciji in zunaj organizacije, vpliva tolerance okolja do absentizma, vpliva skupin na absentizem, kar bi bilo v prihodnje vredno raziskati, s tem pa bi dobili nov, poglobljen

pogled na vzroke absenzizma, še posebej, če bi bila raziskava opravljena v različnih gospodarskih panogah.

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ment Koper. Raziskovalno in publicistično je aktiven predvsem na področju upravnih in organizacijskih ved - managementa ter javnega zdravja (varstva pri delu). Njegova bibliografija obsega več kot 50 izvirnih in preglednih znanstvenih člankov v domačih in tujih revijah. Kot vodja ali član je deloval v 15 raziskovalnih in podjetniških projektih.

The influence of unwanted behaviour in the workplace to absenteeism

The purpose of this survey is to understand and enlighten the perception of unwanted behaviour in the workplace and to research its connection to absenteeism. A questionnaire was composed and a quantitative research of present of unwanted behaviour in organizations and managers perceptions of unwanted behaviour was carried out. Data were collected from managers at two steel industry companies in Slovenia. The findings of the research show that absenteeism in chosen companies is influenced by: the fear of discovery, the contentment with ones immediate superior, the fear of punishment and that the punishment for badly performed work. According the findings of this survey we can conclude: the organizational reasons have important influence on absenteeism and that managers can influence on the absenteeism.

Key words: absenteeism, management of a company, research, survey, unwanted behaviour

Raziskava onesnaženosti odpadnih voda v slovenski tekstilni industriji in ekonomska upravičenost učinkovitega čiščenja

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Odpadne vode iz tekstilne industrije so praviloma zelo obremenjene. Njihovo obremenitev lahko ugotavljamo preko inženirskih normativov, normativov najboljših razpoložljivih tehnologij ter z letnimi obratovalnimi monitoringi. Raziskava zajema vse zavezanca na podlagi Direktive 96/61/ES o celovitem preprečevanju in nadzorovanju onesnaževanja okolja iz tekstilne industrije v Sloveniji, podrobneje pa smo raziskali dve tekstilni tovarni. Pri večini obravnavanih tekstilnih tovarn smo ugotovili bistveno večje emisije, kot bi jih pričakovali na podlagi inženirskih in Best Available Techniques (BAT) normativov. Razlog je zastarela tehnološka oprema, ki znatno odstopa od BAT normativov. Ker so v Sloveniji tekstilne tovarne večinoma priključene na javna kanalizacijska omrežja, ki se zaključijo s centralnimi čistilnimi napravami, se pojavlja vprašanje ekonomske upravičenosti postavitve učinkovitih čistilnih naprav za predhodno čiščenje odpadnih voda. Obvezno je doseganje predpisanih kriterijev za izpust v javno kanalizacijo. Bolj učinkovito čiščenje pa je upravičeno le, če je to ekonomsko upravičeno. Ekonomsko upravičenost presojamo iz vidika stroškov, ki so sestavljeni iz cene sveže vode, okoljske dajatve, cene za odvajanje in čiščenje odpadne vode ter stroškov za učinkovito lastno čiščenje.

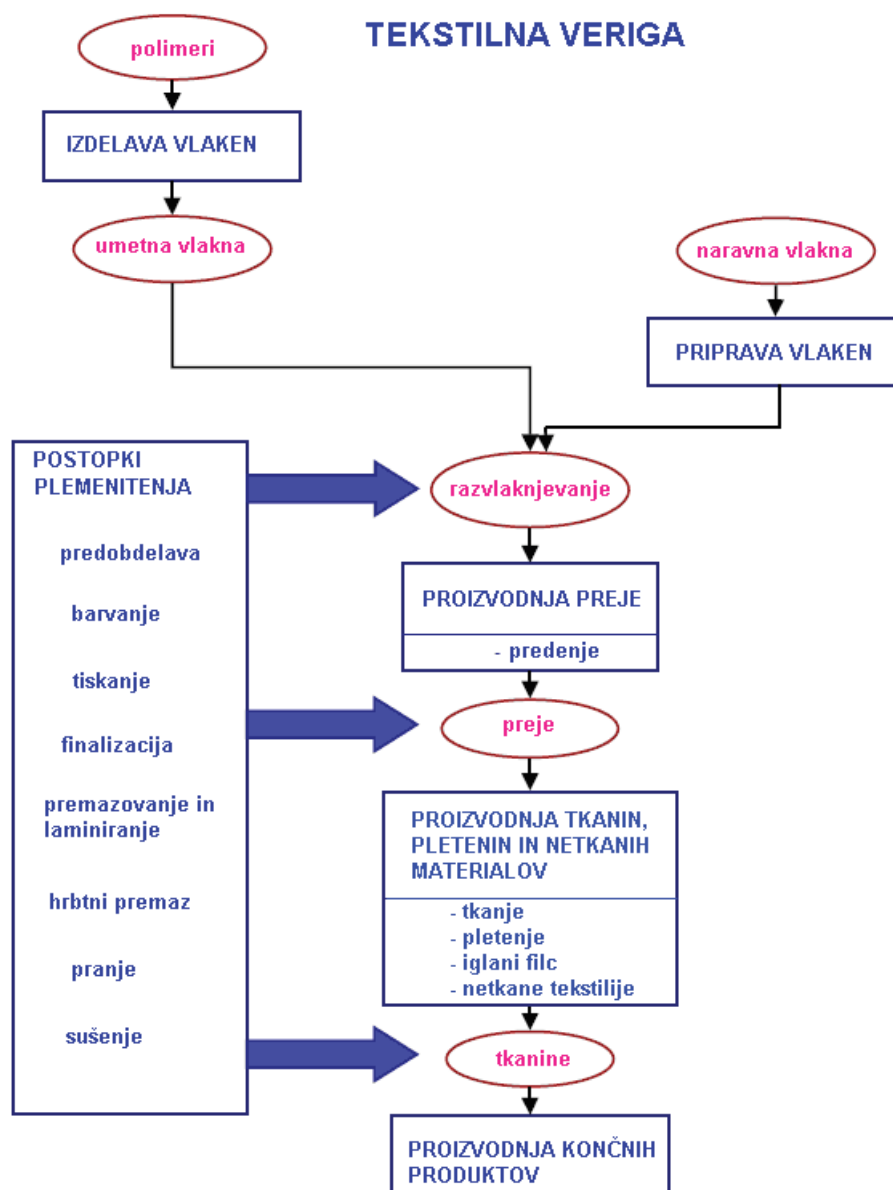
Ključne besede: emisije, predhodno čiščenje, tehnološke odpadne vode, tekstilna industrija

1 Uvod

Industrijske dejavnosti so kljub zmanjšanju emisij v zadnjem desetletju še vedno glavni vir onesnaževanja okolja. V tekstilni industriji nastajajo velike količine močno onesnaženih tehnoloških odpadnih voda v proizvodnji tekstilnih materialov, medtem ko pri konfekciji oblačil nastajajo relativno majhne količine tehnoloških odpadnih voda. Največ močno obremenjenih tehnoloških odpadnih voda nastane pri barvanju in površinskih obdelavah tekstilij. Količina in obremenjenost odpadnih voda se ugotavlja v okviru rednega letnega obratovalnega monitoringa (Ur. l. RS, št. 54/2011; Ur. l. RS, št. 7/2007) ali preko inženirskih normativov. Nemški inženirski normativi: Abwassertechnische Vereinigung (ATV) in Verein Deutscher Ingenieure (VDI) podajo relativno dobro sliko o obsegu onesnaževanja okolja iz tekstilne industrije. Z Direktivo 96/61/EC o celovitem preprečevanju in nadzorovanju onesnaževanja okolja z dne 24. septembra 1996 (IPPC direktiva) so bila uvedena »okoljevarstvena dovoljenja« za industrijske obrate ter ocenjevanje tehnologije glede na njeno

stanje (Najboljše razpoložljive tehnologije/Best Available Techniques (BAT). BAT normativi so nadgradnja ATV in VDI normativov, s to razliko, da vsaka država samostojno oceni, kaj je zanjo BAT. Ocenjevanje tehnologije vključuje uporabljen tehnološki postopek, kot tudi način načrtovanja, gradnje, vzdrževanja, upravljanja in razgradnje obrata. BAT pomeni tehnologijo na takšni ravni, ki omogoča njeno uporabo v posamezni industrijski panogi pod ekonomsko in tehnično izvedljivimi pogoji. Obremenjevanje voda v tekstilni industriji je odvisno od vrste proizvodnje in vrste uporabljene tehnologije (IPPC Reference Document on BAT, 2003; Deutsche Gesellschaft für Technische Zusammenarbeit, 1984). Tekstilna veriga (slika 1) obsega faze od izdelave vlaken do končnih izdelkov (IPPC Reference Document on BAT, 2003). Odpadne tehnološke vode nastajajo vzdolž celotne tekstilne verige. Njihova količina in obremenjenost je odvisna od uporabljenih surovin, tehnološkega postopka in uporabljene tehnološke opreme.

