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# Cultural Dimensions and Leadership Styles Perceived by Future Managers: Differences between Slovenia and a Cluster of Central European Countries

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The article contributes to the body of knowledge about the perceptions of future managers (i.e. business and engineering students) in both Slovenia and a cluster of Central European (CE) countries regarding actual cultural practices in their social environments, the value systems they possess and their attitudes to leadership styles. The main question addressed is whether future Slovenian managers are good representatives of the average future manager from CE (transitional) countries as far as their value system and attitudes to individual leadership styles are concerned.

The research results confirm that the Slovenian (potential) future managers perceive actual cultural practices in their environment rather differently from their counterparts from the cluster of CE countries. Two decades of transition from socialist/communist socio-economic systems were apparently not long enough periods to achieve a higher level of harmonisation of existing cultures. The relevant value systems held by the Slovenian (potential) future managers and the CE cluster's future managers still differ significantly. The Slovenian future managers have (statistically) significantly different attitudes to individual leadership styles than their counterparts in the CE countries' cluster. The smallest differences in perceptions between the two stated groups of (potential) future managers exist regarding their views on what are the most important traits and skills of managers.

**Keywords:** culture, value system, leadership style, Slovenia, Central European (transitional) countries

## 1 Introduction

The GLOBE research project was initiated at the Wharton Business School of the University of Pennsylvania in the early 1990s and investigates business leadership worldwide. It has become a basis for developing a worldwide GLOBE community. Many researchers have joined the GLOBE project whose main research objective is to determine the extent to which the practices and values of business leadership are universal and to which they are specific to a specific country or a cluster of countries (House et al., 2004: 3). They have found that cultural universal attributes as well as culturally contingent attributes exist, enabling them to form implicit leadership theories in several cultural environments (House et al., 2004). Their research

results are based on empirical surveys carried out among middle managers of 61 countries (Chhokar et al., 2008: 1). The research samples have focused on current managers and their perceptions.

Our research interest is linked to the main research objective of the GLOBE project, although we raise somewhat specific questions: What can we expect in the near future? What are the perceptions of today's cultural practices and cultural values of future managers? What can we expect their leadership styles will be in the future? By building on the research findings of the GLOBE research, we assume that future managers will be recruited out of today's university students. Therefore, we started the GLOBE STUDENT research project, which focuses on (potential) future managers and their perceptions of societal cultural dimensions and leadership styles.<sup>1</sup>

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<sup>1</sup> We express our gratitude to the GLOBE community, which provided us with the theoretical background questionnaire items and many empirical insights, but especially to all research participants in the GLOBE STUDENT project. The project is co-ordinated by R. Lang from Chemnitz University of Technology. The other international research participants are for the time being D. Catana and A. Gh. Catana (Technical University of Cluj-Napoca, Romania), A. Lašakova (Comenius University Bratislava, Slovakia), P. Skalova (University of West Bohemia, Plzen, Czech Republic) and the authors of this article (University of Ljubljana, Slovenia).

The GLOBE STUDENT project was initiated in 2008. It is organised as a fairly permanent project and has attracted researchers from five Central European (CE) transitional countries: Czech Republic, Germany (specifically former East Germany), Romania, Slovakia and Slovenia at the beginning. Researchers from these countries have already produced the first research results. They are in the process of preparing them for publication.

Our purpose here is to contribute to the body of knowledge about the cultural dimensions of Slovenian society in which future managers are raised, their value systems and their probable future leadership styles based on our research findings from a specific angle. We explore how the perceived cultural dimensions of Slovenian society and future leadership styles differ from the CE cluster.

We are aware that Slovenia is a CE country. There is no doubt that there are more than five CE transitional countries. However, our CE cluster of countries is defined here as consisting of just four CE countries: Czech Republic, Germany, Romania and Slovakia. Slovenia is excluded from the CE countries' cluster because we need two independent samples that could be statistically tested regarding mutual differences. Other CE transitional countries were not included in the CE cluster because they have not yet participated in the GLOBE student research project.

Our research sample (agreed upon in advance for the whole GLOBE STUDENT project) includes business and engineering students on undergraduate and graduate levels. The presentation of the empirical findings will be systematised by offering answers to the following research questions:

1. How do Slovenian students' perceptions of current practices differ from those of students from the CE countries' cluster on average?
2. How do Slovenian students values differ from those of students in the CE countries' cluster on average?
3. Which future leadership styles are preferred by Slovenian future managers and do they differ from those preferred by future managers from the CE countries' cluster?

The article is structured in six steps. After this introduction, a concise review of the relevant literature on cultural dimensions and managerial leadership styles is offered in part two, followed by a short description of the research methodology in part three. In part four, we present the empirical findings of our study which are based on the assumption that future managers will mostly come from two broad fields of university studies, i.e. business and engineering. In part five, the research results are discussed, followed by a conclusion in part six.

## 2 Literature review

Anthropologists do not agree about the precise meaning of culture (Schneider & Barsoux, 2003: 21). Some definitions include everything from law and religion to art, while others concentrate on specific "value orientations". The anthropologist Margaret Mead proposed to understand culture as "shared patterns of behaviour", while Claude Levi-Strauss and Clifford Geertz define it as "systems of shared meaning or under-

standing" (Schneider & Barsoux, 2003: 22). Trompenaars (Zagoršek, 2004: 59) defines it as the way people resolve dilemmas emerging from universal problems, particularly in connection with relationships, time and the external environment. The management scholar Ed Schein defines culture as "a set of basic assumptions – shared solutions to universal problems, of external adaptation (how to survive) and internal integration (how to stay together) – which have evolved over time and are handed down from one generation to the next" (Schneider & Barsoux, 2003: 22). The GLOBE researchers explain culture as shared motives, values, beliefs, identities and events that result from common experiences of members of collectives and are transmitted across age generations (House et al., 2002: 5).

Due to the wide heterogeneity of explanations of what culture really is, researchers have problems when they try to measure existing cultures. The GLOBE researchers decided to use a number of cultural attributes focused on shared modal values of collectives for measurement purposes. These values are expressed in response to questionnaire items in the form of judgments of what should be. Values represent what is expected or hoped for in a society, not what is actually materialised. Therefore, the other measurement of culture, i.e. modal practices, is based on indicators that assess "what is", or "what are" common behaviours, institutional practices, proscriptions and prescriptions (House et al., 2002: 5).

The GLOBE researchers based their assessment of culture on a psychological/behavioural tradition, which assumes that shared values are incorporated in behaviours, policies and practices. Due to the empirical research needs they have operationalised culture in nine cultural dimensions. These dimensions are: 1) uncertainty avoidance; 2) power distance; 3) collectivism 1 (societal collectivism); 4) collectivism 2 (in-group collectivism); 5) gender egalitarianism; 6) assertiveness; 7) future orientation; 8) performance orientation; and 9) humane orientation (House et al., 2002: 5-6). It is known that the first six dimensions are rooted in cultural dimensions defined originally by Hofstede (1991). Future orientation was derived from Kluckhohn & Strodtbeck, and performance orientation from McClelland (House et al., 2002: 6).

Values are relatively stable and do not change quickly (Ule, 2003). The values in a social system, that are resistant to change, are, according to Williams (1979: 34), those, that are "high in centrality, pervasive, and supported by powerful sanctions and high consensus and supporters of these values hold positions of high prestige and authority". Such values are quite stable but, according to the European Values Survey, might change especially when one generation succeeds another (Keating et al., 2002: 637). Psychologists (Musek, 2003, Mead, 1998, Helson, Jones, Kwan, 2002) warn that people's values do change during their life cycle. In the period of youth, hedonistic values prevail, later on the values of power become more important and, finally, moral values and self-actualisation take primacy.

According to Kovač (2008: 48), organisation can be perceived as consisting of organisational structure, organisational processes and culture. Organisational culture is an important factor of business firm efficiency and effectiveness (Mc Ewan, 2001: 327). On the other hand, many management scholars try

to prove that a direct relationship exists between culture and leadership styles. They argue that specific cultural traditions, values, beliefs and norms, which are the cornerstones of culture, have a direct impact on leadership (House et al., 2002: 3). Values motivate people and normatively lead their behaviour, interests, thoughts and actions (Musek, 2003). Researchers do not agree completely regarding the role of values in guiding behaviour. Studies support the thesis that values do motivate behaviours, but their influence might depend on differences in normative pressures as well as situational pressure on individual's behaviour (Mihelič & Lipičnik, 2010: 296).

Leadership is another phenomenon without a well-accepted unified definition. Zagoršek (2004: 9) very clearly presented the multitude of leadership theories. Each tries to explain leadership somewhat differently. One of them defines leadership as an influence process between a leader and followers whereby the leader influences, motivates and facilitates the activities of an organisational group toward goal achievement through mostly no coercive means (Zagoršek, 2004: 10). Kotter (1990:106) defines leadership as an ability to influence, motivate and direct co-workers towards the achievement of goals. The GLOBE definition of organisational leadership does not differ much from the stated ones and says that it is "the ability of an individual to influence, motivate and enable others to contribute toward the effectiveness and success of the organizations of which they are members" (House et al., 2002: 5).

GLOBE has empirically identified six leadership styles<sup>2</sup> from a large pool of theoretically defined leadership behaviour patterns. These patterns/styles are (House et al., 2004: 14, Steyrer et al., 2008: 365): 1) charismatic/value based leadership; 2) team-oriented leadership; 3) participative leadership; 4) humane-oriented leadership; 5) autonomous leadership; and 6) self-protective leadership. Charismatic/value-based leadership reflects the ability to inspire, to motivate, and to successfully demand high performance outcomes from others based on firmly held core values. Team-oriented leadership emphasises effective team building resulting in mutual support and the creation of a common purpose. Participative leadership develops a high level of involvement of subordinates in making and implementing decisions. Humane-oriented leadership is described as developing a high degree to which leaders in organisations or societies encourage and reward individuals for being fair, altruistic, friendly, generous, caring and kind to others. Autonomous leadership refers to independent and individualistic leadership, whereas self-protective leadership describes leadership behaviour that is self-centred, status-conscious, procedural and conflict inducing.

The GLOBE research findings regarding leadership styles have shown that some of them are seen as good and effective or bad and unwanted in all countries and regions, while others are more culturally contingent (Lang et al., 2010: 111).

Through his well-known empirical survey carried out among the employees of IBM subsidiaries in 1971 in many countries, Hofstede's research was probably the first to discover the characteristics of national cultural dimensions (a cultural dimension is defined as set of cultural attributes identified in empirical research). Slovenia as part of Yugoslavia at that time was also included in his research. Therefore, he found cultural dimensions that are also valid for Slovenia. He was able to present research findings for Slovenia for only four of his five dimensions i.e. power distance, individualism, masculinity and uncertainty avoidance<sup>3</sup>. He did not have enough data for the fifth dimension, i.e. long-term orientation (Hofstede, 2002: 100).

Bakacsi et al. (2002) as co-investigators of the GLOBE project applied GLOBE's methodological approach to samples of the Eastern European cluster of countries at the turn of the century. Slovenia was included in this cluster. They identified key societal cultural dimensions and attitudes to different leadership styles for Slovenia based on a sample of Slovenian middle managers.<sup>4</sup>

Zagoršek focused in his research on the issue of the universality versus cultural contingency of leadership and used samples of MBA students for his research from six countries, including Slovenia (Zagoršek, 2002). He identified the characteristics of four of Hofstede's cultural dimensions for each of the chosen countries and attitudes to GLOBE's leadership styles. Prašnikar et al. (2008) carried out comparative research concentrating on the culture of managers and future managers (i.e. MBA students) in Russia, Serbia and Slovenia, but their research approach was not based on the GLOBE questionnaire. Mihelič and Lipičnik focused their research on managers' and business students' values in Slovenia in 2006. They examined differences in values with regard to age (Mihelič & Lipičnik, 2010: 289). Their questionnaire was radically different from the GLOBE one.

As far as we are aware, only one empirical research so far has tested potential differences in perceptions of managers and students (i.e. future managers by assumption). Keating et al. (2002) investigated whether managers and students of Ireland and Austria share the same perceptions of culture using the GLOBE societal culture questionnaire. Their findings supported the conclusion that in Ireland and Austria, no significant differences exist between managers and students from an individual each country regarding their perceptions of practice but, on the other hand, they found quite significant differences in perceptions regarding practices between the two countries. The differences found in perceptions regarding values were much smaller between all four groups of respondents. These research results suggest that if we have students as respondents we should not expect bigger differences between Slovenian managers and students perceptions of existing cultural practices and values held by both groups.

- 2 K. Lewin defined leadership style as the manner and approach of providing direction, implementing plans, and motivating people (Leadership Styles). Besides K. Lewin, R. M. Stodgill (see his work *Handbook of Leadership*. New York: Free Press, 1974) and B. Bass (see his book *Stodgill's Handbook of Leadership*. New York: Free Press, 1981) made classic contributions to the field (Northcraft & Neale, 1994: 377).
- 3 Hofstede collected data for his famous IBM study from the Yugoslav agent of IBM in 1971. In 1993 he went back to these data and split them into Slovenia, Croatia and Serbia; while the IBM did not have sufficient employees in the other republics (Hofstede, 2002: 100).
- 4 Brenk Klas was the investigator from Slovenia.

### 3 Research methodology

All variables of our study were defined and taken out of the GLOBE research project (House et al., 2004). The relevant GLOBE questionnaire was used with some modifications that were required because of having students and not managers as respondents in our survey. We used a translated version of the adapted questionnaire into relevant domestic languages. Regarding the scales used in the questionnaire the respondents were asked to express their agreement with a given statement using a seven-point, Likert-type scale (from 1 = strongly disagree, to 7 = strongly agree). Answering questions in the second and fourth parts of the questionnaire demanded respondents to assign to the stated attributes an appropriate number of points from the same seven-point scale according to their assessment of the importance of the stated attribute. The last part of the questionnaire collected some demographic information from the respondents.

The research population was defined as business and engineering students studying at the University of Ljubljana in Slovenia and universities in the four other already stated Central European countries. The four countries (Slovenia excluded) represent our Central European cluster. It differs from the Eastern European cluster identified by Gupta et al. in the original GLOBE project research (Gupta et al., 2002), because it includes many more countries from Eastern Europe and even Kazakhstan (as an Asian country). We assume that the chosen four Central European countries well represent a wider set of countries, which are usually taken as Central European (transitional) countries (Warner et al., 2005).

Business and engineering students were chosen based on the assumption that the future generation of middle managers will mostly come from these two fields of study (the German and Slovakian samples also include the group "others", there are a few students from related interdisciplinary fields). Each of the participating countries in the GLOBE research project has to find at least 300 respondents that should be as much as possible equally distributed according to business and

engineering studies as well as first and second study's degree. Table 1 shows the joint sample structure of our respondents, which gave us usable data.

The respondent's population consists of 51% male and 49% female students. Close to half the respondents were undertaking a first study degree and the rest a second degree. The surveys were carried out either in individual participating countries in 2008 or the first half of 2009.

Our main research hypothesis was that Slovenian (potential) future middle managers are the "average" Central European (transitional) managers.<sup>5</sup> Their perceptions of existing cultural practices, values that they prefer (and will most probably try to implement in their future managerial practice) as well as preferred leadership styles should not differ much from the average perceptions of (future) middle managers in the Central European countries' cluster.

We processed the collected empirical data by using SPSS 18. First, a descriptive statistical analysis was carried out for the whole cluster of countries and separately for the Slovenian sample. In the second step, significant differences in mean values for the chosen cultural dimensions as practices and as values between the Central European cluster and Slovenia were investigated. Finally, significant differences in mean values for different leadership styles between the relevant Central European cluster and Slovenia were identified by using two tails t-test for independent samples (Simple Interactive Statistical Analysis, 2010). The research results were later discussed briefly.

### 4 Research results

The research results will be classified in three groups: namely: 1) differences between Slovenian students' perceptions of current cultural practices from those of the CE countries' cluster; 2) differences of Slovenian students' values from those of the CE countries' cluster; and 3) differences between the preferred

Table 1: The joint respondents' sample structure

| Country        | Total number of respondents | Respondents from business studies | Respondents from engineering field | Others |
|----------------|-----------------------------|-----------------------------------|------------------------------------|--------|
| Czech Republic | 324                         | 164                               | 160                                | -      |
| Germany        | 345                         | 162                               | 133                                | 50     |
| Romania        | 427                         | 166                               | 261                                | -      |
| Slovakia       | 339                         | 182                               | 136                                | 21     |
| Slovenia       | 300                         | 150                               | 150                                | -      |
| Total          | 1,735                       | 824                               | 840                                | 71     |

<sup>5</sup> V. Edwards found in his research of managers in Central and Eastern European countries that Slovenian managers took in general a "middle" view on questions he had asked them in his empirical research (Edwards & Lawrence, 2000).

Table 2: Assessed mean values of actual cultural dimensions in Slovenia and the CE countries' cluster

| Cultural dimension | Gender egalitarianism | Performance orientation | Humane orientation | Assertiveness | Family/group collectivism (Collectivism 2) | Institutional collectivism (Collectivism 1) | Power distance | Future orientation | Uncertainty avoidance |
|--------------------|-----------------------|-------------------------|--------------------|---------------|--|---|----------------|--------------------|-----------------------|
| Country or cluster |                       |                         |                    |               |  |   |                |                    |                       |
| Slovenia           | 4.13                  | 4.05                    | 3.97               | 4.24          | 5.22                                       | 4.04  | 5.03           | 3.79               | 4.19                  |
| CE cluster         | 3.97                  | 4.06                    | 3.54               | 4.11          | 4.67                                       | 4.25  | 5.39           | 3.94               | 4.08                  |
| Difference         | 0.16                  | 0.01                    | 0.43               | 0.13          | 0.55                                       | -0.21                                       | -0.36          | -0.15              | 0.11                  |
| Sign. (2-tailed)   | 0.002                 | 0.877                   | 0.000              | 0.028         | 0.000                                      | 0.000                                       | 0.000          | 0.037              | 0.030                 |

future leadership styles of Slovenian students and students in the CE countries' cluster.

#### 4.1 Differences in perceptions of current cultural practices

We used nine of GLOBE cultural constructs representing society, as it is (i.e. actual cultural dimensions or culture-related practices) and computed the mean values for each construct for Slovenia and for the CE countries' cluster. The results are shown in Table 2.

Most cultural practices perceived by the Slovenian students as shown in Table 2 seem to be quite similar to the practices perceived on average in the Central European countries' cluster if we look at the computed absolute differences in the assessed mean scores. However, statistical tests of differences of the stated means reveal quite a different story. On applying

the t-test of differences between the assigned mean scores for these two independent samples, we find that relevant dif-

ferences are statistically significant with all cultural dimensions except one, i.e. performance orientation. The computed two-tailed significance levels, shown in Table 2, prove this conclusion, as all differences except one are significant at  $p < 0.05$ .

Slovenian future managers perceive existing cultural practices according to five dimensions (gender egalitarianism, humane orientation, assertiveness, family/group collectivism and uncertainty avoidance) as present more decisively in Slovenia than their counterparts in the CE countries' cluster. The opposite findings (meaning so intensively not present) are valid for the other three dimensions of existing cultural practices (i.e. institutional collectivism, power distance and future orientation). The latter three dimensions were assessed by respondents from the CE countries' cluster as being present significantly more intensively in these countries in comparison with Slovenia.

According to these research results, it is hard to argue that Slovenian cultural practices are very similar to average Central European (transitional) cultural practices and that therefore they are a good representative of them.

Table 3: Assessed mean scores for future cultural dimensions in Slovenia and the CE countries' cluster

| Cultural dimension | Gender egalitarianism | Performance orientation | Humane orientation | Assertiveness | Family/group collectivism (Collectivism 2) | Institutional collectivism (Collectivism 1) | Power distance | Future orientation | Uncertainty avoidance |
|--------------------|-----------------------|-------------------------|--------------------|---------------|--|---|----------------|--------------------|-----------------------|
| Country or cluster |                       |                         |                    |               |  |   |                |                    |                       |
| Slovenia           | 4.55                  | 5.78                    | 5.08               | 4.09          | 5.69                                       | 4.46  | 2.94           | 4.74               | 4.55                  |
| CE cluster         | 4.53                  | 5.82                    | 5.28               | 3.57          | 5.60                                       | 4.71  | 2.63           | 4.91               | 4.69                  |
| Difference         | 0.02                  | 0.04                    | 0.20               | 0.52          | 0.09                                       | 0.28  | 0.31           | 0.17               | 0.14                  |
| Sign. (2-tailed)   | 0.670                 | 0.550                   | 0.001              | 0.000         | 0.212                                      | 0.000                                       | 0.000          | 0.005              | 0.012                 |

## 4.2 Differences in perceptions of values

The similar nine GLOBE cultural constructs representing society as it should be (i.e. cultural dimensions which future managers believe in) were used to find out which values future managers appreciate the most. The computed mean score values for those variables are presented in Table 3.

Slovenian future managers' perceptions of future cultural dimensions in Slovenia mostly differ from the perceptions of their counterparts in the CE countries' cluster. Table 3 shows that the assessed mean scores for many of the individual cultural dimensions in Slovenia are in absolute terms not very different from the relevant mean scores computed for the whole CE cluster.

The dimensions of assertiveness, institutional collectivism and power distance seem to differ somewhat between the two samples. However, statistical testing of the differences between relevant individual means (t-test of the differences between both groups) show that the truth is different.

We found statistically significant differences linked to the dimensions of humane orientation, assertiveness, institutional collectivism, power distance, future orientation and uncertainty avoidance. These conclusions are based on the computed 2-tailed significance levels shown in Table 3. According to the computed p-values, Slovenian future managers only share similar attitudes with their counterparts from the CE countries' cluster as regards three cultural dimensions, namely gender egalitarianism, performance orientation and family/group collectivism.

Future Slovenian managers will be less radical in increasing a humane orientation and future orientation than their CE counterparts. On the other hand, they will be ready to accept a higher level of assertiveness and power distance. Regarding the diminishing uncertainty avoidance, they will not be as demanding as their CE counterparts will.

There are only three future cultural dimensions, which might be universal within CE (gender egalitarianism, performance orientation and family/group collectivism). If the identified changes in cultural dimensions actually occur, we might predict a move towards a certain homogenisation of cultures within CE countries in the future, but this move will still be far away from any complete harmonisation.

On comparing the mean scores for individual cultural dimensions for the Slovenian environment for the actual and assessed future situation in Tables 2 and 3, one can see the predicted improvements in the dimensions of gender egalitarianism, performance orientation, humane orientation, family/group collectivism, institutional collectivism, future orientation and uncertainty avoidance. Those changes can also be expected in the CE countries' cluster. On the other side, radical reductions of power distance and of assertiveness are predicted in Slovenia and in the CE countries' cluster in the future, which should be seen as a change in the right direction. What is a surprise in a certain sense is the mean score for uncertainty avoidance. Future managers in Slovenia and in the CE countries' cluster believe that the level of uncertainty avoidance will be increased in the future, which runs counter to the trend of cultural harmonisation around the world.

## 4.3 Differences between the preferred future leadership styles

The GLOBE research project has empirically identified six leadership styles (House, 2004). We also used the constructs of these six styles in our GLOBE student research project. The collected empirical data enabled us to ascertain which leadership styles are appreciated by future managers. We computed the mean score values for the set of attributes, which determine each its construct. These indicators are presented in Table 4.

Table 4 mostly does not show big absolute differences between mean scores for individual leadership styles as computed based on assigned points from the seven-point Likert scale by Slovenian future managers and future managers in the CE cluster. Statistical testing for relevant differences in mean scores between both groups shows that our first impression is not correct. The attitudes of Slovenian future managers differ significantly regarding four leadership styles in comparison with future managers from the CE countries' cluster. Slovenian future managers appreciate more self-protective and autonomous leadership styles. More than their Slovenian counterparts, the CE countries' future managers like charismatic/value-based and participative leadership styles. Both groups of respondents appreciate team-oriented and humane leadership styles quite similarly.

Table 4: Computed mean scores for individual leadership styles in Slovenia and the CE countries' cluster

| Leadership style<br>Country<br>or cluster | Value-<br>based | Team-<br>oriented | Participative | Humane | Selfprotective | Autonomous |
|---|-----------------|-------------------|---------------|--------|----------------|------------|
| Slovenia                                  | 5.46            | 5.69              | 3.80          | 4.52   | 3.70           | 4.26       |
| CE cluster                                | 5.58            | 5.70              | 4.10          | 4.53   | 3.46           | 4.11       |
| Difference                                | -0.12           | -0.01             | -0.23         | -0.01  | 0.24           | 0.15       |
| Sign. (2-tailed)                          | 0.004           | 0.791             | 0.000         | 0.880  | 0.000          | 0.030      |



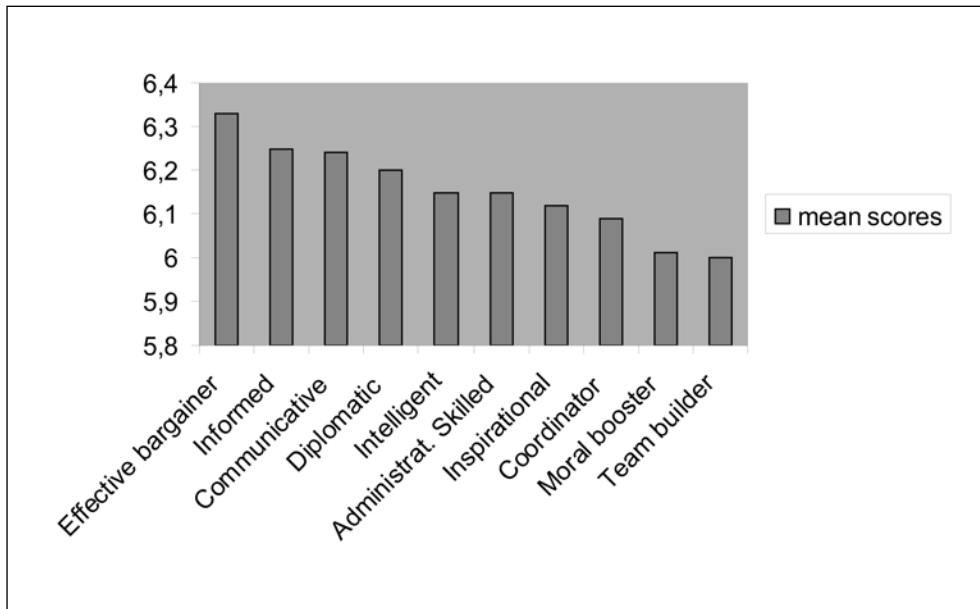


Figure 1: Top appreciated leadership traits and skills by Slovenian future managers

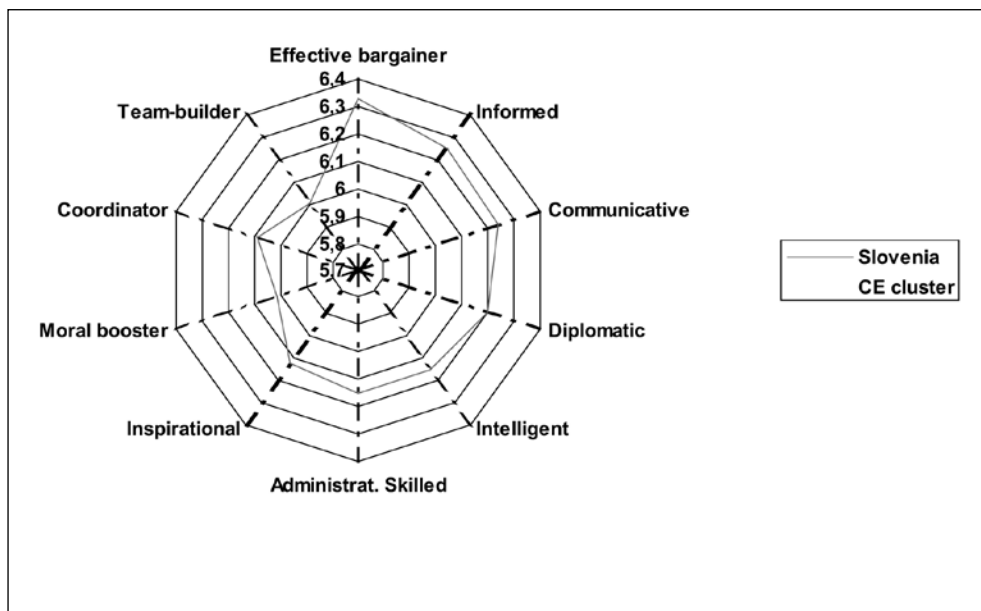


Figure 2: Comparison between the most important leadership traits as perceived in CE cluster and by Slovenian respondents (measurement by mean scores)

The Slovenian future managers assigned the highest mean scores to a team-oriented (i.e. 5.69) and value-based (i.e. 5.46) leadership style which are the two leadership styles also assessed as the most appropriate by respondents in the CE countries' cluster. Respondents in both samples assessed self-protective and participative leadership styles as the least appreciated. These findings might suggest that in the future a certain harmonisation of leadership styles might be expected in the region.

In Figure 1, we present the ten leadership traits and skills most appreciated by our respondents (the concept is based on the trait approach to the leadership theory) (Zagoršek, 2004).

Slovenian future managers consider being effective bargainers as the most important characteristic required of managers. On average, it received 6.33 points on the seven-point Likert scale. A manager as a well-informed human being was ranked second among all traits (mean score of 6.25). Being communicative follows as a required skill (mean score of 6.24). Respondents believe that a very important manager's trait is the skill of being diplomatic (mean score of 6.20). All other traits and skills had an assigned mean score lower than 6.20, but none of the top 10 traits or skills received less than 6.00 points on average.

Future managers in the Central European cluster chose a very similar list of the most important leadership traits and skills. They did not choose three which appeared on the top ten Slovenian list, namely the skill of being a good co-ordinator, of being a morale booster and having a team-building skill. All others appear on both lists.

Figure 2 shows slight differences in the ten most important traits and skills as perceived by the Slovenian respondents and the mean scores assigned to the same traits and skills by the Central European cluster's respondents. The CE cluster's respondents assessed being trustworthy, being a motive arouser and having a win-win problem-solving skill of a leader as traits or skills which belong among the ten most important ones. The Slovenian respondents ranked those three traits or skills lower.

On comparing the ten most important traits and skills assessed by Slovenian future managers with the relevant assessments by future managers in the CE countries' cluster, all absolute differences between the mean scores assigned to individual traits or skills are below the value of 0.20. These identified small absolute differences in assigned importance to an individual leader's traits and skills are statistically confirmed as being mostly insignificant. The statistical test of relevant differences shows that only two traits or skills of a leader are significantly different if we make a comparison based on the ten leader traits or skills most appreciated by the Slovenian respondents. These traits or skills are being intelligent and being communicative. The importance of the other eight most important traits or skills was assessed as very similar in importance in both samples.

## 5 Discussion

Our empirical research results do not support our basic hypothesis formulated in part three. Slovenian future managers cannot be perceived as the "average" Central European (transitional) manager. Their perceptions of existing cultural practices, values as well as preferred leadership styles differ significantly from the perceptions of future middle managers in the Central European countries' cluster. We found that significant differences exist regarding perceptions of actual cultural practices. Relevant value systems are significantly different and most attitudes to different leadership styles differ significantly between the future CE managers and the future Slovenian managers.

The smallest differences in the perceptions of the future managers when comparing the Slovenian sample with the CE cluster's sample were discovered regarding their views of what are the most important traits and skills of a manager.

It is hard to explain the significant differences found in the perceptions of current cultural practices between Slovenia and the CE cluster. Two decades of transition from previous (somewhat different) socialist socio-economic systems might be too short a period for achieving a higher level of harmonisation of existing cultures.

One might explain that the more intensively present (according to the assessments) gender egalitarianism, humane orientation and family/group collectivism in Slovenia are root-

ed in the previous self-management culture, which prevailed in socialist Yugoslavia. Other CE (transitional) countries had central planning systems, which supported the stated cultural dimensions less. Therefore, we might expect that the future managers in the CE cluster will emphasise more the needed changes in these cultural dimensions than their Slovenian counterparts in the future. We found some empirical support for this contention (see the radically increased mean scores for these three cultural dimensions in Table 3 in comparison with the relevant mean scores in Table 2 for the CE countries' cluster).

Slovenian future managers assessed that assertiveness and uncertainty avoidance are more intensively present in the Slovenian environment than the CE cluster respondents assessed them. These differences are not easy to explain. The concept of assertiveness originates (in part) from Hofstede's cultural dimension of masculinity versus femininity (Den Hartog, 2004: 401). It is seen as part of the masculinity dimension and includes aggressive, tough and competitive ways people deal with others. The GLOBE study found a mean score of 4.00 for assertiveness for Slovenia's actual cultural practice, which is between the highest mean score of 4.89 identified for Albania and the lowest mean score of 3.38 for Sweden. The relevant mean score of 4.59 found for the "what it should be", i.e. as a value, was from the ten countries with the highest average score (Den Hartog, 2004: 410). No country from our CE cluster was included in the GLOBE study and therefore we can only conclude on this basis that Slovenian middle managers had assessed the level of assertiveness in actual practice somewhat lower than the Slovenian students in our survey, and that students as respondents believe that the assertiveness level should be lower (compare the relevant mean scores in Tables 2 and 3) although, on the other hand, Slovenian managers believed it should be significantly higher (their mean score of 4.59 compared with the Slovenian students' mean score of 4.09). Of course, one should not forget that these two surveys were carried out in different periods and on different samples. What we might add to these findings is the fact that our survey potentially indicates a common trend in the CE region because we found that, similarly as Slovenian future managers, future managers from the CE cluster also wish to have a lower level of assertiveness in their society in their future.

Hofstede found in his research (Hofstede, 2002: 100) a very high level of uncertainty avoidance (a mean score of 6.16) as an existing cultural dimension in the Slovenian environment. He carried his research out in 1971. His sample included managers from an IBM subsidiary in Slovenia. The GLOBE study in the 1990s identified a relevant mean score of 3.78 for uncertainty avoidance for Slovenian practice, but a belief (as a value) that it should be at the level of 4.99 (De Luque, 2004: 623). Our survey produced the assessed level of existing practice with a computed mean score of 4.19 and the desired level described by a mean score of 4.55. These results suggest the conclusion that Slovenian managers in the socialist past worked in a culture with a very high level of uncertainty avoidance. In the 1990s, managers assessed that the start of the transition had brought quite a radical reduction in this actual cultural dimension in the country, yet they wished to live in a society with a much higher level of uncertainty avoidance.

Slovenian future managers seem to be quite similar in their relevant value system. In comparison with their CE counterparts, they will seek more orderliness, consistency, well-defined structures, formalised procedures and laws to cover situations in their daily lives. Their preferences for higher uncertainty avoidance might be even based in a historic heritage, linked to the centuries of Austrian rule.

According to Hofstede, collectivism combined with strong uncertainty avoidance produces an explosive mixture: strong uncertainty avoidance stands for intolerance of others, of "what is different, is dangerous" which is not far from nationalism (Hofstede, 2002: 99). Therefore, we cannot positively assess the identified predicted changes in the stated cultural dimension in either Slovenia or the CE region.

If we compare our findings regarding the universality of cultural practices within the CE region (i.e. comparing the findings for Slovenia with the findings for the CE countries' cluster) we find that only one actual cultural dimension is "universal" within the region. Namely, it is only performance orientation as a dimension that does not differ significantly between the two samples. By contrast, we found three such "universal" cultural dimensions for the CE region when we compare cultural dimensions as values (what they should be). CE future managers do not value differently (no statistical significance was discovered) the dimensions of gender egalitarianism, performance orientation and family/group collectivism. These findings might mean that a certain harmonisation of cultures within the CE region is happening.

The research results enable us to expect a number of improvements in cultural environments in the CE region. On comparing mean scores separately for Slovenia and for the CE cluster in Tables 2 and 3, we find that future managers will endeavour to increase the level of gender egalitarianism, performance orientation, humane orientation, assertiveness, family/group collectivism and future orientation. Conversely, they would like to reduce the level of power distance, representing another change in an acceptable direction. All of the stated changes would be welcomed.

The "predicted" changes in the majority of cultural dimensions in the CE region should influence improvements in the applied leadership styles. In spite of our findings of statistically significant different attitudes to individual leadership styles held by future Slovenian managers and future managers from the CE cluster, they share important common views linked to leadership styles. We discovered that future managers in the CE region (i.e. Slovenia plus the CE cluster) appreciated charismatic/value-based and team-oriented leadership styles the most and, on the other hand, self-protective and participative styles the least. Such a commonality might contribute to mutual economic co-operation and further regional internationalisation.

Team-oriented leadership styles will apparently be the most appreciated leadership style among Slovenian future managers as well as among CE countries' future managers (see the computed mean scores in Table 4). A charismatic value-based style (building on inspiration, motivation, and high performance requirements as well as core values) will also be very popular. These two leadership styles also received the highest mean scores among all researched styles in the

GLOBE study of Slovenian managerial environment (Bakaczi et al., 2002: 77). Slovenian middle managers as respondents in the stated study carried out in the 1990s assigned an even slightly higher mean score of 5.69 to a charismatic/value-based style and 5.91 to a team-oriented style than the Slovenian student respondents in our survey.

By contrast, self-protective (self-centred, status-conscious, procedural and conflict-inducing leadership) and participative leadership styles seem to have small chances of being applied frequently in managerial practices in the future. The relevant findings of the GLOBE study from the 1990s show that Slovenian middle managers as respondents had quite a similar attitude to the self-protective style (a mean score of 3.61), and appreciated the participative style much more (a mean score of 5.42). It is interesting that in his research in 2001 using the GLOBE questionnaire and using Slovenian MBA students as respondents, Zagoršek obtained exactly the same mean score (i.e. 5.42) for the participative leadership style as was obtained in the GLOBE study. Therefore, our Slovenian respondents surprisingly assess the last stated leadership style as being the least appropriate. Researchers usually relate team-oriented, participative, and humane-oriented leadership styles as those, which support the classic human relations theory, according to which group orientation, and considerate, participative leadership foster goal identification and thereby reduce resistance and withdrawal tendencies in organisations (Steyrer et al., 2008: 370). Is the identified unpopularity of the participative leadership style among Slovenian future managers and CE future managers some kind of a reaction to the "official" socialist/communist values of workers' participation in management or enthusiasm for the past self-management in the region that comes with quite a time lag?

We discovered statistical significant differences in assessing the importance of individual leaders' traits and skills only for two traits or skills when comparing Slovenian future managers and the CE cluster's future managers, namely: 1) being intelligent; and 2) being communicative. Such a finding might lend additional support for the conclusion that certain commonalities in views about what is a good leader exist among future managers in the region. On the other hand, we should not forget that a list of the ten most important traits and skills of leaders does not guarantee that a manager with such characteristics would be successful in all different cultural environments.

## 6 Conclusion

Our research findings offer specific answers to the research questions we posed in the introduction as well as regarding the basic hypothesis we developed in part three. We discovered that:

- Slovenian future managers perceive actual cultural practices in their environment rather differently from their counterparts from the cluster of CE countries. Two decades of transition from socialist/communist socio-economic systems were apparently not long enough periods to achieve a higher level of harmonisation of existing cultures.