Združenje za tekstilno, oblačilno in usnjarsko predelovalno industrijo Gospodarske zbornice Slovenije v sodelovanju



Slika 1: Primer tekstilne verige, povzeto po BAT (IPPC Reference Document on BAT, 2003).

z Inštitutom za vode Republike Slovenije in Fakulteto za gradbeništvo in geodezijo ter Zdravstveno fakulteto Univerze v Ljubljani sodeluje pri mednarodnem CORNET projektu z naslovom »Reducing fresh water consumption in high water volume consuming industries by recycling AOP-treated effluents« in akronimom AOP4WATER (<http://www.cornet-aop4water.eu>). Cilj projekta je zagotavljanje novih virov vode za potrebe industrije z visoko porabo vode (npr. tekstilna in papirna industrija) s ponovno uporabo (recikliranjem) očiščenih odpadnih voda iz papirne, tekstilne in prehranske industrije ter očiščenih komunalnih odpadnih voda v proizvodnem procesu. Ključ do ponovne uporabe vode je izboljšana učinkovitost čiščenja odpadnih voda s pomočjo naprednih oksidacijskih postopkov (AOP) in optimiziranega biološkega čiščenja za zagotovitev optimalne kakovosti očiščene vode ter

s tem omogočiti ponovno uporabo očiščene vode v proizvodnem procesu.

2 Materiali in metode

Količino in obremenitev odpadnih voda iz slovenske tekstilne industrije smo povzeli po letnih obratovalnih monitoringih iz leta 2009 za posamezne tekstilne tovarne (<http://www.arso.gov.si/>). Vse meritve so se izvajale v skladu s predpisanimi standardi za izvajanje prvih meritev in emisijskega monitoringa odpadnih voda, ki so navedeni v prilogi 2 Pravilnika o prvih meritvah in obratovalnem monitoringu odpadnih vod ter o pogojih za njegovo izvajanje (Ur.l. RS, št. 54/2011; Ur.l. RS, št. 14/2010). Raziskava zajema vse IPPC zavezanice iz

tekstilne industrije v Sloveniji, podrobneje pa smo raziskali dve tekstilni tovarni, ki sodelujeta pri raziskovalnem projektu CORNET AOP4WATER. Ekonomsko smo ovrednotili stroške, ki nastanejo v posameznih tovarnah zaradi neučinkovitega čiščenja tehnoloških odpadnih voda. Pri izračunu smo upoštevali ceno 0,4 €/m³ očiščene tehnološke odpadne vode (Ur. l. RS, št. 7/2010).

Okoljsko dajatev smo izračunali na podlagi določil Uredbe o okoljski dajatvi za onesnaževanje okolja zaradi odvajanja odpadnih voda (Ur. l. RS, št. 7/2010).

Izračun obremenitve:

$$\text{seštevek EO za tekoče leto} = \frac{365 \times \text{seštevek EO za preteklo leto}}{\text{število obratovalnih dni v preteklem letu}}$$

Kjer je:

- EO enota obremenitve

Količine snovi, ki določajo enoto obremenitve (EO) so prikazane v tabeli 1.

3 Rezultati

V raziskavi smo zajeli pregled stanja BAT na področju tekstilne industrije v Sloveniji z vidika onesnaževanja voda. BAT na področju tekstilne industrije smo primerjali s stanjem v

slovenski tekstilni industriji z vidika pričakovanih količin in obremenjenosti odpadnih voda ter rezultatov letnih obratovalnih monitoringov. Količine odpadnih voda, ki nastajajo v posameznih tehnoloških fazah, so lahko zelo različne. V tabeli 2 so prikazane okvirne količine porabe vode za različne tehnološke postopke v tekstilni industriji. Podatki so merodajni za tehnologije iz leta 1984 (Deutsche Gesellschaft für Technische Zusammenarbeit, 1984; Hahn, 1987), vendar pa so za slovensko tekstilno industrijo še vedno aktualni.

Pri novejših tehnoloških postopkih je poraba vode bistveno manjša v primerjavi s starejšimi tehnološkimi postopki (IPPC Reference Document on BAT, 2003; Deutsche Gesellschaft für Technische Zusammenarbeit, 1984). V tabeli 3 so navedene najmanjše možne količine porabljenega pri kontinuiranem postopku pranja tkanine iz bombaža, viskoze in njihovih mešanic s sintetičnimi vlakni (BAT) (IPPC Reference Document on BAT, 2003).

Količina in sestava odpadnih voda v tekstilni industriji se bistveno spreminja v odvisnosti od tehnološkega postopka in izbrane tehnološke opreme. V tabeli 4 je primerjava moderne in starega postopka barvanja (IPPC Reference Document on BAT, 2003).

V tabeli 5 je prikazana značilna sestava odpadne vode iz tekstilne industrije z relativno moderno tehnološko opremo. Odpadna voda se ustrezno očisti s čistilno napravo z aktivnim

Tabela 1: Določanje enot obremenitve (EO) za industrijsko odpadno vodo ter koncentracija in letna količina snovi za katero se okoljska dajatev ne plačuje (Ur. l. RS, št. 14/2010)

snov	količina snovi, ki določa enoto obremenitve	koncentracija in letna količina snovi, za katero se okoljska dajatev ne plačuje
kemijska potreba po kisiku - KPK	50 kg O ₂	30 kg/L in 250 kg/leto
fosfor	3 kg	0,1 mg/L in 15 kg/leto
dušik	25 kg	5 mg/L in 125 kg/leto
organske halogenske spojine kot adsorbilivi organski halogeni - AOX	2 kg halogenov, izračunano kot organsko vezani klor	100 mg/L in 10 kg/leto
– živo srebro	20 g	0,1 mg/L in 100 g/leto
– kadmij	100 g	5 mg/L in 500 g/leto
– krom 6+	100 g	10 mg/L in 0,5 kg/leto
– nikelj	500 g	50 mg/L in 2,5 kg/leto
– svinec	500 g	50 mg/L in 2,5 kg/leto
– baker	500 g	50 mg/L in 2,5 kg/leto
strupenost za vodne bolhe	3000 m ³ odpadne vode/S(D)	S(D) = 2

Tabela 2: Okvirne količine nastalih odpadnih vod v tekstilni industriji v letu 1984 (Deutsche Gesellschaft für Technische Zusammenarbeit, 1984)

vrsta proizvodnje	[m ³ /t izdelka]
pranje volne	20 – 70
barvanje	20 – 50
beljenje	50 – 100
proizvodnja tkanin	600 – 1000
viskoza, trgana volna, svila	50 – 100
proizvodnja celuloze	350 – 1000

Tabela 3: Najmanjše možne količine porabljene vode pri kontinuiranem postopku pranja tkanine iz bombaža, viskoze in njihovih mešanic s sintetičnimi vlakni (BAT) (IPPC Reference Document on BAT, 2003).

tehnološki proces	poraba vode [L/kg materiala]	
	skupaj	od tega vroča voda
pranje za odstranitev sredstev za površinsko obdelavo	3 - 4	3 - 4
pranje po alkalnem kuhanju	4 - 5	4 - 5
pranje po beljenju	4 - 5	4 - 5
pranje po hladnem beljenju	4 - 6	4 - 6
pranje po mercerizaciji	4 - 5	4 - 5
- izpiranje NaOH	1 - 2	ni podatka
- nevtralizacija brez sušenja	1 - 2	<1
- nevtralizacija in sušenje		
pranje po barvanju		
- reaktivna barvila	10 - 15	4 - 8
- redukcijska barvila	8 - 12	3 - 7
- žveplova barvila	18 - 20	8 - 10
- naftolna barvila	12 - 16	4 - 8
pranje po tiskanju		
- reaktivna barvila	15 - 20	12 - 16
- redukcijska barvila	12 - 16	4 - 8
- naftolna barvila	14 - 18	6 - 10
- disperzna barvila	12 - 16	4 - 8

Tabela 4: Primerjava porabe sredstev in potrebnega časa pri modernih in zastarelih tehnoloških postopkih barvanja (IPPC Reference Document on BAT, 2003).

dotok	stara tehnologija	nova tehnologija	prihranek
voda ⁽¹⁾ [L/kg materiala]	100 - 130	50 - 90	30 - 70
pomožna sredstva [g/kg materiala]	15 - 75	8 - 40	5 - 25
barvila [g/kg materiala]	10 - 80	10 - 80	10 - 80
para [kg/kg materiala]	100 - 900	80 - 640	60 - 480
električna energija [kWh/kg materiala]	4 - 5	2 - 3	1,5 - 2,5
čas ⁽²⁾ [min]	0,34 - 0,42	0,26 - 0,32	0,18 - 0,22

Pomen oznak v tabeli:

(1) vključno s spiranjem

(2) vključno s polnjenjem in praznjenjem

ogljem ali reverzno osmozno membranskim filtrom (IPPC Reference Document on BAT, 2003).

Pri novejših tehnoloških postopkih je poleg bistveno manjše porabe vode, bistveno manjša tudi poraba pomožnih sredstev, barvil, pare in električne energije (IPPC Reference Document on BAT, 2003). Posledično nastajajo pri novejših tehnoloških postopkih tudi manjše količine manj obremenjenih odpadnih voda (Hahn, 1987; Schönberger and Schäfer, 2003; ATV, 2000). Prvi korak pri ustreznem reševanju problematike odpadnih voda je vedno namenjen zmanjšanju količine in obremenjenosti odpadne vode na izvoru nastajanja. V drugem koraku sledi odvajanje in čiščenje odpadnih voda.

V zadnjih dvajsetih letih se je količina in obremenjenost odpadnih voda v slovenski tekstilni industriji nekaj krat zmanjšala. Razlog za to pa ni v tem, ker bi se tekstilna industrija posodobila in na ta način zmanjšala količino in obreme-

njenost odpadnih voda, temveč zaradi zaprtja mnogih tovarn. V tabeli 6 so prikazani izpusti KPK iz tekstilnih tovarn v letu 2009 (www.arso.gov.si) (Podatki v tabeli 6 trenutno niso več realni, saj se obseg tekstilne industrije v Sloveniji še vedno zmanjšuje).

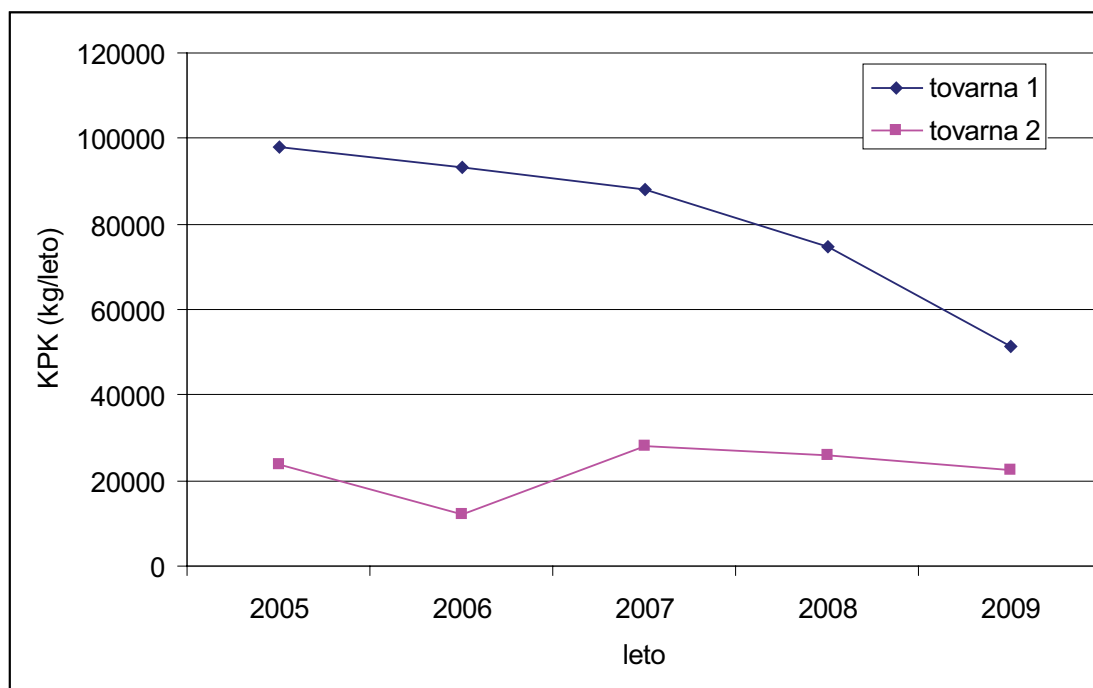
Na sliki 2 so prikazani letni izpusti KPK na iztoku iz dveh tovarn, ki sta zajeti v raziskave. V tovarni 1 je prišlo do zmanjšanja proizvodnje in kot posledica tega tudi do zmanjšanja izpustov KPK, medtem ko se obremenjenost odpadnih vod ni spremenila. V tovarni 2 se je proizvodnja v zadnjih petih letih podvojila, izpusti KPK pa so ostali približno enaki. Iz tega lahko sklepamo, da je bilo onesnaževanje v tovarni 2 nekoliko manjše zaradi povečanje proizvodnih serij in večje tehnološke discipline.

V tabeli 7 je prikazano nihanje obremenitve odpadne vode po posameznih parametrih v tovarni 1 v letu 2009. Kriteriji za

Tabela 5: Značilna sestava tekstilne odpadne vode z relativno moderno tehnološko opremo na dotoku in iztoku iz filtra z aktivnim ogljem (iztok 1) ali reverzno osmotskega membranskega filtra (iztok 2) (IPPC Reference Document on BAT, 2003).

parameter	enota	dotok	iztok 1	iztok 2
el. prevodnost	mS/cm	5,9	6,2	0,8
temperatura	°C	26,2	22,9	/
KPK	mg/L	515	20	10
BPK ₅	mg/L	140	<0,1	<0,1
TOC	mg C/L	135	4,8	3
anionski tenzidi	mg/L	/	0,02	/
kationski tenzidi	mg/L	/	0,02	/
trdota	°dH	2,5	13,6	/
NH ₄ ⁺	mg N/L	0,3	<0,01	/
NO ₃ ⁻	mg N/L	2,5	0,9	/
Fe	mg Fe/L	/	<0,01	/
Al	mg Al/L	/	<0,01	/
Cl ⁻	mg Cl/L	1750	1710	/
SO ₄ ⁻²	mg SO ₄ ⁻² /L	163	188	/
PO ₄ ⁻³	mg PO ₄ ⁻³ /L	0,7	<0,01	/
obarvanost pri 436 nm	m ⁻¹	13	0,04	0
obarvanost pri 525 nm	m ⁻¹	16,2	0,04	0
obarvanost pri 620 nm	m ⁻¹	24,5	0,04	0

/ ni podatka



Slika 2: Prikaz letnih izpustov KPK iz dveh tekstilnih tovarn v Sloveniji v letih 2005-2009.

izpust odpadne vode v kanalizacijo (Ur. l. RS, št. 7/2007) so bili preseženi za vse meritve temperature, pri eni meritvi koncentracije adsorbiranih organskih halogenov (AOX), eni meritvi pH in vseh meritvah koncentracije sulfita. Ostali merjeni

parametri so bili pod mejnimi vrednostmi za izpust odpadnih voda v kanalizacijo. V tabeli 8 je prikazano nihanje obremenitve odpadne vode po posameznih parametrih v tovarni 2 v letu 2009. Kriteriji za izpust odpadne vode v kanalizacijo so bili