- The relevant value systems held by Slovenian future managers and the CE cluster's future managers still differ significantly.
- Slovenian future managers have (statistically) significantly different attitudes to individual leadership styles than their counterparts in the CE countries' cluster.
- The smallest differences in perceptions between the two stated groups of future managers exist regarding their views on what are the most important traits and skills of managers.
- There are signals that future managers in the CE (transitional) countries' cluster will try to make more radical changes than their Slovenian counterparts are in the majority of those cultural dimensions that differ the most for the time being from the cultural practices of the developed Western countries.
- Assertiveness as a cultural dimension is not perceived by Slovenian future managers as something which, being a less acceptable cultural characteristic, demands a radical reduction. Counterparts from the cluster of CE countries show more sensitivity regarding its excessively high level in their environments.
- Slovenian future managers would like to have a higher level of uncertainty avoidance than their CE cluster counterparts and at the same time, on "predicting" its higher level than its actual level is, cannot be assessed as a change in the right direction.
- Only one cultural dimension, i.e. performance orientation, is "universal" in the CE region at present, yet there are signals that changes will happen towards further harmonisation in culture in the CE region (the three cultural dimensions discovered which will become "universal" for the region: gender egalitarianism, performance orientation and family/group collectivism).
- Improvements in the level of gender egalitarianism, performance orientation, humane orientation, assertiveness, family/group collectivism and future orientation as well as power distance can be expected in the CE region (i.e. in Slovenia and the CE countries' cluster).
- Future managers in the CE region appreciate charismatic/value-based and team-oriented leadership styles the most and self-protective and participative styles the least. Such commonalities might contribute to further mutual economic co-operation and regional internationalisation.
- Certain commonalities in views on the issue of which traits and skills a good leader should have exist among future managers in the CE region, and this might contribute to further successful internationalisation in business fields.
- Our basic hypothesis that Slovenian future middle managers would represent, according to their cultural characteristics, the "average" Central European manager was not confirmed. The cultural orientation of Slovenian future middle managers will still in many regards be different from the regional averages.
- Some policy measures and educational programmes are needed to achieve changes in those less efficient value orientations of future managers we discovered (for example, attitudes to assertiveness by Slovenian future manag-

ers and attitudes to a participative leadership style by all regional future managers).

- The dissemination of our research findings among active managers in the region (and beyond) may contribute to better management practices in the region.

Our research findings have at least a few serious limitations. We are aware that assuming that business and engineering students will become a core part of the future population of managers in the CE region is risky. Taking a sample of CE countries, which is only based on four CE countries (Czech Republic, Slovakia, (East) Germany and Romania is possibly another critical assumption. Some would also probably criticise our inclusion of Romania in the CE region. Our comparisons with research findings other researchers have produced based on different samples and in different periods might be problematic. Despite those limitations, we still believe that our research findings offer certain insights into the relevant issues. These insights might be useful to help today's active managers better understand differences in managerial behaviour in the region and engage in more efficient decision-making based on such knowledge.

Future research should focus on studying cultural practices and value systems as well as leadership styles in several directions. One should study possible differences in respondents' relevant perceptions based on sub-segments of our survey respondents (for example, just business students or just graduate students, male respondents or female respondents etc.). In addition, future research should be dedicated to a wider sample of CE countries. We hope that our research group will achieve this in the not so distant future. Subsequent systematic research verifications of how recent predictions would be realised in the CE region would also be needed.

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## Kulturne razsežnosti in vodstveni slogi, ki jih zaznavajo prihodnji managerji: razlike med Slovenijo in osrednje evropskim grozdom držav

Članek prispeva k znanju, ki ga imamo o zaznavah prihodnjih managerjev (tj. študentov poslovnih ved in inženirskih področij) v Sloveniji in grozdu držav osrednje (tranzicijske) Evrope, vezanih na obstoječe razsežnosti kulture v njihovem okolju, sisteme

vrednot, ki jih posedujejo, in njihov odnos do slogov vodenja. Glavno vprašanje, ki se ga loteva, je, ali so slovenski prihodnji managerji dobri predstavniki prihodnjega povprečnega managerja v območju držav osrednje (tranzicijske) Evrope z vidika vrednostnih sistemov in odnosa do posameznih slogov vodenja.

Raziskovalni rezultati potrjujejo, da slovenski (potencialni) prihodnji managerji zaznavajo obstoječe kulturne prakse v okolju precej drugače kot njihovi kolegi iz grozda osrednjeevropskih držav. Dve desetletji tranzicije iz socialističnih/komunističnih družbeno-ekonomskih sistemov nista zadostovali, da bi dosegli višjo raven harmonizacije obstoječih kultur. Relevantni vrednotni sistemi, ki so lastni slovenskim (potencialnim) prihodnjim managerjem in managerjem v grozdu osrednjeevropskih držav se še vedno znatno razlikujejo. Slovenski prihodnji managerji imajo statistično značilno različna stališča do slogov vodenja v primerjavi z njihovimi osrednjeevropskimi kolegi. Najmanjše razlike v zaznavah obeh navedenih skupin prihodnjih managerjev je najti glede njihovih pogledov na vprašanje, katere so najpomembnejše lastnosti in sposobnosti managerjev.

**Ključne besede:** kultura, sistem vrednot, vodstveni slog, Slovenija, osrednjeevropske (tranzicijske) države

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# Problem of Trust in Alliance Networks

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At a time of growing globalization, we can observe the increasing role of cooperative strategies among companies, including alliances, joint ventures, and networks. Trust is one of the most important factors of success for any business activity. It relates especially to alliance networks because it can lower transaction costs, increase productivity and innovativeness, facilitate inter-organizational relationships and resolve conflicts. Therefore the article comprehensively discusses the problems of trust in alliance networks. The conclusion of the text is that trust building in alliance networks has an influence on the effectiveness of the whole network. The text is based on the latest world literature as well as the personal experience of the author in creating effective cooperative network agreements.

**Keywords:** Trust, Cooperation, Partnership, Relationships, Alliance networks, Opportunism

## 1 Introduction

Scientists from various disciplines, including organization and management, marketing, sociology, economy and psychology have expressed their interest in the role of trust. Each of these areas has its own significant contribution to the nature of trust and processes where it grows. On the other hand, they focus on different elements related to the concept of trust. It should however be emphasized that management of trust, which can be defined as a strategic approach to the capital of relations, is the starting point for most of the new management concepts (Grudzewski et al., 2008), especially inter-organizational cooperation within the network. It is even believed that trust is a new paradigm in management science, being a key issue in the 21st century (O'Hara, 2004). Trust management should be considered comprehensively, especially in the context of the company's relationship with the environment, and the key approach to the running of any business activity. Empirical studies carried out in Poland, the United States and Sweden show that although trust is a strategic resource that should be treated as the source of competitive advantage (Barney and Hansen, 1995), it is also a rare good. But, it is the key success factor of any cooperation (Faulkner, 2004: 359), especially when it relates to companies from different countries. Relationships based on trust lead to greater exchange of knowledge between partners, and this is one of the most important goals of alliance networks. Therefore, the purpose of this article is a comprehensive presentation of the issue of trust in alliance networks.

## 2 Methodology

As a research instrument, two basic methods were used:

- critical analysis of the literature devoted to inter-firm cooperation, and

- results of research conducted in the steel industry in Poland.

The main sources of theoretical analysis are publications in scientific journals, which are devoted to inter-firm cooperation. In turn the results of research conducted by the author in steel industry in Poland were utilized as supplementary information to build up an alliance portfolio. They were used to verify the theoretical assumptions in practice. The aim of the surveys was to identify the scope and extent of network relations in the steel industry and they covered three main areas: 1) network formation, 2) network management, 3) network growth and development. Research took place from April to May 2008. Opinion surveys were sent to 50 managers, at least middle-size level, representing 33 companies. Most of them was controlled by ArcelorMittal as the concern controls approx. 70 % of the steel industry in Poland. Suggestions of answers were given in each of the said areas, asking respondents to form an attitude towards suggested statements, by answering yes or no, or by indicating the proper answer by giving points from 1 to 5 (where 1 – little importance, 5 – great importance), or by giving their own answer. 32 answers were received, which amounted to 64 % of all examined.

## 3 Review of the literature

### 3.1 The concept of trust in business

The beginning of systematic research on trust in organizations dates back to the 1950s. (Lewicki et al., 1998). Almost 40 years ago, Zand (1972) argued that trust does not occur immediately but develops with time. The review of the literature confirms the thesis that trust plays an important role

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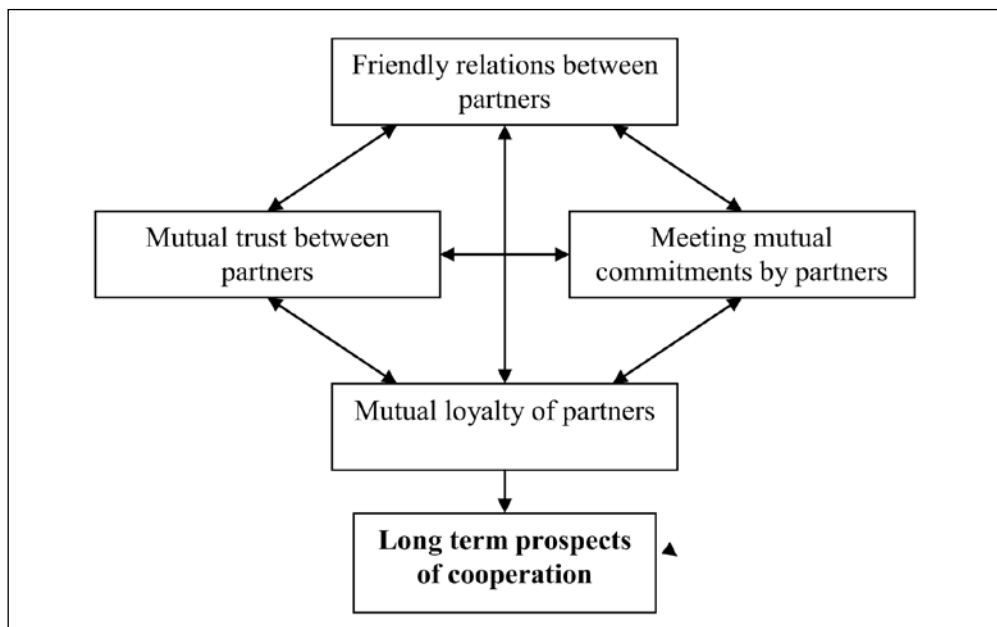


Figure 1. The conditions required for cooperation of enterprises  
Source: Ginevičius, 2010

in facilitating economic exchange between companies, being the most critical factor in the exchange relationship (Hau-siu Chow, 2008). The cooperation of companies is becoming more and more important as a tool of economic development. Differences in culture, laws, and politics challenge companies in the way that cooperation becomes a prerequisite for foreign market entries (Stein and Ginevičius, 2010). Companies tend to work together in order to share their competencies, reduce various costs, consolidate limited resources, and increase their productivity, innovativeness, and profitability (Navickas and Malakauskaitė, 2009). The required conditions for effective cooperation between enterprises include friendly relations between partners, mutual trust and loyalty, and meeting the commitments by the partners (Figure 1).

Personal relations are the result of common work and time spent together by the particular individuals of allies. Meeting the commitments means that partners want to continue cooperation. Loyalty strengthens the relationships among partners and trust is based on honesty, openness and responsibility (Ginevičius, 2010). Through standards and sanctions trust can act as a substitute for the system of formal control, and it is also a factor that facilitates the creation of networks of economic exchange management (Smith Ring, 2002: 117-118). It is more likely that relationships based on cooperation and trust will survive on the market. The company and its managers will have more trust in another company if they feel more comfortable and are not threatened by the way the business is conducted. Factors such as similar organizational culture, control systems, accounting rules and human resources management facilitate mutual understanding. The same applies to the size of the partners, since the smaller organization will not be afraid that the bigger one will use its size in mutual negotiations (Bierly and Gallagher, 2007). This means that companies

which do not trust each other and do not cooperate will be less effective than those who do (Zaheer and Venkatraman, 1995).

Relationships based on trust are built on numerous positive exchanges. Previous cooperation and personal relations are the foundation of mutual trust, in which the partners are willing to share key information. Repetitive transactions reduce opportunism and accelerate cooperation between companies, and communication and interaction play a central role in trust building, because the more connections, the stronger the partnership (Austin, 2000: 127-129). This also has a significant impact on the outcome of cooperation between companies.

Trust can be classified into three categories (Child et al., 2005: 149). At the beginning of the relationship between companies, trust is based on calculations, as in the broadly defined interest of the parties, there is a need to establish a relationship. For this to actually happen, some level of confidence must exist between them. Trust based on understanding develops as the partners discover that cooperation is beneficial, and the actions of one of them may be foreseen by the others. Finally trust based on words occurs in case of close relations between the parties. It does not appear automatically, but in the course of time and benefits from such cooperation.

Companies, like people, have a tendency to show trust. The results of previous cooperation can have an impact on trust in potential new partners in the future (Echols and Tsai, 2005). The culture of individual countries can also influence propensity to trust. It is worth adding that the company will be more willing to show confidence to a potential partner if its organizational culture promotes credibility and trust as a natural way of doing business. In an illustrative way, the impact of trust on the outcome of cooperation can be presented as follows. If the parties want to enter into a business relationship, there must be some motives that guide them, both



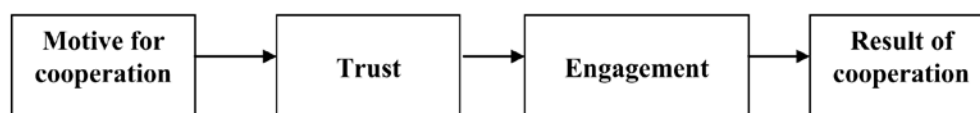


Figure 2. Impact of trust on the result of cooperation  
Source: Chaturvedi and Gaur, 2009.

cooperative and competitive. These motives have an impact on the outcome of cooperation. According to dependency theory, mutual benefits can be achieved by means of social exchange between partners, and the results of this relationship depend on the behaviour of partners, i.e. their involvement, level of trust between them, etc., and in turn, the partners' behaviour depend on their motives, which meaningfully affect the result of cooperation (Figure 2).

The literature provides various definitions of trust, as well as a variety of this term (Table 1). It should be noted, however, that the differences between them are often small, and the basic ideas are the same in different disciplines of science.

The remarkable similarities and significant differences can be seen in the definitions presented in the table. Generally it can be stated that trust is considered as a belief of the parties involved regarding the level of which the other party will behave in the common interest of all partners.

The reputation of the company also has a significant effect on trust. If the company is considered as a solid and reliable partner, its managers will also be trusted. Reputation is created both outside and inside the organization by the features and quality of management. The company develops its general reputation based on its actions in the past. It is worth noting

that the experience of top managers, their education, achievements and behaviour obtained from other cooperative ventures can meaningfully influence the reputation of any company. Generally, the company's reputation has an effect on the level of trust in two ways. Firstly, a greater reputation increases confidence, since the other entities know more about a given company, which in turn diminishes uncertainty. Secondly, the better the reputation, the bigger the growth of trust. Therefore it is very important that companies take care of their reputation, as opportunistic actions can reduce the trust given by potential partners.

### 3.2 Components of trust

Trust is a multidimensional concept. For example, Chaturvedi and Gaur (2009) propose two dimensions of trust, and highlight trust based on calculative understanding and emotional bond. In turn, McAlister divides interpersonal trust on affect-based trust, which is based on the emotional ties between people, and cognition-based trust which is based on the knowledge and understanding of others. Whereas, Das and Teng (1998) distinguish two types of trust, i.e. goodwill trust

Table 1. Selected definitions of trust

| No. | Author                   | Definition of trust  |
|-----|--------------------------|--|
| 1.  | Jarillo, 1988            | Trust relies on the assumption that if one partner (A) encounters difficulties in the discharging its explicit or implicit business obligations, can expect that its ally (B) will act as he was to behave himself (A) in situation if all the resources of the supporting partner (B) were available at his completed disposal (A). |
| 2.  | Bradach and Eccles, 1989 | Expectation that exchange partner will not act opportunistically, despite short-term incentives and uncertainty concerning the long-term benefits.   |
| 3.  | Fukuyama, 1995           | Expectation of regular, honest and cooperative behaviour that is based on jointly shared standards and principles.   |
| 4.  | Das and Teng, 1998       | Positive attitude and reliability towards the partner in risk situation.   |
| 5.  | Lewicki et al., 1998     | Some positive expectations related to the partner's behaviour.   |
| 6.  | Zaheer et al., 1998      | The growing sensibility of the partner for the risk of transaction partner's opportunistic behaviour.  |
| 7.  | Jennings et al., 2000    | Common belief that neither party will behave opportunistically, and that will not use the partner's weaknesses.  |
| 8.  | Sztompka, 2002: 312      | Practically expressed expectation towards the partner that its reactions will be good for us.  |

and competence trust. Competence trust relates to the rational components of relationships whilst goodwill trust relates to the emotional components of relationships.

Other authors also indicate two types of trust, a rational part known as credibility trust and an emotional trust. Rational trust is the kind of confidence with which the partners start a relationship. It is confidence that partners have motives and capabilities to meet their obligations and contributions as agreed. It is treated as a calculative type of trust because each partner can evaluate this aspect on the basis of information available, knowledge, and reliability of the partner. Emotional trust in turn is based on the belief that the partner will behave with goodwill (Chaturvedi and Gaur, 2009). Emotional and rational trust are treated as the two dimensions of trust in cooperative relationships.

## 4 Trust in alliance network

### 4.1 Process of trust building among partners

If two companies want to start cooperation, there must be some minimal level of trust between them. This is where the „I trust you because you trust me” rule starts. The creation of trust through a fair procedure involves benefits from cooperation, which are proportional to the contributions made in the form of tangible and intangible assets. It is also a factor that plays an important role in the cooperation management.

Different types of trust, such as psychological, social and structural (institutional) can be distinguished. From a psychological perspective, trust is the result of interpersonal relations, e.g. between managers involved in the negotiations

of cooperative agreements. This type of trust is based on cognitive and emotional factors. At a social level, trust is the result of continuous interaction between partner companies and depends on the importance of prior relationships. By contrast, at the institutional level, it is assumed that trust is a feature of relationships between companies, i.e. it exists or not. Based on these perspectives, we can identify three phases of accumulation of trust among companies in the network (Figure 3):

Phase I, where there is only a psychological confidence between managers involved in cooperation. Its level may vary considerably, since it depends solely on the way the managers perceive the behaviour of their partners, which in turn can change on a daily basis.

Phase II – partners will proceed to the phase of social trust if psychological trust is supported by the results of ongoing interaction with a partner. This phase is less dependent on the top managers involved in cooperation, and in a greater extent depends on the everyday relations between employees of partner companies.

As the cooperation strengthens, and after realization of some joint projects, not necessarily successful, the companies come to the third phase, i.e. institutional trust. In this phase, the managers perceive other network participants as good partners, even if they were not personally involved in any project of cooperation with other entities.

Companies from the same alliance network will trust each other more, partly because of the similar culture, but also because they are more willing to cooperate, and will be less prone to behave opportunistically. This does not mean that companies with different cultures cannot collaborate effectively, but cultural and organizational similarity facilitates the emergence of trust (Bierly and Gallagher, 2007). The model

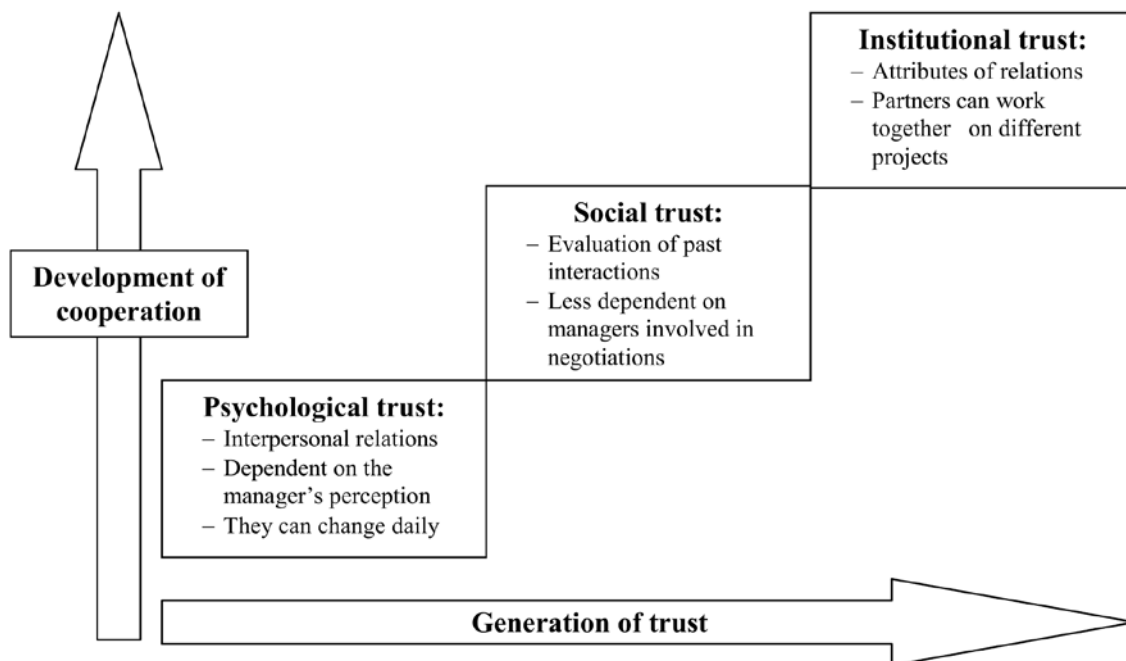


Figure 3. Trust as the function of interorganizational cooperation development  
Source: Garcia-Canal et al., 2002.

of cooperation that is based on trust looks as follows: partners who trust each other will not feel the necessity of cross control. Instead of this they will collaborate together and communicate openly, and accept the influence of the other party. Loyalty in this respect is understood as a state where the partners not only meet the qualitative and quantitative standards, but also go beyond them and jointly contribute to innovative actions, if this is to help to achieve a common goal. If there is no trust among them, they would act quite differently. First of all, they would try to control the behaviour of the other party. Communication would take place only at the strategic level to the extent they would be obliged to, without greater commitment (De Latt, 2002: 162-163). Both, the behaviour based on trust as well as on its absence tend to strengthen each other. The logic of proceedings is as follows: the more the company A is considered by the company B as a fair entity, the easier it would be for the company B to trust in the company A, and vice versa. A spiral of mutual trust is hence created. The same applies in the case of an absence of trust.

Other factors, e.g. cultural aspects, standards and norms can also influence the process of trust building between cooperating companies (Doney et al., 1998). If the partners share the same values and norms, there is a much greater chance to build relationships based on trust<sup>1</sup>. Countries with a so-called high confidence index (Norway, Sweden, Finland or Denmark) can "saturate" with trust regions with a lower level of trust, e.g. Poland, the Czech Republic, Slovakia, Hungary, and Lithuania (Grudzewski et al., 2007: 56). It is quite interesting that the representatives of these countries can also reach a higher level of trust if they are doing business in the countries of a high level of trust. The culture of individual countries can also have an impact on propensity to trust, for example, the Japanese society is more willing to show confidence, with more collective responsibility and focus on long-term objectives. The Japanese company, even if it knows little about its partner, is more prone to put trust in it. However it does not extend to companies out of Japan. It is worth adding, that a company will be more willing to show its confidence in a potential partner if it has some organizational culture that promotes credibility and trust as a natural way of doing business.

A company strongly rooted in the network promotes the development of trust (Echols and Tsai, 2005). This results from the fact that particular members are allowed to know each other, and thus – to verify whether one can trust each other. On the other hand, it should be emphasised that if one places too much attention to trust, other issues will not be reviewed properly and, left to be solved in the future. It can also happen, that a person or a company trust each other so much that they decide to create a network or enter into it without a detailed analysis of other important issues, including strategic fit, which often leads to a failure of cooperation.

## 4.2 The benefits of trust in the network

Cooperation between organizations creates mutual correlation and requires trust. The issue of the meaning of trust for every cooperation among companies is evident. Moreover, the thesis that trust is good and has a positive impact on results is widely accepted. Frequent relationships between partners are based on mutual trust that develops between them and allows them to reduce transaction costs (Goerzen, 2007). Trust facilitates the exchange of information between partners and reduces opportunism. Any relationship based on trust allows for an easier transfer of knowledge and is crucial for innovation and entrepreneurship (Hau-siu Chow, 2008). Other authors raise the issue of facilitating open communication between partners and reduction of conflicts (Zaheer et al., 1998). Trust has a meaningful impact on the quality of relationship management in alliance networks (Thorelli, 1986). The companies which belong to the same network must rely on each other, otherwise there is no chance for effective cooperation (Harari, 1999). This was also confirmed by Das and Teng (1998). According to them, the possibility of cooperation between companies depends on two factors, i.e. trust between them and control. The engagement of both partners can also have an impact on good relationships between them (Faulkner and Bowman, 1996: 134-135). Close relations between companies that are based on mutual trust allow for exchange of confidential information, since the standards that are commonly shared can protect the companies from opportunism. Therefore, the greater the trust between partners, the smaller the possibility of opportunistic behaviour<sup>2</sup>. Moreover, the reputation of a trustworthy partner facilitates the possible change of a network in the future.

Trust improves flexibility of understanding, shortens processes of cooperation management and improves their quality. A high level of trust allows for the development of profitable transfer mechanisms and knowledge creation, and also ensures a reduction in opportunistic behaviour. Along with this, the network evolves towards creation of values based on intangible assets. Beside reduction of transaction costs, it also facilitates the resolving of conflicts and increases the flexibility of the network (Bierly and Gallagher, 2007). At the same time, it predisposes the partners to invest and share a tacit knowledge without having to worry about hostile takeover. Trust is therefore a bridge between knowledge and ignorance, and is closely related to knowledge management – it is a prerequisite for the successful implementation of this concept in inter-organizational cooperation.

## 4.3 Trust vs. opportunism in the network

Trust between partners is a concept that is hard to observe and measure. For example, many scientists link this concept

1 This is more difficult in terms of cultural differences and their impact on trust building. Different authors, however agree that cultural differences make the process of development of trust different. It can therefore be expected that cultural close-up of partners has a positive effect on building of trust between them.

2 It should be noted that some studies indicate that too much trust is not good for a success of long-term cooperation between the companies because it reduces the incentive to negotiate a specific transaction (Jeffries and Reed, 2000).

with previous ties between partners. However, studies done by many researchers indicate that only a small minority of alliances are created between companies which previously had some close ties with each other. Moreover, the early ties could have revealed a lack of confidence instead of confidence, being one of the reasons for which the company does not create further alliances, e.g. when one company does not trust the other. It suggests that changeable strategic fit has more influence on the choice of a partner rather than trust between the parties.

Trust is an important success factor of long-term relationships between companies (Jeffries and Reed, 2000) or every partnership (Mohr and Spekman, 1994). However, despite voluntary cooperation within the network, there exists potential for opportunistic activities by the parties, especially when they make decisions with limited sources of information. Uncertainty associated with unclear information increases the possibility of opportunistic behaviour, because in such conditions, the terms of agreement regarding control are less effective. If there is trust, at the level of individual managers or a company, it reduces the risk of opportunism. Therefore, the choice of a partner in such a situation requires both a strategic fit between parties and trust itself.

Trust fosters the spirit of cooperation between companies, which may reduce the degree of opportunism of one or more partners. We can face such a situation in the case of Japanese companies operating in the keiretsu groups (Hagen and Choe, 1998). Every organization knows that a breach of generally accepted standards and norms will be seen as incredible behaviour. Moreover, it will be accompanied by loss of reputation and ostracism, which practically excludes such a company from the business community. Moreover, this negatively affects the company's longterm ability to maintain the market share.

Sanctions against companies that violate shared standards may also take different forms. In Japanese keiretsu-type networks, which usually involve relationships between large production companies and their suppliers, the central companies choose at least two suppliers of a particular component. Although the mutual relationships between them are more durable and more stable than in other countries, the contracts signed with suppliers last for about 1-1,5 years. This means that there are no formal commitments to maintain longer-term relationships with companies that do not meet the expectations of the leading entity, especially if they neglect their duties significantly. In such situations, the most common sanction is a reduction in orders, and in the extreme cases - a break off of further cooperation. The companies in keiretsu work closely together to improve the quality of products, technologies and production processes. In case of problems, the members of keiretsu can count on the support of other companies, e.g. in keiretsu of Honda or Toyota, the cooperating parties that are unable to identify the causes of problems can always count on the assistance of specialists from both corporations (Liker and Choi, 2006). This may indicate that this type of relationship functions effectively.

Sanctions against companies that violate the principles of cooperation are rare in the Japanese economy. Any information about fraudulent contractors is quickly distributed, not

only within the network but also outside it, which diminishes the chances of its acceptance by other groups. At the same time it must be emphasized that the sanctions imposed on the smaller members of the network can also turn against the central companies since cooperation within the keiretsu group means the flow of information in both directions. Thus, small entities also have certain knowledge about the policy and actions of the central company. It means that all opportunistic behaviour is discovered very quickly and is immediately distributed through the same information channels (Sroka, 2008).

In other countries like United States or Great Britain, we face another situation. Cooperation among companies is determined by certain rules and norms, and any company that violates them can expect some sanctions. On the other hand, the participants are not linked by formal agreements and therefore it is necessary to build up mechanisms of other nature than strictly formal and legal. One of the possibilities is "social sanctions", which include mutual monitoring among partners and quick information on the credibility of the partner companies (Hagen and Choe, 1998; Boyd, 2004). It also allows the avoidance of conflicts. If, however, the company acts against the network, it should be eliminated from the group. It is an extreme and radical case but in some situations it is really a must. It also serves to educate other network members. The network members should act towards the integrity of the network. It relates both to its competitive position as well as the members' competitive positions because it allows to maintain its competitiveness.

The process of partner selection in a situation where more information is available is less vulnerable to opportunism and does not require trust between parties, but only a strategic fit. In other words, in such situations it is possible to prepare the terms and conditions of all control mechanisms.

## 5 Problem with trust

If too much attention is paid to trust, it can mean that other issues will not be substantially analysed during the decision-making process relating to the selection of partners for cooperation. Because the partners trust each other, other issues such as conflicts in the organizational cultures can be put aside, or be completely hidden. This is important since convergent organizational cultures are the best basis for a reduction of risk associated with cooperation, and to build trust (Das and Teng, 2001: 259-262). Some authors indicate the specific mechanisms for trust creation within the network structures that are treated as a tool to support the organization in obtaining information. They include risk-taking, fair proceeding, communication and internal adaptation (Das and Teng, 1998). It happens however that in business practice two people or companies trust each other so much that they decide to work without a detailed analysis of the strategic fit, which may lead to failure. To avoid problems like this, one must ensure in advance that there is a strategic fit between partners, especially if trust is very strong and can overshadow other issues. The company can choose a specific manager who will play the role of devil's advocate.

Another problem related to trust is that perception of trust by the key decision-makers may not be in line with the partner's behaviour in the past. For example, one person making decisions in one of the companies may have a high level of trust in the company based on a past relationship. It does not mean, however, confidence in the entire company. Organizations, just like people, also have their individual propensity to trust. Certainly, the results of previous partnerships have an impact on trust in the new partners in the future. Companies also have a tendency to have greater trust in firms with a similar cultural attitude. It can facilitate communication, however cultural similarities mean the companies have less opportunities to learn something from each other.

## 6 Conclusions

In the article, the topic of trust in alliance networks has been presented. Despite difficulties in trust creation, this factor is a necessary condition to achieve a success and plays a crucial role in the inter-firm cooperation, especially if companies come from different countries, with different cultures, norms and standards. There are clear evidences that relationships based on trust allow for a wide exchange of knowledge between network partners and this is one of the main goals of alliance networks. If trust exists, people are more willing to hand over the useful knowledge and also to listen and absorb the knowledge from partners. Additionally it reduces the costs of knowledge exchange through diminishing the potential for conflicts. Therefore trust building in alliance networks has an influence on the effectiveness of the whole network. Based on this we can state that the portfolio of alliances based on trust is worth pursuing.

On the other hand companies evolve over time, and their environments also change. The same relates to alliance networks. It means that further research into trust in alliance networks is required, if they are to be more effective. Additionally if companies use alliance networks to compete, success will depend on a parallel set of actions, i.e. both inside the company (proper management) and external (cooperation based on trust). These actions will require management to think broadly about its business and its capabilities, and often demand an outside-in perspective.

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### Problem zaupanja v zavezniških omrežjih

V času naraščajoče globalizacije lahko opazimo, da narašča vloga strategij sodelovanja med podjetji, vključno z zavezništvu, skupnimi projekti in omrežji. Zaupanje pa je eden najbolj pomembnih dejavnikov za uspeh katere koli poslovne aktivnosti. To še posebej velja za zavezniška omrežja, saj lahko zmanjša transakcijske stroške, dvigne produktivnost in inovativnost, podpira in olajša medorganizacijske povezave in razrešuje nasprotja. Članek celovito obravnava problem zaupanja v zavezniških omrežjih. V zaključku avtor ugotavlja, da vzpostavitev zaupanja v zavezniških omrežjih vpliva na učinkovitost celotnega omrežja. Članek temelji na novejši znanstveni literaturi in na izkušnjah avtorja pri oblikovanju učinkovitih dogovorov za sodelovanje v omrežju.

**Ključne besede:** zaupanje, sodelovanje, partnerstvo, odnosi, zavezniško omrežje, oportunitizem

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# Upgrading of the Management Review on the Basis of the EFQM Excellence Model

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Suppliers in the automotive industry can use for strategical planning a number of different approaches and tools, which can upgrade the quality management systems (ISO 9001, ISO/TS 14696) to achieve the breakthrough power to meet needs in order to achieve a significant role in the automotive supplying chain. One of the very popular and positively accepted tools to achieve continually improving is implementing of the principles of excellence, according to the EFQM model.

On the basis of case studies is in the article analysed and represented a useful value of the implementation of the quality management system audits and management review according to ISO/TS and their positive impact on the development of key indicators of the company TPV d.d. from Novo mesto, which is mounted as a development supplier in the automotive industry. With the implementation of self assessment according to the model of excellence EFQM we demonstrate the added value of the take up of the principles of excellence, according to the present system auditing according to ISO standards and the implementation of management review according to ISO/TS requirements.

We upgraded in the existing management system performing of management review as manager's tool, which came directly from the requirements of standard ISO/TS, on to the level of the fundamental principles of excellence by EFQM model and mark it as one of the more effective managers tools with which you can still effectively introduces the leadership of the continuous improvements and strategically manages the company.

**Keywords:** quality management standard, EFQM Excellence model, auditing, self-assessment, management review

## 1 Introduction

»Improve or perish» is the motto that the business world should assume with the aim to remain competitive in a constantly changing and evolving global market (Karapetrovic and Willborn, 2001).

The automotive industry is known for a high degree of emphasis on the introduction of continuous improvement. These are the condition that the individual automobile factory together with the whole system of their suppliers to compete at a very demanding market and provide a stable and positive business. One of the unpopular, but very effective levers to achieve still better results in the automotive industry, and search and implementing procedures of continually improving is a constant downward pressure on prices or so called "the progress of prices". This means, that by the negotiations of a particular business transaction in supplying chain customer usually requires an annual reduction of product prices. Because of fact, that basic costs of material and work are known by the signing of the Contract is therefore on the supplier to continually searches for possible improvements in its own process, and in such way ensure positive business remains competitive and attractive to customers.

The rapidly increasing global competition that many industry sectors world wide have been facing over the past

decade, associated with rapid technological changes and product variety proliferation have led to a new scenario in which industries, in order to remain competitive, must continuously change, improve and implement best practice management principles, strategies and technologies. The competitiveness of a company is mostly dependent on its ability to perform well in dimensions such as cost, quality, delivery dependability and speed, innovation and flexibility to adapt itself to variations in demand (Carpinetti, Buosi and Gerólamo, 2003).

Also Spence (2008) notes that the changes are imminent. There is not only one strategy, which will retain the organisation on the market for always. Stern, Shiely and Ross (2003) underline that an enterprise needs a winning strategy and relevant organization. Also the well known companies namely can lag behind the competition, if they are not adaptable.

In particular, the production companies have been in recent years the area, where the use of various approaches to improve the competitiveness increased. Such as Just-In-Time (JIT), World Class Manufacturing (WCM), total quality management (TQM), Process Reengineering (BPR), PRSPO (Recognition of Republic Slovenia for Business Excellence), Lean production are just some of them (Horžen, 2005).

Entire family of standards, which are currently the most commonly in the operational use (quality management system ISO 9001, the technical specification for the automotive indus-

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try ISO/TS 16949, the environmental management system ISO 14001, etc.) have as a key starting point for a defined request: "the organisation shall establish, document, implement, maintain and continually improve the system ..." (SIST ISO 9001, ISO 14001). This of course clearly shows how important role the continually improving of the quality has on a successful business of enterprises. Based on the empirical analysis from 212 responses of Slovenian companies that had already acquired the ISO 9001 quality standard certificate, Piskar and Dolinšek (2006) proved that positive effects can be noticed in different business activities stemming from the implemented quality management system.

Zulauf (2007) provides the conclusions regarding the ability of the system thinking. On this basis concludes that the vision of the future is not a forecast in the statistical sense, but this is simply seeing how the system works and where it is intended.

Mønsted and Føns (2002) note that, based on the fact that ISO standards are not as versatile as the EFQM model, it is logical to start searching for the achievement of excellence in the implementation of ISO 9001.

It is therefore appropriate to highlight the difference between the audit, which provides the comparison with the base standard, and self-assessment by EFQM model where the organization looks into herself and specifies the priorities for improvement.

That therefore indicates the direction of upgrading of the integrated system of quality management with all the characteristics and consequently the monitoring through the system of audits in the system through self-assessment (without stand as a candidate for the prize) to the evaluation of excellence (stand as a candidate for the prize). Van der Wiele et al. (2000) note that the use of the self-assessment is mostly internal decision, since the biggest difference between ISO 9001 and 9004 standards and models of excellence is in the reasons for their use. Both approaches have different objectives and purposes.

If we focus ourselves on the analysis of the situation or improving business performance from the views of the two models, we have available (internal audit and self-assessment by the model of excellence), it is necessary to establish, that only implementation of this two approaches is not sufficient.

The important role can play the top management, which is by ISO standards family 9000 committed to regularly management review checks, to provide its leading role for the continuing progress (SIST, 2004).

In this article our focus is on the activities of the audit, self-assessment and management review and their contribution to the performance of the company. We build on the premise that it is possible to connect the quality and excellence models in an effective tool in hands of the top management and define the implementation of management review as key universal tool, with which the top management controls and manages performance of the company.

The company TPV d.d. recognizes that the environment in which it works is extremely dynamic and variable. Competition is growing, also come from countries where the worker deserves a tenth of the incomes of our employees, but car manufacturers (OEMs) are looking for a cheaper solution as soon as possible. It is imperative, that the company as soon

as possible responds to all these changes. Therefore existing integrated quality management system represents no longer that breakthrough power, which would provide a constant adaptation to new challenges. EFQM excellence model is recognized as one of the possible solutions. The implementation of management review should be seen in the company as a process, so we want by introducing the quality management principles to the principles of business excellence to upgrade also management review. In this way we want to show and confirm the flexibility of both root systems and their mutual complementarities, which results in more successful and more comfortable approach of company to the market.

## 1.1 Approaches to the assessment and implementation of continuous improvements

Mønsted and Føns (2002) note that one of the biggest advantages of using the model of excellence EFQM is in implementation of the self-assessment. Model of excellence can be the perfect tool for the detection of strengths and opportunities for the organization. If a process of continuous improvement is to be sustained and its pace increased, then it is essential, that executives monitor on a regular basis what activities are going well, which have stagnated, what needs to be improved and what is missing. Self-assessment against a recognized quality/excellence model could provide a useful framework (Williams et al., 2006).

Karapetrovic and Willborn (2001) indicate that audit tells us whether we are good in relation to the baseline standard, while the self-assessment explores how good we are at a scale of excellence. In doing so it has the objective of the top-level importance performance, the starting point is the initial state of execution and we are looking at which level of performance we are. Van der Wiele, Dale and Williams (2000) note that there is a big difference between two models of quality management ISO 9001 and EFQM and consequently application of audit or self-assessment in the reason why a particular model is used. Therefore implementation of self-assessment as a continuation of improvements in the direction towards excellence is an internal decision of the organisation.