Tabela 6: Emisije KPK iz tekstilnih tovarn v Sloveniji v letu 2009 (www.arso.gov.si)

tovarna	izpust v občini	tip iztoka	vodotok	ime KČN	KPK (mg O ₂ /leto) x 10 ⁶
Beti tekstilna industrija d.d.	Metlika	v okolje	potok Obrh		3 506
Beti tekstilna industrija d.d.	Metlika	na KČN		Metlika	86 059
Gorenjska predilnica d.d.	Škofja Loka	na KČN		Škofja Loka	60 980
Inplet pletiva d.o.o.	Sevnica	v okolje	kanal in nato v reko Savo		27 237
Konus Konex d.o.o.	Slovenske Konjice	na KČN			51
MTT Tekstil	Maribor	na KČN		Maribor	15 504
Polzela tovarna nogavic, d.d.	Polzela	na KČN		Kasaze	51 503
Svilanit - v likvidaciji d.d.	Kamnik	na KČN		Domžale - Kamnik	16 025
Šešir, d.d.	Škofja Loaka	na KČN		Škofja Loka	199
Tekstilna tovarna Okroglica d.d.	Nova Gorica	v okolje	melioracijski kanal		143
Tekstila d.d. Ajdovščina	Ajdovščina	na KČN		Ajdovščina	19 187
Tosama d.d.	Domžale	na KČN		Domžale - Kamnik	42 196
TSP, d.d.	Maribor	na KČN		Maribor	22 264
Velana d.d.	Ljubljana	na KČN		Ljubljana - Zalog	7 870
Zvezda SPT d.o.o.	Kranj	na KČN		Kranj	7 006

Pomen oznak v tabeli:

KČN – komunalna čistilna naprava

preseženi za vsebnost celotnih ogljikovodikov pri treh vzorcih od štirih. V obeh tovarnah so bile pri vseh meritvah izmerjene visoke vrednosti KPK. Če primerjamo odpadne vode iz preiskovanih tekstilnih tovarn (tabela 7 in 8) s komunalnimi odpadnimi vodami, vidimo, da so odpadne vode preiskovanih tekstilnih tovarn skoraj dva krat bolj obremenjene kot komunalne odpadne vode (Hahn, 1987; Gray, 1999; Schönberger and Schäfer, 2003; ATV, 2000). Vzorci so bili odvzeti pred iztokom iz tovarne v javno kanalizacijo.

V tabeli 9 je prikazana primerjava porabljenih količin vode na kilogram barvanega izdelka na podlagi letnih poročil o obratovalnih monitoringih za leto 2009 ter normativnimi porabami za staro in novo tehnologijo (BAT) (IPPC Reference Document on BAT, 2003). Iz tabele 9 je razvidno, da tovarna 1 ne dosega normativov niti s staro tehnologijo, medtem ko je poraba vode v tovarni 2 v normativih z novo tehnologijo.

Ker obe tovarni spuščata odpadne vode v javno kanalizacijo, plačujeta taksi, ki sta zmanjšani za učinek čiščenja na

komunalnih čistilnih napravah. Tovarna 1 je plačala za leto 2009 vsega skupaj približno 30.555,00 €, približno toliko je plačala tudi tovarna 2 (tabela 10). Cene so le okvirne, saj obstajajo različne cene za čiščenje tehnoloških in komunalnih odplak na posameznih čistilnih napravah.

4 Razprava

Stanje tehnologije v nekem obratu (tovarni) se lahko ugotavlja tudi preko letnih poročil o obratovalnih monitoringih. V letnem poročilu obratovalnega monitoringa je navedena poleg vodnih bilanc in onesnaževanja odpadne vode tudi količina proizvedenih izdelkov. Okoljski normativi pa so navedeni v ATV, VDI in BAT dokumentaciji. Na podlagi primerjave rezultatov letnih obratovalnih monitoringov in mejnih ekoloških parametrov s področja odpadnih voda (Ur. l. RS, št. 7/2007) smo ugotovili, da je slovenska tekstilna industrija tehnološko precej zaostala.

Tabela 7: Rezultati letnega obratovalnega monitoringa v tovarni 1 za leto 2009

parameter	mejna vrednost		1. vzorec	2. vzorec	3. vzorec
	kanalizacija	vodotok			
temperatura [$^{\circ}\text{C}$]	40	30	50,0	41,2	46,8
pH vrednost	6,5 - 9,5	6,5 - 9,5	9,35	9,11	10,34
nerazt. sn. [mg/L]	(a)	80	72	55	32
used. sn. [ml/L]	10	0,5	0,05	0,35	0,05
obarvanost pri 436 nm [m^{-1}]	(b)	7,0	34,5	10,4	25,9
obarvanost pri 525 nm [m^{-1}]	(b)	5,0	15,6	6,3	15,6
obarvanost pri 620 nm [m^{-1}]	(b)	3,0	11,7	4,5	10,8
KPK [mg O_2/L]	(h)	200 (i)	1340	600	1130
BPK ₅ [mg O_2/L]		30	500	280	320
biološka razgradljivost [%]	70	(h)	70	70	80
Al [mg/L]	(c)	3,0	0,1	0,1	0,05
Zn [mg/L])	3,0	3,0	0,06	0,05	0,05
Cu [mg/L]	1,0	1,0	0,16	0,28	0,27
Cd [mg/L]	0,1	0,1	0,001	0,001	0,001
Cr _{VI} [mg/L]	0,1	0,1	0,025	0,025	0,09
Cr - celotni [mg/L]	2,0	2,0 (1,0 (d))	0,04	0,03	0,05
Co [mg/L]	0,5	0,5	0,04	0,08	0,17
Sn [mg/L]	1,0	1,0	0,1	0,1	0,02
Pb [mg /L]	0,5	0,5	0,01	0,01	0,01
TOC [mg C/L]	(h)	60 (g)	573,6	141,5	316,9
celotni ogljikovodiki [mg/L]	20	10	0,6	1,1	11
celotni fosfor [mg/L]		1,0	2,94	5,9	4,6
amonijev dušik [mg N/L]	200 (e)	5,0	46,2	2,6	5,0
sulfat [mg/L]	400	(f)	147	109	84
sulfid [mg/L]	1,0	0,5	0,02	0,02	0,02
sulfit [mg/L]	10	1,0	18,2	24,5	12
AOX [mg/L]	0,5	0,5	0,540	0,395	0,129
LKCH [mg/L]	0,2	0,1	0,01	0,01	0,01
fenoli [mg/L]	10	0,1	0,17	0,10	0,05
tenzidi-vsota [mg/L]	(a)	1,0	47,2	17	4,0
tenzidi-anionski [mg/L]			0,41	1,3	0,47
tenzidi-neionski [mg/L]			47	16	3,5

(a) mejna koncentracija neraztopljenih snovi in tenzidov v industrijski odpadni vodi se določi v okoljevarstvenem dovoljenju na podlagi mnenja upravljavca javne kanalizacije oziroma komunalne ali skupne čistilne naprave o vrednosti, pri kateri še ni škodljivega vpliva na kanalizacijo ali ni motenj pri obratovanju komunalne ali skupne čistilne naprave,

(b) uporabljajo se določbe tretjega odstavka 3. člena Uredbe o emisiji snovi in toplote pri odvajanju odpadne vode iz naprav za proizvodnjo, predelavo in obdelavo tekstilnih vlaken.

(c) mejna vrednost parametra je določena posredno z mejno vrednostjo za neraztopljene snovi,

(d) če se v isto kanalizacijo odvajajo industrijske odpadne vode iz več naprav za proizvodnjo, predelavo in obdelavo tekstilnih vlaken, ki se čistijo na isti komunalni ali skupni čistilni napravi, je mejna vrednost za odvajanje v javno kanalizacijo 1 mg/L,

(e) za odpadne vode, ki odteka v čistilne naprave z zmogljivostjo, manjšo od 2.000 PE, je mejna vrednost 100 mg/L. Za odpadne vode, ki odteka v čistilne naprave z zmogljivostjo, enako ali večjo od 2.000 PE, je mejna vrednost 200 mg/L,

(f) mejna vrednost se določi v skladu s predpisom, ki ureja emisijo snovi in toplote pri odvajanju odpadnih vod v vode in javno kanalizacijo,

- (g) če v mesečnem povprečju iz analize 24-urnega reprezentativnega vzorca izhaja, da je vrednost TOC v surovi industrijski odpadni vodi na dotoku v biološko stopnjo čiščenja večja od 400 mg/L, velja namesto mejne vrednosti za TOC mejna vrednost za učinek čiščenja industrijske čistilne naprave, ki ne sme biti manjši od 85 odstotkov. Učinek čiščenja se v tem primeru izračunava kot povprečna vrednost razmerja 24-urnih obremenitev odpadne vode, merjeno s TOC, na dotoku in iztoku iz industrijske čistilne naprave,
- (h) odvajanje odpadne vode je dovoljeno, če je stopnja biološke razgradljivosti odpadne vode, izražena z vrednostjo KPK ali TOC, najmanj 70 odstotkov stopnje biološke razgradnje komunalne odpadne vode na komunalni čistilni napravi,
- (i) če v mesečnem povprečju iz analize 24-urnega reprezentativnega vzorca izhaja, da je vrednost za KPK v surovi industrijski odpadni vodi na dotoku v biološko stopnjo čiščenja industrijske čistilne naprave večja od 1.350 mg/L, velja namesto mejne vrednosti za KPK mejna vrednost za učinek čiščenja industrijske čistilne naprave, ki ne sme biti manjši od 80 odstotkov. Učinek čiščenja se v tem primeru izračunava kot povprečna vrednost razmerja 24 urnih obremenitev odpadne vode, merjeno s KPK, na dotoku in iztoku čistilne naprave,
- (j) vrednost parametra v industrijski odpadni vodi se izračuna kot vsota alifatskih kloriranih ogljikovodikov z vreliščem do 150 °C, kakršni so diklormetan, 1-1-1-trikloretan, 1-2 dikloretan, trikloreten in tetrakloreten, izraženih kot Cl.
- Pri tem pomeni 1PE = 60 mg BPK₅/dan, oziroma onesnaževanje, ki ga povzroči en povprečni prebivalec.

Tabela 8: Rezultati letnega obratovalnega monitoringa v tovarni 2 za leto 2009.

parameter	mejna vrednost		1.vzorec	2.vzorec	3.vzorec	4.vzorec
	kanalizacija	vodotok				
temperatura [°C]	40	30	35,6	38,4	32,2	24,3
pH vrednost	6,5 - 9,5	6,5 - 9,5	7,54	6,60	7,11	7,43
nerazt. sn. [mg/L]	(a)	80	270	340	220	200
used. sn. [ml/L]	10	0,5	0,1	0,4	5,0	3,0
obarvanost pri 436 nm [m ⁻¹]	(b)	7,0	62,7	20,8	62,1	11,8
obarvanost pri 525 nm [m ⁻¹]	(b)	5,0	67,2	13,3	72,0	9,5
obarvanost pri 620 nm [m ⁻¹]	(b)	3,0	43,3	8,8	41,2	7,4
KPK [mg O ₂ /L]	(h)	200 (i)	1090	1170	1060	480
BPK ₅ [mg O ₂ /L]		30	380	400	300	180
biološka razgrad. (%)	70	(h)	85	90	90	94
Al [mg/L]	(c)	3,0	0,15	0,19	0,13	0,079
Zn [mg/L]	3,0	3,0	0,05	0,05	0,11	0,05
Cu [mg/L]	1,0	1,0	0,02	0,02	0,06	LOD
Cd [mg/L]	0,1	0,1	LOD	0,001	LOD	LOD
Cr – celotni [mg/L]	2,0	2,0 (1,0 (d))	0,11	0,14	0,11	0,029
Cr _{VI} [mg/L]	0,1	0,1	0,025	LOD	LOD	0,025
Co [mg/L]	0,5	0,5	0,01	0,020	0,016	0,01
Sn [mg/L]	1,0	1,0	LOD	0,02	LOD	LOD
Pb [mg/L]	0,5	0,5	LOD	0,01	0,01	LOD
TOC [mg/L]	(h)	60 (g)	219	220	226	137
celotni ogljikovodiki [mg/L]	20	10	28	28	59	15
AOX [mg/L]	0,5	0,5	0,28	0,054	0,35	0,088
celotni fosfor [mg/L]		1,0	0,98	1,46	0,73	0,36
amonijev dušik [mg/L]	200 (e)	5,0	21,6	23,2	13,8	9,6
tenzidi-vsota [mg/L]	(a)	1	6,4	14,7	17,6	7,8
tenzidi-anionski [mg/L]			0,23	0,35	0,35	0,12
tenzidi-neionski [mg/L]			6,2	14,34	17,2	7,7
sulfat [mg/L]	400	(f)	138	233	120	107
sulfid [mg/L]	1,0	0,5	0,02	0,02	LOD	0,02
sulfit [mg/L]	10	1,0	0,3	0,3	0,3	0,3
LKCH [mg/L]	0,2	0,1	LOD	0,002	0,002	0,002
Fenoli [mg/L]	10	0,1	0,61	0,87	1,00	0,31

LOD -meja zaznavnosti

(a), (b), (c), (d), (e), (f), (g), (h), (i), (j) – glej tabelo 6.

Tabela 9: Primerjava porabe vode na kilogram barvanega izdelka na podlagi letnih poročil o obratovalnih monitoringih za leto 2009 v tovarnah 1 in 2 z normativnimi porabami vode po BAT (IPPC Reference Document on BAT, 2003).

proizvajalec	proizvodnja [t/leto]	poraba vode [m ³ /leto]	poraba vode [L/kg]	normativna poraba vode [L/kg] (BAT)	
				stara tehnologija	nova tehnologija
tovarna 1	143	54.000	378	100 - 130	50 – 90
tovarna 2	900	57.000	63		

Tabela 10: Skupno letno plačilo za takso in čiščenje odpadne vode v tovarni 1 in tovarni 2 za leto 2009.

	tovarna 1		tovarna 2	
	količina izpusta	cena (€)	količina izpusta	cena (€)
EO	1207,2	31.885,00	859	22.688,00
zmanjšano EO	97,2	2.567,00	60,6	1.601,00
letna količina odpadne vode (m ³)	69970	27.988,00	57600	23.040,00
SKUPAJ		30.555,00		24.641,00

EO – število enot obremenitve

Večina slovenskih tekstilnih tovarn porabi bistveno več vode, kot bi jo lahko z uporabo moderne tehnologije, iz česar lahko sklepamo, da nekateri obrati ne izpolnjujejo BAT kriterijev. Posledično posameznim obratom grozi, da pri naslednjem podaljšanju okoljevarstvenega dovoljenja ne bodo uspešni. Poleg tega uporaba zastarele tehnologije povzroča dodatne stroške in s tem zmanjšuje konkurenčnost slovenske tekstilne industrije. Pri obravnavi količine in obremenitve odpadnih voda iz tekstilne industrije v Sloveniji je potrebno upoštevati dejstvo, da slovenska tekstilna industrija z redkimi izjemami že dalj časa ni vlagala v posodobitev proizvodnje. Slovenska tekstilna industrija se že dolgo časa bori za preživetje, zato so bila vlaganja v ekološko posodobitev tehnološke opreme samo tolikšna, da so bili zadoščeni minimalni kriteriji za pridobitev okoljevarstvenih dovoljenj. Vendar pa je tudi doseganje minimalnih kriterijev pogosto težavno. Naša raziskava je pokazala, da v letu 2009 pri obravnavanih tekstilnih tovarnah niso bili v celoti doseženi niti vsi kriteriji za izpust v javno kanalizacijo, kaj šele v vodotoke (tabeli 7 in 8). V obravnavanih tovarnah so bila prisotna velika nihanja pH vrednosti in ostalih merjenih parametrov (KPK, BPK₅, neraztopljene snovi, obarvanost, olja, itd.). Odpadna voda iz tekstilne industrije ima v večini primerov višjo temperaturo od najvišje dovoljene temperature za izpust v kanalizacijo in vodotoke. To pomeni, da se z odpadnimi vodami v okolje odvaja tudi velika količina toplotne energije, kar predstavlja precejšnjo ekonomsko škodo. Obremenitev odpadne vode tekstilne industrije je odvisna tudi od organizacije proizvodnje. Pogosto menjavanje proizvodnih procesov povzroča nastajanje večjih količin obremenjenih odpadnih voda na enoto proizvoda kot pri velikih serijah.