Technical specification ISO/TS 16949, which is adapted to the automotive industry and is based on the ISO 9001 in the introductory part stresses that implementation of the quality management system should be strategic decision of the organization. To lead the organisation in direction of improved performance standard states, that the top management shall guide and manage the organisation in a systematic and transparent manner. Therefore there are eight quality management principles identified: focus on customers, leadership, involvement of the employees, process approach, systematic approach to management, continual improvements, decision-making on the basis of the facts and mutual beneficial relations with suppliers (SIST ISO 9001).

ISO 9001 for the purpose that organization should function effectively requires the process approach. The advantage of the process approach is that it allows carrying out constant supervision during the links of the individual processes within



the system processes as well as control over their interactions (SIST ISO 9001).

The process of internal audit is an independent tool for gaining objective evidence that the existing requirements have been met. Internal assessment measures performance and achieved improvements in the quality management system according to the basic standard of quality management.

ISO 9004 in section 8.2.1.3 sets out examples which should be examined in internal assessment (SIST ISO 9004):

- effective and efficient implementation of processes,
- opportunities for continuous improvement,
- the ability of the processes,
- successful and effective use of statistical methods,
- use of information technology,
- analysis of data on the costs relating to the quality,
- successful and effective use of resources,
- the results and expectations of the processes and products performances,
- the adequacy and accuracy measurements of performance,
- activities for improvement and
- relations with interested parties.

A basic guide, which must be observed (if there are any sincere intentions) in the implementation of internal audit is to bring real benefits. If the assessments are properly designed, they can help organization, by achieving the objectives pursued and open always new areas, where it is possible to implement continuous improvements. Internal audit should not become only to count the number of non-compliance. This is linked in particular to the approaches and relationship of management. In so far as it has a relationship to the audit minimalistic and sees it only as additional operating costs, ensuring that it is formally establishing compliance with the requirements are met, then it is not possible to expect greater progress. The advantage of efficient audit is a systematic search for deviations from the prescribed activities within the processes of the company, and the search of possible areas for continuous improvement. Alič and Rusjan (2009) indicate that internal audits in duly motivated companies give more positive than negative effects on businesses and have an important contribution to achieving the objectives of the business.

Unlike the standard ISO 9001, which lays down the requirements for the quality management system of the enterprise is a model of excellence EFQM wider in horizon of action, and directs the company into a more comprehensive approaches.

The global, systematic and open approach of the model is a key aspect. The framework of criteria, sub-criteria and areas of improvement is essential for the continuous improvement of organizations in the never-ending search for excellence. The open character is determined by the continuous search of excellence. This process is unlimited because the areas of improvement are in nite. Organisations and people will always be motivated to achieve continuous improvement (Martín-Castilla and Rodríguez-Ruiz, 2008).

Excellence means approach to business that strives for optimal operation of all the activities and functions, it means holistic approach (Savić et al., 2007). This model attempts to

include all areas of business. The organisation EFQM defines the following ways of the application of the model:

- as an internal tool for the implementation of self-assessment whereby the organization gets the information, how far has gone on the road to excellence, helps her understand the gaps and indicate solutions,
- as the basis for a common language and way of thinking about the organization, shared by all workplaces in the organization,
- as a framework for the promotion of initiatives, prevent duplication and identifying gaps and
- as the structure for the system of management of the organization.

EFQM Excellence Model takes into account the eight basic principles of excellence: focus on results, the focus on the customers, leadership and stability of purpose, management by processes and facts, development and integration of employees, ongoing learning, innovating and improvements, developing of partnerships and social responsibility of the organization.

Model of excellence as a method for determining the Status, uses the so-called logic of RADAR, which is made up of the following elements (MIRS, 2004): **Results, Approach, Deployment, Assessment, Review.**

The findings shall be defined through two scoring metrics and valued as enablers and results.

Mønsted and Føns (2002) indicate that the model of excellence is, whether that is the basis for the European Prize of excellence, very useful in understanding and identifying the key links, and the cause/consequence relations, which the organization faced by business. They note that one of the biggest benefits of using a model of excellence EFQM is in the introduction of the self-assessment. Model of excellence can be the perfect tool for the detection of the advantages and opportunities of the organization.

Through self-assessment with the model of excellence the organization in addition to their strengths and opportunities realizes also where it is located in the path to excellence, where is located relative to the comparable competition and where are the areas where it is necessary to target resources to maximise the progress and benefits. There are four basic techniques of self-assessment developed, but regardless of which approach the organization has chosen is the key meaning to choose self assessment as a strategic tool which is implemented in the long term. In this way approach is becoming gradually more difficult, but organisation develops herself and becomes more sovereign (MIRS, 2004).

Each of the techniques has its advantages and brings certain benefits. Which is suitable to each organization, should determine the organization by itself. It is appropriate to start with the simpler techniques and gradually make progress with the use of complex techniques.

In the process of self-assessment is to stress two basic situations, which substantially affect the launch of activities tied to the excellence (MIRS, 2004):

1. the strong commitment of the leadership

Suitable for the start of the activities of self-assessment, it is expected the steering role of leadership as the generator of changes.

2. the weak commitment of leadership

In this case it is necessary to reflect upon whether it is appropriate to begin a self-assessment, or whether it is still too early.

Van der Wiele et al. (2000) note that the great difference between the two models of quality management ISO 9001 and EFQM and consequently applying of audit or self-assessment is in the reason why the particular model used. Therefore, implementation of self-assessment as a continuation of the improvement in the direction towards excellence is internal decision of the organization.

Both approaches have different objectives. ISO 9001 requires the described processes; deviations must be dealt in accordance with prescribed procedures. Self assessment with the model of excellence requires a broader understanding of the organization and orientation on a wide range of activities either inside as well as also outside of the organization.

Karapetrovic and Willborn (2001) indicate that audit tells us whether we have a good assessment in relation to the baseline standard, while the self-assessment explores how good we are at a scale of excellence. Management review is defined in the ISO 9001 in section 5.6. The results of the management review must enable controlling of the achievements of the organisation at least quality objectives that are defined in the business plan and satisfaction of customers with delivered products (SIST ISO 9001).

ISO & IAF (2009) defines different ways and approaches for the implementation of the management review:

- a review on the basis of the report of the representative of the management or other staff,
- use of electronic media,
- ordinary meetings of the management, which examined areas or issues of the budget and objectives.

Among other things, also observes that the management review was not intended exclusively to meet the requirements of the standard, but should be an integrated part of the business process of the organization. Management review is a bilateral process in which top management meets with other levels of the organization. The key is to be shown a sincere interest of both sides. The above indications confirms Bones (2009) who indicates that auditors in practice too often note that management review is carried out as a formality, with a view to only provide the clear record of carried activity, which represents a clear deviation from the requirements of the standard to the »commitment of leadership.« Participants of the management review often seen this activity as the inevitable barrier on the path to certification and identified it as the loss of time of top management.

Practice, with which we face in the company TPV d.d. in third parties audits shows quite the opposite, since they usually begin with a review of the minutes of the management review and then, on this basis, develop a full assessment of the processes. A key focus is on the added value of the management review, clarity of objectives, the realisation of the objectives

and ongoing progress. Also this is one of the causes to emphasis management review.

## 2 Methodology

On the basis of case studies we carried out a survey in TPV d.d., which operates in the field of the automotive industry as a development supplier. In this article is analysed and shown the added value of the implementation of quality management system audits and management review according to ISO/TS and their positive impact on the development of key performance indicators of company. In the analysis we have included data of audits according to ISO/TS for first and third parties, the performance indicators and business operations for the period from 2006 to 2008 and the results of the self-assessment according to model EFQM.

### *Presentation of TPV d.d. company*

The beginnings of automotive operations in Novo mesto began in 1954 when the company was founded as Moto montaža. Production of delivery vehicles began in cooperation with the company Autounion from Germany, from which they developed its own delivery vehicle in following years. By promoting its own brands of cars have also changed the name to the Industry of Motor Vehicles (IMV).

With the collapse of Yugoslavia, the market IMV's shattered. Thanks to the rapid restructuring of production programs and adapting to new global market conditions, decreased from IMV's developed a new company, one of them was TPV, which has started a new production of automobile parts and components in connection with established global manufacturers of automotive equipment.

A key product of the car seat Renault Clio and Twingo, the factory is specialized in producing components for seats, as well as other products especially the first installation for car interiors.

Specifics of company TPV d.d. from Novo mesto additionally to the production programmes also tied to the following important factors:

- Customers are located in Slovenia and wider in Europe, representing the diversity of approaches and of course for the TPV as a supplier the obligation to respond to any specifics.
- Production is organized in independent technological rounded production units and subsidiaries. Other business functions are organized by directorates. In directorates, production units and subsidiaries are organized sections, which are finally organized in jobs in which they combined, which represent the simplest elements of the process.
- Individual plant (business units) as part of the TPV are specialized by technology and processes and are among themselves dislocated.
- Directorate (Joint Services) are located in Novo Mesto, their processes are highly intertwined with the operations of individual business units.

- Natural conflict between development processes (central) and production (site), evident in project management ie. shifting responsibility from the department to department.

Decision to introduce the principles of excellence is part of the strategic direction of the company, which wants to provide longer-term existence on the market and improve her competitive advantage.

Specifics of automotive industry lies in the fact that the buyer no longer expected only quality, but the perfection that is reflected in the strategy to achieve the quality level measured in a few ppm and cost effectiveness.

In this paper is on the case of TPV d.d. carried out an analysis of actual company data TPV d.d. who has implemented an integrated quality management system based on three initial ISO standards (quality, environment, health and safety) and reflects a long experience with implementation and includes:

- Introduction of an integrated system of quality management, and analysis of the results of internal audits carried out on the model of ISO TS 16949, ISO 14001 and OHSAS 18001. Results of them are connected with the attainment of indicators of the enterprise and business results.
- Performing of self-assessment according to the model EFQM, based on the analysis results are set out areas for improvement, and found out the differences between the two approaches.
- According to both analysis there is shown the differences of the two baseline approaches, strengths and weaknesses of assessment models and their added value. Furthermore, there are indicated guidelines for development activities upon which it is possible to take advantage of synergistic effects of different approaches towards business excellence.

Table 1: Analysis of the results of internal audits and audits by third parties (2006 - 2009)

| SHARE OF NON-CONFORMITY BY AREA OF QUALITY MANAGEMENT SYSTEM | First party audit |      |      | Third party audit |      |      |
|--|-------------------|------|------|-------------------|------|------|
|  | 2006              | 2007 | 2008 | 2006              | 2007 | 2008 |
| System general   | 5%                | 7%   | 2%   |                   |      | 25%  |
| Documentation  | 17%               | 18%  | 31%  | 24%               |      | 13%  |
| Management commitment  |                   |      | 1%   |                   |      |      |
| Focus in customer  | 3%                | 9%   |      |                   |      |      |
| Policy   |                   |      |      |                   |      |      |
| Planning   | 4%                | 1%   | 2%   | 14%               |      |      |
| Responsibility, authority and communication                  | 9%                | 9%   | 13%  | 10%               |      |      |
| Management review  |                   |      |      | 5%                | 8%   | 6%   |
| Resource management  | 2%                | 3%   |      |                   |      |      |
| Human resources  | 2%                | 9%   | 3%   |                   | 8%   | 6%   |
| Infrastructure   | 5%                | 3%   | 1%   |                   |      |      |
| Work environment   | 2%                | 1%   | 3%   | 14%               |      |      |
| Product realization  | 3%                | 8%   | 12%  | 10%               |      |      |
| Customer related processes                                   |                   | 1%   | 1%   | 5%                |      |      |
| Design and development                                       | 5%                | 1%   |      |                   |      | 6%   |
| Purchasing   | 4%                | 2%   | 2%   |                   | 17%  |      |
| Production and service provision                             | 16%               | 9%   | 7%   | 5%                | 25%  | 19%  |
| Monitoring and measuring equipment                           | 8%                | 7%   | 6%   |                   | 17%  | 13%  |
| Measurement, analysis and improvement                        |                   | 2%   |      |                   |      |      |
| Monitoring and measurement                                   | 4%                | 9%   | 14%  | 10%               |      | 6%   |
| Control of nonconforming product                             | 2%                | 1%   |      |                   | 17%  | 6%   |
| Analysis and use of data                                     | 2%                |      |      | 5%                |      |      |
| Improvement  | 9%                | 3%   | 3%   |                   | 8%   |      |
| Total  | 100%              | 100% | 100% | 100%              | 100% | 100% |

### 3 Research

Presentation and analysis of the results of audits, the relationship with indicators

Analysis of internal audit is conducted on the basis of studies carried out audit records in the three-year period (2006 - 2008).

The evaluation was conducted as a calculation of the volume of the non-compliance in the particular field of standards depending on the number of detected non-compliance in the period.

By comparing the proportions of non-compliance identified in internal audits and audits by third parties relating to the fields, we want to see how the approach to assessment one another is covered and which areas are more vulnerable in terms of non-compliance. In the present analysis are grouped all the non-compliance in audits carried out within integrated system of quality management, including assessment of ISO TS 16949, ISO 14001 and OHSAS 18001.

Results of the analysis (Table 1) can be summarized in the following substantive points:

- Internal audits focus on the content of the documentation and induce changes which provide more effective implementation, which is positive.
- The company is a manufacturing-oriented, so the emphasis in audits is on the realization of the product when considering the unconscious present.
- documentation, i.e. in the direction of increasing efficiency and

- for effective performing of the company and the processes that are taking place in it is a necessary condition of trained and competent employees and a clear polyvalence within processes.

Allocation of substantive findings in internal audits, also indicates that the assessments are carried out comprehensive, because all substantive comments as identified in almost all areas, which is very positive, indicates a desire for continuous holistic business improvement, while also indirectly shows impact pressures from market which quickly eliminate inactive companies from the game.

In order to obtain a comprehensive overview on the operation of process, there is carried out also an analysis of third-party audits.

The results indicate more systemic problems, which is understandable, since audits are performed by professional auditors, who are not burdened with internal problems. This is most visible through the non-compliances on the implementation of management reviews, while by internal audits these findings have not been seen.

Summaries of these assessments are related to:

- setting clear trusts in relation to operational objectives,
- sense of individual decisions and their added value and
- the role of management reviews by continuous improvements in performance.

Key operating indicators are systemic identified, also manner and frequency of calculating them is clearly defined. Most indicators are calculated on a monthly basis and a smaller share quarterly or annually. Evaluation of indicators

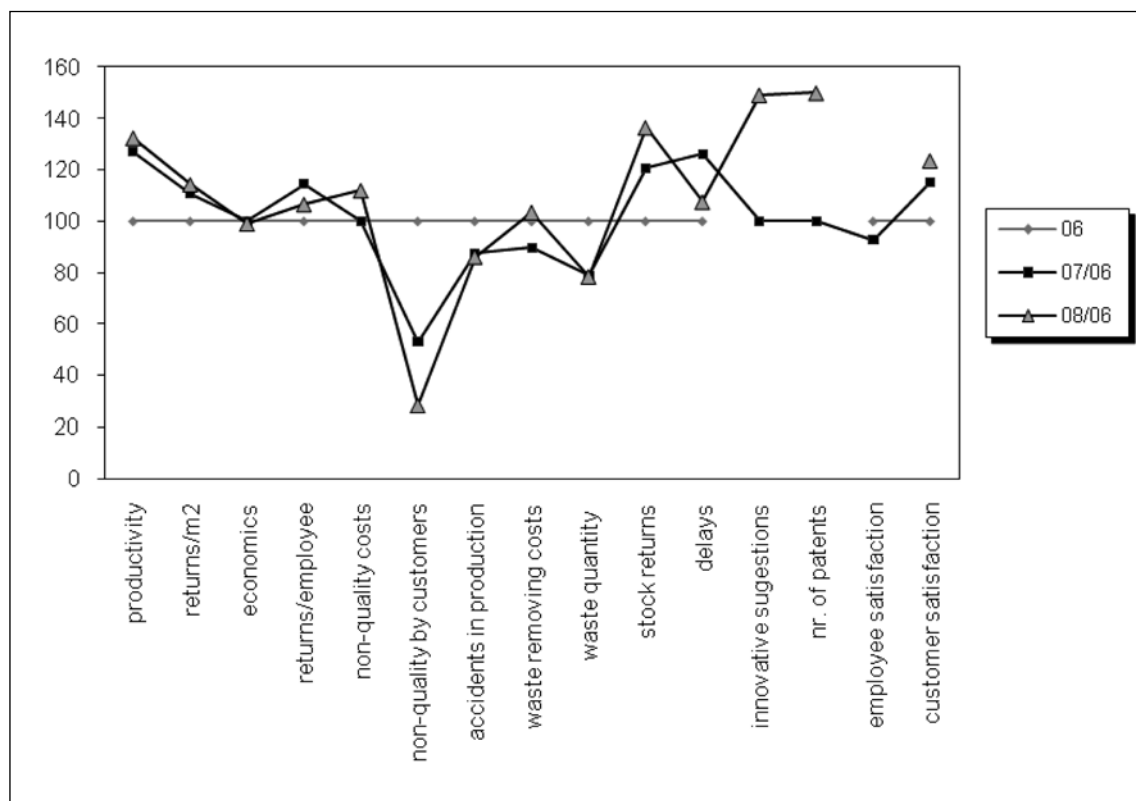


Figure 1: Performance indicators for the period from 2006 to 2008 (in %)

in specific time period from success point of view takes into account the ratio between the realization of performance regards to target.

Most performance indicators show positive trend (Figure 1). Improvement of most indicators scored according to the base year (taking into account problems in times of economic crisis), reflect to the fact, that conducting of audits and efficiency of corrective actions based on identified non-compliance is also shown through the indicators, which are used by company to monitor the level of business performance of its operations, particularly in relation to proper implementation of management review, which through its structure and form, in particular correct implementation represents a powerful lever for promoting the necessary activities and rapid, appropriate actions.

### *Self-assessment*

Approach to the introduction of the principles of excellence in the performance of the company took place in project manner. An internal project was opened for performing self-assessment, where were defined all necessary boundary conditions and parameters for the successful implementation of the project.

Self-assessment activities were conducted by two trained assessors for EFQM excellence model. Initial training of employees was implemented which includes:

- presentation of model EFQM,
- recognizing of fundamental principles of excellence and self-assessment techniques,
- the expected effects of excellence model use and
- presentation of an internal project.

Self-assessment was conducted on four internal organizational units within three manufacturing factories and joint service unit.

The sample of participants in self-assessment is linked to the internal organization:

- board and directorate directors,
- production plant directors and section leaders,
- leaders of working units in production plants.

The self-assessment involved 39 employees, representing 93% of the target population. A total of 1951 responses were obtained. Self-assessment in individual units was moderated by internal assessors.

Special basic questionnaire technique was used for self-assessment. The reason for using the basic questionnaire is in the following of recommendations by EFQM for gradual introduction of self-assessment activities.

Participants in the self-assessment have been reminded to the importance of maximum objectivity in the evaluation and propriety, as the best way to present a honestly view mirror which is seen by employees.

Results are evaluated on a scale: A - fully achieved; B - significant progress; C - some progress; D - has not yet begun (MIRS, 2004).

In the framework of self-assessment exercise was also included recognition of the key factors of success in the fol-

lowing areas: organizational environment, organizational relationships, competitive environment, strategic challenge and system for improvement.

The results obtained on the basis of the questionnaire showing the distribution predominantly in category B and C (Table 2). Numerical grades were not crucial for the results; we were interested mainly for position and perception of current state from employees. Figure 2 presents the results for each criteria in individual units and the average level of TPV d.d.

Self-assessment showed that there is slightly more positive perception of enablers against to perception of the results, suggesting that results are achieved with planned and systematic work.

*Table 2: Statistic of obtained self-assessment answers*

| Distribution of responses | frequency | share |
|---------------------------|-----------|-------|
| has not yet begun - D     | 233       | 12%   |
| some progress - C         | 1054      | 54%   |
| significant progress - B  | 617       | 32%   |
| fully achieved - A        | 47        | 2%    |
| Total                     | 1951      | 100%  |

Profile of self-assessment (Figure 2) shows a fairly evenly distributed evaluations according to individual assessment criteria - some larger deviations are conditioned by the fact, that each unit operates in a specific environment and is faced with specific problems on the basis of specialized production.

Summary of the findings based on self-assessment:

- employees stressed as the most positive criteria processes, which suggests to the tradition linked to a mature quality management system and results related to the society, which is substantially mostly tied to the ISO 14001 standard, with which employees are faced in every days business life,
- as the most negative, it was recognized results relating to employees, which is confirmed by dropping of satisfaction in the survey, but also indicates the time period in which the self-assessment was carried out (global economic crisis - resulting concern for jobs) ,
- maximum difference of 24% between extreme units is a good starting point for reflection on what is happening in each unit and on the other hand in addition what was the approach to the self-assessment
- according to fact, that company puts great emphasis on process approach and process management in particular, is from self-assessment evident, that perception of processes is not homogeneous through units, because the largest difference of 33% is recorded between the lowest and highest score,
- employees perceive the key results fairly balanced, because of the smallest difference 17% is observed between the lowest and highest score.

Based on self-assessment key areas for improvement and strengths have been identified. On this base were introduced actions to improve the situation.

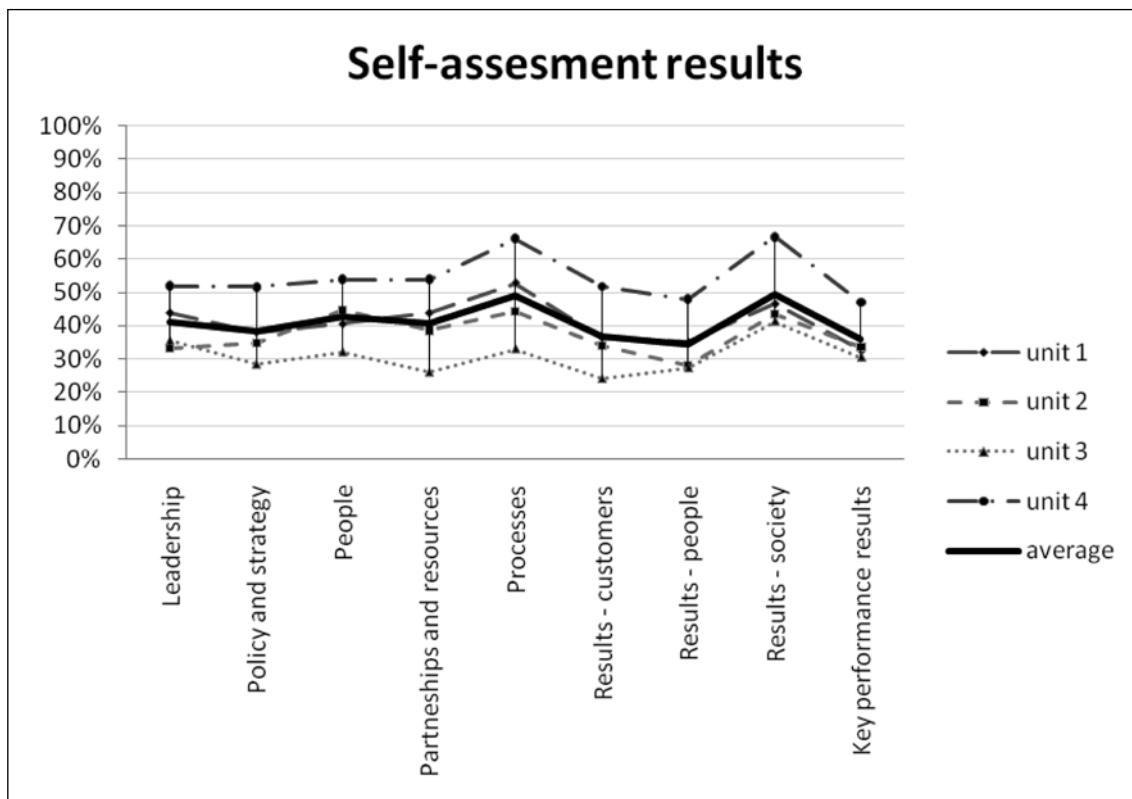


Figure 2: Results of the self-assessment by individual criteria in individual units and average

## 4 Discussion

Mønsted and Føns (2002) notes that according to fact that ISO standards are not as versatile as the EFQM model, it is logical to start the search to achieve excellence through the implementation of ISO 9001:2000.

Van der Wiele, Dale and Williams (2000) argue that the benefits from the use of self-assessment according to base model are not in obtaining recognition, but in adapting a methodology for assessing progress towards excellence.

Russell (2000) notes, that it is more realistic, if we see the standard ISO 9001 as a useful, even necessary step on the path to excellence. EFQM excellence model provides a holistic framework, on which can organization map out her route in the future. Well-established quality management system can significantly contribute to the efforts of the organization's path towards achieving excellence and complementary approach.

However, Russell (2000) points out, that organization on their path towards excellence and taking into account the fact that they already have implemented ISO 9001 first properly thought, how efficiently they use their quality management system.

If the quality management system depends on the quality manager, and taking into account a potential threat to the external auditors of quality management system, then the organization is not mature for steps toward excellence.

Therefore management of organizations should take a clear commitment and demonstrate the will and determination for continuous improvement, and particularly with their own action demonstrate commitment to the promotion.

That use of ISO 9001 is only a step on the path to excellence is evident from the requirements of both models, since the initial four elements of ISO 9001 can be connected or extended to the EFQM excellence model (Figure 3).

Russel (2000) concluded that ISO 9001 is not to be seen as competing model, but as a complement to the model of excellence.

Among other things he states, that management review is not intended exclusively to meet the requirements of the standard, but should be an integrated part of business process of organization. Management review is a two-way process in which top management meets with other levels of the organization.

Up stated remarks confirmed Bones (2009), which states that auditors in practice too often find that management review is conducted as a formality, with the aim to provide only evident record of checks carried out, which represents a clear deviation from the standard requirements for a "management commitment".

Robitaille (2004) emphasizes the transformation of the management review implementation from passive reporting to strategic planning. Management review is defined as dynamic, constantly evolving set of operations that convert the policy of the organization into operational performance.

It has been empirically verified, that the application of holistic management models such as the EFQM excellence model has a positive effect on corporate performance (Kristensen et al., 2000).

Based on this experience we assume, that performing of management review can be transformed in a way to allow

| ISO 9001                               |  | EFQM                    |
|--|--|-------------------------|
| Management responsibility              |  | Leadership              |
|  |  | Policy and strategy     |
| Resource management                    |  | People                  |
|  |  | Partnership & Resources |
| Product realization                    |  | Processes               |
| Measurement, analysis and improvements |  | Results - customers     |
|  |  | Results - employees     |
|  |  | Results - society       |
|  |  | Key results             |

Figure 3: Relationship between elements of ISO 9001 and EFQM

monitoring of organizations achievements in broader context and provide additional input (the results of the EFQM model self-assessment and review of the achievement according to implementation of company's strategy) and outputs (output decisions and actions of management review) become an additional condition for approving of annual business plan (Figure 4).

Upgrading of the model (Fig. 5) takes into account according to the technical specification ISO/TS 16949 key leadership role, who is responsible for promoting continuous improvement in the organization, implementation of management review fits in the PDCA cycle to phase C (control).

Therefore, the update is performed on the right side of the excellence model, which defines results, thereby leadership as

a generator of change must ask itself about the factors, that have influenced achieved.

In doing so, we consider the use of proactive RADAR logic, which is not intended only for assessment but also for development of management system based on structured problem analysis.

Based on own experience of implementation of ISO / TS and taking into account their requirements and achieved positive trends in indicators which are used to achieve a positive development, can for such approach to management review be used following bases:

- technical specification ISO/TS 16949 in the input data in the management review sets out recommendations for improvements and in output improvements of efficiency of quality management system and its processes, which indicates the openness of the specification,
- management review is one of the key tools of top management to implement the continuous improvement in organisation, so it is feasible to update on a new, higher baseline level of quality management, which is defined as excellence,
- achieving of objectives of organization's continued improvements must be linked with the process of planning,
- introduction of excellence also means receiving basic principles of excellence, which have recognized correlation with the fundamental principles of quality management and upgrade them in specific points,
- according to higher goals of the company's sufficient progress in the management system.

Management review in this way gets more dynamic and decisive role by strategic transformation of defined business policies in the long term, efficient operations. Managers can on the basis of large-scale information, quickly and effectively act on the necessary short-term and long-term changes in the company and completely focus to management of strategically important areas. By adopting the principles of excellence management review on the input side includes information of the results of self-assessment and on exits extends throughout the company's structure even stronger culture of excellence.

With upgrading of the management review to the principles of excellence follows:

- self-assessment include in the systemic approach of process oriented performing,

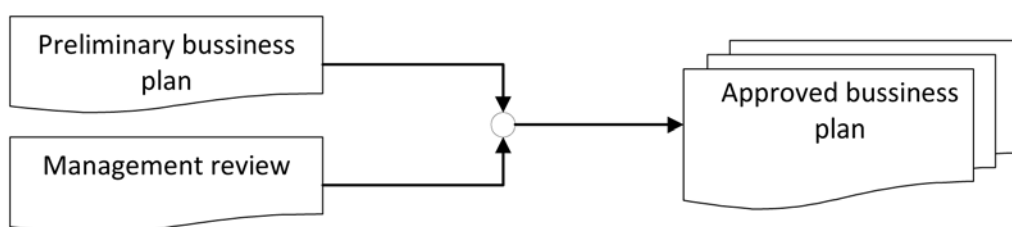


Figure 4: Approving the annual business plan

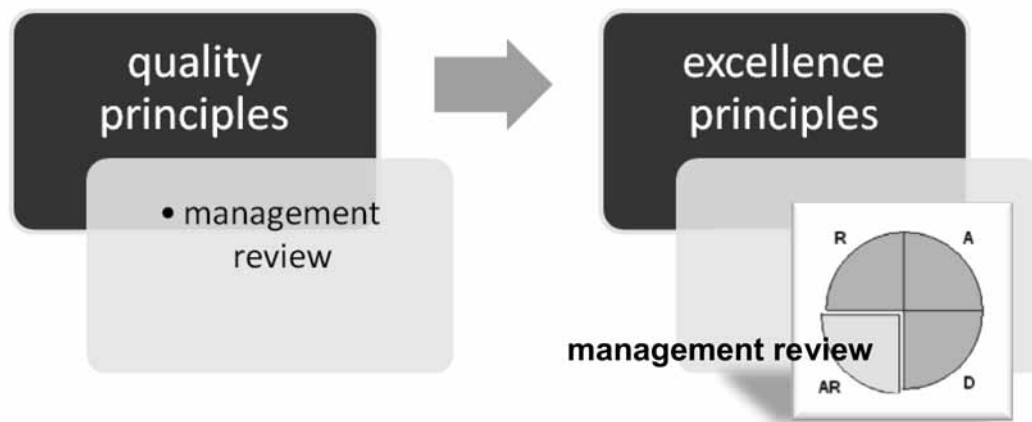


Figure 5: Schematic representation of an upgraded management review

- results of self-assessment are controlled at the highest level of the organisation and thereby highlight the role of top management,
- the principles of excellence extends throughout the company's structure and thus develop culture of excellence,
- process of management strengthen its role towards continuous improvements.

## 5 Conclusions

The results of self-assessment can be further, in addition to the information required in accordance with ISO / TS, used as input data into a management review.

Usefully complement and build upon the results of audits, and guide organisation to development of "soft" factors, which are necessary for the comprehensive treatment of the organization for achieving the desired or necessary competitive advantage.

Implementation of the management review based on a model of excellence we recognize as logical loop into a whole circle of continuous improvement, which offers a reasonable upgrade of existing management review implementation.

The results of internal audits analysis carried out shown mainly operational problems associated with:

- lack of documentation management,
- inefficient management of corrective actions,
- non-compliant operation of manufacturing processes and
- lack of the defined responsibilities and empowerment.

Therefore, the decision to compare internal audits with third parties audits makes sense, since the summaries of these audits indicated substantially more on systemic problems that are associated with:

- setting clear trusts in relation to operational objectives,
- sense of individual decisions and their added value and
- role of management reviews to continuous improvements.

Positive trends of most presented indicators indicate a content value and appropriateness of internal audits and third parties. Implementation of the EFQM excellence model self-assessment with the results obtained guide in the comprehensive treatment of influential factors to achieve the desired results.

Based on analysis of the requirements of ISO / TS to carry out audits and management reviews we identified gaps and opportunities, how it is possible to upgrade the existing approaches which are used in TPV d.d.

In this way EFQM excellence model self-assessment additionally focus to further direction of development:

- areas of management and organizational climate and
- strategic planning of enablers, which achieve results.

Top management can take with upgraded management review a much more proactive role in monitoring and developing activities of continuous improvement. In this way can organisation faster and more effectively achieve the realization of the set strategic directions and objectives in the field of quality management. It is also an opportunity to place it broader - we can move even into the areas of strategic planning.

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## Razvoj vodstvenega pregleda na podlagi modela odličnosti

Dobavitelji v avtomobilski industriji imajo pri strateškem načrtovanju na voljo več različnih pristopov in orodij, s katerimi lahko zahtevane sisteme managementa kakovosti (ISO 9001, ISO/TS 14696) nadgrajujejo za doseganje tiste prebojne moči, ki zadosti potrebam za doseganje pomembnejše vloge v avtomobilski dobaviteljski verigi. Eno od zelo razširjenih in pozitivno sprejetih orodij za doseganje nenehnega izboljševanja delovanja je uvajanje načel odličnosti po modelu EFQM.

Na osnovi študije primera je v prispevku analizirana in prikazana uporabna vrednost izvajanja presoje sistema managementa kakovosti in vodstvenega pregleda po ISO/TS in njihov pozitiven vpliv na razvoj kazalnikov delovanja podjetja TPV d.d. iz Novega mesta, ki je kot razvojni dobavitelj vpeto v avtomobilsko industrijo.

Z izvedbo samoocene po modelu odličnosti EFQM smo prikazali dodano vrednost vpeljave načel odličnosti glede na dosežani sistem presojanja po ISO standardih in izvedbe vodstvenega pregleda po ISO/TS zahtevah.

Izvajanje vodstvenega pregleda kot managerskega orodja, ki izhaja direktno iz zahtev standarda ISO/TS, smo v obstoječem sistemu nadgradili na nivo temeljnih načel odličnosti po modelu EFQM ter na tak način nadgradili vodstveni pregled, kot enega uporabnejših managerskih orodij, s katerim lahko vodstvo še učinkoviteje uvaja stalno izboljševanje in strateško upravlja podjetje.

**Ključne besede:** standard managementa kakovosti, model odličnosti EFQM, presojanje, samoocenjevanje, vodstveni pregled

# Simple Stochastic Model for Planning the Inventory of Spare Components Subject to Wear-out

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We treat an industrial system which comprises of a number of identical components subject to wear-out. To support the system maintenance an appropriate inventory of spare components is needed. In order to plan the sufficient inventory of spare components, two variants of a simple stochastic model are developed. In both variants, the aim is to determine how many spare components are needed at the beginning of a planning interval to meet demand for corrective replacements during this interval. Under the first variant the acceptable probability of spare shortage during the planning interval is chosen as a decision variable. While in the second variant the adequate spare inventory level is assessed by taking into account the expected number of component failures within the planning interval. A comparison of both variants of the model shows that calculations involved in the second variant are simpler. However, it can only be used when the inventory of spare components can be planned for a relatively long period of time.

The determination of an adequate number of spare components according to both variants of our model depends on the form of the probability density function of component failure times. Since the components are subject to wear-out, this function exhibits a peak-shaped form that can be described by different statistical density functions. Advantages and disadvantages of using the normal, lognormal, Weibull, and Gamma density function in our model are discussed. Among the probability density functions studied, the normal density function is found to be the most appropriate for calculations in our model. The applicability of both variants of the model is given through numerical examples using field data on electric locomotives of Slovenian Railways.

**Key words:** industrial system, wear-out, maintenance, corrective replacements, spare components, inventory planning, stochastic modelling

## 1 Introduction

During the operation, the components of an industrial system deteriorate with usage, and frequently fail causing the system downtime and consequently a loss of income. In order to reduce the system downtime, various maintenance activities are performed. Maintenance costs represent a major part of the total system operating costs. Significant savings can be achieved by introducing an efficient maintenance policy. In defining the maintenance policy, greater attention should be paid to the availability of spare components at the times of component replacements.

Many mathematical models for the spare provisioning policy for deteriorating systems have been proposed in the literature. Usually, the optimal spare provisioning policy is defined by the minimization of the total system maintenance costs that comprise of the component replacement costs (corrective and preventive), and the inventory costs including ordering, holding and shortage costs. Such mathematical

models are usually quite complex, containing a great number of parameters (see e.g. Brezavšček and Hudoklin, 2003; Diallo et al., 2008; Hu et al., 2008; Huang et al., 2008; de Smidt-Destombes et al., 2009; Wang et al., 2009), and are often difficult to implement. From a practical point of view, simpler methods for defining an efficient spare provisioning policy would be most desirable.

In our opinion, in many industrial plants such a traditional approach in defining the inventory policy can be simplified. In large systems the cost of system downtime due to the shortage of spare components frequently exceeds all the other elements of the maintenance costs substantially (see e.g. Brezavšček and Hudoklin, 2003). We think that in such a situation there is no need to optimize the total maintenance costs. It is enough to ensure the sufficient quantity of spare components to prevent the inventory shortage in a given time. This approach enables the development of a spare provisioning model which is much easier to implement than the traditional optimization models.

In the paper, we will develop a simple stochastic model for planning the inventory of spare components needed to support maintenance of an industrial system if the shortage of spare components leads to high costs. The model is useful for components subject to wear-out, when the preventive replacements are performed according to the block replacement policy (Pham, 2003). Two variants of the model are presented. Under the first variant, the adequate number of spare components is calculated taking into consideration the acceptable probability of spare shortage during the planning interval. In the second variant, the expected number of component failures during the planning interval is used as the decision variable in planning an adequate spare inventory level.

The determination of an adequate number of spare components according to our model depends on the form of the probability density function of component failure times. Since the components are subject to wear-out this function exhibits a peak-shaped form that can be described by different statistical density functions. Advantages and disadvantages of using the normal, lognormal, Weibull, and Gamma density function in our model are discussed. The applicability of both variants of the model is shown using field data on electric locomotives of Slovenian Railways.

## 2 Preliminaries

The inventory of spare system components includes the spares needed for component preventive replacements, and the spares needed for corrective replacements. The number of spare components needed for preventive replacements in a given planning interval is known in advance. Therefore, in defining an efficient spare provisioning policy, the essential task is to ensure the sufficient number of spare components needed for corrective replacements in the interval between two successive preventive replacements.

The process of corrective replacements of a particular component during the system operation can be described by an ordinary renewal process. The renewal process is ordinary when all inter-renewal times are independent identically distributed random variables, all with the probability density function  $f(t)$  (e.g. Cox, 1970). In our model two characteristics of an ordinary renewal process will be used: the number  $N(t)$  of renewals in the interval  $(0,t)$ , and the renewal function  $H(t)$  defined as the expected number of renewals in the interval  $(0,t)$ :  $H(t) = E [N(t)]$ .