Z bolj učinkovitimi postopki predhodnega čiščenja odpadnih voda (pred izpustom odpadnih voda v kanalizacijski sis-

tem) bi bilo možno znatno znižati stroške, ki nastanejo zaradi obremenjevanja voda (taksa, oz. okoljska dajatev + čiščenje) (Čvan, 2004). Ugotovili smo, da v obravnavanih tovarnah znašajo letni stroški zaradi taks in čiščenja odpadnih voda med 20.000,00 € in 30.000,00 € (brez stroškov za dobavo vode in brez stroškov porabljene energije). Ti stroški bi se lahko bistveno znižali, če bi odpadno vodo očistili do te mere, da bi jo lahko vračali v tehnološki proces. S tem bi se znižala tudi cena za porabo vode ter zmanjšala izguba toplotne energije. Z uvajanjem primernih metod predhodnega čiščenja bi lahko iz odpadnih voda tekstilne industrije odstranjevali tudi potencialno nevarne snovi navedene na seznamu prioritarnih substanc Direktive 2008/105/EC. Industrijske odpadne vode bodo morale biti v prihodnosti bolj strogo nadzorovane, če bomo želeli ohraniti naravno ravnovesje v okolju. V skladu z Vodno direktivo 2000/60/EC je potrebno vse industrijske vire onesnaževanja voda redno analizirati tudi glede prisotnosti številnih spojin, ki so strupene, bioakumulativne ali delujejo kot endokrini motilci. Direktiva 2000/60/EC v svojem 4. členu kot enega od ciljev na področju upravljanja voda določa doseganje dobrega stanja površinskih voda do leta 2015, določa pa tudi konkretne cilje glede onesnaževanja površinskih voda s prednostnimi in prednostnimi nevarnimi snovmi, in sicer: i) postopno zmanjšanje onesnaževanja s prednostnimi snovmi in drugimi onesnaževali ter ii) ustavitev oziroma postopno odpravo emisij, odvajanja in uhajanja prednostnih nevarnih snovi. Klasične komunalne čistilne naprave niso narejene za odstranjevanje nevarnih organskih substanc (Gray, 1999; ATV, 2000), tako le te po izpustu v vodotoke konzumirajo vodni organizmi, kar posledično predstavlja nevarnost za celotno prehranjevalno verigo. Med bolj uspešnimi metodami predhodnega čiščenja so med drugim različne vrste membranske fil-

tracije in napredni oksidacijski postopki (AOP) (Schönberger and Schäfer, 2003; ATV, 2000).

5 Sklepi

Tekstilna industrija v Sloveniji je relativno zastarela, kar se kaže v večjih emisijah snovi in toplote v vode, kot bi jih pričakovali pri najboljših razpoložljivih tehnologijah (BAT). Ker je večina tekstilnih tovarn priključena na javne kanalizacijske sisteme s centralnimi komunalnimi čistilnimi napravami, se zadovoljijo le s kriteriji, ki veljajo za izpust v javno kanalizacijo. Pogosto teh kriterijev ne dosegajo. Pozabljajo tudi na ceno sveže vode, ki odteka v kanalizacijo ter veliko količino izgubljene toplotne energije. S tem se sprijaznijo z visokimi stroški za odvajanje in čiščenje odpadnih voda ter okoljskimi dajatvami. Z učinkovitim čiščenjem in rekuperacijo toplote bi bistveno znižali stroške. Učinkovito čiščenje odpadnih voda je ekonomsko upravičeno, če so stroški izgradnje in obratovanja čistilne naprave takšni, da se investicija povrne v nekaj letih. Pri tem ne smemo pozabiti na toplotno energijo, saj rezultati obratovalnih monitoringov kažejo, da spuščajo tovarne občasno v kanalizacije tako vroče odpadne vode, da ne dosegajo niti kriterijev za izpust v javno kanalizacijo.

Sanacija odpadnih voda iz tekstilne industrije se naj rešuje kot sestavni del posodobitve tehnologije in organizacije proizvodnje. S takšnimi ukrepi se lahko bistveno zmanjša količina in obremenjenost odpadnih voda. Šele nato pridejo na vrsto različne tehnologije čiščenja. Na primer v okviru naših raziskav smo ugotovili, da se lahko v tovarni 1 zamenja $\text{Fe}_2(\text{SO}_4)_3$ s cenejšim FeCl_3 . S tem so se bistveno zmanjšale emisije neprijetnih vonjav v okolje ter vsebnost SO_4^{2-} v odpadni vodi. Nekoliko so se pri tem znižali tudi stroški proizvodnje. Tipičen organizacijski ukrep, ki zmanjša količino in obremenjenost odpadnih voda, je združevanje naročil v večje serije. Zelo pogosto menjavanje proizvodnih serij povzroča večje količine odpadnih voda (menjava barvnih flot, itd.). Šele po tehnoloških in organizacijskih ukrepih pridejo na vrsto različni postopki čiščenja odpadnih voda. Če bi se na primer v tovarni 1 postavili toplotni izmenjevalec, bi lahko velik delež toplotne energije koristno izrabil. Iz ohlajene vode bi se nato lažje izločala mineralna olja. Morda bi lahko nadgradili obstoječi egalizacijski bazen v preprosto flotacijsko čistilno napravo s katero bi iz odpadne vode izločali velik delež mineralnih olj in tenzidov. Obstoječe raziskave v okviru projekta CORNET AOP4WATER so namreč pokazale, da bi na ta način znatno znižali obarvanost. Izbira učinkovitega predhodnega ali dokončnega čiščenja je odvisna od vrste odpadne vode ter stroškov postavitve in obratovanja čistilne naprave. Različni kemijski in fizikalni postopki so praviloma relativno dragi (O_3 , H_2O_2 , UV, kavitacija, ultrazvok, aktivno oglje, membranska filtracija, itd.), medtem, ko so biološki postopki znatno cenejši. Vendar pa s klasičnimi biološkimi postopki navadno ne moremo dovolj uspešno odstranjevati obarvanosti in mineralnih olj. Pri tovrstnih odpadnih vodah je zato smiselno iskati rešitve z zmanjšanjem obremenitev na izvoru nastajanja (tehnološka in organizacijska posodobitev proizvodnje) ter kombinacijo ustreznega predhodnega in dokončnega biološkega čiščenja.

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Aleksandra Krivograd Klemenčič je zaposlena na Univerzi v Ljubljani, Zdravstveni fakulteti ter Fakulteti za gradbeništvo in geodezijo kot vodja projektov in raziskovalka na nacionalnih in mednarodnih projektih. Ima dolgoletne izkušnje iz ekologije voda, limnologije, ekologije in taksonomije alg, ekološkega pretoka, čiščenja odpadnih voda in ekoremediacijskih tehnologij. Sodelovala je pri pripravi metodologije vzorčenja in laboratorijske obdelave vzorcev alg (fitobentosa) za določanje ekološkega stanja vodotokov v Sloveniji. Je soavtorica znanstvene monografije z naslovom "Monografija sladkovodnih in kopenskih alg v Sloveniji", ki je na območju Slovenije edinstveno delo s področja algologije. Na Inštitutu za celulozo in papir v Ljubljani je delovala kot vodja mikrobiološkega laboratorija in vodja projektov. Svoje delo je predstavila na številnih mednarodnih in domačih konferencah, seminarjih, delavnicah in srečanjih.

Boris Kompare, redni profesor za področje Okoljsko inženirstvo je zaposlen na Univerzi v Ljubljani, Fakulteti za gradbeništvo in geodezijo. Njegov osnovni profil je gradbeno inženirstvo, dodatno se je specializiral na področju

sanitarnega in okoljskega inženiringa s bio-geo kemijo. Ukvarja se predvsem z ekološkim modeliranjem in strojnim učenjem (ML). Ima številne izkušnje na področju mednarodnega svetovanja, na primer UN-GEF Danube programa za zmanjšanje onesnaževanja, implementacija EU direktiv (UWWT in WFD). Bil je vodja projekta RR1: Biološke tehnologije čiščenja odpadnih voda v slovenski nacionalni mreži odličnosti Okoljske tehnologije. Ima izkušnje na področju čistilnih naprav in modelov QSAR - biorazgradljivost kemikalij s pristopom ML.

Darko Drev je redno zaposlen na Inštitutu za vode Republike Slovenije, pogodbeno pa tudi na Univerzi v Ljubljani, Fakulteti za gradbeništvo in geodezijo. Ima bogate delovne izkušnje v gospodarstvu in negospodarstvu, kjer je opravljal različna dela (tehnolog, vodja proizvodnje, vodja razvoja, tehnični direktor, v.d. direktor, itd.). Pri tem si je pridobil različna funkcionalna znanja in pooblastila (stotnik 1. stopnje ABKO, pooblaščen inženir projektant in revident, sodni izvedenec in cenilec, itd.). V svoji dolgoletni karieri je večkrat zamenjal delovna področja, ali pa jih dopolnjeval z novimi vsebinami (tehnični tekstil, plastika, keramika, ekologija, sanitarno inženirstvo). Čeprav je v zadnjem obdobju težišče njegovega dela znanstveno raziskovalno delo, je po srcu še vedno tehnolog, tako kot je bil v začetku svoje kariere. Ko je delal v gospodarstvu, so se rezultati njegovega dela odražali v novih izdelkih, novih tehnologi-

jah, novih objektih, itd. Pozneje pa je začel objavljati tudi strokovne in znanstvene članke, prijavljati patente in pisati učbenike.