The number  $N(t)$  of component corrective replacements (i.e. renewals) is a random variable with the probability distribution  $p_r(t) = P [N(t) = r]$ ,  $r = 0, 1, 2, \dots$  which can be calculated according to the equation

$$p_r(t) = F_r(t) - F_{r+1}(t) \quad r = 0, 1, 2, \dots \quad (1)$$

with  $F_0(t) = 1$ . The symbol  $F_r(t)$  in the equation (1) denotes the  $r$ -fold convolution with itself of the cumulative distribution function  $F(t) = \int_0^t f(x)dx$ . When there are  $n$  independent

identical components under observation, the process of their corrective replacements represents a superposition of  $n$  independent renewal processes. The probability distribution of the number of renewals of all  $n$  components in  $(0,t)$  is given by the discrete convolution formula

$$p_r^{(n)}(t) = \sum_{i=0}^r p_{r-i}^{(n-1)}(t)p_i(t) \quad r = 0, 1, 2, \dots, n > 1 \quad (2)$$

with  $p_r^{(1)}(t) = p_r(t)$ . For an arbitrary  $n$  an analytical solution of  $p_r^{(n)}(t)$  exists only when the analytical solution of (1) is available. Even then, the calculation of  $p_r^{(n)}(t)$  is rather tedious. However, for large values of  $n$  the function  $p_r^{(n)}(t)$  can be approximated by the normal density function with the mean  $nH(t)$  and the variance  $nV(t)$ <sup>1</sup> (Haehling von Lanzenuer and Lundberg, 1974; Bergstrom, 2006).

The renewal function  $H(t)$  can be calculated according to the equation

$$H(t) = \sum_{r=1}^{\infty} F_r(t) \quad (3)$$

For an arbitrary time  $t$  a simple solution of (3) is obtainable for some specific types of  $f(t)$  only. For large values of time  $t$  a simple asymptotic formula for  $H(t)$  can be used (Cox, 1970). When there are  $n$  independent identical components under observation, the expected number of renewals of all  $n$  components during time  $t$  is equal to  $nH(t)$ .

It is evident that the calculation of  $p_r(t)$ ,  $p_r^{(n)}(t)$  and  $H(t)$  depends on the probability density function  $f(t)$  of inter-renewal times. In our case  $f(t)$  is equal to the probability density function of component failure times.

## 3 Model development

A simple stochastic model for planning the inventory of spare components needed for corrective replacements of system components is developed. The model addresses the situation when the costs of system downtime due to the shortage of spare components considerably exceed all the other elements of the total maintenance costs.

The model is based on the renewal theory. In developing the model the following assumptions are considered:

- The system includes  $n$  identical components operating independently in the similar conditions.
- The components are subject to wear-out. The preventive replacements are performed according to the block replacement policy every  $t$  units of time.
- To meet demand for corrective replacements between planned preventive replacements, the inventory of spare components is replenished periodically. The planning interval is  $T = k\tau$  where  $k$  is an integer. In the variant 1 of the model  $k = 1$ , while in the variant 2  $k$  is a large integer ( $k \rightarrow \infty$ ).

1 The symbol  $V(t)$  denotes the variance of the number of renewals in the interval  $(0,t)$  defined by the expression  $V(t) = E [(N(t) - H(t))^2]$ .

- At the beginning of  $T$ ,  $Q$  spare components should be available.
- A failed system component is replaced immediately by a new one if a spare component is available. The replacement time and consequently the unplanned system downtime is negligible.
- If the replacement of the failed component cannot be performed due to the shortage of spare components the unplanned system downtime occurs.

The aim of the model is to determine the minimal number  $Q$  of spare components in the inventory at the beginning of the planning interval  $T$  to meet demand for component corrective replacements during  $T$ . Two variants of the model are presented. In the first variant the number  $Q$  is determined considering an acceptable probability of spare shortage during  $T$ . While in the second variant the number  $Q$  is assessed taking into account the expected number of component failures within  $T$ .

*Variant 1*

The assumption  $k = 1$  means that  $T = \tau$ . Let the acceptable probability of spare shortage during  $T$  to be  $P_s(T)$ . The value  $P_s(T)$  is predetermined considering the specific requirements of the system operation. We want to determine the minimal number of spare components  $Q$  at the beginning of  $T$  which ensures that the probability of spare shortage during  $T$  does not exceed the value  $P_s(T)$ . The number  $Q$  is the minimal integer that satisfies the relation

$$\sum_{r=Q+1}^{\infty} p_r^{(n)}(T) \leq P_s(T) \tag{4}$$

where the symbol  $p_r^{(n)}(t)$  denotes the probability distribution of the number of corrective replacements of  $n$  components, given by the equation (2).

*Variant 2*

The inventory of spare components needed for corrective replacements is planned for the interval  $T = k\tau$ , where  $k$  is a large integer. We want to determine the number of spare components  $Q$  at the beginning of  $T$  in such a way that  $Q$  is at least equal to the expected number of component failures within  $T$ . Considering the proposed maintenance policy, the expected number of failures of  $n$  components in  $T$  is equal to  $knH(\tau)$ . The number  $Q$  is then the minimal integer satisfying the relation

$$Q \geq knH(\tau) \tag{5}$$

where  $H(\tau)$  is calculated according to the equation (3). If the condition ( $k \rightarrow \infty$ ) is fulfilled, then the sum of deviations of the actual number of component failures during  $T$  from the expected number of failures in  $T$  approaches zero. Therefore, when there are  $Q$  spare components available for corrective replacements at the beginning of  $T$ , the probability of spare shortage during  $T$  approaches zero.

The calculations in variant 2 of the model are much simpler than in variant 1. Besides, the inventory of spare components needed for corrective replacements during  $T = k\tau$  is replenished once at the beginning of the interval  $T$ , while in the variant 1 the inventory should be replenished  $k$  times at the

beginning of every interval  $T = \tau$ . On the other hand, the condition ( $k \rightarrow \infty$ ) means that the inventory of spare components should be planned for a very long period of time. In practice, very large values of  $k$  could lead to the planning interval of several years what could be unreasonable. However, this variant of the model is applicable also if  $k$  is not a very large number, but the number  $n$  of components under consideration is large. In such a situation the dispersion of the number of component failures during  $T$  around the expected number  $knH(\tau)$  is relatively small. This implies that the expected number of component failures in  $T$  can be used as the decision variable in inventory planning.

### 4 Selection of appropriate probability density function of component failure times

The calculation of an adequate number  $Q$  of spare components according to our model depends on the form of the probability density function  $f(t)$  of component failure times. The function  $f(t)$  for components subject to wear-out follows a peak-shaped curve. Times to failure are distributed around a peak value specific for a given deterioration mechanism (e.g. corrosion, fatigue cracking, diffusion). A general form of the function  $f(t)$  for components subject to wear-out is shown in Fig. 1.

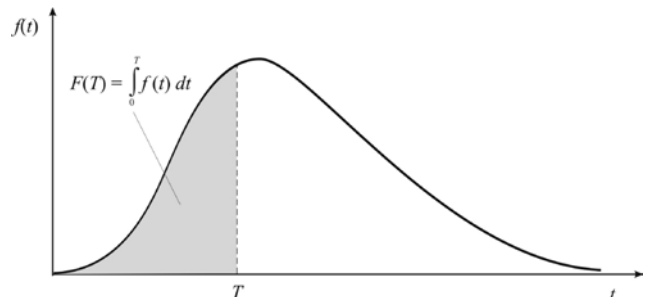


Figure 1: General form of the probability density function  $f(t)$  of failure times of components subject to wear-out

The normal, lognormal, Weibull, and Gamma probability density functions are frequently used to describe the function  $f(t)$  for the components subject to wear-out (see e.g. Jardine and Tsang, 2006; Kececioglu, 1995). Advantages and disadvantages of using a particular statistical density function in our model will be discussed. The following criteria will be taken into account:

- availability of the analytical expressions for the renewal characteristics needed in the model ( $p_r(t)$ ,  $p_r^{(n)}(t)$ , and  $H(t)$ ),
- difficulty of the numerical calculation of the renewal characteristics needed,
- simplicity of the assessment of the statistical density function parameters.

*Normal (Gaussian) density function*

$$f(t) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{t-\mu}{\sigma}\right)^2} \quad -\infty < t < \infty, \quad -\infty < \mu < \infty, \quad \sigma > 0$$

with parameters the mean  $\mu$  and the standard deviation  $\sigma$ . The form of the normal density function for different values of parameters  $\mu$  and  $\sigma$  is shown in Fig. 2.

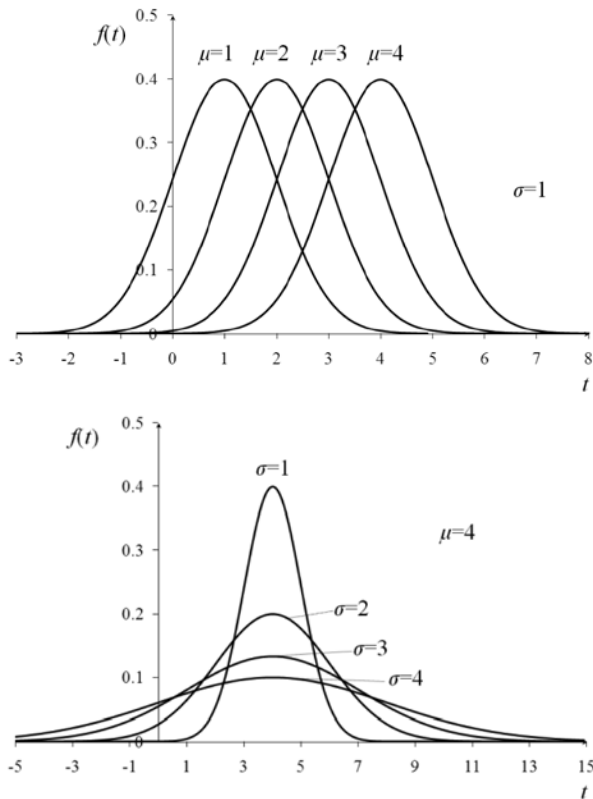


Figure 2: Form of the normal density function for different values of parameters  $\mu$  and  $\sigma$

*Advantages of using the normal density function*

- The numerical calculation of  $p_r(t)$ ,  $p_r^{(n)}(t)$ , and  $H(t)$  is rather simple because the  $r$ -fold convolution of the normal distribution function  $F(t)$  with parameters  $\mu$  and  $\sigma$  is also a normal distribution function with parameters  $r\mu$  and  $\sigma\sqrt{r}$ .
- The assessment of the values of parameters  $\mu$  and  $\sigma$  is easy because the normal probability plotting paper is available (see e.g. <http://www.weibull.com>).

*Disadvantages of using the normal density function*

- Since time to component failure is a positive random variable the area under a normal curve for the negative values of time should be negligible. This is true when the ratio between  $\mu$  and  $\sigma$  is significantly higher than 1. Otherwise a truncated normal distribution should be used (see e.g. Johnson et al., 1994; Kottogoda and Rosso, 1997).

**Lognormal density function**

The lognormal density function is in the relationship to the normal density function. If the random variable  $t$  is distributed according to a lognormal density function, the logarithm of  $t$  is distributed according to a normal density function. The lognormal density function is given by the expression

$$f(t) = \frac{1}{t\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{\ln t - \mu}{\sigma}\right)^2} \quad t > 0, \mu > 0, \sigma > 0$$

where  $\mu$  and  $\sigma$  are the mean and the standard deviation of  $\ln t$ . The form of the lognormal density function for different values of parameters  $\mu$  and  $\sigma$  is shown in Fig. 3.

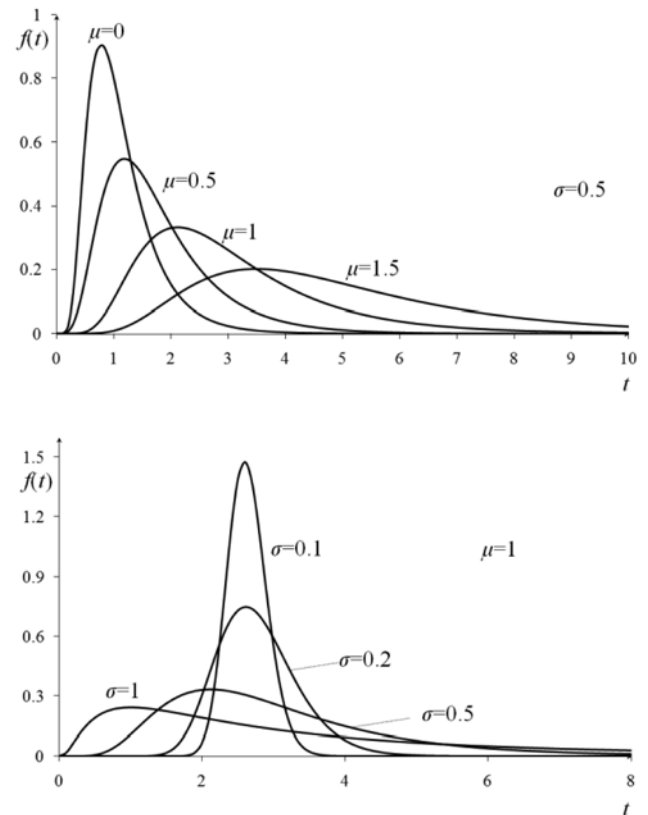


Figure 3: Form of the lognormal density function for different values of parameters  $\mu$  and  $\sigma$

*Advantages of using the lognormal density function*

- The assessment of the values of parameters  $\mu$  and  $\sigma$  is easy because the lognormal probability plotting paper is available (see e.g. <http://www.weibull.com>).

*Disadvantages of using the lognormal density function*

- The closed form of  $F_r(t)$  is not available. Some approximate formulas are available in the literature but calculations are quite tedious (see e.g. Barouch and Kaufman, 1976; Romeo et al., 2003; Lam and Le-Ngoc, 2006).

**Weibull density function**

The two-parameter<sup>2</sup> Weibull density function is given by the formula

$$f(t) = \frac{\beta}{\eta} \left(\frac{t}{\eta}\right)^{\beta-1} e^{-\left(\frac{t}{\eta}\right)^\beta} \quad t \geq 0, \beta > 0, \eta > 0$$

2 In reliability theory, the three parameter Weibull density function is also used. The third parameter  $\gamma$ ,  $-\infty < \gamma < \infty$ , is the location parameter. When  $\gamma = 0$  the density function starts at time  $t = 0$ .

where  $\beta$  denotes the shape parameter, and  $\eta$  denotes the scale parameter. The form of the Weibull density function for different values of  $\beta$  and  $\eta$  is shown in Fig. 4.

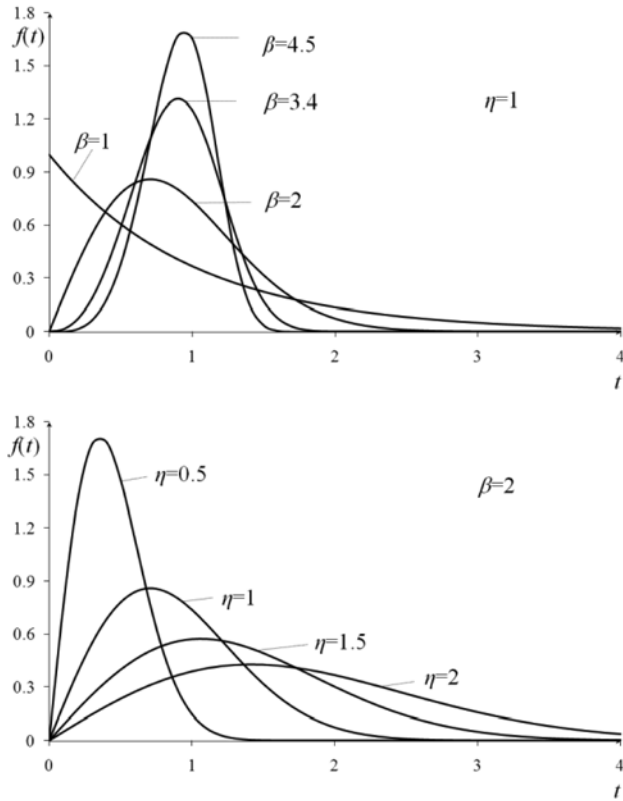


Figure 4: Form of the Weibull density function for different values of parameters  $\beta$  and  $\eta$

It can be seen from Fig. 4 that the Weibull density function exhibits a peak-shaped form when  $\beta > 1$ . If  $\beta = 1$ , the Weibull density function becomes exponential with the parameter  $\lambda = 1/\eta$ .

*Advantages of using the Weibull density function*

- The assessment of the values of parameters  $\beta$  and  $\eta$  is easy because the Weibull probability plotting paper is available (see e.g. <http://www.weibull.com>).

*Disadvantages of using the Weibull density function*

- In the case of the Weibull density function with  $\beta > 1$ , the closed form of  $F_r(t)$  is not available. The numerical calculations of  $p_r(t)$ ,  $p_r^{(n)}(t)$ , and  $H(t)$  are quite tedious (see e.g. Jiang, 2008). A comprehensive overview of different numerical calculations of the Weibull renewal function is given in the book by Rinne (2009).

**Gamma density function**

The two-parameter<sup>3</sup> Gamma density function is given by the formula

$$f(t) = \frac{1}{\eta\Gamma(\beta)} \left(\frac{t}{\eta}\right)^{\beta-1} e^{-\frac{t}{\eta}} \quad t \geq 0, \beta > 0, \eta > 0$$

where  $\beta$  denotes the shape parameter,  $\eta$  denotes the scale parameter<sup>4</sup>, and  $\Gamma(\cdot)$  denotes the Gamma function<sup>5</sup>.

The form of the Gamma density function for different values of parameters  $\beta$  and  $\eta$  is shown in Fig. 5.

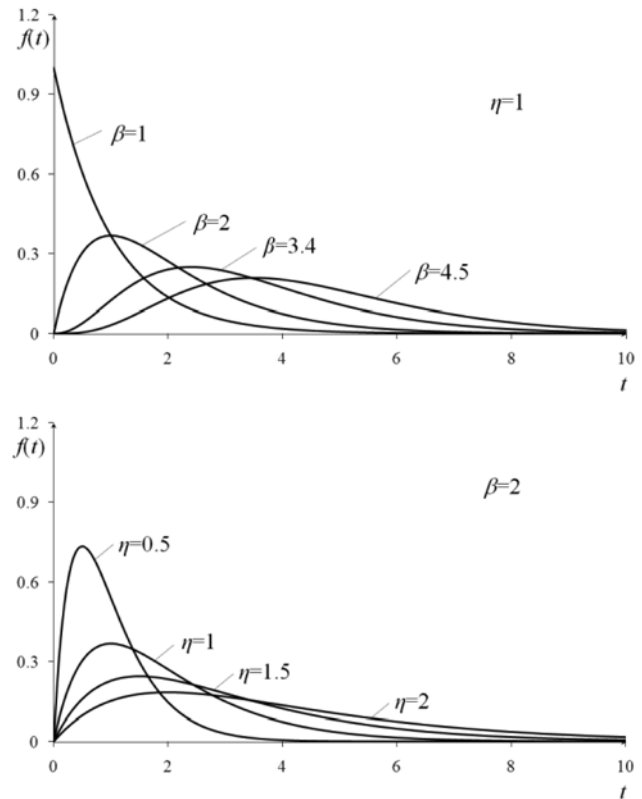


Figure 5: Form of the Gamma density function for different values of parameters  $\beta$  and  $\eta$

It can be seen from Fig. 5 that the Gamma density function exhibits a peak-shaped form when  $\beta > 1$ . If  $\beta$  is equal to 1, the Gamma density function becomes exponential with parameter  $\lambda = 1/\eta$ .

*Advantages of using the Gamma density function*

- Analytical solutions for  $p_r(t)$  and  $H(t)$  exist if  $\beta = 2$ :

$$p_r(t) = \frac{2e^{-\frac{t}{\eta}}(1+r)\left(\frac{t}{\eta}\right)^{2r} \left[t + \eta(1+2r)\right]}{\eta\Gamma(3+2r)}$$

3 In reliability theory, the three parameter Gamma density function is also used. The third parameter  $\gamma$ ,  $-\infty < \gamma < \infty$ , is the location parameter. When  $\gamma = 0$  the density function starts at time  $t = 0$ .

4 When  $\beta$  is integer the Gamma density function becomes the Erlang density function. When the shape parameter is  $\beta/2$  ( $\beta$  is any integer) and the scale parameter is equal to 2 the Gamma density function becomes the Chi-square density function.

5  $\Gamma(x) = \int_0^{\infty} z^{x-1} e^{-z} dz$

$$\text{and } H(t) = \frac{1}{4} \left( e^{\frac{2t}{\eta}} + \frac{2t}{\eta} - 1 \right)$$

Using the expression for  $p_r^{(n)}(t)$  given above, an analytical solution for  $p_r^{(n)}(t)$  can be calculated according to the equation (2).

- The  $r$ -fold convolution of the Gamma distribution function with parameters  $b$  and  $\eta$  is also a Gamma distribution function with parameters  $r\beta$  and  $\eta$ . Therefore, a numerical calculation of  $p_r(t)$ ,  $p_r^{(n)}(t)$  and  $H(t)$  according to the equations (1), (2) and (3) is easy for any value of parameter  $b$ .

*Disadvantages of using the Gamma density function*

- The assessment of the values of parameters  $\beta$  and  $\eta$  is not trivial because the Gamma probability plotting paper is not commercially available. The general maximum likelihood method can be used to estimate the values of  $\beta$  and  $\eta$  (see Evans et al., 2000; Johnson et al., 1994). This is probably the reason why the Gamma density function is not widely used as a mathematical model for the probability density function of component failure times.

The results of suitability analysis of selected statistical density functions for using in our model are shown in Table 1.

We conclude from Table 1 that among the four statistical density functions studied, the normal density function is the most appropriate for use in our model.

## 5 Numerical example

We will illustrate the application of both variants of our model using field data on electric locomotives of Slovenian Railways. As in the paper Brezavšček and Hudoklin (2003), the arcing chamber which is an important locomotive component is studied. There are  $n = 120$  components under observation. The components are subject to wear-out. Preventive replacements are performed according to the block replacement policy every  $t=23$  weeks. It is assumed that times to component failure are distributed normally. The parameters of  $f(t)$ ,  $\mu$  and  $\sigma$ , are 44 and 12 weeks respectively.

*Variant 1*

The planning interval is  $T = \tau = 23$  weeks. We want to determine the minimal number of spare components  $Q$  at the

beginning of  $T$  which will ensure that the probability of spare shortage during  $T$  will not exceed 3%.

The probability distributions  $p_r(t)$  and  $p_r^{(120)}(T)$  of the number of component corrective replacements during  $T$  are calculated numerically according to the equations (1) and (2).

The results are shown in Tab. 1. Besides, the probabilities of spares shortage  $\sum_{i=r+1}^{\infty} p_i^{(120)}$  for  $r = 0,1,2\dots$  are also added.

Considering that  $P_s(T) = 0.03$ , and the equation (4) we determine the minimal integer  $Q$  which satisfies the relation

$$\sum_{r=Q+1}^{\infty} p_r^{(120)}(T) \leq 0.03$$

Using the results from Table 2 we obtain  $Q = 9$ . At the beginning of each interval  $T = 23$  weeks between two successive preventive replacements, 9 spare components for corrective replacements during  $T$  are required. The shortage probability during  $T$  is equal to 2,32%, and the requirement above is fulfilled. Besides spares for corrective replacements, 120 spare components are needed for preventive replacements of all components at the beginning of  $T$ .

*Variant 2*

We have come to the conclusion that the period for planning the inventory of the arcing chambers is still acceptable up to 3.5 years which is approximately 184 weeks. Since  $\tau = 23$  weeks the value of  $k$  is 8. Because the number of components under consideration is relatively large we suppose that  $k = 8$  is large enough to justify the usage this variant of the model.

We want to determine the number of spare components  $Q$  at the beginning of  $T=184$  weeks which is at least equal to the expected number of component failures within  $T$ .

The value of the renewal function  $H(\tau)$  is calculated according to the equation (3). From this we obtain  $H(\tau) = 0.0401$ . The number of spare components needed for corrective replacements during  $T$  is determined according to the equation (5) as the minimal integer satisfying the relation

$$Q \geq 8 \cdot 120 \cdot 0.0401 = 38.50$$

We obtain  $Q = 39$ . Apart from 39 spares for corrective replacements, 960 spare components are needed to perform eight block preventive replacements of all 120 operating components.

Table 1: Suitability of different statistical density functions for using in the model

| Criterion  | Normal pdf | Lognormal pdf | Weibull pdf | Gamma pdf  |
|--|------------|---------------|-------------|--|
| The analytical expressions for the renewal characteristics are available | No         | No            | No          | Only for some specific integer values of the parameter $\beta$ (e.g. $\beta = 2$ ) |
| The numerical calculation of the renewal characteristics is easy         | Yes        | No            | No          | Yes  |
| The assessment of the pdf parameters is easy                             | Yes        | Yes           | Yes         | No   |

Table 2: Probability distribution of the number of component corrective replacements, and shortage probabilities in  $T = 23$  weeks

| r                                   | 0        | 1        | 2        | 3        | 4        | 5        | 6        | 7        | 8        | 9        | 10     |
|-------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--------|
| $p_r(t)$                            | 0.9599   | 0.04     | 6.40E-05 | 7.84E-08 | ...      | ...      | ...      | ...      | ...      | ...      | ...    |
| $p_r^{(120)}(T)$                    | 7.40E-03 | 3.70E-02 | 0.0918   | 0.1506   | 0.1839   | 0.1783   | 0.1428   | 0.0973   | 0.0576   | 0.03     | 0.014  |
| $\sum_{i=r+1}^{\infty} p_i^{(120)}$ | 0.9926   | 0.9556   | 0.8638   | 0.7132   | 0.5292   | 0.3509   | 0.2081   | 0.1108   | 0.0532   | 0.0232   | 0.0092 |
| r                                   | 11       | 12       | 13       | 14       | 15       | 16       | 17       | 18       | 19       | 20       | 21     |
| $p_r^{(120)}(T)$                    | 0.0059   | 0.0022   | 0.0008   | 0.0003   | 0.0001   | 2.07E-05 | 5.34E-06 | 1.29E-06 | 2.93E-07 | 6.25E-08 | ...    |
| $\sum_{i=r+1}^{\infty} p_i^{(120)}$ | 0.0034   | 0.0011   | 0.0004   | 0.0001   | 2.77E-05 | 6.99E-06 | 1.66E-06 | 3.71E-07 | 7.81E-08 | 1.55E-08 | ...    |

## 6 Conclusion

In the paper, a simple stochastic model for planning the inventory of spare components needed to support maintenance of an industrial system is proposed. The aim of the model is to determine the minimal number of spare components in the inventory at the beginning of a given planning interval to meet demand for component corrective replacements during this interval. Two variants of the model are presented. In both variants it is assumed that components are subject to wear-out, and the preventive replacements are performed according to the block replacement policy. In the first variant of the model, the adequate number of spare components for corrective replacements is calculated considering the acceptable probability of spare shortage during the planning interval. In the second variant, the required number of spare components for corrective replacements is assessed taking into account the expected number of component failures within the planning interval.

In both variants of the model, the process of successive corrective replacements of a particular component is described by an ordinary renewal process. The determination of the characteristics of the renewal process depends on the form of the probability density function of component failure times. Since the components are subject to wear-out, this function can be described by a peak-shaped statistical density function. Advantages and disadvantages of using normal, lognormal, Weibull, and Gamma density function in the model are discussed. In our opinion, among the four statistical density functions studied, the normal density function is the most appropriate for calculating the probability distribution of the number of corrective renewals as well as the expected number of corrective renewals in a planning interval.

The applicability of the model is given through numerical examples using field data on electric locomotives of Slovenian Railways. Both variants of the model are useful for practical purposes. When the inventory of spare components can be planned for a relatively long period, we recommend the

second variant because the calculations involved are much simpler than in the first variant.

The model proposed represents a simplification of rather complicated optimization models widely published in the literature. It is suitable for implementation in a variety of industrial systems where the costs of the system downtime due to the shortage of spare components considerably exceed all the other parameters of the system maintenance costs.

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### Enostavni stohastični model za planiranje zaloge rezervnih komponent v obdobju izrabe

V prispevku obravnavamo proizvodni sistem, ki vsebuje določeno število identičnih komponent v obdobju izrabe. Komponente sistema lahko med delovanjem sistema odpovedo, kar povzroči zastoj sistema. Da lahko komponento, ki odpove, čim prej nadomestimo z novo, je potrebno imeti na zalogi zadostno količino rezervnih komponent. Predstavljeni sta dve varianti enostavnega stohastičnega modela, ki omogočata določitev minimalnega števila rezervnih komponent na zalogi na začetku intervala planiranja tako, da je zadoščeno izbranemu kriteriju. V prvi varianti modela je kot kriterij pri določanju ustrezne zaloge rezervnih komponent upoštevana verjetnost, da se zaloga tekom intervala planiranja izčrpa, medtem ko v drugi varianti planiramo zalogo rezervnih komponent glede na povprečno število odpovedi, ki jih v intervalu planiranja pričakujemo. Primerjava obeh variant modela je pokazala, da je druga varianta modela z matematičnega stališča enostavnejša, njena pomanjkljivost pa je v tem, da je uporabna le, kadar je možno zalogo rezervnih komponent planirati za daljše časovno obdobje. Določitev ustreznega števila rezervnih komponent na podlagi obeh variant modela je odvisna od funkcije gostote verjetnosti za čas do odpovedi obravnavanih komponent. Kadar so komponente v obdobju izrabe, ima ta funkcija karakteristično kopasto obliko, ki jo lahko opišemo z ustrezno verjetnostno porazdelitvijo. Z vidika uporabnosti v modelu smo analizirali normalno, lognormalno, Weibullovo in gama verjetnostno porazdelitev. Ugotovili smo, da je za izračune, ki so v modelu zahtevani, najbolj prikladna normalna verjetnostna porazdelitev. Uporabnost obeh variant modela smo ponazorili z numeričnimi primeri in podatki o eksploataciji električnih lokomotiv iz Slovenskih železnic.

**Ključne besede:** proizvodni sistem, izraba, vzdrževanje, odpoved, zamenjava, rezervna komponenta, zaloga, planiranje, stohastično modeliranje

# The Influence of Broadband Regulation in EU on the Development of the Regulated Technology

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The aim of the article is to answer the question if the level of intensity of “ex ante” regulation (also “regulation”) imposed by NRA (national regulatory Authority or regulators) influence on the development of incumbent DSL technology against other Access technologies. There are several approaches which support the basic idea of regulation, that “ex ante” regulation promotes the competition. The approaches must be also based on the size of the market. In the internet world there are different access technologies. Open Access is crucial for the development of competition. Regulators have to ensure, that also new entrants can reach end users through the facilities of the incumbent operator. Based on the approach of three criteria, European Commission defines two wholesale relevant access markets both based on DSL technology (“bitstream” access and unbundled local loop) susceptible to sector specific “ex ante” regulation. In the last stage also optical access is included on the relevant markets. Other technologies are still not equivalent to incumbent DSL technology according to the opinion of the commission. The intensity of regulation influences on the competition conditions. It influences on the level where and at which point of the investment ladder entrants will enter the market through wholesale inputs or through building its own infrastructure.

**Keywords:** regulation, market analyses, broadband, correlation, DSL technology

## 1 Introduction

Among the different platforms for broadband access it is possible to distinguish between wired, wireless and fixed wireless (Picot and Wernick 2007, 660-661). Wired access platforms include digital subscriber line (DSL)/ copper line, fibre optics, powerline and cable. Wireless platforms comprise 3 G cellular and satellite transmission, while fixed wireless encompasses WiFi and WiMax. The distinction between different technology platforms is important for several reasons. First of all, in many countries distinguishes between technology platforms. Cable and DSL networks, as well as other broadband platforms show different technological properties. Designed for broadcasting, all participants in a coaxial cable share the bandwidth, which leads to variations in the capacity available to the user. Regulation of optical Access (also: next generation Access) will not be included in the analyses, because only a few regulators have started with “ex ante” regulation in the recent past and “there is perceived uncertainty about consumers’ willingness to pay for next-generation Internet access services, which raises deep reservations about the viability of the business case for optical Access” (Siciliani, 2010). Since the liberalisation of the telecommunications sector, a debate exists on how to promote competition in the best interest of end users. The creation of good competitive conditions is seen

as an efficient way to promote high penetration levels of communications services. “Regulating the incumbent’s bottleneck by mandatory local loop unbundling and cost based open access provision has been the cornerstone of the regulatory framework in most European countries” (Bouckaert and van Dijk, 2010). In comparison to cable, DSL based on copper telephone lines offers steady bandwidth due to the fact that each participant has his or her own connecting line. Countries with both DSL and cable infrastructure benefit from infrastructure competition significantly. “There is an inverted u-relationship between cable market share and broadband penetration. The peak is at 50 % equal market shares of cable and DSL technology” (Höffler, 2005). For Broadband Internet connectivity there are two major networks: telephone and cable. There are also alternative technologies to Broadband Access, such as wireless, power line, satellite and UMTS. However, these technologies are still at the development stage, although in the future they might compete with cable and DSL. From this information it is possible to conclude that DSL is still the dominant technology, beside the next generation access via optical fibres. Regulators have to evaluate their decisions in the light of whether they promote the rolling out of parallel, competing infrastructure (infrastructure competition) or whether they further competition in a single network with regulated Access (intra-platform competition). Experiences from telecommunications deregulation and regulation show that up to now

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regulators have tried to establish frameworks enabling both forms of competition. Nevertheless, especially in the US the positive aspects of service competition are put to the test (Picot and Wernick, 2007). In 2003 the obligation to provide shared DSL access to competitors were eliminated in the same way as non-discrimination obligations and obligations to offer DSL at wholesale in 2005 as the wholesale market for DSL and cable modem Internet access services were assessed effective and to remain so even in the absence of regulation. On the other hand, one should bear in mind that platform competition may also lead to negative results if gains from the reduced dead-weight loss due to higher competition are outweighed by the inefficient duplication of an existing infrastructure (Laffont and Tirole, 2000). For example, in contrast to the European “ladder of investment”, whereby new entrants would seek to progressively grow their business, in the USA, the only rung that solidly remains is the unbundling of copper loops.

The new recommendation of the European (EC, 2007) on relevant markets defines Market 4 (previously Market 11) as the market for wholesale (physical) network infrastructure Access (also local loop unbundling) at fixed location and market 5 as Broadband Access (also bitstream). The both markets were recommended also via first European Commission recommendation in 2003. Those markets need to be analysed by national regulators to find out the existence of significant market power. There can be one or more operators with the significant market power. Most of the EU sector regulators (also: National Regulatory Agencies) have finished the first round of analyses and the results are shown on the market. The regulators are now in the process to conclude the second round of analyses. The wholesale broadband access market comprises non-physical or virtual network access including “bit stream” access at fixed location. With bitstream access, the wholesale product of the incumbent DSL technology consists of transmission capacity, which allows new entrants to offer their own services to their customers. Bitstream access may also include “backhaul” services to carry traffic to higher layers in the DSL network, where the entrant already has a point of presence (Bouckaert and van Dijk, 2010). This market is situated downstream from the physical access covered by the wholesale unbundled access in that wholesale broadband access can be constructed using this inputs combined with other elements. Under the local loop unbundling lease, entrants have to invest in own equipment and facilities. Products or services included in both relevant markets are used as wholesale inputs to provide retail broadband access to end users at the retail level. This paper addresses the problem of using the different approaches of market regulation. Regulators imposed different remedies on both relevant markets bitstream and local loop unbundling. At the moment the only regulated technology in EU is DSL technology via bitstream or local loop unbundling inputs. Those wholesale inputs are regulated through various intensity of regulation in EU member states. Regulation should have a positive effect on the technology, which is regulated. Increased intensity of regulation should increase the market share of the regulated DSL technology of the incumbent. The mechanism of increased regulation forces the regulated incumbent to invest in other technologies based on the data from different markets. The intensive Local Loop unbun-

dling regulation should be imposed after the results from the bitstream regulation have showed some positive results on the market development. According to the ladder of investment approach, the entrant is able to invest in its own network in the longer term and the experience from early entry at the retail level helps him in building up a competitive network. Paper describes in second section the different approaches in literature regarding different approaches in regulating the market. Especially it describes what are the advantages or disadvantages of different remedies imposed to SMP players. Different analyses have been done to find out the relationship between the level of competition on different levels of the incumbent network and the market development, but no analyses between the intensity of regulation on both Access markets and the parameters of market have been done since now. The third section explains the overall situation on the Broadband market and the practice in some of the most developed countries. Section 4 focuses on description and ranking of different possible remedies and explains the methodology used to answer the question, how the intensity of regulation influences the development of the regulated technology and how different chosen types of regulation influences on the behaviour of the incumbent and competition. The last two sections offered the proposed policy to regulators how to regulate both Access markets and on what kind of regulation should focus mostly, based on the results of the analyses. The proper regulation of Access market will still be the most important case in the process of Broadband development, also in period of co-existence of copper and fibre optics Access. The decision of which type of regulation should be chosen should also depends on the size of the country.

## 2 Literature review and theoretical framework

Regulatory policy gives rises to three modes of competition in broadband services, as presented in Table 1 (Bouckaert and van Dijk, 2010):

Table 1: type of competition modes

| Competition mode                    | Type of the technology used by entrants              |
|-------------------------------------|--|
| Inter-platform                      | DSL, cable and other technologies                    |
| Facilities-based/<br>intra-platform | DSL incumbent wholesale/<br>Unbundling of local loop |
| Service-based/<br>intra-platform    | DSL incumbent retail/<br>Bitstream and resale        |

Without the mandatory access to the incumbent’s DSL network, competition in broadband services takes the form in literature of inter-platform competition. Inter-platform competition refers to rivalry between the incumbent DSL operator and infrastructure-based operators on other platforms, most notably cable, but possibly also fibre-to-the home and wireless. When the regulator imposes access to the incum-

bent's network, competition takes the form of intra-platform competition. Intra-platform competition thus refers to rivalry between different DSL operators on the incumbent's network through regulated access. Mandatory access to DSL networks can take various forms, ranging from full local loop unbundling (ULL) to reselling the DSL incumbent's services.