Jože Panjan je izredni profesor za področje Okoljsko inženirstvo na Univerzi v Ljubljani, Fakulteti za gradbeništvo in geodezijo in predstojnik Inštituta za zdravstveno hidrotehniko. Ima tudi bogate delovne izkušnje, saj je bil okoli deset let zaposlen v gospodarstvu. Največ izkušenj ima na področju gradnje sistemov za odvod padavinskih in odpadnih voda in čiščenja onesnaženih voda. Raziskovalno, razvojno in strokovno delo usmerja na razvoj sodobnih tehnoloških rešitev v tehniki čiščenja odpadnih voda (nitrifikacija, denitrifikacija, defosfatizacija, membranska filtracija, adsorpcija idr.), odvajanju onesnaženih voda (kanalizacijski sistemi, zadrževanje, prelivanje, samočiščenje idr. in zaščiti voda (samočiščenje v površinskih vodotokih, naravni in antropogeni vplivi ter njihovi sanaciji idr.) ter s komunalno zdravstveno hidrotehnično infrastrukturo, z izdelavo modernih upravljaljskih sistemov zdravstveno hidrotehnične infrastrukture v GIS. Je pooblaščen inženir projektant za področji gradbeništva in sanitarnega inženirstva ter pooblaščen revident za področja gradbeništva in tehnologije s strani Inženirske zbornice Slovenije. Je avtor dveh učbenikov, v Cobissu ima obsežno bibliografijo s čez osemsto naslovi.

Investigation of wastewater pollution in Slovenian textile industry and economic viability of effective treatment

Wastewaters from textile industry are generally highly loaded. Their load can be determined by engineering standards, standards of best available technologies and annual operational monitoring. Investigation presented covers all textile factories in Slovenia obligated by the Directive 96/61/ES on integrated pollution prevention and pollution control; two textile factories in Slovenia were studied in details. In the majority of discussed textile factories significantly higher pollution emissions that would be expected on the basis of engineering and Best Available Techniques (BAT) standards were found. The reason is outdated technological equipment which departs significantly from BAT standards. As the textile factories in Slovenia are mostly connected to public sewer networks which are terminated by central treatment facility, economic viability of installing treatment plants for efficient wastewater pre-treatment is questionable. It is mandatory to achieve the required criteria for discharge into public sewers. More efficient treatment is justified only when it is cost efficient. Economic viability is assessed in terms of costs, which consist of expenses for fresh water supply, environmental taxes, charges for wastewater collection and wastewater treatment and expenses of effective treatment within the factories.

Keywords: emissions, pre-treatment, industrial wastewater, textile industry

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AVTOTEHNA d.d.

Slovenska cesta 54, 1000 LJUBLJANA

BIGRAD

Kolodvorska 37d, 2310 SLOVENSKA BISTRICA

BRDO - PROTOKOLARNI SERVIS

Predoslje 39, 4000 KRANJ

DEDALUS d.o.o.

Dunajska 156, 1000 LJUBLJANA

DELO - Časopisno in založniško podjetje d.d.

Dunajska 5, 1509 LJUBLJANA

DOMEL d.d. - Elektromotorji in gospodinjski aparati

Otoki 21, 4228 ŽELEZNIKI

DOMPLAN d.d.

Bleiweisova cesta 14, 4000 KRANJ

ELEKTRO GORENJSKA Javno podjetje za distribucijo električne energije, d.d.

Bleiweisova cesta 6, 4000 KRANJ

ELEKTROTEHNIŠKO PODJETJE d.d.

Ulica Mirka Vadnova 11, 4000 KRANJ

EL - VER, Elektroinstalacije Zvonko Verlič s.p.

Strelška 150, 2000 MARIBOR

ETIKETA Tiskarna d.d.

Industrijska ulica 6, 4226 ŽIRI

EXOTERM Kemična tovarna, d.d.

Struževo 66, 4000 KRANJ

FOTO TIVOLI d.o.o.

Cankarjeva 7, 1000 LJUBLJANA

GORENJSKA BANKA d.d.

Bleiweisova 1, 4000 KRANJ

GORENJSKA PREDILNICA d.d.

Kidričeva cesta 75, 4220 ŠKOFJA LOKA

GORENJSKI TISK d.d.

Ul. Mirka Vadnova 6, 4000 KRANJ

GRADBINEC GIP d.o.o.

Nazorjeva 1, 4000 Kranj

GRATEX d.o.o.

Spodnja Rečica 81, 3270 LAŠKO

HIT d.d. Nova Gorica - Hoteli igralnica turizem

Delpinova 7a, 5000 NOVA GORICA

HTG - Hoteli Turizem Gostinstvo d.d.

Partizanska cesta 1, 6210 SEŽANA

IBM Slovenija d.o.o.

Trg Republike 3, 1000 LJUBLJANA

IBI Kranj - Proizvodnja žakarskih tkanin d.d.

Jelenčeva ulica 1, 4000 KRANJ

ISA Anton Mernik s.p. - Izvajanje sanacij v gradbeništvu

Kolodvorska ulica 35c, 2310 SLOVENSKA BISTRICA

ISKRAEMECO, d.d.

Savska Loka 4, 4000 KRANJ

ISKRA - Iskra avtoelektrika d.d.

Polje 15, 5290 ŠEMPETER PRI GORICI

ISKRA - Industrija sestavnih delov d.d.

Savska loka 4, 4000 KRANJ

ISKRA INSTRUMENTI d.d.

Otoče 5a, 4244 PODNART

ISKRATEL - Telekomunikacijski sistemi d.o.o., Kranj

Ljubljanska cesta 24/a, 4000 KRANJ

ISKRA TRANSMISSION d.d.

Stegne 11, 1000 LJUBLJANA

Izredni študenti FOV**JELOVICA d.d.**

Kidričeva 58, 4220 ŠKOFJA LOKA

JEROVŠEK COMPUTERS, d.o.o.

Breznikova 17, 1230 DOMŽALE

KOGRAD GRADNJE d.o.o.

Preradovičeva ul. 20, 2000 MARIBOR

KOMUNALNO POD JETJE GORNJA RADGONA p.o.

Trate 7, 9250 GORNJA RADGONA

KOPIRNICA DEU s.p.

Kidričeva 55a, 4000 KRANJ

KOVINAR d.o.o. Vitanje

Kovaška cesta 12, 3205 VELENJE

KRKA, d.d., Novo mesto

Šmarješka cesta 6, 8501 NOVO MESTO

KRKA ZDRAVILIŠČA - Zdravilišče, turistične in gostinske storitve d.o.o.

Germova ulica 4, 8501 NOVO MESTO

LESNA Lesnoindustrijsko podjetje d.d.

Pod gradom 2, 2380 SLOVENJ GRADEC

LETNIK SAUBERMACHER d.o.o.

Sp. Porčič 49, 2230 LENART V SLOVENSKIH GORICAH

LINIJA - Rajko Flerin, s.p., Slikopleskar in črkoslikar

Britof 284, 4000 KRANJ

LJUBLJANSKE MLEKARNE d.d.

Tolstojeva 63, 1000 LJUBLJANA

LUKA KOPER d.d.

Vojkovo nabrežje 38, 6000 KOPER

MAGNETOMEDICINA d.o.o.

Tržaška cesta 468, 1351 BREZOVICA PRI LJUBLJANI

MARMOR HOTAVLJE d.d.

Hotavlje 40, 4224 GORENJA VAS

MAT d. o. o.

Orlova 12 a, 1000 LJUBLJANA

MEHANIZMI - Iskra Mehanizmi d.d. Lipnica

Lipnica 8, 4245 KROPA

MERCATOR - TRGOAVTO d.d. - Trgovina, servis

Pristaniška 43/a, 6000 KOPER

MERCATOR - PC GRADIŠČE d.d.

Golijev trg 11, 8210 TREBNJE

MERCATOR-OPTIMA - Inženiring d.o.o.

Breg 14, 1000 LJUBLJANA

MERKUR - Trgovina in storitve d.d. KRANJ

Koroška cesta 1, 4000 KRANJ

MESNA INDUSTRIJA PRIMORSKE d.d.

Panovška 1, 5000 NOVA GORICA

MICROSOFT d.o.o.

Šmartinska cesta 140, 1000 LJUBLJANA

MOBITEL d.d.

Vilharjeva 23, 1537 LJUBLJANA

OBČINA RADOVLJICA

Gorenjska cesta 19, 4240 RADOVLJICA

Opravljanje del z gradbeno mehanizacijo**MARJAN RAZPOTNIK s.p.**

Krače 8, 1411 IZLAKE

OPTIMA - Podjetje za inženiring in trgovino d.o.o.

Ulica 15. maja 21, 6000 KOPER

PALOMA SLADKOGORSKA - Tovarna papirja d.d.

Sladki vrh 1, 2214 SLADKI VRH

PIVOVARNA UNION d.d.

Pivovarniška ulica 2, 1001 LJUBLJANA

POSLOVNI SISTEM MERCATOR d.d.

Dunajska cesta 107, 1000 LJUBLJANA

POSLOVNI SISTEM - ŽITO LJUBLJANA d.d.

Šmartinska cesta 154, 1000 LJUBLJANA

POSLOVNO PRIREDITVENI CENTER - GORENJSKI SEJEM Kranj d.d.

Stara cesta 25, 4000 KRANJ

POŠTA SLOVENIJE d.o.o.

Slomškov trg 10, 2000 MARIBOR

PRIMORJE d.d.

Vipavska cesta 3, 5270 AJDOVŠČINA

REGIONALNI CENTER ZA RAZVOJ d.o.o.

Cesta zmage 35, 1410 ZAGORJE OB SAVI

SATURNUS - AVTOOPREMA d.d.

Letališka c. 17, 1001 LJUBLJANA

SAVA - Gumarska in kemična industrija d.d.

Škofjeloška 6, 4502 KRANJ

SIEMENS d.o.o.

Dunajska cesta 22, 1000 LJUBLJANA

SLOBODNIK JOŽE

Generalni častni konzul RS v Kanadi

SLOVENIJALES PRODAJNI CENTRI

Dunajska cesta 22, 1000 LJUBLJANA

SLOVENSKE ŽELEZNICE d.d.

Kolodvorska ulica 11, 1000 LJUBLJANA

SVEA LESNA INDUSTRIJA d.d.

Cesta 20. julij 23, 1410 ZAGORJE OB SAVI

SUROVINA d.d. MARIBOR

Pobreška cesta 20, 2000 MARIBOR

TELEKOM SLOVENIJE d.d.

Cigaletova 15, 1000 LJUBLJANA

TERME MARIBOR Zdravstvo, turizem, rekreacija d.d.

Ul. heroja Šlandra 10, 2000 MARIBOR

TERMO d.d. - Industrija termičnih izolacij

Trata 32, 4220 ŠKOFJA LOKA

TERMoeLEKTRARNA TOPLARNA Ljubljana d.o.o.

Toplarniška 19, 1000 LJUBLJANA

TOVARNA KLOBUKOV ŠEŠIR d.d.

Kidričeva 57, 4220 ŠKOFJA LOKA

TRIMO Inženiring in proizvodnja montažnih objektov d.d.

Prijateljjeva 12, 8210 TREBNJE

UNITAS - Tovarna armatur d.d.

Celovška cesta 224, 1107 LJUBLJANA

USTANOVA SLOVENSKA ZNANSTVENA FUNDACIJA

Štefanova 15, 1000 LJUBLJANA

ZAVAROVALNICA TRIGLAV, d.d.

Miklošičeva cesta 19, 1000 LJUBLJANA

ZVEZA RAČUNOVODIJ, FINANČNIKOV IN REVIZORJEV SLOVENIJE

Dunajska cesta 106, 1000 LJUBLJANA

ŽIVILA KRANJ - Trgovina in gostinstvo d.d.

Cesta na Okroglo 3, 4202 NAKLO

ŽITO GORENJKI d.d.

Rožna dolina 8, 4248 LESCE

UNIVERZA V MARIBORU - FAKULTETA ZA ORGANIZACIJSKE VEDE



Kadrovanje

VESNA NOVAK

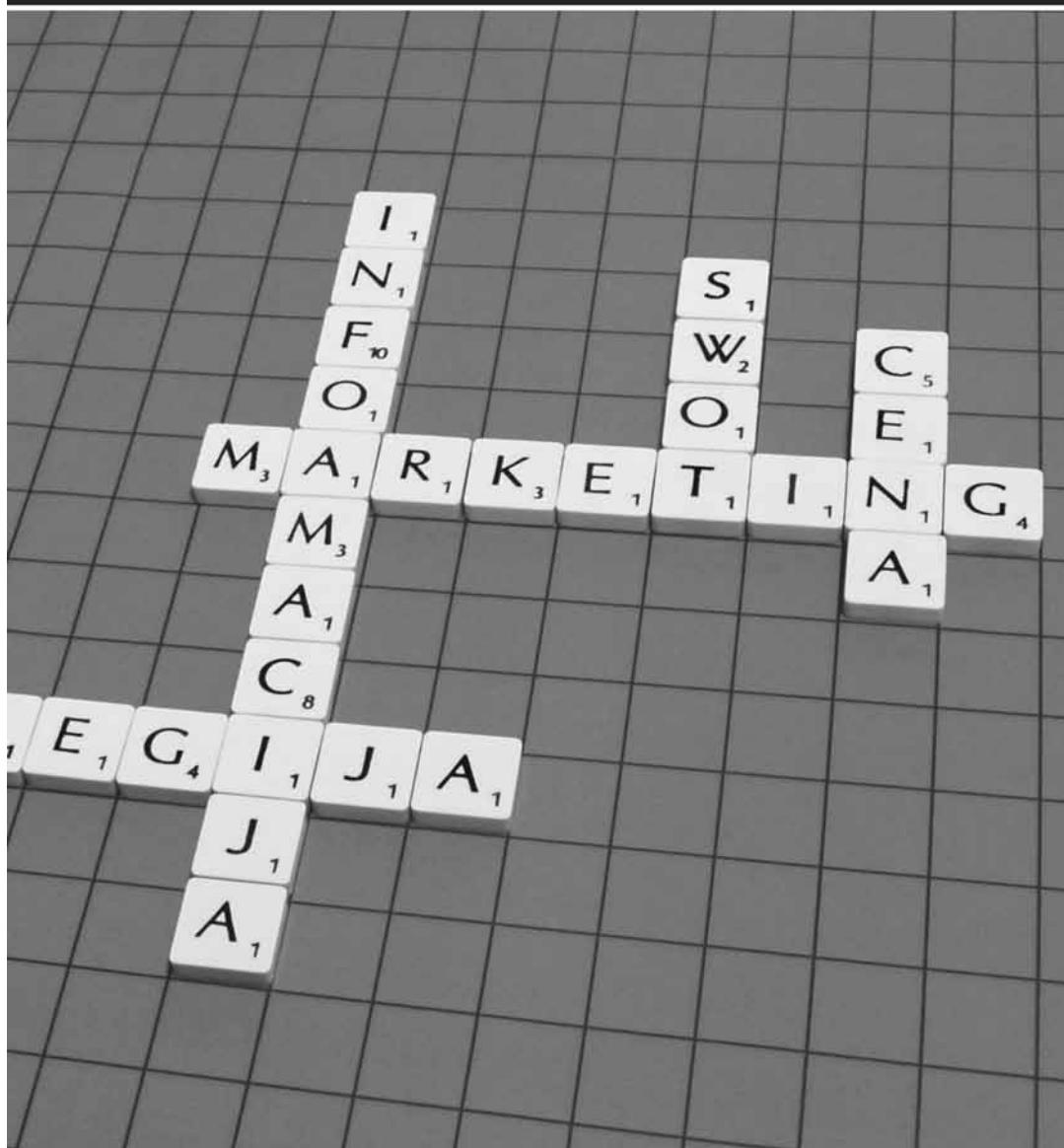


Založba Moderna organizacija



Univerza v Mariboru

Fakulteta za organizacijske vede



Marketing
Goran Vukovič, Bruno Završnik

Založba  Moderna organizacija