Typically the SMP operator (operator with significant market power) is the national incumbent with the exception of the one NRA that defined sub-national geographic market identifying the corresponding local incumbents as having SMP (for example "Finland"). The EU framework of the European Parliament and of the Council recommends following remedies to be imposed on SMP players to prevent independent behaviour (EP, 2002): transparency, access obligation, accounting separation, non-discrimination, price control and cost accounting separation. The new framework issued in 2009 (EP, 2009) also includes the new remedy called functional separation. Among cost orientation two instruments of Access obligation are used: retail minus and cost-based. Cost based methods (ERG 2009) uses Historical cost Accounting (HCA) and Current Cost Accounting (CCA). Models like LRIC (long run incremental costs), LRAIC (Long run Average incremental costs) and FDC (Fully Distributed costs) are used. The most intensive regulation uses LRIC (LRAIC) as a method of regulation. The less intensive regulation uses FDC method based on current or historic costs. Non cost based regulation uses mostly retail minus (define the difference between the retail and wholesale price) for wholesale regulation. Models like benchmark and price cap are mostly used for retail regulation. Other remedies are non price control methods and are much weaker. Mostly just show the intention of regulation as a threat. Deregulation or no regulation is the level, where the NRA finds the market as fully competitive or regulation has not even started. Different remedies can be imposed to players with significant market power. "Retail minus regulation avoids foreclosure and leads to better results than cost-based regulation in terms of investment level and consumer surplus. Retail minus regulation allows a higher consumer surplus than deregulation of access price as long as the regulator carefully defines the retail minus instruments" (Brandão and Sarmiento, 2007). The practice of the regulators in the definition of cost-based policy is to require that the entrants contribute to cover the fixed costs of providing access. Then, regulators define the mark-up to cover the fixed costs, or part of it. The concept of cost-based regulation adopted by many telecommunication regulators is the Long Run Incremental Costs (LRIC). The implementation of LRIC involves the quantification of the incremental cost of providing access in a forward-looking perspective. With this perspective it is necessary to consider the substitution costs of the assets that will be supported in the future. This is in contrast to historic cost accounting. Several problems can be indicated, when using LRIC model. "The precise quantification of LRIC raises many questions, namely concerning the allocation of common costs and the process of gathering the necessary information to compute appropriate replacement costs" (Mason and Valletti, 2001). The concept of LRIC mostly does not take into the consideration neither the irreversible nature of many telecommunications investments, nor costs with the

development of new services that did not succeed in the market. LRIC model adopted by some European countries discourages investment in fixed networks by the incumbent firms, because they anticipate that they will be required to offer access at cost-based prices (Cave and Prosperetti, 2001). LRIC model also has a poor performance in terms of dynamic efficiency of cost-based regulation because firms do not have the incentive to innovate if they know that they will be required to offer access to their rivals at cost-based prices. If the regulator carefully defines the margin between retail and access (wholesale) prices, with retail minus regulation it is possible to achieve better results than either with deregulation or cost-based regulation, in terms of protection of downstream competition and consumer surplus. Retail minus regulation allows greater flexibility in access price definition than cost based regulation. Under the former, the access price definition is influenced not only by the costs but also by demand characteristics and oligopoly interactions that occurs in the retail market. The incumbent firm has a higher incentive to invest in network improvements, which has positive consequences on market development. Retail minus regulation does not require that the regulator has precise information about firm's costs. This is a very important feature for regulatory instruments considering the profound difficulties that the regulators may face in gathering information about the internal characteristics of firms, in particular in new markets where there is high uncertainty about costs. "Mandatory unbundling to incumbent operators can also delay facilities-based entry and reduce network investments, particularly if unbundled input prices are set too low. Excessive prices for essential network elements could hamper competitive entry." The results of statistical analysis show (Dippon and Ware 2010, 54-64) that when relevant demand and supply determinants are included in the analysis, the association between mandatory unbundling and increased penetration is not statistically significant. "The dynamic nature of the sector and the costs of implementing mandatory unbundling imply that policy makers should carefully examine the costs and benefits of regulatory intervention." The costs of mandatory unbundling is particularly complex because some of the costs are indirect- for example, reduced incentives to invest may stifle innovation and network development in ways that are not immediately apparent. It is also difficult to measure the impact of mandatory unbundling on investment and innovation because many factors, including change in other forms of regulation, mergers and acquisitions, and the state of the national economy, affects those activities, and only net effects are observable at the retail market. Policy makers must consider whether unbundling requirements could distort retail market competition because some platforms are regulated while others are not. The analysis of Dippon and Ware (2010) could also lead to wrong conclusion, while the parameter of mandatory unbundling is explained by percentage of MDFs (main distribution frames) with competitors present and not with the whole number of unbundled loops. The whole number could vary from the figures in the analyse, while there could a different number of unbundled loops at different MDFs. Almost it is impossible to come to the conclusion that regulation does not stimulate the growth. "The country-specific outcomes of liberalisation in Cyprus are consist-

ent with the general tendency in small European economies and jointly provide strong evidence that smallness affects the success of liberalisation” (Pavlos, 2009). The regression results show, that the effect of the number of operators on penetration rates appears to be statistically insignificant for internet services and the incumbent’s market share remains unaffected by changes in the number of operators. For a large economy, intensive competition is very likely to both reduce market concentration and induce increase in service penetration. For a small economy, a loss in the incumbent’s share will very probably impair its efficiency due to market size limitations, whilst expectations for a respective increase in service penetration must be reduced. Small economies maintain higher concentration levels after competition in all technologies. The Policy makers must take into the consideration also the each technology’s life cycle in its policy formation. The closer to its saturation stage the technology is, the less likely its penetration rate will be influenced by competition. The success of liberalisation is not determined by the number of alternative operators and the decline in the incumbent’s market share, but by the magnitude of increase in consumer welfare as this is depicted by service affordability, accessibility, quality, and innovation. Small economies can expect to achieve comparable outcomes to large economies by allowing only a few operators in their markets. The NRA needs to ensure that the incumbent will not abuse its dominant position while giving the incumbent operator sufficient incentives to increase its efficiency. The NRA may decline entry to candidate firms on efficiency grounds. Whilst discouraging entry might promote more concentrated markets, this should not necessary disadvantage consumer welfare. Intra-platform competition as measured by incumbent market share on the regulated DSL technology shows positive sign with penetration, but not statistically significant (Höfler, 2005). Thus, more intense competition in the retail market for DSL does not seem to significantly increase the broadband penetration. This sheds some doubt on the effectiveness of service or intra-platform competition. Based on the previous conclusions also smallness affects the concentration level and service or intra-platform competition, while on the other hand it is difficult to increase the infrastructure competition in a small market. Additionally, population density for example has positive effects on penetration.

### 3 Existing situation on International Broadband market

In 2009 the EU broadband market continued to be the largest in the world, with some Member states leading in terms of penetration rates. The EU was catching up with the US in broadband take-up. The gap in penetration rates declined to 2.8 % percentage points in July 2009, from 3.4 points in July 2008. The penetration rate in US was 26, 7 % in July 2009, while the EU average was 24, 8 % (EC, 2010). Table 2 shows top 5 countries with the highest penetration rate in July 2009:

Table 2: Top 5 World Countries in Broadband penetration

| Country     | Penetration rate |
|-------------|------------------|
| Netherland  | 37, 9 %          |
| Denmark     | 37,2 %           |
| Norway      | 35 %             |
| Switzerland | 34 %             |
| South Korea | 33 %             |

Source: EU 15 Implementation Report

Most of the EU fixed broadband lines at the end of 2009 were based on copper DSL technology (79 %) and average speeds were usually lower than in other developed countries with high broadband penetration. Lines based on the fibre access only represented between 1, 8 and 5 % in EU countries, while this share was much higher in countries such as Japan (51, 4 %) or Korea (46 %). In the US, this share was 6 %. As of January 2010, 61 % of fixed broadband lines in the EU countries offered speeds between 2 and 10 Mbps. Low speed broadband lines with download rates between 144 kbps and 2 Mbps represented 15 % of all fixed broadband lines in January 2010, down from 25 % in 2009, while the fastest category of lines (10 Mbps and above) increased its share, from 14 % in January 2009 to 23 % of all fixed lines in January 2010. The speeds via optical fibres started mostly at 20 Mbps.

The penetration rates in EU increased from January 2004 till January 2010 from 4, 9 % to 24, 8 %. Overall growth has been slowing down over the past year and this is the evidence that the market is getting slowly mature. Local loop unbundling recorded positive growth and has become the main form of wholesale access for new entrant with 73.7 % of DSL lines in January 2010, up from 69,2 % in January 2009 (EC, 2010). New entrants, use of bitstream access for local loop unbundling in the provision of broadband services remain stable (15, 9 %). The share of lines based on resale, which represents a type of access for low-investment intensive new entrant, had shrunk by 3, 5 % percentage during the year of 2009. Its market share was 9, 4 % at the end of 2009. At the end of 2009 only 1 % of lines were realised by the own network of the new entrants. Countries like Bulgaria, Romania, Czech Republic with the penetration rate below the EU average have very low percentage of DSL technology. Competition is based on cable modem networks, local new networks and fixed wireless access. The similar situation is in small countries like Latvia, Lithuania, Estonia, Slovakia and Malta, where the incumbent operator fully or almost fully, controls the DSL market. With the Exception of Slovakia, in none of these countries is DSL predominant technology. Also the intensity of regulation is weak in all of those countries. Penetration rate is quite low in bigger countries with low intensity of regulation. Based on the study on OECD countries by Bouckaert and van Dijk (2010) only inter-platform competition has a significant, positive effect on broadband penetration. From this point of view regulation needs to encourage infrastructure competition, which is not really the case at the moment in EU. On the other

side it is necessary to take into the consideration different size of EU member states by adopting the appropriate regulatory measures. The intensity of regulation did not result in significant decreases of local unbundling prices in 2009. On average, prices for fully unbundled lines only decreased by 1 %, while prices for shared access declined by 5,1 %. These reductions are similar to the 2007 levels. So we can assume that also the intensity of regulation was quite stable during the period. The penetration level in EU is the highest in Netherland and Denmark. Regulation in Netherland is cost based, but not based on LRIC model. That means that regulator uses the costs of existing network and not the optimal one on both access relevant markets. In Denmark the regulation is based on LRIC model on both markets. Regulation is also very strong in Switzerland on both markets, while in Norway the regulation is based mostly on local loop unbundling. South Korea as the fifth country regarding top level of world penetration focuses mostly on sector regulation and not "ex ante" regulation. State of South Korea supported dialog between main players on market, Access providers, equipment providers and content providers. High level of penetration is also the result of the high level of infrastructure competition (Bae, Jeon and Kim, 2008). The government of South Korea also encourages the demand by recommendations regarding the price policy. South Korea is a big country with high demand and probably this practice should be taken with care in smaller countries.

## 4 Research method

The basic research method used is survey of obligations imposed to incumbent operator on two relevant Access markets recommended by the European Commission. »Ex ante« regulation in EU is based on service and facility regulation. Service regulation is ensured by imposed obligations on bitstream market, while facility based regulation is ensured by imposed obligations on local loop relevant market. The set of imposed obligations are published in ERG Report (ERG, 2009). The sample is 27 EU countries, Switzerland and Norway, which implemented the Electronic Communications Law based on EU Directives. It is important to emphasise that first EU recommendation regarding the relevant markets was published in 2003. Since then regulators in EU countries have started analyses based on relevant markets. They have imposed different obligations to incumbent operator, which is mostly the only one who is the subject of »ex ante« Access markets regulation. In the last years regulators started to impose different level of the regulation intensity to incumbent operator. The list of imposed remedies is in Table 1. There are five different levels of ranking. If some regulator did not complete the analyses or did not impose any obligation to the incumbent then its ranking is 1. If the regulator did not impose any of the price control remedies then its ranking is 2. The possible non price controls are transparency, non-discrimination and access obligation. Those remedies allow a lot of freedom to incumbent regarding setting its wholesale prices. Obligation of retail minus only imposes the difference between retail and wholesale price to the incumbent operator. So it allows still some freedom to the incumbent regarding setting its wholesale prices. The last and

most intensive regulation is cost based regulation. It is divided in two groups, one for cost based regulation which is based on the actual network of the incumbent and the most intensive regulation which is based on the optimal network, built now and with current prices. The most intensive regulation is definitely based on imposed LRIC model, which is quite a common practice in EU, despite the fact that networks were built in the past. Summarized ranking is presented in Table 3:

Table 3: Ranking of remedies

| Remedy  | Rank |
|---|------|
| No regulation                                 | 1    |
| Remedies except cost price control            | 2    |
| Price control with the retail minus remedy    | 3    |
| Cost based prices (FDC ...) except LRIC model | 4    |
| LRIC, LRAIC model                             | 5    |

Both markets defined for the purpose of wholesale Access Broadband regulation should be analysed together, but different remedies were imposed to each of them. So the main question is how the increasing intensity of regulation from 1 to 5 influences the share of DSL technology in different member states and also the intra and inter-platform competition in EU. To answer this question we will use the correlation matrix and linear regression model. We will compare the data of intensity of regulation on both Access markets, market share of DSL technology, incumbent share on retail broadband market, incumbent share on DSL technology and the level of penetration.

## 5 Results

The Pearson's correlation coefficient between the two variables is defined as (Nicewander and Rodgers, 1988):

$$r_{yx} = \frac{c_{yx}}{s_y * s_x} \quad \text{and} \quad -1 \leq r_{yx} \leq 1 \quad (1)$$

Where  $c$  is koeficient of co-variance and  $s$  is standard deviation koeficient. We insert data (Appendix 1) with normal distribution from EC Reports (2010) and from ERG Reports (2009) into the model SPSS15 for windows and come to the results in Table 4.

From the matrix we can predict that intensity of regulation on both markets has positive effect on the development of DSL technology, but not statistically significant with high risk of acceptance. The correlation is not statistically significant. The correlation between the market share of incumbent on the retail level and the share of DSL technology is slightly negative, but also not statistical significant. The correlation is statistical significant and positive between market share of incumbent on the retail market and the intensity of bitstream regulation. So there is evidence that intensive bitstream regulation force incumbent to invest in other technologies (not just DSL) and try to improve its market share on the retail level.

Table 4: Results from SPSS15 (correlation matrix)

| X/Y   | Regulation (bitstream) | Regulation (local loop) | Share of DSL tech.  | Share of incumbent on DSL | Share of Incumbent (retail) | Broadband penetration |
|---|------------------------|-------------------------|---------------------|---------------------------|-----------------------------|-----------------------|
| Regulation (bitstream)<br>Pearson Correlation (r)<br>Sig. (2-tailed)<br>N             | 1<br><br><br>29        | ,635**<br>,000<br>29    | ,056<br>,789<br>27  | -,463*<br>,015<br>27      | ,433*<br>,024<br>27         | ,561*<br>,002<br>29   |
| Regulation (local loop)<br>Pearson Correlation (r)<br>Sig. (2-tailed)<br>N            | ,635**<br>,000<br>29   | 1<br><br><br>29         | ,216<br>,279<br>27  | -,404*<br>,036<br>27      | ,116<br>,563<br>27          | ,429*<br>,020<br>29   |
| Share of DSL technology<br>Pearson Correlation (r)<br>Sig. (2-tailed)<br>N            | ,056<br>,789<br>27     | ,216<br>,279<br>27      | 1<br><br><br>27     | -,075<br>,709<br>27       | ,118<br>,557<br>27          | -,182<br>,363<br>27   |
| Share of incumbent on DSL (retail)<br>Pearson Correlation (r)<br>Sig. (2-tailed)<br>N | -,463*<br>,015<br>27   | ,404*<br>,036<br>27     | -,075<br>,709<br>27 | 1<br><br><br>27           | -,347<br>,076<br>27         | -,434*<br>,024<br>27  |
| Share of incumbent (retail)<br>Pearson Correlation (r)<br>Sig. (2-tailed)<br>N        | ,433*<br>,024<br>27    | ,116<br>,563<br>27      | ,118<br>,557<br>27  | -,347<br>,076<br>27       | 1<br><br><br>27             | ,337<br>,086<br>27    |
| Penetration<br>Pearson Correlation (r)<br>Sig. (2-tailed)<br>N                        | ,561*<br>,002<br>29    | ,561*<br>,002<br>29     | ,561*<br>,002<br>29 | ,561*<br>,002<br>29       | ,337<br>,086<br>27          | 1                     |

\* Correlation is stastical significant

\*\* Correlation is statistical significant (high level of correlation)

The impact of the intensity of regulation on both markets has negative influence on the market share of incumbent on the DSL technology. "The intensive regulation increases the service competition and service competition also increases penetration" (Höffler, 2005). The correlation matrix also in our case shows us a significant negative statistical correlation between the incumbent share on the regulated DSL technology and level of penetration. This correlation proves that service competition or intra-platform is also important, because it has definitely positive influence on market development. The correlation matrix shows us, that intensive bistream regulation has stronger influence on the level of penetration than local loop unbundling regulation. Despite the fact that EU market in some countries is close to saturation, bitstream regulation is also important. Especially in small countries and countries with lower penetration, intensive bitstrem regulation should be the main key driver of competitive environment.

Additionally we can evaluate the linear regression model (method ENTER) between two types of regulation, which are strongly correlated. It is expressed by Pearson's correla-

tion coefficient  $r=0,635$ . The average regulation based on local loop unbundling is stronger and it counts on the level of 3,45, while the level of bitstream regulation is 2,72. Also the standard deviation in case of local loop unbundling is higher. The regression model between the two types shows following results:

The regression model is constructed in such a manner that we can explain 38 % of local loop unbundling regulation intensity by the intensity of bitstream regulation. Table 5 contains the regression coefficients  $b_0 = 1,501$  and  $b_1 = 0,715$ . If the intensity of bitstream regulation is increased by 1, the intensity of local loop unbundling is also increased by 0,715. If there is no bitstream regulation (rank=1) the intensity of local loop unbundling regulation is 2,215. The correlation between the variables is progressive. So the regulation is either strong on both segment or weak on both segments. We can assume that principle of the ladder of investment regulation is not completely fulfilled or the observed EU countries are not at the stage where the regulation started to go down the ladder

Table 5: Regression ENTER model

| Model                               | Unstandardized Beta | Std. Error | Standardized Beta | T     | $\alpha$ |
|-------------------------------------|---------------------|------------|-------------------|-------|----------|
| Constant                            | 1,501               | ,506       |                   | 2,964 | ,006     |
| Intensity of regulation (bitstream) | ,715                | ,168       | ,635              | 4,266 | ,000     |

*Dependent variable: Intensity of regulation (local loop unbundling)*

even the fact that market is somewhere close to saturation and only higher access speeds will be offered in the future.

## 6 Discussion of research results

The model shows no statistical evidence that intensity of regulation influence the development of DSL technology. Anyway there is slight evidence, that regulation improves the benefits of regulated technology. We can see from the correlation matrix that correlation between regulation of bitstream and local loop unbundling is strongly correlated and positive. So at the moment it is no evidence of complete validation of the ladder of investment regulation in EU, despite the fact that regulation on local loop unbundling is more intensive than bitstream regulation. The correlation between level of regulation on two markets should be statistical significant, but probably negative to confirm the validation of the ladder of investments regulation. The results also show that incumbent tries to invest in new networks based on strong wholesale bitstream regulation. Strong local loop regulation does not force the incumbent to invest in other broadband technologies or at least the correlation is not statistically significant. The bitstream regulation forces the incumbent to improve its retail market position by investing in other technologies. It has definitely stronger influence on the market development than local loop unbundling regulation. This statement is also confirmed by the fact that local loop regulation is more intensive at the average, but has less influence on market characteristics. It has less influence on the level of competition and also on the market share of the incumbent on retail market. The intensity of local loop unbundling regulation has more influence only on the development of DSL technology compared to others Access technologies. It improves the value of DSL technology more than bitstream regulation. More the intensity of regulation goes down the ladder of investment highest is the market share of DSL technology. Anyway Broadband regulation should be based mostly on bitstream regulation, which is strongly recommended for small countries, where the concentration is very high and carriers are not highly interested to invest in its own Access network. Regulators should basically focus on local loop unbundling regulation after the precise market analyse and the fact, that the results from bitstream regulation are proven on the market outcomes. Regulation must have positive effect on infrastructure competition in dependence from size of the economy. The results of this analyse proves that with the increasing intensity of regulation incumbent market share

started to decline on the regulated technology and increase on other non regulated technologies. The intensity of regulation has a positive effect on the development of the regulated technology, despite the fact that the statistical correlation is not significant. Increased intensity of regulation increases intra-platform competition and also forces the incumbent to be more active in infrastructure or inter-platform competition on the market. On the other side the level of intra-platform competition measured by incumbent market share on the regulated technology has positive effect on penetration level. Bitstream regulation has stronger effect on the penetration level than local loop unbundling.

## 7 Conclusion

This study explores the influence of different levels of intensity of regulation on the development of regulated technology and the behaviour of the regulated operator or operator with significant market power. Based on the results from this study it is obvious, that at the moment bitstream regulation which promotes service competition is less important in Europe than local loop unbundling regulation which promotes facility based competition. In both cases new operators are using incumbent's network, where the entrant is able to invest in its own network in the longer term and the experience from early entry at the retail level helps him in building up a competitive network. Regulators should promote inter-platform competition through the process of mandatory access from service to facility based competition. Bitstream regulation forces incumbent to invest in other non-regulated technologies and from this point of view has positive effect on investments. Strong bitstream regulation has a strong negative influence on incumbent's market share on the regulated technology. While entrants entering the retail market through resale, bitstream or local loop unbundling are offering on the retail market DSL services, we can conclude that bitstream regulation is more effective than local loop unbundling in EU countries. Despite the fact that most of the non EU countries promotes only local loop unbundling it is crucial to define the point where it is necessary to phase out bitstream regulation. Regulation must follow the investment ladder and allow new entrant firstly to get bitstream product by intensive service regulation, later on to start with intensive regulation on local loop unbundling and finally to promote inter-platform competition. European Market is at the stage, when regulators should focus and increase the intensity of regulation of Bitstream products,



especially in smaller economies and countries below the average penetration level. At the later stage of market development, it is also crucial to define the limits between regulation and deregulation. It is important to define the point when the intra-platform and infrastructure competition on the vertically correlated retail market are high enough to prevent independent behaviour on the wholesale level, taking into the consideration also the level of market saturation. This should be the basis for further researches.

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## Appendix 1

|    | Country         | Intensity/LLU | Intensity/BS | DSL Share | Incumbent DSL share | Incumbent retail share | Penetration level |
|----|-----------------|---------------|--------------|-----------|---------------------|------------------------|-------------------|
| 1  | Austria         | 5             | 3            | 0,68      | 0,75                | 0,51                   | 22,7              |
| 2  | Belgium         | 5             | 5            | 0,57      | 0,86                | 0,49                   | 29,1              |
| 3  | Czech Republic  | 1*            | 1            | 0,39      | 0,87                | 0,34                   | 19,1              |
| 4  | Denmark         | 5             | 5            | 0,6       | 0,73                | 0,63                   | 37,8              |
| 5  | Estonia         | 4             | 3            | 0,42      | 0,94                | 0,52                   | 26                |
| 6  | France          | 4             | 4            | 0,95      | 0,48                | 0,46                   | 30,3              |
| 7  | Germany         | 2             | 2            | 0,9       | 0,51                | 0,46                   | 30,4              |
| 8  | Greece          | 5             | 3            | 100       | 0,56                | 0,55                   | 17                |
| 9  | Hungary         | 5             | 2            | 0,44      | 0,77                | 0,41                   | 18,7              |
| 10 | Ireland         | 5             | 3            | 0,72      | 0,69                | 0,51                   | 22,2              |
| 11 | Italy           | 4             | 4            | 0,97      | 0,59                | 0,57                   | 20,6              |
| 12 | Lithuania       | 4             | 1            | 0,36      | 0,99                | 0,49                   | 18,9              |
| 13 | Netherlands     | 4             | 4            | 0,62      | 0,74                | 0,48                   | 37,7              |
| 14 | Norway          | 4             | 2            |           |                     |                        | 35                |
| 15 | Poland          | 1             | 1            | 0,56      | 0,72                | 0,4                    | 13,5              |
| 16 | Portugal        | 3             | 4            | 0,59      | 0,73                | 0,44                   | 18,6              |
| 17 | Romania         | 3             | 1            | 0,28      | 100                 | 0,28                   | 13                |
| 18 | Slovak Republic | 1             | 1            | 0,46      | 0,92                | 0,44                   | 14,8              |
| 19 | Slovenia        | 5             | 4            | 0,62      | 0,66                | 0,46                   | 22,9              |
| 20 | Spain           | 3             | 4            | 0,8       | 0,68                | 0,55                   | 21,5              |
| 21 | Sweden          | 5             | 3            | 0,59      | 0,61                | 0,39                   | 31,5              |
| 22 | Switzerland     | 5             | 5            |           |                     |                        | 34                |
| 23 | UK              | 5             | 2            | 0,79      | 0,36                | 0,28                   | 29,8              |
| 24 | Finland         | 3             | 2            | 0,76      | 0,68                | 0,67                   | 29,4              |
| 25 | Luksemburg      | 2             | 3            | 0,83      | 0,8                 | 0,67                   | 32,1              |
| 26 | Malta           | 2             | 2            | 0,48      | 0,94                | 0,45                   | 26,8              |
| 27 | Cyprus          | 3             | 3            | 0,94      | 0,83                | 0,78                   | 22,2              |
| 28 | Bulgaria        | 1             | 1            | 0,31      | 100                 | 0,31                   | 13                |
| 29 | Latvia          | 1             | 1            | 0,49      | 100                 | 0,52                   | 19,3              |

Source : EC Reports and ERG 2009

\*Regulators did not finish the first round of analyses regarding those two markets till 2009 or did not impose any obligations to SMP player

### Vpliv regulacije širokopasovnega dostopa v Evropski skupnosti na razvoj regulirane tehnologije

Namen članka je odgovoriti na vprašanje ali nivo intenzivnosti regulacije vpliva pozitivno ali negativno na razvoj regulirane tehnologije. Obstaja veliko različnih pristopov regulacije, ki podpirajo osnovno idejo, da predhodna regulacija pospešuje konkurenčnost na trgu. Način regulacije mora biti odvisen tudi od velikosti posameznega nacionalnega trga. Pri ponudbi širokopasovnega dostopa obstaja veliko dostopovnih tehnologij. Odprt dostop za vse operaterje je ključ za razvoj konkurence. Regulatorji morajo zagotoviti, da imajo tudi novi vstopniki na trg, možnost ponudbe storitev končnim naročnikom preko dostopovnih kapacitet vodilnega operaterja (Telekoma). Na podlagi metode treh kriterijev je evropska komisija za potrebe predhodne regulacije priporočila oz. definirala na DSL tehnologiji Telekomov dva medoperaterska relevantna trga in sicer dostop preko bitnega toka in razvezavo lokalne zanke. V sklopu zadnjega priporočila je vključila tudi storitev optičnega dostopa na oba relevantna trga. Ostale tehnologije ne ponujajo enakih funkcionalnosti in zato evropska komisija ne priporoča predhodne regulacije. Intenzivnost regulacije, ki se izvaja na posameznih relevantnih trgih vpliva na konkurenčne razmere. Vpliva tudi na odločitev operaterjev, na katerem nivoju lestvice investicij bodo vstopili na trg ali preko uporabe medoperaterskih storitev ali pa preko izgradnje lastne infrastrukture.

**Ključne besede:** regulacija, tržne analize, širokopasovni dostop, korelacije, DSL tehnologija

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# Perceived Factors and Obstacles to Cognitive Schema Change during Economic Crisis

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The main objective is to present the perceived factors in cognitive schema change as experienced by participants from two Slovenian sectors and to compare them with factors from schema change theory in order to evaluate specific circumstances and obstacles to effective cognitive schema change. 31 interviews with participants from six companies were conducted twice during the 2008 economic crisis. The prevalent perceived antecedents of schema change lie within an organisation and in the business environment. Stimulating factors are also economic and financial crises and personal characteristics. The prevalent obstacles to schema change, as perceived by participants, are stability of current cognitive schemas, personal characteristics of management, and rigidity.

**Key words:** cognitive schema, change, factors, obstacles, economic crisis

## 1 Theoretical background

In this paper we present one part of a broader qualitative cognitive schema research. Influencing factors in schema change, as perceived by representative members of two sectors in Slovenia during the 2008 economic crisis, are presented.

Economic crisis is a period of financial insecurity, often illiquidity as well, and consequently of increased likelihood of employee dismissals and transfers as well as other methods of crisis management. In such a period, there are various speculations on the actual scale of the crisis and even the most prominent economists do not guarantee for their own predictions. Consequently, players in economy experience increased insecurity and lack of orientation. The existing studies (e.g. Bartunek 1984; Reger and Palmer 1996; Diplock 1999; McKinley et al. 2000) show that the way how individuals perceive changes influences their behaviour. Although the expectations and knowledge of individuals usually serve them well, the rigid and poor informational presumptions in schemas lose their functionality in new situations or changed circumstances and therefore need to be examined anew.

In social psychology, cognition and mental processes have always had an important role. As the main interest of social psychology is social context, it is common to use the term social cognition. Social cognition is mainly an automatic process with only minor conscious awareness. According to the definition, the centre of social cognition is in its study of social context in social behaviour (Fiske and Taylor, 1991). In this view, perception is rather active construction on the

basis of individuals' beliefs, experiences, values, etc., which are stored in cognitive schemas. Poole et al. (1989) believes that in times of organizational changes organizational schemas become more explicit. The time of changes thus gives an opportunity for studying the processes of organizational transformation.

### 1.1 Cognitive schemas

In general, cognitive schemas are viewed as everyday subjective theories about how the world operates, so they are important sense-making frameworks. Organisational or interpretive schemas are defined as shared knowledge frames for understanding and behaviour in an organisation. They provide interpretation and organisation of experience in an organisation (Bartunek, 1984). For example, one's "department" schema would include the knowledge regarding typical attributes (e.g. colleagues, boss, office, break, work) and the relationships between those attributes (e.g. the boss allocates benefits to employees) (e.g. Augoustinos et al., 2006).

Cognitive schema theories assume that people rapidly generalize their schemas, and with increased experience they become more abstract, complex, organized and compact. People learn schemas from direct experience or from other people's communications (Hala, 1997). Cognitive schemas have several functions: they help a person identify incoming stimuli with providing hypotheses about stimuli; they help with interpreting the stimuli and with gathering further schema-related information (Poole et al., 1989). Schemas

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also guide subsequent behaviour in response to information (Harris, 1994).

McKinley et al. (2000) suggest schemas are often a result of social interaction and negotiations which, at one point, lead to a specific standard or »typification«. Once established, they tend to endure and become resistant to change, even when disconfirming information is presented (Reger and Palmer, 1996). However, they can change over time, particularly if the information in the environment is dramatically altered (Bartunek, 1984; Fiske, 2000). An economic or organizational crisis may thus be seen as one of the factors that may lead to cognitive schema change (e.g. Bartunek, 1984; Chattopadhyay et al., 1999). Cognitive schemas may, furthermore, differ across participants from different companies or sectors because of different antecedents.

## 1.2 Antecedents of organizational schema change

The main *research question* of this paper concerns antecedents of schema modification. What are the main influencing factors that lead to schema modification and change? Which circumstances of the inner and outer environment determine whether new information will be assimilated (brought about) into the existing schema, and in which circumstances will the existing schemas be accommodated (changed) in order to fit the environment?

### *Influencing factors in effective schema change*

According to the literature, two types of factors that may have an influence on schema change exist, namely personal and organisational (Grossenbacher, 2008).

Some of the personal factors are:

- personality, personal history, background and beliefs (Axelrod, 1973; Poole et al., 1990);
- function in a company (Grossenbacher, 2008);
- the degree to which business situation is perceived as threatening (Grossenbacher, 2008);
- organisational commitment and general attitude toward change (Bartunek, 1984; Lau and Woodman, 1995);
- motivational background, e.g. the need to understand and share social reality, which is enabled through the processes of social comparison (Harris, 1994).

Among organisational antecedents are, for example:

- crisis (within oneself, in an organisation or in the environment) (Bartunek, 1984; Schein, 1980; Isabella, 1990; Chattopadhyay et al., 1999);
- personal characteristics of management, e.g. age, work experience, hierarchical level, national culture (Grossenbacher, 2008);
- perceived challenges in the business environment (Bartunek, 1984);
- changes in managers' value system or within a new management team (Bartunek, 1984);
- organisational structure changes (Bartunek, 1984);

- shifts in sense-making: definition and adoption of new values, vision and mission (Balogun and Johnson, 2004; Isabella, 1990; Labianca, Gray and Brass, 2000);
- the degree to which management encourages participation (Kelly and Gennard, 1996);
- developing deep understanding of various perspectives on the organisation, defining and implicitly or explicitly fostering new organisational schemas (Chattopadhyay et al., 1999; Poole et al., 1989).

### *Obstacles to effective schema change*

There are tendencies toward the preservation of existent schemas. Individuals are motivated to preserve them in order to retain understanding of the social reality and to give meaning to it. Once cognitive schemas are established, individuals feel psychological safety and (organisational) surroundings are interpreted as known and manageable. Information processing and retrieval from memory is more functional and faster (Balogun and Johnson, 2004).

According to literature, there are several obstacles to long lasting and in-time schema change:

- modification of (schema-incongruent) information in order to conserve the old schema (Augoustinos et al., 2006);
- organisational identity, which serves as extremely strong schematic filter for understanding, interpreting and responding (Reger et al., 1994);
- bounded capacity for learning and integration of new information with old schemas (Augoustinos et al., 2006; Reger et al., 1994; Schein, 1980);
- low level of cognitive consciousness (Fiske, 2000);
- too big a gap between current experience and expectations (Fiske, 2000).

Demands toward schema change can lead to increased levels of uncertainty and paralysis of individuals. Schein (1980) adds that attempts to change cognitive schemas can be perceived by an individual as stressful and harmful events.

## 2 Methods

### 2.1 Participants

Altogether 31 in-depth interviews were conducted with participants from six Slovenian companies. Interviews were conducted twice with 16 representative members of the companies, namely with CEOs, Executives in HR department and trade union leaders. Previously made studies are partly the argument for this particular selection of interviewees; e.g. Isabella (1990) showed that managers are in the centre of cognitive shifts. HRM managers were selected because we assumed they are in contact with the schemas of organizational members. Interviews were conducted also with trade unionists, who served as a data source of a different perspective and served triangulation purposes (Table 1). After one year, interviews with the selected interviewees were repeated in order to explore antecedents of potential schema change.

Table 1: Structure of the interviewees according to the sector and their position in the organisation.

| Sector        | Top management |      | HRM executives |      | Trade unionists |      |
|---------------|----------------|------|----------------|------|-----------------|------|
|               | 2009           | 2010 | 2009           | 2010 | 2009            | 2010 |
|               |                | +    | +              | +    | +               | +    |
| Manufacturing | +              | +    | +              | +    | +               | +    |
|               | +              | +    | +              | +    | +               | +    |
|               | +              | +    | +              | +    | +               | +    |
| Financial     | +              | +    | +              | +    | +               | +    |
|               | +              | +    | +              | +    | +               | +    |
|               | +              | +    | +              | +    | +               | +    |

The average age of the participants was 50 years. The ratio between men and women was 10:6. The interview with one participant was postponed due to his health problems.

The selected companies operate in the automotive industry and in the financial sector, which were both affected in the economic crisis. Because of the initial troubles regarding the access to the highest managerial positions during the crisis, a convenience sample was used. In spite of this, we consider the selected companies appropriate representatives of their industry, because most of them are renowned and one of the largest in their branch.

## 2.2 Instruments

An in-depth interview was chosen as the most appropriate methodology for assessing cognitive schemas. Interview transcripts were coded and analyzed by the computer program for qualitative data analysis ATLAS.ti. With the help of this program, research consistency and internal reliability can be increased (Hannes et al., 2009).

## 2.3 Procedure

In-depth interviews were conducted twice from April 2009 to October 2010. First interviews (April – September 2009) were followed by second ones after one year (April – October 2010). All interviews were tape-recorded. The transcripts were further followed by additional comments. Interviews lasted on average 55 minutes. They were followed by the transcription, coding and analysis in the ATLAS.ti program.

In first-order analysis we ascribed meaningful quotes to relevant codes and made summaries according to our research questions. In second-order analysis conclusions were made on the basis of the first-order analysis findings and conceptual framework was established. In the second order analysis, a researcher is able to find common themes within several different codes according to matching contents in these codes. Those themes are afterwards merged into larger conceptual frameworks that correspond to the main attributes of cognitive schemas in the selected companies.

In order to avoid subjectivity when conducting in-depth interviews, the following precautions were made: enough time was allocated for discussion part in order to get additional information. An additional researcher, uninformed about research aims but experienced in coding, independently coded a sample of interview material. We considered 88 % of the material allocated to the same codes an adequate compliance. This was considered a minimum condition of scientific research, by which it was still possible to get research autonomy and at the same time retain participants' own expressions, which was emphasized as a *sine qua non* in cognitive schema research (Diplock, 1999).

## 3 Results

Quotes regarding cognitive schema change were searched for in all the existing codes that had arrived for analysis in the ATLAS.ti program. Whereas sum of all codes was 52, quotes from 19 codes were extracted for the research aim of this paper. In the results section, first order analysis is presented in brief in table 1, which is followed by second order analysis.

In table 2, perceived factors and obstacles to cognitive schema change as derived from participants' quotes are listed:

A difference in occurrence of some themes in table 2 is due to differences in schemas that exist among individuals in different companies and in different sectors. Table 2 sums up the most prevalent factors that might lead to, or decelerate cognitive schema change according to number of quotes in codes Crisis affects schemas of HRM, Crisis affects schemas in an organization, Crisis does not affect organizational schemas, Disagreement in an organization, Obstacles to schema change, Other factors affect schemas and Sleepiness in an organization.

The most occurring factors that stimulate cognitive schema change are, according to the interviewees, new strategy or mode of operation and relationship with management and competence of the personnel, and, to a certain extent, the current (2008 -) crisis. Among perceived obstacles, the stability of current schemas and personal characteristics and values of management & employees were stressed by the interviewees.

Table 2. Perceived factors and obstacles to cognitive schema change.

| Perceived factors  | Frequency*                 | Perceived obstacles   | Frequency*       |
|--|----------------------------|---|------------------|
| New strategy or mode of operation                            | Extremely high to moderate | Stability of current schemas  | Extremely high   |
| Relationship with management and competence of the personnel | Extremely high             | Personal characteristics and values of management & employees       | Moderate to high |
| Current (2008 -) crisis                                      | Low to high                | “Sleepiness” and rigidity & personal advantages of previous schemas | Moderate         |
| Disagreement within company                                  | Moderate to high           | Legislation   | Moderate         |
| (Personal) crisis  | Moderate to high           | Organisational & national culture                                   | Low to high      |
| Coercion in the business environment                         | Moderate to high           | Previous crises   | Low              |
| Personal characteristics of employees & self-interest        | Moderate to high           |   |                  |
| Sectorial and organisational specifics                       | Moderate                   |   |                  |
| Experience with change (previous crises)                     | Non-existent to moderate   |   |                  |

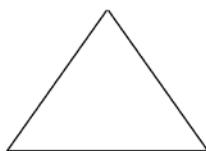
\* 0-5 quotes: non-existing or low presence of the theme in a cognitive schema; 6-11 quotes: moderate presence of the theme in a cognitive schema; 12-17 quotes: high presence of the theme in a cognitive schema; 18 or more quotes: extremely high presence of the theme in a cognitive schema.

First order analysis was a good starting point for further exploration of antecedents in cognitive schemas change. The occurrence of the themes (see Table 1) was searched for in larger number (19) of codes that were significant for the purposes of this paper. On this basis, attributes of cognitive schema change and persistence were formed.

#### **Prevalent perceived factors in schema change**

Following the research data, it was possible to find three most occurring groups of factors that promote and foster schema change:

**Within an organisation & in the business environment**  
(new business strategy, sectorial specifics, disagreements, restructuring, etc.)



**Economic and financial crisis**  
(current crisis, previous crises)

**Personal characteristics**  
(personal crisis, self interest, disagreements, relationship with management, competences, etc.)

Figure 1: Factors in cognitive schema change among the selected companies.

Cognitive schema change may exist, first of all, due to organisational factors, such as new business strategy, sectorial specifics, disagreements and restructuring. The second most occurring factors are economic and financial crises (current and previous ones), which are followed by intrapersonal factors. This group of factors is the most heterogeneous one and consists of various intra- and interindividual variables, i.e. crisis within an individual, interests of organizational members, disagreements between organizational members, and relationship with management and competences of the HRM executives.

Below are listed examples (quotes) of the main perceived factors that stimulate schema change. Letters A and F in brackets are abbreviations for the financial and automotive industry interviewees. The first number is an interview number and the second number stands for consecutive quotations number of this particular interview.

#### **1) Within an organisation & in the environment**

Coercion in the business environment:

“We will proceed in this direction on our own, of course, because conditions force us. If we want to employ young, competent, motivated human resources, we are forced to create conditions that will motivate them.” (A 9:52)

From this quote, it can be assumed that forces in the business environment stimulate this company to improve their working environment and reward system in order to get (and retain) competent engineers and other talented human resources. This feature was more evident in companies that

operate on the international automotive market in comparison to the selected financial institutions.

## 2) Economic and financial crisis

*“As far as the future is concerned, it is certainly bright. But bright at this moment doesn't mean that we'll still bag 20 % a year; bright is 0.5 % above inflation and you'll be called Sir if you preserve your money. Years will come, though, when you will be able to gain more, if you invest properly.”* (F 14:78)

The current economic crisis is working as leverage for cognitive shifts. In the upper example it can be seen that the definitions of gains and losses in the selected banking sector institutions have (at least temporarily) changed. This particular feature was more evident among the interviewees from financial institutions, whereas in manufacturing companies former (economic) crises led to more stable and enduring schemas that are serving them well also in this crisis.

## 3) Personal characteristics

(Personal) crisis

*“As far as nature is concerned, I have to say: an individual needs lots of time to change something within oneself. As long as one is not in a crisis or in trouble, as long as one can turn to his rationality and has a command of one's relationships ... but this is on a rational level. But when one is in trouble and when one's real self comes out, a lot of work on one's self is needed. Only a personal problem enforces you to do that.”* (A 1:61)

This observation was made by a human resource manager, who studies human nature a lot. His experience shows that (personal) shifts in thinking and doing things seldom happen. A major stimulating factor behind (personal) change is, in his opinion, a personal crisis. In this connection was also the idea of changes within an organization. Human resources will, according to this interviewee, not change *per se*, but through a crisis that is perceived on an individual level. Personal characteristics were one of the highly perceived factors behind schema change in companies from both sectors. It seems that sectorial specifics do not play an important role in regard to this factor.

### Prevalent obstacles to schema change

On the basis of research data we created a figure of three most occurring obstacles to effective cognitive schema change, as perceived by participants:

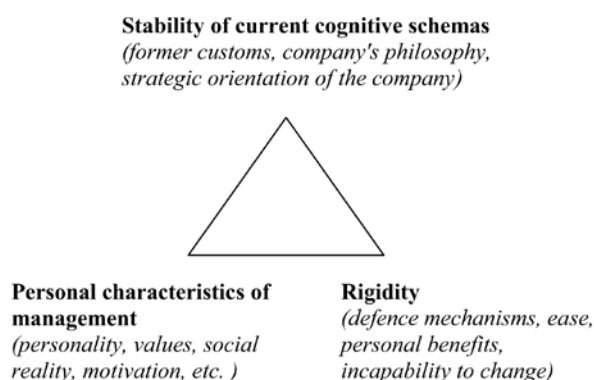


Figure 2: Factors that worsen or disable effective cognitive schema change.

Predominant factors that worsen or disable effective schema change among the selected interviewees are the existing cognitive schemas in the organization, the company's philosophy and its business strategy, etc., which have been formed in the past. Current schemas are followed by another factor, i.e. by personal characteristics of participants, such as personality, values, social reality and motivation. The third group of factors are defence mechanisms and other similar types of rigidity, which prevent organizational cognitive schemas the effective and long-lasting change.

Below are listed examples (quotes) of the main perceived obstacles to schema change.

### 1) Stability of current cognitive schemas

*“I was getting on everybody's nerves when I required that we should go through the processes 3 times- how are we going to function. But then, we didn't function properly (laugh). Because it was not communicated clearly enough to employees, and everybody ... fell back into their old forms of functioning, which were known as best and safe.”* (F 13:22)

In this quote, a director from a financial institution explains what was happening in this particular company after major restructuring in the current crisis. She emphasized the difficulties, with which they were faced when a new organizational structure enforced them to do their job differently. The existing cognitive schemas may thus be a powerful factor in schemas' maintenance and their reluctance to accept new ones. Even though this example has been taken from a financial institution, the interviewees from automotive companies reported more about stability of current schemas in regard to schema preservation. This is due, in part, to the former crises in this sector that led to “the changed schemas”. So in the current crisis, participants cling to the existing “change” attributes.

### 2) Personal characteristics of management

Personality and values of management

*“According to fall-offs in orders, the number of employees could and should be downsized. But still, they are people. Downsizing is a big torture for me.”* (A 14:23)

A member of the board of directors at a manufacturing company, which produces for the international automotive industry, explains his inclination towards maintaining his workforce (rejection of downsizing) in the current crisis. This quote may be directly linked to the outcomes in this particular company, in which the statistics of layoffs is particularly low. Personal cognitive schemas may be thus directly connected to managers' behaviour.

### 3) Rigidity

Personal advantages of previous schemas

*“Even though things had changed dramatically in '91 as we entered another system, some people lived in a new system but in their mind they continued to live in the previous one (...), they still wanted to have privileges of the previous system transferred to the current one.”* (F 4:46)

This statement is an excerpt from an answer connected with (the lack of) changes in mentality of employees in the selected companies in the banking sector after Slovenia had

gained its independence in 1991. Quotes like this one were especially frequent in both Slovenian banks that were included in this research. In this quote, a trade union leader illustrated the reluctance of one part of population to change cognitive schemas in order to preserve the old privileges. From this it can be assumed that, in an organizational change program, organizational members have to perceive the intended changes (at least in part) as an acquisition for themselves. In this sense, a program will have better chances of desirable outcomes.

## 4 Discussion

We listed several factors and obstacles to effective schema change as perceived by representative members from companies in the two sectors. We have then compared our findings with the ones from the literature.

The most frequently perceived factor that may stimulate cognitive schema change lies *within an organisation or/and in the business environment*. The new business strategy, sectorial specifics, restructuring, etc., may thus foster schema change. This is to certain extent in accordance with the findings of other researchers. In her famous study of a religious order, Bartunek (1984) asserted that changes in organisational structure may act as a lever for cognitive shifts of order members. The implication for managers is that changes in the company and in the business environment foster cognitive schema change. Furthermore, the results show that if changes in an organisation are to be carried out, they should be in accordance with other specifics of a particular organisation and/or a sector.

Also, the *economic and financial crisis* was one of the most perceived factors that might stimulate cognitive schema change, as reported by the selected interviewees. They reported crisis as a force of schema change within themselves, in an organization or in society in general. This was expected, since interviews were conducted in the middle of the economic crisis and such time is in the social cognition literature listed as one of the prevalent factors in schema change, because participants realise that their old schemas are not congruent with the new situation/environment any more. Therefore, schemas have to be revisited in order to survive in social environment. This is also in accordance with other research findings that suggest crisis is often the predominant force for cognitive schema change (e.g. Schein, 1980; Bartunek, 1984; Isabella, 1990; Chattopadhyay et al., 1999).

Frequently, a perceived antecedent of schema change is also *personal characteristics of management*. Personal characteristics of management were the third frequently mentioned possible antecedent of schema change. This is congruent with research findings that management's personal variables, value systems and their shifts in sense-making co-create conditions for schema change (e.g. Harris, 1994; Lau and Woodman, 1995). Also, personal characteristics of employees and their interest in schema change might be important. From this it follows that individuals differ among each other in their motivational background, in personality, beliefs ... It can be concluded that motivation level and other personal characteristics are important antecedents of cognitive schema change and this should be admitted when planning the organizational change

program. Cognitive schemas of individuals in an organization should be explored prior to program execution. Individuals differ from each other as well as their organisational commitment and general attitude towards change. In the future, our aim is to explore which personal variables are predominant antecedents of cognitive shifts and to what extent is each of them present. In order to do this, quantifications of research results on the basis of quantitative methodology is intended.

Another possible scenario for cognitive schema change is coercion in the business environment (see Table 1), such as a need to act globally or aggressive competitors. In her case study, Bartunek (1984) reports perceived challenges in the business environment are an important antecedent of schema change. Coercion can therefore be a powerful determinant of schema change, but on the other hand, it can also be a cause for rigidity of organisational members. When a gap between current experience and expectations is too big, it can lead to defence mechanisms.

On the other hand, some obstacles to cognitive schema change were identified by the interviewees from the selected companies. Most commonly perceived obstacle to schema change is the *stability of current cognitive schemas*. According to their answers, former customs, company's philosophy, strategic orientation of the company and similar are the main factors in schema preservation. This is in accordance with Augoustinos et al. (2006), who stated that individuals may undergo modification of schema-incongruent information in order to sustain and conserve the old schemas.

*Personal characteristics*, such as personality, values, social reality, motivation, etc., are, according to our respondents, the most frequent second factor against cognitive schema change.

Personal characteristics and values of organizational members and personal characteristics of employees were recognised as an obstacle to schema change. This is interesting and worth of further research interest. Demands towards schema change can lead to an increase in the levels of uncertainty of individuals. According to Schein (1980), attempts to cognitive schema change can be perceived as stressful and harmful events. Further analyses could show a more accurate picture of personal characteristics that act as obstacles to schema change, so quantifications in further research phases are needed in order to identify and further investigate the barriers that can reinforce the old schema.

Because organizational changes are perceived as stressful events for organization members, it is important for managers to minimise the feelings of uncertainty and threat. This can be done by frequent and substantial internal communication about the reasons and stages at which a change program is. The consequences and (if possible) the amenities of a change program for individual members should be presented as well. Furthermore, not only top-down communication channels, but also the opposite direction communication should be planned.

*Rigidity*, such as defence mechanisms, ease, personal benefits, incapability to change, is the third group of factors that prevent cognitive schema change (or at least make it more difficult). "Sleepiness" and rigidity of the entire (mostly banking) sector and of individual employees are most commonly perceived obstacles to schema change. This can be explained partly by the lack of previous crises in banking sector. Partly,



“sleepiness” and rigidity are a consequence of inclination to modify any incongruent information in order to conserve the old and well preserved schema. Learning and integration of new information with old schemas are therefore limited. In addition, among the main obstacles to effective cognitive schema change were also personal advantages of previous schemas (Reger et. al., 1994). So the implication for managers is that if organization members do not see the benefits of accepting/integrating new schemas, it is less likely for them to become prevalent. Secondly, if a planned change program is too ambitious in a sense that a gap between the existing and planned schemas is big, the success of a planned schema transformation is limited.

### Limitations and suggestions for further research

At the end, some limitations of this study should be mentioned. First of all, the design of the study does not allow making generalizations about factors in cognitive schema change of organizational members as a whole. Secondly, our sample was to a certain extent auto-selected. Some methodological reservations are connected with this, namely only managers that do not experience major existential problems within the company are willing to participate. In spite of this, we consider companies in each sector eligible representatives of their field of operation, either because of their size, or because of their position in the Slovenian market. Thirdly, more data sources improve research reliability. In further stages of research we, therefore, plan to access company publications, such as annual reports and strategic plans in order to improve the research findings.

In the future phases of research, more data sources (annual reports, company publications) will be taken into account in order to improve validity and reliability of the research findings. Furthermore, quantitative research will be conducted in order to specify and quantify predominant (personal) factors that stimulate and/or prevent cognitive schema change. This is important as all (cognitive) shifts in companies are basically derivatives of cognitive schema changes. Knowing the factors that promote or worsen the probability of schema change is thus important in attempts to manage change.

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**Zaznani dejavniki in ovire pri spreminjanju kognitivnih shem med gospodarsko krizo**

V prispevku so predstavljeni dejavniki spreminjanja kognitivnih shem, kot jih zaznavajo udeleženci iz dveh slovenskih panog, ki jih primerjamo z glavnimi dejavniki iz teorije kognitivnih shem. Namen raziskave je ovrednotiti poglobitve dejavnike, ki spodbujajo in ovirajo dolgoročno in trajno spremembo kognitivnih shem. V dveh časovnih obdobjih v času finančne in gospodarske krize je bilo opravljenih 31 intervjujev s predstavniki šestih podjetij. Rezultati kažejo, da so med prevladujočimi dejavniki, ki spodbujajo spremembo shem dejavniki znotraj podjetja in v poslovnem okolju. Sledijo jim aktualna gospodarska kriza ter osebne spremenljivke. Prevladujoči dejavniki, ki ovirajo spremembo kognitivnih shem, so stabilnost obstoječih kognitivnih shem v organizaciji, osebne spremenljivke managementa in rigidnost.

**Ključne besede:** kognitivne sheme, spremembe, spodbudni dejavniki, ovire, gospodarska kriza

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# The Perspective of Business Process Outsourcing in Slovenian Organizations

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Business process management (BPM) and business process outsourcing (BPO) play an important role in organizations helping them ensure competitiveness and competitive advantages and increase efficiency and effectiveness. Our study analyzes the role of outsourcing in Slovenian organizations. Data was obtained through a survey and interpreted with descriptive statistics, frequency statistics and Wilcoxon's signed ranks test. According to the results of statistical analysis there is 95% reliability that the degree of outsourcing of business processes in Slovenian organizations will increase and this applies to most business processes. Thus we can conclude that Slovenian organizations are following the trends in global markets and are adjusting to them as well.

**Key words:** business process management, business process outsourcing, BPO, management, process

## 1 Introduction

Organizations have to constantly move forward. Only in this way they will survive and prosper in competitive markets. In order to achieve this they have to use every available opportunity. The best approach to ensuring an ongoing competitive advantage is Business Process Management (BPM). In order to successfully implement it, two factors are necessary: (1) business process re-engineering; and (2) employee involvement (Hung, 2006). Business Process Outsourcing (BPO) can be viewed as part of the business processes management.

BPO means contracting of operations and responsibilities of business function (i.e. business process or process) to a third-party company or service provider. A contract is an agreement between two or more parties, usually between vendor (organization) and supplier; and outsourcing is the process of contracting. Business process is sometimes perceived as activity or task, however in our study we will use a short expression: process. In general outsourcing means hiring a service from a company located in another country; more precisely, nearshore outsourcing means hiring a nearby country company and offshore outsourcing means hiring an overseas country company such as India. Outsourcing is a short expression for BPO.

Organizational changes are usually the consequence of adaptation to market conditions. Slovenian economy has made two major adaptations – after independence in 1991 and after joining the EU in 2004. As protectionism was eliminated and international standards adopted, Slovenian economy was forced to introduce radical organizational changes, including business process outsourcing. Initially, organizations chose to outsource business processes in the field of Food service and

Security, which are both supporting processes; while today they also opt for partially or completely outsourcing primary processes. The main objective are improvements in the area of costs, deadlines and quality, as businesses have recognized that some tasks could be performed cheaper, faster and better by a specialized supplier than by the organization itself.

The purpose and objective of our research is to determine how Slovenian organizations view outsourcing business processes and the forecasts for the future. We can expect that life-cycle rules apply for BPO: progressive growth after the introduction, followed by a period of maturity or steady growth and finally decline of activities. In accordance with this, we have defined the following hypothesis: the level of business process outsourcing will increase in Slovenian organizations over the next three years.

## 2 Literature review

Business process outsourcing is a strategic decision that affects the entire organization. The most common motivation for BPO introduction is cost reduction. This is not a valid approach and it leads to trouble. Abraham and Taylor (1996) believe that one of the main causes for global outsourcing is high-wage organizations taking advantage of low market wage rates, e.g. in overseas countries. Stronger strategic reasons have to be found. Beverakis, Dick and Cecez-Kecmanovic (2009) argue that the most important reason is to become more competitive in the marketplace; by reducing its operational costs, and establishing a global presence.

Often, the implementation of BPO brings with itself significant organizational changes; therefore all argu-

ments in favour must be closely examined. The reasons are (Power, Desouza & Bonifazi, 2006): (1) cost savings; (2) focus on core business; (3) access to resources and knowledge; (4) growth in global knowledge; (5) increased sophistication of IT (Information Technology); and (6) global diffusion of knowledge. Not to forget cost reduction in telecommunications, higher level of computerization and informatization, higher level of education, mobile technology, e-mail, video conferencing, web conferencing, instant messaging and other collaborative tools. Access to resources is important for all organizations; ownership of resources is only of secondary importance. Similarly Brown and Wilson (2005) list ten arguments for outsourcing: (1) accelerate re-engineering benefits; (2) gain access to world-class capabilities; (3) earn cash back; (4) release resources for other purposes; (5) re-evaluate problematic functions; (6) improve company focus; (7) make capital funds available; (8) lower operating costs; (9) minimize risk; and (10) gain access to resources not available internally. Dyer, Kale and Singh (2001) define four advantages of strategic partnerships: (1) improving knowledge management; (2) increasing external visibility; (3) providing internal coordination; and (4) facilitating intervention and accountability. Hoving (2007) stresses the importance of: (1) engaging professional skills; (2) selective partnerships; and (3) integrated external solutions. Atesci et al. (2010) draw attention to organizations' needs to: (1) manage strategic transformations; (2) be able to execute contingency plans; and (3) balance the risks and rewards of BPOs in terms of knowledge and capabilities dependencies.

Similarly, all arguments against the BPO must be closely examined as well. All risks have to be identified and in particular it has to be checked how these risks could be avoided or at least reduced to an acceptable level. Ten most common mistakes in implementation are (Power, Desouza & Bonifazi, 2006): (1) lack of management commitment; (2) minimal knowledge of outsourcing methodologies; (3) lack of an outsourcing communications plan; (4) failure to recognize outsourcing business risks; (5) failure to tap into external sources of knowledge; (6) not dedicating the best and brightest internal resources; (7) rushing through the initiative; (8) not appreciating cultural differences; (9) minimizing what it will take to make the vendor productive; and (10) poor relationship management program. Similarly, Shi (2007) indicates problems on the organization's side: (1) cost-saving mirage; (2) lack of process model maturity; and (3) lack of understanding or consensus of target business model. On the other hand, the reasons for the failure on the supplier's side are: (1) competence gap; (2) heavy turnover of key personnel; and (3) weak security practices or requirements. Finally, the causes for the failure may also be in the relationship between the organization and suppliers: (1) lack of precise and detailed project specification; (2) language and culture misalignment; (3) knowledge transfer difficulties; (4) process calibration difficulties; (5) incompatible pace of technology change; (6) incompatible architectural style; and (7) loss of continuity due to employee shuffles. Gewalt and Dibbern (2009) propose risk-benefit model; risks are: (1) performance risk; (2) financial risk; (3) strategic risk; and (4) psycho-social risk; and benefits are: (1) cost advantage; (2) focus on core competences; (3) access to

specialized resources; and (4) quality improvement. Aron, Clemons and Reddi (2005) conclude that various risks are factors that restrict the growth of outsourcing. However they can be reduced by redesigning work flows and dividing work among multiple suppliers. Risks are: (1) strategic risks; (2) operational risks; (3) intrinsic risks of atrophy; and (4) intrinsic risks of location.

The process of outsourcing is very demanding. All seven steps of the life-cycle of outsourcing must be consistently implemented by the organization (Power, Desouza & Bonifazi, 2006): (1) strategic assessment; (2) needs analysis; (3) vendor assessment; (4) contract and negotiation management; (5) project initiation and transition; (6) relationship management; and (7) continuance modification or exit strategies. If any step is performed inadequately or is omitted, outsourcing is doomed to failure. Organizational changes must be initiated and supported by top management. Rottman and Lacity (2006) have collected fifteen best practices for successful IT outsourcing, which can be generalized to all outsourcing domains: (1) escalate the learning curve with an aggressive, integrated program of pilot project; (2) select an offshore outsourcing destination based on business objectives; (3) use offshore supplier competition to lower domestic supplier rates; (4) diversify the supplier portfolio to minimize risk and maximize competition; (5) allow business users to share in the benefits of offshoring to motivate adoption; (6) break project into segments to protect intellectual property; (7) ready the infrastructure; (8) understand how different contracts give suppliers different incentives; (9) elevate your own organization's Capability Maturity Model (CMM) certification to close the process gap between organization and supplier; (10) bring in a CMM expert with no domain expertise to flush out ambiguities in requirements; (11) negotiate "flexible" CMM; (12) factor in the use of an on-site engagement manager into the staffing models and ratios; (13) give offshore suppliers domain-specific training to protect quality and lower development costs; (14) overlap onshore presence to facilitate supplier-to-supplier knowledge transfer; and (15) create balance score-card metrics. Standardization of processes is a prerequisite for the success of outsourcing (Willenweber, Beimborn, Weitzel & König, 2008). The processes have to be evaluated according to three dimensions (Johnson, 2006): (1) complexity; (2) independence; and (3) strategic importance. Conklin (2005) argues that activities essential to a company's competitive advantage should not be outsourced.

BPO's success can be evaluated according to four criteria: (1) how successfully the project implementation was done; (2) improvement in organization's performance; (3) improvement in IT performance; and (4) how successful are the relations between customer and supplier. Gilley and Rasheed (2000) note that the connection between outsourcing and effectiveness and efficiency of the organization does not exist. Similar findings have also been revealed by Bengtsson and Dabhilkar (2009) who summarize that some authors demonstrate significant positive effects of outsourcing while others do not. In their study, Hirschheim and Lacity (2000) conclude that half of the organizations recorded savings and the other half not. Aron and Singh (2005) conclude in their study that there are three different causes for success or failure of outsourc-

ing: (1) select the right processes; (2) supervise both the operational and structural risks; and (3) adapt organizational forms to needs. Handley and Benton (2009) emphasize that strategic evaluation, contractual completeness and relationship management practice are necessary for achieving estimated outsourcing results; outsourcing performance is significantly influenced by strategic evaluation and proactive relationship management. Business process management and relationship management are the key factors of BPO success (Bharadwaj & Saxena, 2009). Integration between organization and provider is crucial (Luo, Zheng & Jayaraman, 2010): (1) process integration; (2) knowledge integration; and (3) personnel integration.

BPO market was estimated to one trillion US dollars annually in 2005 by Brown and Wilson (2005), a threefold increase over the next few years was expected. They stated in 2005 that organizations would opt mostly for outsourcing of IT (55%), administration (47%), distribution and logistics (22%), finance (20%), HR (19%), manufacturing (18%), contact centers/call centers (15%), sales/marketing (13%), real estate/facilities management (11%) and transportation (9%); the sum is greater than 100% because of multiple answers.

### 3 Method

A questionnaire was distributed to 484 Slovenian organizations, which were selected completely randomly. We chose the largest organizations according to the average number of employees in financial year, amount of net income from sales and asset value. In this way, we covered the medium-sized and large organizations (population) for which the sample is representative. We received 80 responses (sample), which are used in the survey. The questionnaire was sent to the Heads of IT (CIO). Respondents occupy the following professional positions or functions (share in percent): 3.8% CEO, 11.4% division director, 59.5% CIO, 13.9% Head of an IT department and 11.4% other function or position. The average seniority of respondents was 19.4 years. Based on the function or position and seniority we can conclude that the respondents had adequate knowledge to complete the questionnaire.

The basic research method was a survey questionnaire with three questions:

- 1) Where are the business processes (business functions) of organizations performed and where will they be performed in the future, over 3 years?
- 2) The function or position of the respondent.
- 3) Work experience of the respondent in years.

The first question is divided into fourteen processes: (1) Purchasing; (2) Sales; (3) Manufacturing – production or service activity; (4) Quality; (5) Maintenance; (6) HR – personnel, human resources; (7) Finance – finance and accounting; (8) R&D – research and development; (9) IT; (10) Logistics – logistics, transport; (11) After-sales; (12) Legal service; (13) Food service; and (14) Security – physical protection of facilities. There are four possible answers: (1) process is performed internally within the organization; (2) process is performed partly in the organization and partly by the supplier; (3) pro-

cess is performed fully by the supplier; and (4) organization has no such process. The answers to the first two questions are treated as nominal variables; the answer to the last question is a rational variable.

Data obtained from the survey was analyzed using descriptive statistics, frequency statistics and non-parametric Wilcoxon's signed ranks test. Statistical significance is denoted by  $p$  and defined at 0.05, i.e. 5%. If only  $p$  is given, we have a two-tailed test i.e.  $p(2\text{-tailed})$ . Mean is denoted by  $M$ , median by  $Mdn$ , effect size by  $r$  and z-scores by  $z$ . Statistics were recorded in accordance with the recommendation of the American Psychological Association (APA), numeric values in the text are given with an accuracy of two decimal places.

## 4 Results and discussion

### 4.1 The trend of business processes outsourcing

The question "Where are the business processes of organizations performed and where will they be performed in the future" is divided into two sub-questions. The first sub-question is aimed at finding out about the current situation and the second at finding out about the future situation. The results of the frequency statistics are shown in Table 1. From them we can draw the following conclusions: organizations (1) most frequently retain Purchasing, Sales, HR and Finance; (2) most frequently choose Food service and Security for outsourcing; and (3) most frequently do not have Logistics and Food service in organizational structure.

From the frequency statistics, we can see that the occurrences of individual processes will not change significantly at the moment or in future. We can conclude that in the future we cannot expect any radical changes in the area of outsourcing. If we look only at the column 'Internally', we can see that the share of internal execution of processes will decrease for the processes; on the contrary, the share of process outsourcing will remain unchanged or will increase, which can be seen in the column 'Externally'. From this we can conclude that generally the share of BPO will increase. All these considerations are only valid for our sample and cannot be generalized to the entire population.

### 4.2 Choice of business processes for outsourcing

The answers to the first question are treated as nominal variables. Therefore, to determine the relationship between the current and future business processes performance of processes, we use the Wilcoxon's signed ranks test (Table 2). Outsourcing of Quality, HR, IT and After-sales will increase the most over the next three years; and Logistics, Food service and Security the least in the same period. All processes have a dominant positive rank, which means that the level of outsourcing will further increase in the future. On the contrary, processes with a dominant negative rank will experience a decline in the level of outsourcing – there are no such processes in our case.

Table 1: Frequency statistics where a process is performed and where it will be performed

| Process           | Current / Future | Internally [%] | Partly [%] | Externally [%] | N/A [%] |
|-------------------|------------------|----------------|------------|----------------|---------|
| 01) Purchasing    | C                | 90.0           | 8.8        | 1.3            | 0       |
|                   | F                | 83.8           | 15.0       | 1.3            | 0       |
| 02) Sales         | C                | 88.8           | 5.0        | 2.5            | 3.8     |
|                   | F                | 81.3           | 12.5       | 2.5            | 3.8     |
| 03) Manufacturing | C                | 73.8           | 22.5       | 0              | 3.8     |
|                   | F                | 67.5           | 27.5       | 1.3            | 3.8     |
| 04) Quality       | C                | 86.3           | 6.3        | 0              | 7.5     |
|                   | F                | 77.5           | 16.3       | 1.3            | 5.0     |
| 05) Maintenance   | C                | 50.0           | 41.3       | 7.5            | 1.3     |
|                   | F                | 38.8           | 51.3       | 8.8            | 1.3     |
| 06) HR            | C                | 90.0           | 7.5        | 2.5            | 0       |
|                   | F                | 76.3           | 21.3       | 2.5            | 0       |
| 07) Finance       | C                | 92.5           | 5.0        | 2.5            | 0       |
|                   | F                | 81.3           | 15.0       | 3.8            | 0       |
| 08) R&D           | C                | 73.8           | 18.8       | 1.3            | 6.3     |
|                   | F                | 68.8           | 23.8       | 1.3            | 6.3     |
| 09) IT            | C                | 39.2           | 50.6       | 10.1           | 0       |
|                   | F                | 28.8           | 58.8       | 12.5           | 0       |
| 10) Logistics     | C                | 32.5           | 50.0       | 5.0            | 12.5    |
|                   | F                | 30.0           | 50.0       | 7.5            | 12.5    |
| 11) After-sales   | C                | 73.4           | 17.7       | 3.8            | 5.1     |
|                   | F                | 60.8           | 30.4       | 3.8            | 5.1     |
| 12) Legal service | C                | 36.3           | 31.3       | 28.8           | 3.8     |
|                   | F                | 27.5           | 38.8       | 30.0           | 3.8     |
| 13) Food service  | C                | 18.8           | 5.0        | 56.3           | 20.0    |
|                   | F                | 16.3           | 7.5        | 56.3           | 20.0    |
| 14) Security      | C                | 7.5            | 23.8       | 61.3           | 6.3     |
|                   | F                | 6.3            | 22.5       | 63.8           | 6.3     |

The rates of the current outsourcing of HR, Quality and After-sales are low, therefore it will come to an increase in the future. The rate of IT outsourcing is high and will increase further in the future. For this reason IT takes a special place, which is also confirmed by Brown and Wilson (2005). The share of services sector in the economy being on the increase, so is service outsourcing within the BPO. In this way we can talk about the transition of BPO into Knowledge Process Outsourcing (KPO), as the outsourcing of activities that require a higher level of knowledge, experience and education is on the increase (Aranha & Wheelwright, 2007). In contrast, the level of outsourcing of Food service, Security and Logistics will increase minimally, since they already have the highest rate. Wilcoxon's signed ranks test of Food service is written in the following form: current situation of outsourcing ( $M = 1.98$ ,  $Mdn = 3.00$ ) will not significantly increase in the future ( $M = 2.00$ ,  $Mdn = 3.00$ ),  $z = -1.41$ ,  $p > 0,05$  – the difference is not significant,  $r = 0.37$ . Similar statistics can also be written for all other processes. The differences for R&D, Food service, Security and Logistics are not significant, differences for other processes are statistically significant, i.e. there

is 95% reliability that the degree of outsourcing of most processes will increase in the next three years. The hypothesis – the rate of business process outsourcing will increase in Slovenian organizations over the next three years – is thus confirmed. As organizations are aware of the importance of strategic position in global supply chains, they more and more often opt for business process outsourcing (Chandraprakaikul, Baines & Lim, 2010). Also other authors have come to the same conclusion about the increase in BPO market (Duan, Grover & Balakrishnan, 2009; Weerakkody & Irani, 2010).

A decline in the level of outsourcing is in most cases due to negative experiences with suppliers. This confirms the fact that the implementation of BPO is a very demanding project. Even more complex is everyday management of relations between the organization and suppliers. Lack of precise and detailed collaboration specification result in negative experiences and suspension of cooperation. Gorla in Lau (2010) note that negative experiences from the past have a negative influence on future decisions; (1) supplier competencies and loss of control have a direct influence; and (2) supplier infrastructure

Table 2: Wilcoxon's signed ranks test between current and future performance of processes

| Future vs. Current | Negative Ranks [n] | Positive Ranks [n] | Ties [n] | Total [n] | Wilcoxon's Test |      |
|--------------------|--------------------|--------------------|----------|-----------|-----------------|------|
|                    |                    |                    |          |           | za              | Sig. |
| 01) Purchasing     | 0                  | 5                  | 75       | 80        | -2.24           | 0.06 |
| 02) Sales          | 0                  | 6                  | 74       | 80        | -2.45           | 0.03 |
| 03) Manufacturing  | 1                  | 7                  | 72       | 80        | -2.12           | 0.07 |
| 04) Quality        | 0                  | 10                 | 70       | 80        | -2.97           | 0.00 |
| 05) Maintenance    | 0                  | 9                  | 71       | 80        | -2.89           | 0.00 |
| 06) HR             | 0                  | 11                 | 69       | 80        | -3.32           | 0.00 |
| 07) Finance        | 0                  | 9                  | 71       | 80        | -2.89           | 0.00 |
| 08) R&D            | 1                  | 5                  | 74       | 80        | -1.63           | 0.22 |
| 09) IT             | 1                  | 10                 | 68       | 79*       | -2.14           | 0.04 |
| 10) Logistics      | 0                  | 4                  | 76       | 80        | -2.00           | 0.12 |
| 11) After-sales    | 0                  | 10                 | 69       | 79*       | -3.16           | 0.00 |
| 12) Legal service  | 0                  | 7                  | 73       | 80        | -2.53           | 0.02 |
| 13) Food service   | 0                  | 2                  | 78       | 80        | -1.41           | 0.50 |
| 14) Security       | 1                  | 4                  | 74       | 79*       | -1.34           | 0.37 |

Notes: \*: missing data, a: based on negative rang, Negative Ranks: future < current, Positive ranks: future > current, Ties: future = current

and behaviour, and competencies inside the organization have an indirect influence.

## 5 Conclusions

Business process management and business process outsourcing are becoming increasingly important in helping organizations increase effectiveness and efficiency. In addition to processes, employees are very important as well. How to choose the right processes for outsourcing is a delicate choice, and educating the employees is very demanding. Failures of BPO are the consequence of mistakes in the organization, mistakes of the supplier and mistakes in the relations between the two of them.

BPO has been evolving for the last twenty years. Myths that some processes are not suitable for outsourcing are being dispelled. Some organizations are choosing to outsource supporting processes, other primary process, some also core business. The BPO market will grow in the future. However, outsourcing is a very difficult process and many attempts are not successful. In the process of outsourcing we have to pay attention to: (1) thoroughly planning the introduction of outsourcing; and (2) constantly attending to relations with suppliers.

With the hypothesis – the level of business process outsourcing will increase in Slovenian organizations over the next three years – we have confirmed that Slovenian organizations are following developments in the global markets and adapting to new economic realities. Most organizations will increase the level of outsourcing and also the level of outsourcing will increase for the majority of business processes. Processes with the largest BPO increases in the future are Quality, HR, IT and After-sales; consequently Logistics, Food service and Security

will not increase significantly in the future. This will lead to great organizational changes in organizations. Organizations will use all available means to increase efficiency and effectiveness in the future, including business processes outsourcing. This research demonstrates that the BPO in the Slovenian market will grow in the future.

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## Perspektiva zunanjega izvajanja poslovnih procesov v slovenskih organizacijah

Menedžment poslovnih procesov (BPM) in zunanje izvajanje poslovnih procesov (BPO) imata pomembno vlogo v organizacijah za zagotavljanje konkurenčnosti in konkurenčnih prednosti ter za povečevanje uspešnosti in učinkovitosti. Z raziskavo analiziramo vlogo zunanjega izvajanja v slovenskih organizacijah. Z anketo pridobljene podatke interpretiramo z opisno statistiko, frekvenčno statistiko in Wilcoxonovim testom za parne vzorce. Z rezultati statistične analize z 95 % verjetnostjo napovemo, da se bo stopnja zunanjega izvajanja poslovnih procesov v slovenskih organizacijah povečala in da to velja za večino poslovnih procesov. Tako lahko zaključimo, da slovenske organizacije sledijo trendom na globalnih trgih in se le-tem tudi prilagajajo.

**Ključne besede:** menedžment poslovnih procesov, zunanje izvajanje poslovnih procesov, BPO, menedžment, proces



# Dodatek

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# Prenos znanja skozi perspektivo teorije družbene menjave

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V članku avtorja raziskujeta proces prenosa znanja v organizacijah. Organizacije danes posvečajo veliko pozornosti upravljanju znanja, kjer pa procesi ne tečejo vedno tako kot je bilo pričakovano. Raziskovalci so odkrili različne dejavnike, ki zavirajo procese prenosa znanja. Pričujoči članek se ukvarja z (ne)pripravljenostjo posameznikov, da bi prenašali znanje na sodelavce. Avtorja analizirata proces prenosa znanja kot proces družbene menjave. Razlikujeta med družbeno in ekonomsko menjavo in razkrivata, da je družbena menjava med posamezniki lahko neinstitucionalizirana, kjer vsi procesi potekajo spontano ali pa je institucionalizirana, spremljana s pravili in normami ter vrednotami, ki jih v te namene spodbuja organizacija. Osnovni namen avtorjev je bil izdelati konceptualni okvir za koherentno povezavo mikro in makro ravni pri obravnavi procesov prenosa znanja v organizaciji. Teorija družbene menjave omogoča pojasnitev predpostavk delovanja posameznika, ki se jih je v dosedanjih raziskavah upravljanja znanja ni raziskovalo.

**Ključne besede:** delitev znanja v organizacijah, družbena menjava, (ne)institucionalizirana družbena menjava.

## 1 Uvod

Prenos znanja v organizacijah je po mnenju mnogih raziskovalcev, analitikov in praktikov eden najbolj kritičnih elementov procesa upravljanja znanja (Blankenship, Ruone, 2009). Večina se tudi strinja, da ne razumemo dobro kako posamezniki prenašajo znanje v organizaciji. Prav tako pa niso jasni vsi dejavniki, ki posredujejo v tem procesu in pa predvsem kakšna je njihova vloga. Od začetne usmeritve v raziskovanju, ki je poudarjala predvsem vlogo tehnologije v prenosu znanja, se je pozornost počasi usmerila na družbene odnose v katerih se znanje prenaša. V zadnjem desetletju je zanimanje za odkrivanje ovir in pospeševanje pretoka znanja po organizaciji zelo narastlo. Kljub vsej intenzivnosti pa je raziskovanje v določeni meri enostransko. Največkrat je način za pojasnitev ovir in spodbud obravnavan zgolj na vedenjski – empirični ravni, brez da bi se avtorji spraševali o predpostavkah, ki vedenje posameznikov modelirajo oziroma določajo. S tega vidika menimo, da je takšno raziskovanje, ki nima teoretične osnove, prešibko. V pričujočem članku želimo preseči ta omejen doseg obstoječih empiričnih raziskav in podati naš pogled na prenos znanja v organizaciji. Izhajamo iz teorije družbene menjave, ki v sebi nosi potencial za razjasnitev predpostavk o tem, kako posamezniki ravna v določenih situacijah in kaj jih pri tem ravnanju vodi.

V pričujočem besedilu bova najprej pokazala ugotovitve raziskovalcev, ki odkrivajo, kako potekajo procesi prenosa znanja v organizacijah. Nato bova identificirala najpogostejše ovire, ki se pojavljajo v teh procesih. V nadaljevanju bova

predstavila teorijo družbene menjave in procese prenosa znanja. Naša osnovna teza je, da imajo v naših organizacijah procesi prenosa znanja obliko neinstitucionalizirane menjave, kar precej zavira pretok znanja po organizaciji. Naše stališče je, da je treba prenos znanja iz ravni neinstitucionalne menjave dvigniti na raven institucionalne menjave, ki bo bolj učinkovita, stabilna, urejena in bo tudi trajnejša. Prepričani smo, da lahko z izdelavo koherentnega okvira v katerem poteka interakcija obeh ravni (mikro torej ravni posameznika in makro torej kolektivne oziroma organizacijske ravni) do določene mere odkrivamo mehanizme procesov menjave, posredovanja in pretoka znanja v organizaciji. Kajti teorija družbene menjave s pojasnitvijo temeljnih predpostavk delovanja posameznika razkriva nevidne in implicitne družbene norme, ki usmerjajo delovanje posameznikov. Z razkrivanjem teh predpostavk lahko bolje razumemo mehanizme in dinamiko prenosa znanja v organizaciji. Namen tega prispevka je razviti konceptualen okvir, ki bo uspel integrirati mikro in makro raven obravnave prenosa znanja v organizaciji in povezati različne teoretične perspektive in različne ravni analize v enoten koherenten okvir.

Zavedava se, da teorija družbene menjave ne pojasni celotne kompleksnosti procesov prenosa znanja v organizaciji. Njena prednost pa je v tem, da razjasni predpostavke delovanja posameznikov v organizaciji in tako premakne obravnavo problema prenosa znanja iz čisto empirične ravni na bolj kompleksno raven obravnave.

## 2 Proces prenosa znanja v organizacijah

Zaradi prepričanja, da sta ustvarjanje in prenos znanja bistvena za dolgoročno organizacijsko učinkovitost, se vse bolj povečuje interes za samo upravljanje znanja. Upravljanje znanja definiramo kot proces, s katerim organizacija ustvarja, zajema, pridobiva in uporablja znanje, zato da bi vzdrževala in izboljševala učinek organizacije (Nonaka in Takeuchi, 1995). Različni avtorji razpravljajo o specifičnih procesih, ki so povezani z upravljanjem znanja. Seng et al. (2002) so razvili pet stopenj v procesu upravljanja znanja: a) *zajemanje znanja* je razumljeno kot zabeleženi koraki, ki so vključeni v reševanje problema; b) *skladičenje znanja* je razumljeno kot hranitev zajetih informacij v bazah podatkov, skladiščih, aplikacijah ali kakšnemu drugemu produkcijskemu sistemu; c) *procesiranje znanja*, ki vključuje razvrščanje, filtriranje, organiziranje, analiziranje, primerjanje in iskanje znanja; d) *prenos znanja*, ki zajema distribucijo skozi informacijske sistema ali skozi osebno interakcijo, sočasno ali zaporedno; e) *uporaba znanja*, ki pomeni reševanje problemov z namenom doseganja ciljev organizacije.

Upravljanje znanje je hkrati cilj in proces. Kot cilj, trdita Bollinger in Smith (2001), je upravljanje znanja popolnoma osredotočeno na prenos znanja in informacij v korist organizacije. Zato je od zgoraj naštetih stopenj procesa upravljanja znanja, četrta stopnja, to je prenos znanja pritegnil največ pozornosti raziskovalcev. Sveiby (2007) je definiral devet ravnih transferja znanja v organizaciji in sicer od prenosa znanja med posamezniki, prenosa znanja od individualnih k eksternim strukturam in v obratni smeri, prenosa znanja od individualnih kompetenc v interno organizacijsko strukturo in obratno, do prenosa znanja po interni strukturi in v eksterno strukturo in obratno in do prenosa znanja po eksterni strukturi in v interno strukturo ter v obratni smeri. V našem prispevku se bomo ukvarjali le s prenosom znanja med posamezniki v organizaciji.

Empirična evidenca, ki se je razvila v zadnjem desetletju na področju upravljanja znanja, se je ukvarjala s prenosom znanja iz različnih perspektiv. Velika večina raziskav se je ukvarjala s problemom ovir (Dixon, 2000; Cabrera et al., 2006; Sveiby, 2007). Naslednji močan interes se je oblikoval pri proučevanju motivacije zaposlenih za prenos znanja in vlogo upravljanja s človeškimi viri v organizaciji, ki pospešujejo ta prenos (Minbeava, 2005).

Minbaeva (2005) je preučevala dejavnike, ki spodbujajo možnost sprejemanja znanja in tudi okolje, ki podpira prenos znanja. (1) Zmožnost sprejemanja znanja vključuje tako posameznikovo sposobnost kot tudi motivacijo. (2) Dejavniki, ki vplivajo na sprejemanje znanja pa so: a) predhodno znanje prejemnikov in b) intenzivnost navora, ki ga pri tem vložijo zaposleni. Obstaja namreč veliko dokazov, ki kažejo na to, da vlaganje v izobraževanje zaposlenih poveča človeški kapital organizacije, ki ima kasneje pozitiven učinek na uspešnost organizacije.

Najpomembnejši vpliv izobraževanja in usposabljanja raziskovalci ugotavljajo na rast človeškega kapitala, ki je neposredno povezan s kvaliteto delovne sile. Usposabljanje in izobraževanje zaposlenih je ključnega pomena za organizacije

zaradi potreb po novih in izrazito kompleksnih sposobnostih in veščinah, ki jih narekuje globalna konkurenca, spremembe v tehnologiji in organizacijskih strukturah. Bessant in Venables (2008) dokazujeta, da se je v 21. stoletju zgodil preobrat v gospodarstvu, v katerem se "bogastvo ustvarja preko znanja". OECD ocenjuje, da se približno en biljon \$ vsako leto porabi (v javnem in privatnem sektorju) za ustvarjanje novega znanja, ki razširja meje in ustvarja prebojni tehnološki napredek.

Mnogo raziskav je iskalo in našlo povezavo med različnimi praksami usposabljanja in izobraževanja in različnimi merami organizacijske uspešnosti (Becker in Huselid, 1998). Vse seveda niso našle močne in pozitivne povezanosti vendar na splošno velja, da ta obstaja (Cunha et al., 2003; Nikandrou et al., 2008). Nikandrou et al. (2008) so dokazali mnogo dejavnikov, ki posredujejo v razmerju med usposabljanjem, izobraževanjem in uspešnostjo organizacije kot so na primer kulturni, institucionalni in organizacijski dejavniki. Toda intenzifikacija globalne konkurence in relativen uspeh gospodarstev, ki dajejo poudarek na investicije v izobraževanje, je rezultirala v spoznanju pomembnosti izobraževanja in usposabljanja v zadnjih letih. Praktiki upravljanja s človeškimi viri poročajo, da je izobraževanje in usposabljanje eden največjih izzivov za njih v prehodu v novo tisočletje (Nikandrou et al., 2008).

Blacker (2004) trdi, da obstajajo različne vrste organizacij, odvisno od tega ali je znanje v njih "utelešeno" (embodied), "vtisnjeno" (embedded), "intelektualizirano" (en-brained) ali "kulturno integrirano" (culturally integrated). 1. Nekatere organizacije so odvisne od strokovnjakov in se naslanjajo na "utelešeno" (embodied) znanje svojih ključnih članov. V teh organizacijah je učinkovitost strokovnjakov ključna. Primer takih organizacij so bolnišnice. Njihov osnovni problem je narava in razvoj individualnih kompetenc. 2. Druge so organizacije, ki so rutinirane znanjske organizacije in so močno odvisne od znanja opredmetenega (embedded) v tehnologijah, pravilih in postopkih. Te organizacije so tipično kapitalsko, tehnološko in delovno intenzivne. Strojne birokracije so tipičen primer. Najpomembnejši problem s katerim se soočajo je razvoj računalniško integriranih sistemov. 3. Organizacije, ki so odvisne od zaposlenih, ki analizirajo simbole, se močno naslanjajo na "intelektualizirano" (en-brained) znanje in veščine ključnih članov. Podjetniško reševanje problemov in manipulacija s simboli je ključna veščina v takšnih organizacijah. Primer takšne organizacije je znanjsko intenzivno podjetje kot na primer računalniško svetovanje. 4. Komunikacijsko intenzivne organizacije pa so močno odvisne od "kulturno integriranega" (culturally integrated) znanja in skupnega razumevanja. Ustvarjanje znanja v inovativno integrirani proizvodnji je ključni problem takšnih organizacij. Adhokracija je klasičen primer te vrste organizacij.

Pri tem pa je pomembno razumeti, da ne glede na to, za kakšno vrsto organizacije gre, je pomemben individualni napredek v veščinah posameznih članov organizacije. Tudi Lamova (2000) je naprej razvila tipologijo organizacijskih struktur predvsem s stališča prenosa znanja. Lamova (2000) je ugotovila, da je treba pri prenosu znanja biti pozoren na tip znanja, ki ga je potrebno prenašati in še posebej, je to pomembno, če upoštevamo tip organizacije, ki so zelo odvisne od svojih znanjskih delavcev. Zaradi različne vloge

svoje znanja v organizaciji in različne stopnje avtonomije pri uporabi znanja, imajo zaposleni različna stališča kdaj in zakaj ter komu posredovati določeno znanje. Ravno zaradi tako oblikovanih stališč Lamova in Lambermont-Ford (2010) ugotavljata, da je potrebno zaposlene različno motivirati z različnimi motivatorji, da bodo ti pospeševali transfer znanja in ne njegovo kopičenje.

Vendar Minbeava (2005) tudi opozarja, da rigidne organizacijske strukture postavljajo ovire za pretok znanja. Z vpeljevanjem organizacijskih praks, ki odstranjujejo tradicionalne meje, »topijo« birokratske strukture lahko organizacije oblikujejo okolje, ki pospešuje pretok znanja.

Da procesi prenosa znanja v organizacijah ne dosejajo optimalnih rezultatov pričajo naslednji argumenti: Ruggless (1998) je raziskoval 431 ameriških in evropskih organizacij in našel pomembne ovire, ki preprečujejo prenos znanja. Riege (2005) in Sveiby (2007) sta identificirala ovire pri prenosu znanja. Kontekst delitve znanja, to je kulturo in klimo v organizaciji, so raziskovali Al-Alawi et al. (2007). Organizacijske značilnosti (kot so velikost, starost, strukturo in obliko), ki vplivajo na proces prenosa znanja je proučeval Ruggless

(1998). Družbene vezi in zaupanje v procesih prenosa znanja pa Yang in Chen (2007) in van Wijk et al. (2008).

Riege (2005) je našel 39 ovir pri večini avtorjev, ki so raziskovali procese, ki ovirajo prenos znanja. Ločil je organizacijske probleme (kot na primer pomanjkanje strategije za upravljanje znanja, ustreznega vodenja, odsotnost primernih prostorov in časa, zaviralna kultura, pomanjkanje nagrad in spodbud, visoka kompetitivnost med zaposlenimi); probleme, ki izvirajo iz posameznikov (nizka ozaveščenost glede vrednosti znanja, razlike med posamezniki, pomanjkljive veščine komuniciranja, zadrževanje znanja in prepričanje, da je znanje moč, strah pred izgubo delovnega mesta, pomanjkanje zaupanja); in tehnološke ovire (kot na primer neučinkovita IT podpora).

Sveiby (2007) je identificiral 91 problemov, ki negativno vplivajo na procese znanja v organizaciji. In sicer: mentaliteta funkcionalnih delitev znotraj organizacij (11,1%); tehnološki problemi (7,8%); nezainteresiranost vodstva za procese delitve znanja v organizaciji (7,6%); mentaliteta, da je zadrževanje znanja moč posameznika v organizaciji (6,0%); neobstoje formalnih pravil in postopkov za delitev znanja 5,0%; pomanjkanje časa 4,5%; neizpolnjevanje obljubljenega s strani vodstva

Tabela št. 1: Dejavniki in ovire pri prenosu znanja v organizaciji

| Dejavniki in ovire pri prenosu znanja v organizaciji                   |   |  |
|--|---|--|
| Dejavniki na organizacijski ravni                                      | Dejavniki na ravni posameznika  | Dejavnik znanja samega   |
| kultura, klima, Al-Alawi et al. (2007), Ruggless (1998), Hislop (2005) | Znanje je moč posameznika, Sveiby (2007)                                  | eksplicitno znanje Nonaka in Takeuchi (1995)                               |
| velikost, starost, strukturo in obliko organizacije Ruggless (1998)    | dovzetnost za znanje Darroch (2003)                                       | implicitno znanje Nonaka in Takeuchi (1995), Lam in Lambermont-Ford (2010) |
| družbene vezi in zaupanje Yang in Chen (2007), van Wijk et al. (2008)  | motivacija Sveiby (2007), Cook, Cook 2005), Lam in Lambermont-Ford (2010) | negotovost, utelešenje, opredmetenje, izražanje Yand in Chen (2007)        |
| komunikacijska tehnologija Ruggless (1998), Sveiby (2007)              | stališča Bock in Kim(200), Cabrere in Cabrera, (2006)                     |  |
| sistem nagrajevanja Ruggless (1998)                                    | osebnostni tipi Cabrera et al. (2006)                                     |  |
| fluktuacija Ruggless (1998)  |   |  |
| birokratske ovire Sveiby (2007)  |   |  |
| nezainteresiranost vodstva Sveiby (2007)                               |   |  |
| neobstoje formalnih pravil in postopkov Sveiby (2007)                  |   |  |
| pomanjkanje časa Sveiby (2007), Riege (2005)                           |   |  |
| pomanjkanje podpore Sveiby (2007), Riege (2005)                        |   |  |
| organizacijska struktura, Lam (2000)                                   |   |  |

(3,7%); pomanjkanje podpore s strani vodij (3,0%) in odpor vodij do sprememb (1,9%).

V tabeli 1 prikazujemo dejavnike in ovire, ki so jih v zadnjih desetih letih raziskovali na področju prenosa znanja.

Če analiziramo kateri dejavniki so močnejše zastopani v literaturi o procesih posredovanja znanja, nam tabela 1 pokaže, da je primat pozornosti in raziskovanja dejavnikov prenosa znanja v organizaciji pridobila makro raven obravnave tega procesa - torej organizacijska raven. V procesih posredovanja znanja v organizacijah je bila obravnavana tudi mikro raven torej raven posameznika. Vidimo lahko, da so se raziskovalci ukvarjali z motiviranostjo posameznika za prenos svojega znanja. Tudi stališča posameznika so pomemben dejavnik prenosa znanja (Bock in Kim, 2002). Stališče posameznika, ki vključuje prepričanje, da drugi v organizaciji (sodelavci in vodje) pričakujejo, da bodo zaposleni prenašali svoje znanje na druge, je lahko pomemben dejavnik pospeševanja procesov prenosa znanja v organizaciji. Prav tako je pomembno prepričanje posameznikov ali lahko pričakujejo recipročnost s strani drugih, torej, da bodo tudi drugi v organizaciji prenašali svoje znanje in da ne bodo kopicili znanja samo zase. Nekateri posamezniki pa so kot osebnosti bolj nagnjeni k posredovanju znanja kot drugi (Cabrera et al., 2006).

V razpravi o dejavnikih, ki pospešujejo prenos znanja v organizaciji je očitno, da obstaja nekaj zadrege, ker manjka določen člen v razlagi med organizacijskimi in individualnimi dejavniki posredovanja znanja v organizaciji. Nekateri avtorji trdijo, da so to prakse upravljanja s človeškimi viri, ki bi te dejavnike spravile v konsistenten okvir. Da bi spodbudili pretok znanja znotraj organizacije se veliko organizacij odloča za uvedbo praks upravljanja s človeškimi viri, ki olajšajo prenos znanja. Darroch (2003) je analizirala prakse in vedenje zaposlenih pri upravljanju znanja. Merila je pridobivanje, shranjevanje, razširjanje in uporabo znanja. Oltra (2005) je ugotovil, da prakse upravljanja s človeškimi viri pozitivno vplivajo na uspešnost upravljanja znanja. Ugotovil pa je tudi, da ni toliko pomembno odkriti idealne prakse za upravljanje znanja kot to, da morajo biti prakse med seboj usklajene in z zahtevami industrije, poslovno strategijo in značilnosti delavcev znanja.

Če pogledamo tabelo 1 vidimo, da so avtorji pretežno obravnavali makro (kolektivne, organizacijske) dejavnike procesa prenosa znanja v organizaciji. Veliko manj pa je obravnavane mikro ravni teh procesov. Zato bomo v nadaljevanju našo pozornost usmerili na mikro raven procesa prenosa znanja v organizaciji. Ne gre le za to, da je raven posameznika premalo proučevana, gre tudi za to, da je obravnavana na zelo specifičen način. Posameznik je obravnavan na način, da je akter, ki je samo del določene situacije in ki se sooča s dejavniki v situaciji. Torej je del sistema nagrajevanja, del organizacijske strukture, del organizacijske kulture. Je del situacije in nanjo reagira na določen način. Razlaga v teh pristopih gre v smeri: bolj ko bo posameznik nagrajen za prenos znanja, bolj bo pripravljen znanje prenašati in več ga bo delil s sodelavci v organizaciji. V omenjenih raziskavah pa sam koncept posameznika ni bil obravnavan v zadostni meri. Naš namen v pričujoči obravnavi je prav ta, da si zastavimo vprašanje, kakšna je narava posameznika v procesih prenosa znanja v organizaciji. Kakšna so pravila, norme, ki iz ozadja vplivajo na to, kako se posameznik obnaša in deluje v teh procesih.

Nekateri avtorji kot na primer (Cabrera in Cabrera, 2005; Wilkesmann et al., 2009; Antal in Richebe, 2009) so začeli analizirati različne teorije kot so teorija družbenega kapitala, teorije družbene dileme in teorija družbene menjave, ki razlagajo družbeno dinamiko prenosa znanja s stališča posameznika. Vendar je bil to le začetek, ki ni prinesel obsežnega analitičnega poizkusa razlage narave delovanja posameznika. Večina teh prispevkov se je osredotočila na teoretično perspektivo, ki razlaga stališča posameznika do prenosa znanja skozi teorijo racionalnega delovanja in teorijo družbene dileme. Po tej teoriji je znanje posameznika najprej razumljeno kot privatno dobro, kjer posameznik znanje ne želi prenašati, saj se znanje oplaja v organizaciji brez, da bi posameznik moral sodelovati pri ustvarjanju znanja. Lahko pa ima koristi od organizacijskega znanja. Cabrera in Cabrera (2002) ugotavljata, da to lahko vodi k oportunističnemu vedenju in učinku »prostega strelca«, kajti obstaja možnost imeti korist, ne da bi zato kaj prispeval. Stroški posameznika niso samo v tem, da mora z znanjem prispevati čas in napor, stroški so tudi v tveganju, da ob tem, ko posameznik prispeva svoje znanje lahko izgubi priložnost za napredovanje. S svojim znanjem je lahko omogočil napredek drugim in tako izgubil prednost v konkurenčni tekmi z drugimi v organizaciji. Lamova govori o »strahu pred izgubo individualne vrednosti posameznika za organizacijo« (Lam, 2010). Na drugi strani tudi Hislop (2005) opozarja, da je znanje moč posameznika in ker je organizacija hierarhičen sistem, je zato prenos znanja v organizaciji vedno težko spodbuditi.

V našem prispevku je prenos znanja v organizaciji opredeljen in proučevan skozi proces družbene menjave v katerem sodelujejo zaposleni. Prepričani smo, da bo teorija družbene menjave pojasnila procese prenosa znanja v organizaciji saj bo osvetlila izhodišče tako glede vedenjskih kot tudi kognitivnih predpostavk, ki vodijo posameznika pri delovanju.

Teorija družbene menjave je za analizo procesov prenosa znanja v organizaciji koristna saj omogoča vpogled, v

- razloge, zakaj ljudje prenašajo znanje,
- to koliko znanja prenesejo drugim,
- to koliko časa prenašajo znanje in
- to, kaj lahko organizacije storijo, da pospešijo procese prenosa znanja.

V nadaljevanju bomo analizirali izhodiščne teoretične predpostavke in razložili razliko med ekonomsko menjavo in družbeno menjavo in tako tudi opredelili različno razumevanje posameznika v procesih menjave, ki ga zastopajo dve disciplini, na eni strani ekonomija in na drugi strani sociologija. Razlike so ključne, saj nam šele odkrivanje razlik v razumevanju posameznika in njegovega delovanja pokaže način, ki ga lahko uporabimo, da bi v organizaciji sprostili in morda celo pospešili posredovanje znanja. Teorija družbene menjave omogoča okvir, kjer lahko razmišljamo o prenosu znanja kot o obliki sodelovanja v organizaciji, ki presega zgolj tržne, transakcijske odnose. Kajti teorija menjave je že v preteklosti identificirala tihe in nevidne družbene norme, ki so osnova za menjalne procese. Razumeti te norme, ki so netržne narave in so hkrati bistveni element za učinkovito delovanje modernih organizacij, pomeni korak bližje k razumevanju mehanizmov,

ki delujejo v ozadju procesov upravljanja znanja v organizaciji. V tem vidimo glavni doprinos našega prispevka.

### 3 Ekonomska in družbena menjava

Kljub temu da organizacije delujejo v gospodarski sferi kot gospodarske enote, je očitno, da postopki, ki potekajo znotraj njih, presegajo okvire zgolj ekonomske menjave.

Blau (1964) je definiral glavno razliko med družbeno in ekonomsko menjavo. Ekonomska menjava temelji na zasebnih podjetjih in različnih enotah, ki so na voljo na trgu in je dosegljiva vsakemu, ki lahko kupi izdelke po ceni, ki jo določata ponudba in povpraševanje. Kupci se za ceno lahko pogajajo. Plačilo za blago je pravno zagotovljeno in opredeljeno v enotah, času in prostoru. Glavna razlika med ekonomsko in družbeno menjavo je obstoj »neopredeljenih obveznosti« v družbeni menjavi. Družbena menjava ne vključuje natančno definirano plačilo za blago ali storitev. Družbena menjava vključuje menjavo storitev med akterji, ki tvorijo »difuzijo obveznosti v prihodnosti« in ni natančno definirana tako kot je to v ekonomski menjavi. Povračilo v družbeni menjavi ni ne količinsko, ne časovno niti prostorsko opredeljeno.

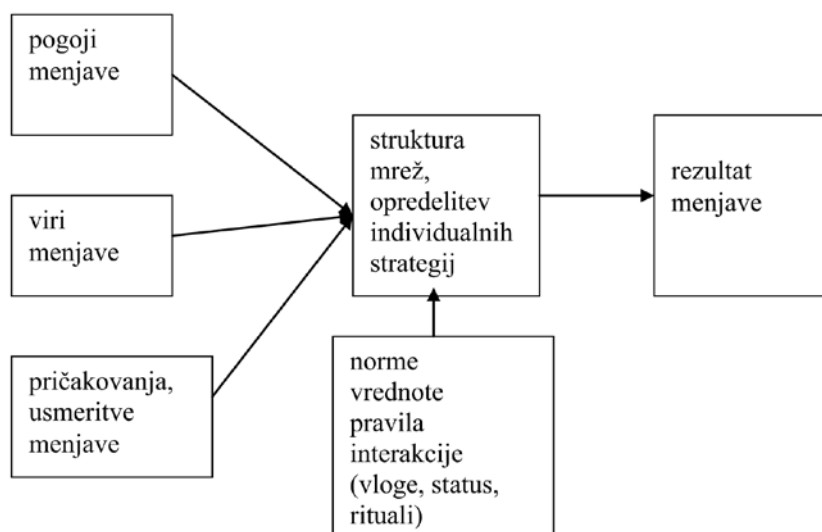
Druga razlika med družbeno in ekonomsko menjavo je v tem, da v družbeni menjavi »povračilo ni stvar pogajanj, temveč je v domeni osebe, ki daje« (Blau, 1964:13). Od posameznika je odvisno kako bo obveznosti poravnal. To je njegova diskrecijska pravica. V splošnem je družbena menjava, v primerjavi z ekonomsko menjavo, manj natančno definirana in poteka med akterji v manjšem številu. Da bi razjasnili in bolj natančno definirali sam potek družbene menjave, smo se odločili, da je to potrebno bolj natančno pogledati, saj nam bo lahko izhodišče za razumevanje procesov posredovanja znanja v organizaciji. Takšno razumevanje pa zagotavlja boljše osnovo za oblikovanje primernih praks in sistemov za prenos znanja v organizaciji.

Družbena menjava v organizaciji poteka v organizacijskem kontekstu, ki je v splošnem zelo konkurenčno in hierarhično okolje. Zaposleni kot posamezniki ali skupine, timi ali oddelki tekmujejo za vire, na drugi strani pa morajo med sabo tudi sodelovati, da dosežejo zastavljene cilje. V takšni situaciji je prenos znanja del procesa menjave, kjer je znanje pomemben vir. Prenos znanja v organizaciji ima ozadje, kjer posamezniki tehtajo svoje sedanje, bodoče koristi (nagrade) in stroške vendar natančni izračuni in izbira niso določeni.

V splošnem prenos znanja poteka pod pogoji, ki jih želijo člani menjave nadzorovati. Ljudje vstopajo v razmerja z drugimi, da dobijo vire, ki jih drugi nadzorujejo. V procesu družbene menjave zaposleni menjajo različne vire: materialne (plača in nagrade) in simbolne vire (informacije, znanje, napor, moč, spoštovanje, pripadnost, zaupanje, sankcije, varnost in emocije itd.). V procesu menjave so vedno prisotna pričakovanja posameznikov (Etzioni, 1975). Slika 1 prikazuje omenjeni proces družbene menjave.

Slika 1 prikazuje, da menjava poteka v določenih pogojih, udeleženci v procesu menjave menjajo vire, ki jih nadzorujejo/posedujejo. V procese menjave ljudje vstopajo z določnimi pričakovanji in vzpostavljenimi odnosi. Pričakovanja posameznikov so lahko osnova za oblikovanje individualnih strategij menjave. Pri procesu menjave pa se morajo posamezniki držati pravil, če so oblikovana in norm, ki jih usmerjajo v menjavi. Rezultati menjave so učinki spleta vseh omenjenih dejavnikov.

V organizaciji obstaja več oblik menjave. Homans (1961:380) definira dve obliki obnašanja v procesu družbene menjave: neinstitucionalizirano in institucionalizirano oblike menjave. Prva je bolj enostavna, druga bolj kompleksna. V drugi obliki je menjava regulirana s pravili, vrednotami in normami medtem ko je prva oblika neregulirana, saj posamezniki iščejo zadovoljiv izid samo v medsebojni neposredni (diadni) menjavi. Homans (1961) vedenje v neinstitucionalni menjavi opredeli kot tisto, kjer posamezniki delujejo neposredno kot rezultat delovanja drugih in se ne menijo za pravila. Homans



Slika 1: Proces družbene menjave. Vir: lasten

(1961:4) pravi, da je pomembno vedeti »kako zaposleni pomagajo drug drugemu tudi kadar tega od njih ne zahtevajo pravila«. Prenos znanja v neinstitucionalizirani menjavi ima v organizaciji enako naravo. Dogaja se kot neinstitucionalno vedenje, ki ga ne regulirajo nobena pravila ali norme.

## 4 Prenos znanja v organizacijah kot institucionalni proces

Do sedaj je bil prenos znanja v naših organizacijah opredeljen kot neinstitucionalni proces, ki poteka v institucionalni praznini. Spontane transakcije med posamezniki v procesu menjave niso podvržene institucionalnim pritiskom (normam, pravilom) zato menjava poteka kot »čista oblika« (skupinska pomoč, reševanje problemov ali povezanost med zaposlenimi). Da lahko razumemo ta proces, moramo podrobneje opredeliti tudi proces družbene menjave v organizaciji.

V organizaciji s hierarhično strukturo obstaja najprej težnja po zadrževanju informacij (Berlogar, 1999). Vendar organizacija ni zgolj skupina posameznikov, ki želijo informacije obdržati zase. V organizaciji obstaja tudi veliko delovnih skupin in timov, ki sodelujejo pri doseganju skupnih ciljev, kar posledično oblikujejo težnja po prenosu in razširjanju informacij z drugimi člani v skupini in med skupinami. Posamezniki razširjanje in prenos informacij, znanj in mnenj potrebujejo razen za doseganje skupnih ciljev tudi za druge namene, kot je ohranitev skupnih tem, skupne definicije realnosti, potrebujejo ga za sinhronizacijo vrednot in ciljev v organizaciji ipd. – vse to zahteva izmenjavo informacij. Rečemo lahko, da v organizaciji obstajata dve nasprotni tendenci v procesu posredovanja znanja. Prva je tendenca zadrževanja znanja v hierarhični strukturi, ki je posledica dejstva, da je znanje moč in v organizaciji pomeni tovrstna moč izboljšanje razmerij moči v korist posameznika (ta tendenca s strani posameznika je popolnoma instrumentalna). Obstaja pa še druga tendenca po posredovanju znanja zaradi prvič, doseganja skupnih ciljev v organizaciji, timu.. (kar je zopet povsem instrumentalni motiv) in drugič, zaradi drugih družbenih motivov, kot so ohranitev skupnih tem, skupne definicije realnosti, vrednot, skupinske pripadnosti in identitete, povezanosti in ki jih v analizi procesa prenosa znanja ne smemo zanemariti.

Med člani in med skupinami v organizaciji obstaja t.i. mikro interakcijski prostor, kjer informacije in znanje predstavljajo sredstvo menjave. Veliko informacij, za katere ni potrebno veliko napora in stroškov, posameznik posreduje brezplačno. Za tiste informacije, ki zahtevajo veliko napora in visoke stroške za njihovo pridobitev pa so pod strogim nadzorom osebe, ki jih poseduje. To so pomembni, visoko vrednoteni viri, ki so pod strogim varstvom posameznikov. To imenujemo samo-ohranitveno vedenje v organizaciji (Morgan, 2005). Akter poseduje in vzdržuje »notranje domene« za svojo avtonomno uporabo (Goffman, 1997). Meje »varovanih domen« so pod nadzorom lastnika (posameznika), saj so pomembne za obstoj dobrih pogojev menjave v prihodnosti, v katere bo posameznik še vstopal. Akterji si namreč stalno prizadevajo za ohranitev recipročnosti in stabilnih pogojev menjave.

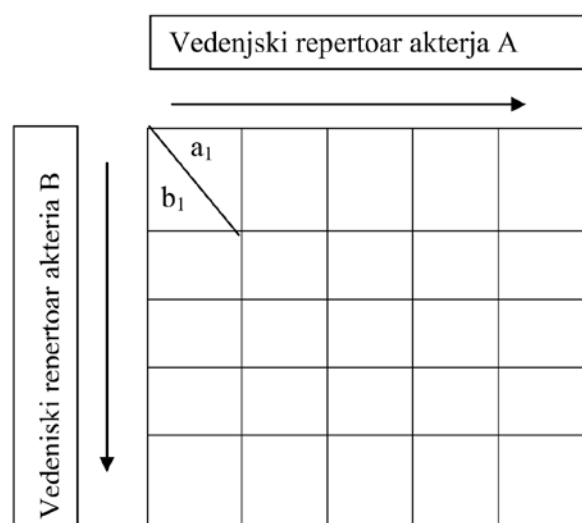
Zaposleni v organizaciji načeloma ne razdajo vsega svojega znanja, ker ne želijo sprejeti slabših pogojev menjave v prihodnosti. Uspešnost menjave je namreč povezana z dobrimi rezultati menjave. To so vredni menjalni izidi: na primer pridobitev tržnih ali simbolnih vrednosti (pridobitev nagrad, virov, ki so v posesti drugih, izboljšanje odnosov, pridobitev moči, zaupanja, varnosti, ohranjanja in pridobivanja priložnosti, pričakovane recipročnosti).

Z namenom, da organizacija vzpostavi dobre pogoje za posredovanje znanja, mora oblikovati prakse upravljanja s človeškimi viri, ki bodo zagotovile boljše nagrade za zaposlene, da bi prenašali vse potrebno znanje. S tem trenutno izboljšamo individualne menjalne izide. Če zaposleni pričakujejo, da lahko vstopijo v uspešen proces menjave, ki jim nekaj ponuja, bodo tudi raje sodelovali. V menjavi lahko posameznik pričakuje boljše plačilo, napredovanje, možnosti lastnega kariernega razvoja, ugled, spoštovanje, moč, pravico odločanja, sprejetje in naklonjenost s strani drugih, občutke povezanosti, identifikacije, pripadnosti itd.

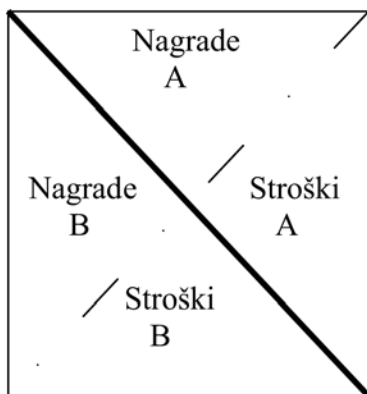
Homans (1961:61) pojasnjuje skrivnost človeške menjave. Meni, da akterji vstopajo v proces menjave pod naslednjimi pogoji:

1. Vsi morajo imeti nekaj, kar drugi v procesu nimajo, vendar potrebujejo;
2. Vsi posedujejo približno enake vrednote (skupno organizacijsko kulturo, ki je naklonjena posredovanju znanja - op. avtorja);
3. Vsi morajo pridobiti več kot posredujejo drugim, drugače menjava ne bo imela pomena in smisla za akterje in se ne bo zgodila.

Thibaut in Kelley (1959) trdita, da se bodo akterji v procesu menjave obnašali glede na razmerje med stroški in nagradami. Za ponazoritev sta oblikovala matriko vedenjske verige dveh akterjev v diadni menjavi (A in B predstavljata akterja).



Slika št 2: Matrika vedenjske verige akterja A in akterja B. Vir: Thibaut in Kelley (1959:14)



Slika 3: Matrika pričakovanih nagrad in stroškov

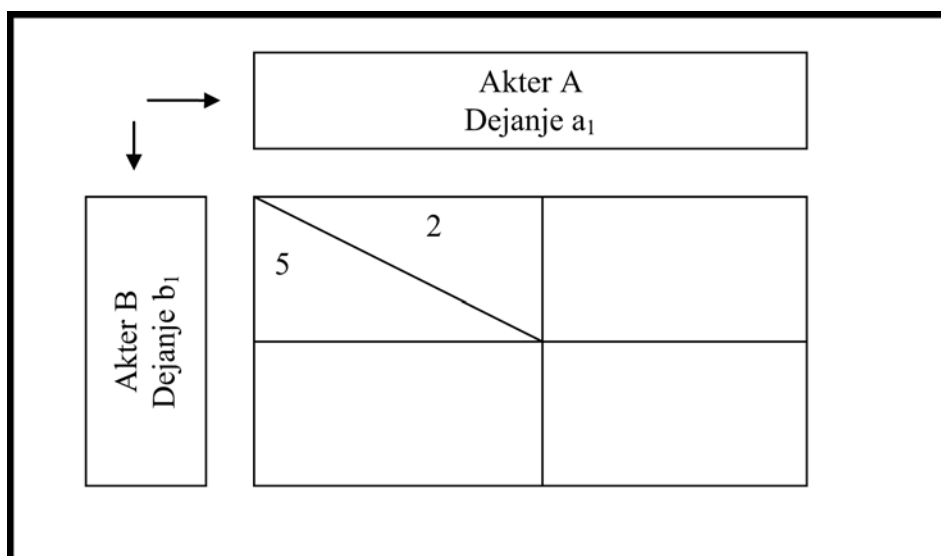
Vsaka celica (slika 2) v matriki ima točno določeno razmerje med nagradami in stroški za akterja A in B. Slika 3 pa govori o tem, da ima tako akter A kot akter B svoje lastno razmerje med nagradami in stroški pri skupnem dejanju v menjavi. Iz fenomenološke analize delovanja posameznika sicer vemo, da vsako dejanje v vedenju posameznika ni motivirano posebej, zato tu raje govorimo o vedenjskih vzorcih vsakega od akterjev in ne o posamičnem ravnanju. Vedenjska veriga obeh akterjev je selektivna in se spreminja v odvisnosti od pričakovanih nagrad in stroškov. Možnih je več rezultatov. Matrika pričakovanih nagrad in stroškov v sliki 3 prikazuje, kako se lahko rezultati spreminjajo v odnosu do različnih vedenjskih vzorcev vsakega od akterjev. Informacije, ki jih akter nudi drugemu akterju, so lahko povezane z nizkimi ali visokimi stroški (v smislu časa in napa pri njihovem pridobivanju), vendar so lahko na primer povezane tudi z visokim spoštovanjem, častjo in pripadnostjo akterju B, ki prejema informacije. Slika 4 prikazuje, če so stroški za akterja A npr. 4 in nagrada znaša 6, je pozitiven rezultat za A enak 2. Na drugi strani pa imajo lahko podane informacije za akterja B visoko vrednost, saj je akter B zelo odvisen od teh informacij, informacija, ki jo prejema ima lahko velik pomen za akterja B in

ima vrednost 6. Ker pa akter ni visoko podrejen akterju A, so stroški za B samo 1. Celoten rezultat znaša 5 v korist akterja B. Situacijo lahko ponazorimo z matriko (slika 4), celica št. 1 kot sledi  $a_1b_1$ .

Akter A ima v svojem vedenjskem procesu najmanj dve opciji: da ponudi informacijo akterju B ali ne, kar pomeni, da ima situacija lahko različne rezultate (nagrade minus stroški). B lahko sprejme ali zavrne informacijo, odvisno od njegovega individualnega izračuna.

Thibaut in Kelley (1959:21) menita, da akter vrednoti rezultate na podlagi dveh standardov, ki niso ekonomski kriteriji. Prvi standard kaže nivo privlačnosti odnosov: za osebo, ki sodeluje v interakciji je ta interakcija lahko bolj ali manj privlačna. Ta standard sta poimenovala »nivo primerjave« ali angl. »comparison level – CL«. Drugi standard postavlja spodnji nivo rezultatov v luči obstoječih alternativ. To je nivo, kjer posameznik sprejema odločitev o tem, ali nadaljuje ali preneha z razmerjem oziroma interakcijo. Ta standard sta poimenovala »primerjalni nivo alternativ ali angl. »comparison level for alternatives – CL<sub>alt</sub>«. Lahko se zgodi, da razmerje za posameznika ni zadovoljujoče (pod nivojem primerjave), vendar vseeno ne bo prekinil razmerja. Prekinitev interakcije oziroma razmerja se zgodi takrat, kadar nivo nezadovoljstva doseže najnižjo raven v luči alternativ, ki so na voljo (pod nivojem primerjave alternativ). Takoj ko rezultat pade pod nivo primerjave alternativ, bo oseba prekinila razmerje. Da lahko dve osebi ohranjata in nadaljujeta razmerje morata ohranjati razmerje med nagradami in stroški nad nivojem primerjave alternativ.

Thibaut in Kelley (1959) trdita, da je vrednotenje rezultatov povezano s posameznikovim nivojem primerjave, ta nivo pa je povezan z vsemi predhodnimi rezultati. Za posameznika se primerna raven oz. nivo rezultatov oblikuje na osnovi vseh rezultatov v preteklosti in prihodnosti (obstoj alternativ). Vzemimo primer zaposlenega. Zadovoljstvo z dohodkom oziroma s plačo ni povezano samo s primerjavo vseh plač v sedanosti, temveč tudi v luči preteklosti, v primerjavi z



Slika št. 4: Celica številka 1 v matriki



vlogo v organizaciji takrat in danes, z izobrazbo in mandatom. Posameznik je del hierarhične strukture v organizaciji, zato se primerja z ostalimi v njej v sedanjosti in preteklosti. Primerja svojo plačo s plačo svojih sodelavcev, s plačo po dogovorih sindikatov itn. Primerja nivo varnosti, ki ga ima in svoj status, moč, ugled, odnose s sodelavci in vodji, delo, ki ga opravlja in zadovoljstvo pri tem, ocenjuje klimo v kateri dela, primerja svoje izgleda za prihodnost, recipročnost odnosov v prihodnosti, obete materialnih in simbolnih nagrad v prihodnosti. Vse to sodi v izračun stroškov in koristi, ki jih opravi posameznik, ko primerja alternative. V izračun so vključeni tako materialni dejavniki kot so plača, kot tudi druge finančne in nefinančne nagrade.

Na tem mestu pa velja omeniti še subjektivni izračun vrednosti. Gre za določanje subjektivne stopnje koristnosti v menjalnem procesu. Ugotavljanje koristnosti oziroma subjektivnih vrednosti pri tem pa ni nujno visoko racionalen postopek in tudi ne zelo natančen. Kot pa vemo je pri tem izračunu finančna plat vključena le takrat in toliko časa, dokler so drugi dejavniki tudi prisotni. Raziskovalci (Michailova in Husted, 2003) na primer ugotavljajo, da uporaba finančnih nagrad v »sovražnem« organizacijskem okolju ne bo povzročila povečan prenos znanja, zaradi odsotnosti ustrezne kulture, ki bi omogočala prenos znanja med zaposlenimi. Določanje eksterne objektivne, tržne vrednosti je pri tem treba ločiti od problematike, ki so jo zaznali teoretiki družbene menjave. Družbene vrednosti so tiste, ki nastanejo kot posledica vzpostavljanja odnosa in so lahko nematerialne narave. Družbene vrednosti imajo v nasprotju s tržnimi, ki so objektivne narave in so kvantitativno merljive, tudi subjektivno stran. Materialni objekt, ki ima tržno vrednost, ima lahko tudi objektivno družbeno vrednost, na primer avto ima poleg tržne vrednosti tudi objektivno družbeno vrednost (status). Ima pa tudi še neko količino subjektivne vrednosti, ki je povezana s tem, koliko nam ta objekt pomeni. Načeloma obstaja med omenjenimi vrednostmi pozitivna korelacija. Objekti z visoko tržno vrednostjo so pogosto tudi statusni simboli, torej objekti z visoko objektivno družbeno vrednostjo, njihova pridobitev pa ima lahko tudi veliko subjektivno vrednost. Tovrstna kongruenca pa ni nujna. Določanje subjektivne vrednosti ima elemente idiosinkratične narave in je rezultat subjektivnih presoj. Na primer zlat prstan, ki ga oseba prejme od osebe A ima lahko manjšo vrednost kot šopek rož, ki ga oseba prejme od osebe B.

Vendar pa subjektivna vrednost tudi ni rezultat čiste poljubnosti in naključnosti. Sociološko je zanimiva, če so tudi pri njenem nastajanju prisotne visoke verjetnosti pojavljanja ob določenih razmerah. Medtem ko pri ekonomski teoriji ni prave potrebe po oblikovanju koncepta koristnosti oziroma subjektivne vrednosti, je prav ta za teorijo družbene menjave temeljnega pomena. Subjektivna vrednost v primerjavi z objektivno pa ima opravka tako z njeno določitvijo kot tudi z medsebojnimi primerjavami.

Prenos znanja pomeni, da v procesu menjave znanja posameznik upošteva celotne stroške in nagrade v smislu izračuna subjektivne vrednosti. Pred tem pa morajo obstajati pogoji za vstop posameznika v menjavo. Po Homansu (1961:61) so ti pogoji naslednji:

1. Posameznik ne bo vstopil v proces menjave, če ne bo imel potrebe po menjavi,

2. Če prenaša znanje bo želel nekaj v zameno, kar je zanj dragoceno,
3. Proces menjave mora biti zanj ugoden torej s pozitivnimi rezultati (nagradami).

Thibaut in Kelley (1959) pravita, da bo posameznik ocenil rezultat samega procesa menjave glede na razmerje nivoja primerjave in primerjave alternativ ( $C$  in  $CL_{alt}$ ). Nato se bo odločil ali bo ohranil proces menjave tudi v prihodnje ali pa bo zapustil razmerje oziroma transakcijo.

Kot vemo, je vsak menjalni odnos lahko transakcija med dvema posameznikoma, vendar je ves čas treba upoštevati tudi vpetost posameznika v širše menjalne mreže, ki s svojimi potencami vplivajo na aktualni proces. Obstoj in vpliv teh ozadij ne pomenita zanikanje oziroma nadomeščanje aktualnih menjalnih procesov ali deformacije aktualnega menjalnega procesa, ampak pomenita, da jih je treba pri analizi menjalnega vedenja upoštevati, saj jih upoštevata tudi posameznika, ki sta vključena v menjavo. Pomembno je omeniti, da v organizacijah poleg diadnega obstaja tudi trojiški proces menjave. V trojiškem sistemu se pojavijo kompleksnejši odnosi medsebojne odvisnosti treh akterjev. Gre za možnost pojava koalicij v skupini, situacije konformnosti in določanju skupnih ciljev in podobno. Upoštevanje pojava koalicije dveh posameznikov, ki si s pomočjo take strukture in s skupnim delovanjem omogočata izboljšanje menjalnih izidov glede na tretjega, postane s stališča analize prenosa znanja bolj kompleksna. Analiza moči je pomembna variabla v teh odnosih, saj dobro pojasni razmerja in tudi samo analizo stroškov in koristi udeležencev v menjavi.

## 5 Prenos znanja v organizacijah kot institucionalni proces

V organizacijah poleg diadnega in trojiškega procesa menjave, obstaja tudi posredna menjava. Ta oblika menjave je menjava med posamezniki, skupinami in organizacijami, ki temelji na vrednotah, normah in reguliranih družbenih odnosih. Posamezniki v teh razmerjih ocenjujejo stroške in nagrade ali pa delujejo spontano in ohranjajo razmerje, dokler jim le to nudi korist. Vendar pa si posameznik v težnji po odločanju med različnimi aktivnostmi, ki mu bodo prinašale enake koristi, teh aktivnosti ne more izbirati prosto kot bi sam želel. Posameznik izbira med možnimi maksimalnimi variacijami vedenja znotraj nujnih institucionalnih in normativnih okvirov, ki pomenijo »zunanjo« omejitvev, pritisk in korekcijo trenutne menjalne usmerjenosti.

»Elementarno družbeno vedenje« (Homans, 1961), ki pomeni neposredno družbeno menjavo, ne obstaja neodvisno od institucionalnega menjalnega procesa. Sfere človeškega obnašanja in delovanja, ki so bolj regulirane in institucionalno rangirane, niso izolirane od pravil menjave. »Norme in institucionaliziranost« ne pomenijo nekaj drugega, kar bi bilo izolirano od procesa menjave. Niso alternativa neposredni menjavi. Tudi razmerja na makro ravni med: (1) posamezniki in organizacijami; (2) organizacijami samimi in (3) organizacijami in družbo, so še vedno procesi menjave, vendar menjava ni neposredna pač pa je organizirana s pravili, ki določajo

primerna razmerja, družbeno kontrolo in stabilne transakcije. V teh razmerjih se pojavijo novi mediji oziroma prenosniki: kot so denar, vrednote in norme. Na tem nivoju se odvijajo transakcije, ki ne temeljijo zgolj na medsebojnem zaupanju, privlačnosti in obojestranskih nagradah. V posredni menjavi posamezniki delujejo kot predstavniki vlog, ki jih določajo norme, pravila in organizacijski cilji, strategije, nagrade, ki jih ponuja organizacija. Proces menjave na tej ravni je bolj kompleksen, ima nove dimenzije in kvalitete. Norme in vrednote so prenosniki (mediji) v procesu družbene menjave tako kot je denar medij v ekonomskih transakcijah. Norme in vrednote stabilizirajo obnašanje in ga determinirajo. Prav tako norme zagotavljajo tudi pravice udeležencev v procesu menjave.

Številni teoretiki s področja upravljanja znanja (Cabrera in Cabrera, 2005; Awad in Ghaziri, 2004; Hislop, 2005; Stankosky, 2005; Michailova in Husted, 2003) so ugotovili, da morajo organizacijske vrednote (kultura) podpirati prenos znanja, če organizacija želi, da aktivnosti upravljanja znanja učinkujejo (DeTienne et al., 2004). Kultura, ki podpira prenos znanja (Cabrera in Cabrera, 2002) najprej oblikuje norme naklonjene prenosu znanja; te norme se ohranjajo prek procesov socializacije novih članov in preko ritualov skozi katere živi kultura v organizaciji (ritualov prehoda, ritualov reševanja konfliktov, ritualov ohranjanja skupne identitete itn.). Kultura v organizaciji lahko zagotovi okolje zaupanja, podpore in sodelovanja. Velja namreč, da so posamezniki bolj pripravljene prenašati svoje znanje v okolju, kjer obstaja zaupanje med člani organizacije (Al-Alawi et al., 2007; Sharrat in Usoro, 2003). To lahko dosega organizacija na primer z normami »odprte komunikacije«, veliko »face-to-face« komunikacije, ki je dobro podprta tudi s sodobno tehnologijo. Spreminjanje hierarhične organizacijske strukture v bolj »ploščate«, kjer člani organizacije pridobivajo občutek bolj enakovrednih članov. Opuščanje hierarhično urejenih odnosov ter vzpostavljanje odnosov in ureditev, kjer obstajajo majhne razlike v moči. Dimenzija pravičnosti vodenja in obravnave zaposlenih lahko pripomore k večji pripravljenosti posameznikov, da bodo prenašali znanje, saj bodo z večjo gotovostjo lahko pričakovali odnose recipročnosti s strani organizacije tudi v prihodnosti (Cabrera in Cabrera, 2002). Prehod iz mikro ravni na makro raven v procesu menjave vsebuje namreč povečano vlogo skupnih vrednot, ki nastopajo kot mediator v procesu posredne družbene menjave. Brez kulture, ki podpira delitev znanja v organizaciji, vrednote ne morejo nastopati v vlogi mediatorja v posrednem procesu menjave (Hislop, 2004). Neposredni in posredni proces menjave sta prepletajoča procesa, saj posamezniki delujejo kot nosilci vlog, ki se zavedajo pravil in delujejo v smeri neposrednih in posrednih razmerij in na ta način lahko predvidijo dolgoročne in kratkoročne prednosti in nagrade. Vendar le z internalizacijo družbenega življenja (norm in vrednot, kulture), ki omogočajo dolgoročne interaktivne povezave med posamezniki, skupinami in organizacijami lahko prenos znanja doseže dolgotrajno osnovo.

Da bi zagotovili dolgoročni proces prenosa znanja in orientacijo zaposlenih, mora organizacija a začetku razviti pravila delitve znanja, ki bodo sčasoma vplivala na razvoj kulture, ki bo naklonjena prenosu znanja. Organizacije so v praksi že oblikovale vrsto pravil za prenos znanja med posamezniki, v timu, med skupinami in projekti itn. Ta pravila

zaposlenim povedo kdaj morajo obvezno posredovati znanje, komu vse morajo znanje posredovati in kakšnih pravil se morajo v teh procesih držati. Awad in Ghaziri (2004) na primer navajata shemo: »Give to get,« ki govori, da nihče ne sme vzeti znanja iz oblikovane baze, ne da bi nekaj prispeval vanjo. Navaja še vrsto drugih pravil kot so : shema: »Action speaks louder than words,« shema: »The 3-star life cycle,« shema: »Respect for peers,« shema: »Start talking and get to work,« shema: »Slack time for knowledge sharing.« Holbeche (2005) na primer navaja shemo: »Skip level meetings,« in shemo: »After action review,« ki govori, da mora tim opraviti refleksijo svojega delovanja takoj po dejanju.« Stankovsky (2005) navaja obvezno objavo najboljših praks in naučenih lekcij in shemo »Strokovnjak strokovnjaku«. Hislop (2004) navaja shemo: »Templates for action,« shemo: »Non-project staff involvement,« ter shemo: »Two teams meeting.« Cook in Cook (2005) navajata shemo: »Solution to a panel,« ki govori, da morajo inženirji svoje rešitve kompleksnih problemov predložiti sodnikom, ki ocenijo novosti, vrednost in praktičnost rešitve, nagrajani pa so s prestižem. Veliko avtorjev govori o učeči se organizaciji, kjer se posamezniki lahko učijo skupaj z organizacijo in kjer zaradi tega lahko delovni in poslovni procesi hitreje potekajo. Koncept učeče se organizacije od Argyris (1978) in Sengeja (1990) do Garvina in Edmondsona (2008) izhaja iz predpostavke, da ima najpomembnejši prispevek k organizacijski konkurenčnosti, sposobnost organizacije, da se uči hitreje od ostalih. Rezultat tega je, da organizacije skušajo postati učeče se organizacije, da bi izboljšale razvijanje novega znanja, kar bo vodilo do konkurenčne prednosti in transformacijskih sprememb (Senge, 1990), hkrati pa je treba ohranjati učinkovitost organizacije. Vendar brez uspešnega prenosa znanja v organizaciji je organizacijsko učenje močno ovirano.

Tudi vodenje vpliva na prenos znanja. Potencialno konfliktna narava hierarhične organizacije (Hislop, 2005) in dejstvo, da znanje predstavlja pomemben vir moči (še posebej kadar je znanje redko in ima visoko vrednost) povzročata, da ni povsem enostavno pripraviti ljudi, da bi prenašali znanje svojim kolegom ali nadrejenim. Viri konfliktov v organizaciji so lahko zelo različni (od zgodovinskih nasprotij in rivalstva, prepričanja glede nepravilnosti nagrad, priznanj in napredovanj, spori glede izvora določenega znanja, strah pred izgubo statusa, poizkusi nadzora nad iniciativami vodenja itd.). Empsonova (2001) pokaže primer takšnega konflikta in kako ta vpliva na procese prenosa znanja. Analizirala je poizkuse združevanja baz znanja v podjetjih, ki so se združevala in odkrila široko razprostranjen odpor proti prenosu znanja v takšnih situacijah. Ciborra in Patriotta (1998) sta pokazala kako je strah zaposlenih pred tem, da bi vodje videli, kaj si zaposleni izmenjujejo preko elektronskega sistema menjave znanja, povzročil, da zaposleni v njem niso več želeli sodelovati. Problem moči in zaupanja je eden glavnih kontekstualnih dejavnikov v organizacij in najbolj odvisen od narave vodenja v organizaciji. Oblikovanje stališč zaposlenih je pod močnim vplivom zaupanja v vodstvo in sodelavce (Kelly, 2007; van Wijk et al., 2008). Zato je vodenje ključno. Sveiby (2007) in (Riege, 2005) sta ugotovila, da so stališča neposrednih nadrejenih, ki so apatični glede prenašanja znanja med zapo-

slenimi eden najpomembnejših zaviralcev prenosa znanja v organizaciji.

Da bi v organizacijah zagotovili dolgoročen in stabilen proces prenosa znanja, moramo predhodno rešiti naslednje probleme:

- kako ohraniti stabilnost procesov menjave z manjšimi stroški,
- kako ohraniti stabilnost nivoja primerjave (alternativ) posameznika v procesu menjave,
- kako zagotoviti predvidljivost procesa menjave in
- kako vzpostavimo dosledno koordinacijo, ki temelji na posrednem procesu menjave.

Ohranitev reda v procesu menjave zahteva njegovo institucionalizacijo, ki je prvi pogoj dolgoročnega procesa menjave. Proces interakcije (prenos znanja) v organizaciji ne more biti le rezultat naključnosti neposredne menjave med posamezniki na osnovi medsebojne privlačnosti, temveč mora postati del obstoječe strukture vrednot in norm, ki ohranjajo pogoje delovanja in vzajemne transakcije. Institucionalizirani vzorci interakcij pa naj nudijo posamezniku različne nagrade.

Blau (1964:100) pojasnjuje klasifikacijo nagrad, ki jih posameznik pridobi v procesu menjave ter jih loči v dve skupine: spontane in namerne. V spontanem delovanju so lahko nagrade intrinzične (privlačnost) ali ekstrinzične (družbena sprejetost, spoštovanje, status). Tudi v namernem delovanju so nagrade lahko intrinzične (družbena sprejetost) ali ekstrinzične (materialne nagrade, podrejenost, podpora, moč). Če so nagrade manjše, kot so posamezniki pričakovali ali jih celo ni, ti ne bodo vstopili v proces menjave ali pa bodo iskali druge oblike institucionaliziranih dogovorov. Management nagrad za namen prenosa znanja v organizaciji mora biti celovit, kar pomeni, da mora biti integriran v celovit in usklajen sistem praks upravljanja s človeškimi viri (Oltra, 2005). To nas vodi k vprašanju kateri so specifični vidiki človekove motivacije, ki lahko pospešujejo procese prenosa znanja.

V nadaljevanju podajamo nekaj ugotovitev raziskav o motivaciji posameznika za prenos znanja v organizaciji. Al-Alawi et al. (2007) so ugotovili, da ekstrinzična motivacija vpliva na prenos znanja. Cruz et al. (2009) so ugotovili nasprotno, da ekstrinzična motivacija ni pomembna za prenos znanja, pač pa intrinzična motivacija. Bock in Kim (2002) sta ugotovila celo negativen vpliv ekstrinzičnih in pozitiven vpliv intrinzičnih nagrad na prenos znanja kot so na primer pričakovana recipročnost, pričakovani rezultati. Bock et al. (2005) so ponovno potrdili negativen vpliv ekstrinzičnih nagrad na prenos znanja. Raziskovalci Brazelton in Gorry (2003), Cabrera et al. (2006), Cho et al. (2007) so ugotavljali, da tudi osebnosti tipi vplivajo na to, kako posamezniki posredujejo svoje znanje sodelavcem. Antal in Richebe (2009) govorita o strasti zaposlenih za prenos znanja. Liu (2008) je ugotovil, da Machiavellistična vrednotna orientacija (neetično vedenje) negativno vpliva na prenos znanja.

Vendar raziskovalci večinoma ugotavljajo, da ekstrinzične nagrade negativno vplivajo na prenos znanja v organizaciji. Očitno je, zakaj denarne nagrade same po sebi ne povečujejo prenosa znanja v organizaciji (Dixon, 2002). Mehanizem za ta učinek sta dobro razložila Lam in Lambermont-Ford (2010). Avtorja najprej razdelata taksonomijo motivacije in motivacij-

skih mehanizmov. Pri tem sta analizirala različne tipe motivacije: ekstrinzično in intrinzično motivacijo. Ekstrinzična motivacija posamezniku omogoča zadovoljevanje potreb posredno in sicer z doseganjem virov kot so denar, napredovanje in druge oblike nefinančnih nagrad. V organizaciji te motivatorji vključujejo plačilo po enoti dela, plačilo za uspešnost in karierno napredovanje. Ekstrinzična motivacija je lahko uspešna pri posredovanju znanja, ki je eksplicitne narave, ker sta posredovanje in znanje merljivi količini. Ta tip motivacije pa največkrat ni uspešen pri posredovanju tacitnega znanja, ker sta znanje samo in proces prenosa neoprijemljive narave in zato nemerljiva. Na drugi strani intrinzična motivacija daje neposredno zadovoljitev določene potrebe posamezniku. To je motivacija, kjer je določena dejavnost vredna samo po sebi in je samo-nanašajoča in samo-vzdrževana. Ta vrsta motivacije pa podpira in pospešuje tudi prenos tacitnega znanja (Lam in Lambermont-Ford, 2010). Poleg delitve motivacije na ekstrinzično in intrinzično, Lamova in Lambermont-Ford (2010) razdelita intrinzično motivacijo še nadalje na normativno in hedonistično. *Normativna intrinzična motivacija* je usmerjena na posameznikovo sprejemanje osebnih in družbenih norm, ki se na organizacijski ravni izkazuje skozi formalne vrednote in na ravni posameznika v smislu identifikacije z družbenimi skupinami, ki jim posameznik pripada. To je tisti del družbene menjave na katero smo opozarjali v našem teoretičnem delu. *Hedonistična intrinzična motivacija* pa izhaja iz vključitve posameznika v samo-determinirajočo aktivnost, v kateri posameznik uživa, pomeni mu nadgradnjo njegovih lastnih sposobnosti in osebne izpopolnitve ter zadovoljitve. Z vidika prenosa znanja ta motivacija vpliva na pripravljenost za posredovanje znanja glede na to, kakšen pomen posameznik pripisuje svoji vključitvi v takšne aktivnosti glede na obstoječe pogoje. Hedonistična motivacija se je izkazala kot pomemben motivator za kreativnost in inovacije, prav tako pa tudi za iskanje znanja in povečevanje kognitivnega napora posameznika (Amabile, 1997). Lamova in Lambermont-Ford (2010) opozarjata, da te tri vrste motivacij niso nujno sinergične, temveč je njihovo razmerje lahko bolj zapleteno. Nekateri učinki se lahko »izrinjajo« (crowding-out) ali »vrinjajo« (crowding-in). Ekstrinzične nagrade lahko spodkopavajo intrinzično motivacijo in pospešujejo kopičenje znanja namesto, da bi pospeševale prenos znanja (Lam in Lambermont-Ford, 2010; Bock in Kim, 2002). Nekatero nagrade za prenos znanja lahko zmanjšajo intrinzično motivacijo zaposlenih za prenos znanja in tako relacijski odnos zamenjajo s transakcijskim odnosom zaposlenih. Na drugi strani pa lahko nekateri zunanji motivatorji, kot sta na primer napredovanje in povečana vključenost zaposlenih, dajejo pozitivne sinergične učinke in skupaj s hedonistično in normativno motivacijo pospešujejo prenos znanja zaposlenih.

Ne glede na to, da ekstrinzična motivacija negativno vpliva na prenos znanja, pa ima v organizaciji le-ta še dodatno vlogo. Z vidika organizacijske kulture lahko formalni sistem nagrajevanja prenosa znanja v organizaciji signalizira zaposlenim, da vodstvo visoko vrednoti in ceni prenos znanja med zaposlenimi in je z vidika socializacije takšen sistem nagrajevanja pomemben v organizaciji. Lam in Lambermont-Ford (2010) opozarjata, da morajo normativni in hedonistični motivatorji biti usklajeni z ekstrinzičnimi motivatorji, če želijo

Tabela št. 2 Prenos znanja kot institucionaliziran proces družbene menjave. Vir: lasten

| Mehanizmi za okvirjanje procesov menjave              | Ravni in oblike  | Primeri praks  |
|---|--|--|
| <b>Oblikovani pogoji za interakcijo</b>               | strukture, procesi, tehnologija                                  | timi, vzdrževanje skupnosti praks, informacijsko komunikacijska tehnologija  |
| <b>Koordinacija</b>                                   | osebe, vloge, organi, organizacijske enote                       | skrbnik in upravljalca znanja, tim za razvoj upravljanja znanja, upravljanje s človeškimi viri   |
| <b>Rezultati CL, CL alt</b>                           | usklajene motivacijske sheme, nagrajevanje                       | intrinzične (normativni in hedonistični motivatorji)<br>ekstrinzične nagrade   |
| <b>Predvidljivost in zagotavljanje varnega okolja</b> | oblikovanje rutin, oblikovanje varnega okolja, zaupanje          | Sestanki, pogosto vertikalno in horizontalno komuniciranje, kratko dajanje napotkov, zagotavljanje prostora in časa za komuniciranje, druženje |
| <b>Norme menjave, trajanje menjave, čas menjave</b>   | pravila, kdaj je potrebno prenašati znanje in na koga prenašati, | izmenjava dobrih praks, izkušenj, pogledov, informacij, pravila za oblikovanje skupnosti praks   |
| <b>Trajanje</b>                                       | Institucionalizacija vrednot in norm                             | kultura, management, mentorji, socializacija,  |
| <b>Vrednote</b>                                       | artikulacija, modeli vlog, heroji organizacije                   | izjave, vedenje in odločanje ter komuniciranje managerjev, kodeksi etike,  |

organizacije dosežati sinergične učinke na prenos znanja med zaposlenimi. Obseg motivatorjev, ki so na voljo organizaciji in njihove motivacijske osnove se zelo razlikujejo med različnimi tipi organizacij.

Če se vrnemo na razpravo o družbeni menjavi v organizaciji, je sedaj jasno, da motivacija in razvite motivacijske sheme v organizaciji lahko pospešuje nekatere institucionalizirane in formalne vzorce menjave v organizaciji. Institucionalizirani vzorci menjave v organizacijah tako ne le omejujejo obnašanje posameznikov temveč ga tudi omogočajo in usmerjajo in vključujejo tako *primerjalni nivo* kot tudi *nivo primerjave alternativ* rezultatov med posamezniki, skupinami in organizacijami. To pomeni, da sta primerjalni nivo in nivo primerjave alternativ ne le rezultat neposrednega in posrednega procesa transakcije, ki temelji na vzajemni privlačnosti in tekmovanju za redke vire med posamezniki, ampak sta tudi determinirana tudi z institucionalnim procesom. Posamezniki po drugi strani vstopajo v proces menjave na podlagi individualnih izračunov med nagradami in stroški ter jih ohranjajo dokler so nagrade primerne in zadovoljive. V spodnji tabeli št.2 so prikazane dimenzije procesa prenosa znanja v organizaciji, ki so podprte z oblikovanimi pogoji, strukturami in procesi, ki omogočajo, da proces prenosa nemoteno poteka, da je prenos stabilen, pričakovani, urejen, koordiniran in dolgotrajen.

## 6 Zaključki

V pričujoči razpravi smo želeli raziskati kakšna je narava procesa prenosa znanja v organizaciji, kateri so osnovni elementi tega procesa in kako poteka dinamika prenosa znanja med dvema posameznikoma, v triadi in v razširjeni menjavi v organizaciji. V dosedanjem raziskovanju smo namreč pogrešali konceptualna izhodišča za razumevanje tega procesa. Večina raziskav do sedaj je proučevala zgolj vedenjsko aktivnost posameznika, povezanost pogojev za prenos znanja v organizacije in reakcijo zaposlenih na te pogoje – in to povsem na empirični ravni. Ni pa bilo poglobljenega raziskovanja, kjer bi raziskovalci raziskovali temeljne predpostavke ravnanja posameznika in na ta način oblikovali razumevanje kako ti procesi v organizaciji sploh potekajo.

Na osnovi teorije družbene menjave smo želeli razkriti osnovne predpostavke delovanja posameznika, njegovo razumevanje procesa menjave. Na ta način smo prišli do temeljnih pravil in norm, ki usmerjajo vedenje posameznikov v teh procesih. Tako smo razjasnili mehanizme, ki delujejo v ozadju teh procesov. Razložili smo razliko med ekonomsko in družbeno menjavo, razjasnili oblikovanje vrednosti v procesu menjave, pravila, ki vodijo proces tako na ravni diadnih odno-

sov kot na ravni razširjene institucionalne menjave. Ugotovili smo, da naše organizacije prenos znanja prepuščajo neinstitucionalizirani menjavi in se tako odpovedujejo možnosti, da bi te procese vsaj do neke mere usmerjale. Predlagali smo institucionalizacijo procesov prenosa znanja v organizaciji s pomočjo mehanizmov za okvirjanje te menjave. Izpostavili smo tiste elemente menjave, na katere morajo biti organizacije pozorne, da bi zagotovile primerno okolje za vzpostavitev procesov menjave, stabilnost menjave, trajanje, koordinacijo, pravila in norme. Na ta način smo povezali mikro raven – raven posameznika z makro ravni – ravni organizacije.

Organizacija mora prenos znanja usmerjati preko procesov in praks upravljanja s človeškimi viri in njihovih orodij:

Oblikovati mora sistem merjenja uspešnosti zaposlenih, kjer bo prenos znanja ena izmed aktivnosti, ki se jih meri (glej zgoraj: pravila za prenos znanja).

Oblikovati mora delovno mesto posameznikov tako, da bo to zahtevalo delitev znanja. V ta namen je najbolje oblikovati multifunkcijske time in uporabiti sodobne pristope organiziranja delovnih procesov kot so skupnosti praks, samoregulirajoče delovne skupine.

Sistem nagrajevanja mora biti zasnovan tako, da bo motiviral posameznike, da bodo prenašali svoje znanje. Ustrezna kombinacija ekstrinzičnih in intrinzičnih (normativnih in hedonističnih) motivatorjev in njihova kompatibilnost naj omogoča prenos objektiviziranega in tacitnega znanja.

Razviti kulturo, kjer bo delitev znanja pričakovana, zadrževanje in skrivanje znanja pa nezaželeno in nenavadno. Vodenje igra pri tem ključno vlogo.

Vsi ti načrtovani procesi in mehanizmi bodo dvignili proces prenosa znanja iz neposredne menjave, kjer je vse prepuščeno naključju in dobri volji posameznikov, v institucionalizirano, posredno menjavo, ki je spremljana s pozornostjo vodenja, podprta z ustrežno infrastrukturo (tehnološko in družbeno), organizacijskimi vrednotami normami in sistemi nagrajevanja.

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# Možnosti odstranjevanja ogljikovega dioksida iz zraka

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Previsoka vsebnost toplogrednih plinov v zraku predstavlja trenutno nerešljiv problem, ker jih narava ni sposobna tako hitro odstranjevati iz ozračja, kot se v ozračje sproščajo. Upravljanje z okoljem (eko-management) na političnem in gospodarskem nivoju se ukvarja s tem vprašanjem povsem enostransko. Poudarek je skoraj izključno na tem, kako zmanjšati emisije toplogrednih plinov v ozračje, skoraj popolnoma pa je zanemarjen vidik odstranjevanja le-teh iz ozračja. Posledično se predvsem podpira razvoj novih tehnologij, pri katerih nastanejo bistveno manjše emisije toplogrednih plinov. To so trenutne rešitve, za katere pa ni nujno, da bodo v prihodnosti tudi ekonomsko najučinkovitejše. V razvoju so namreč nove tehnologije, ki bodo odstranjevale odvečno količino toplogrednih plinov iz zraka, podobno kot to počnejo čistilne naprave z onesnaževali v vodi.

**Ključne besede:** ekologija, zrak, management, toplogredni plini, ogljikov dioksid

## 1 Uvod

V preteklosti je bila ekološka problematika tema lokalnega pomena, ki ji politika ni pripisovala kakšne posebne teže. V zadnjem času pa postaja ekologija svetovni problem in hkrati tudi prvorazredna politična tema. Razlogi zato so zelo velike klimatske spremembe in omejeni naravni viri. V tem članku se bomo omejili le na globalni problem onesnaževanja zraka s toplogrednimi plini in strateški eko-management pri tem.

CO<sub>2</sub> je glavno obremenjevanje med toplogrednimi plini (Ausfelder, 2008: 1-36). Posamezni plini imajo sicer večjo sposobnost tvorbe tople grede (metan, itd), vendar pa je njihov delež v ozračju bistveno manjši. Okoljska politika in ena izmed njenih nepogrešljivih vsebin eko – management, sta trenutno najbolj obremenjena s segrevanjem ozračja zaradi naraščanja CO<sub>2</sub> v zraku (Commission of the European communities, 2008: 1-56). Politika je sprejela celo vrsto predpisov, s katerimi poskuša zmanjšati izpuste CO<sub>2</sub> v ozračje. Te omejitve lahko razdelimo v več skupin:

- prepovedi
- takse
- finančne spodbude

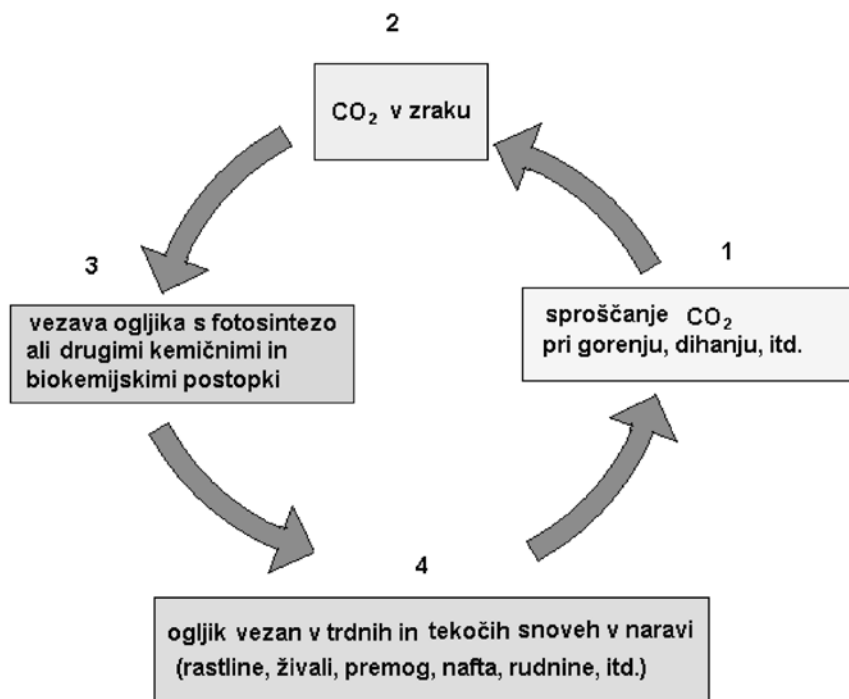
Vsi ti ukrepi morajo biti ustrezno vodeni, da lahko dosežejo zastavljene ekološke, politične in ekonomske cilje. Vodenje teh procesov je prav tako management, tako kot vodenje vseh ostalih procesov v industriji, kmetijstvu, bančništvu, turizmu, šolstvu, zdravstvu, itd. (Wuppertal Institut, 2007:

1-249). O managementu običajno ne govorimo pri vodenju globalnih procesov, temveč na podjetniški ravni.

Področje ekologije je težko omejiti le na nivo enega podjetja. Vendar pa je tudi to možno. Izvajanje mednarodnega standarda za ravnanje z okoljem ISO 14000 je tipična naloga eko-managmenta na nivoju gospodarske družbe. Tudi na nivoju določene gospodarske družbe je lahko prisoten problem onesnaževanja zraka s toplogrednimi plini. Vendar pa se problem emisije CO<sub>2</sub> obravnava običajno globalno. Tipičen primer takšne globalne obravnave problematike onesnaževanja s CO<sub>2</sub> je trgovanje s kuponi za onesnaževanje s toplogrednimi plini.

Pri normalnem ekološkem ravnotežju v naravi prihaja do kroženja CO<sub>2</sub> na ta način, da se v ozračju ne povečuje njegova vsebnost. CO<sub>2</sub> iz ozračja dovolj hitro vežejo rastline pri fotosintezi, pri čemer ga vgrajujejo v svojo sestavo v obliki celuloze, sladkorjev, itd.. Nastane pa O<sub>2</sub>, ki se vrača v ozračje. S krčenjem gozdov in onesnaževanjem oceanov se zmanjšuje sposobnost narave za vezanje CO<sub>2</sub> iz ozračja. Z industrijskim razvojem in povečevanjem prebivalstva se povečujejo emisije CO<sub>2</sub> v ozračje (promet, industrija, gospodinjstva, kmetijstvo, itd.). Rezultat takšnega stanja je povečanje koncentracije CO<sub>2</sub> v ozračju in nastanek tople grede. Ta cikel kroženja CO<sub>2</sub> v naravi je prikazan na sliki 1.

Če pregledamo politične ukrepe za zaščito zraka pred povečano vsebnostjo CO<sub>2</sub>, lahko ugotovimo, da je težišče na zmanjšanju izpusta CO<sub>2</sub> v ozračje (R.S., 2009, OP TG – 1). V tem smislu so naravnane prepovedi, takse in finančne spodbude. Iz slike 1 pa je razvidno, da lahko dosežemo zmanjšano

Slika 1: Kroženje CO<sub>2</sub> v naravi

vsebnost CO<sub>2</sub> v ozračju tudi s povečano hitrostjo vezanja CO<sub>2</sub> iz zraku. Povečano hitrost vezanja CO<sub>2</sub> iz zraku je možno zagotoviti na več načinov:

- povečanje zelenih površin (ozelenitev puščav, itd.)
- zmanjšanja zazidanih površin (zgradbe, ceste, železnice, itd.)
- pogozdovanje (gozdovi vežejo več CO<sub>2</sub> kot travnate površine)
- ustrezna kmetijska proizvodnja (izbira rastlin glede na sposobnost vezanja CO<sub>2</sub>)
- novi tehnološki postopki (biokemijski, kemijski)
- itd.

K zmanjšanju emisij CO<sub>2</sub> v ozračje lahko prispeva vsak posameznik s svojim ravnanjem. Če seštejemo deleže vseh posameznikov, dobimo zelo velik učinek. To je vsekakor prava pot, ki mora biti ustrezno podprta s strani držav (predpisi, vzgoja, itd.). Približno takšen delež onesnaževanja, kot ga povzroči prebivalstvo, pa nastane iz gospodarske dejavnosti (termoelektrarne, industrija, kmetijstvo, promet, itd.). Tudi za gospodarsko dejavnost so potrebne ustrezne prepovedi in spodbude za zmanjšanje emisij CO<sub>2</sub> na državnem in mednarodnem nivoju. Če bo politikom uspelo zmanjšati emisije CO<sub>2</sub> v okolje, ne bodo več potrebne posebne tehnološke rešitve. Vendar pa dvomimo, da bo politikom to resnično uspelo. Dvomimo tudi, da bo politikom uspelo bistveno povečati zelene površine, pogozdovati travnate površine in omejiti ali zelo zmanjšati zazidane površine. Glavni razlog za to je porušeno ravnotežje je v rojevanju in smrti prebivalstva. Večje število prebivalstva ima večje potrebe po hrani, prostoru, vodi, zraku, tehnoloških pridobitvah, itd. Obstoječi tehnološki razvoj in

s tem povezano povečanje izobilja povečuje vsebnost CO<sub>2</sub> v zraku, kar je prikazano na sliki 2 (Keith 2005, 1-29).

Izobilje, ki ga prikazuje slika 2, je mišljeno predvsem kot tehnološki napredek prebivalstva (stanovanja, avtomobili, TV, računalniki, oblačila, itd.). Izobilje ne pomeni istočasno tudi kvalitete življenja. Indijanec iz pragozdov Amazonke živi morda kvalitetnejše življenje od prebivalca Londona, kljub temu, da nima obleke, hiše, avta, računalnika, telefona, itd.

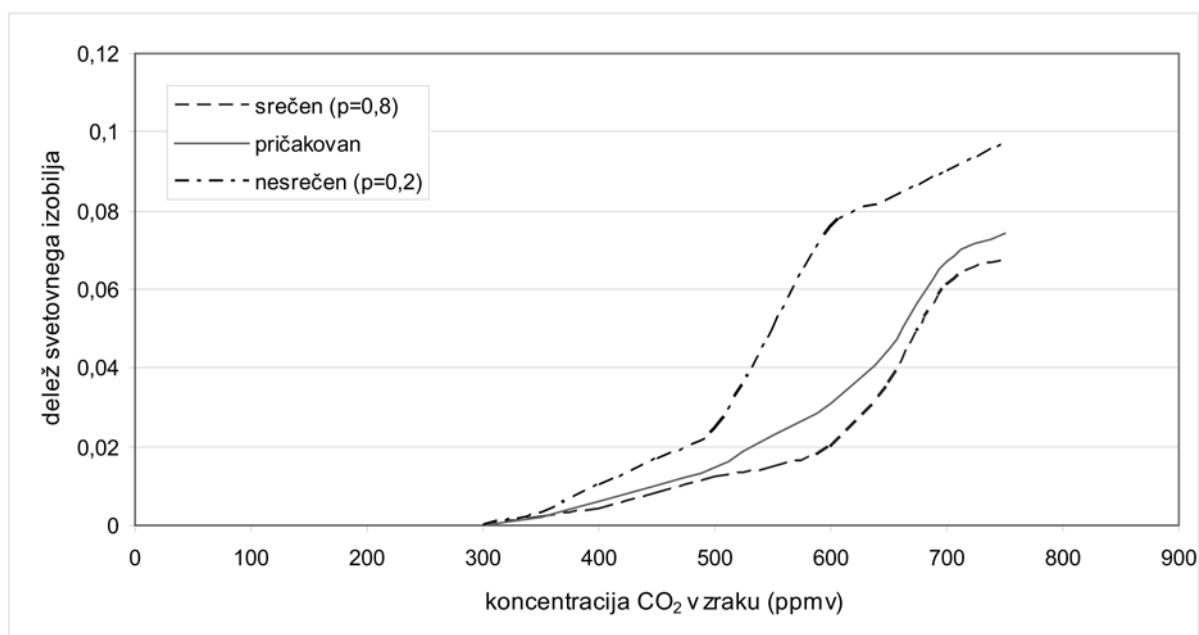
V prihodnosti bodo verjetno reševali problem obremenjevanja s CO<sub>2</sub> s političnimi in tehnološkimi rešitvami. Obstaja pa tudi tretja alternativa, da narava sama očisti ozračje in vzpostavi novo ekološko ravnotežje. Takšna naravna rešitev pa po vsej verjetnosti pomeni ekološko katastrofo, ki bo bistveno zmanjšala število ljudi in zavrla gospodarski razvoj. Nastala bo kriza, pri kateri bo prišlo tudi do vojn zaradi boja za naravne vire (voda, zemlja).

## 2 Metodologija raziskave

Naša raziskava ne obravnava problematike onesnaževanja zraka s CO<sub>2</sub> iz vidika ovrednotenja okoljskih vplivov na podlagi EMAS sheme temveč bistveno širše. V raziskavi smo upoštevali realno stanje glede onesnaževanja zraka s CO<sub>2</sub> in s tem povezano politiko varstva okolja. Težišče raziskave je omejeno na možne nove tehnologije za odstranjevanje CO<sub>2</sub> iz zraka iz vidika eko – managementa.

Raziskave, ki potekajo na tem področju, še niso prišle do te stopnje, da bi lahko tehnološke rešitve ocenjevali z vidika realne opcije za rešitev problema onesnaževanja zraka s CO<sub>2</sub>. Do teh tehnoloških rešitev se trenutno tako obnaša tudi politika na globalnem in lokalnem nivoju.



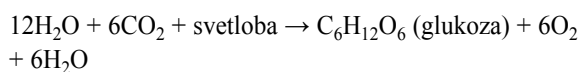


Slika 2: Vpliv izobilja na povečano koncentracijo CO<sub>2</sub> v ozračju (2000 = 0) (Keith, 2005)

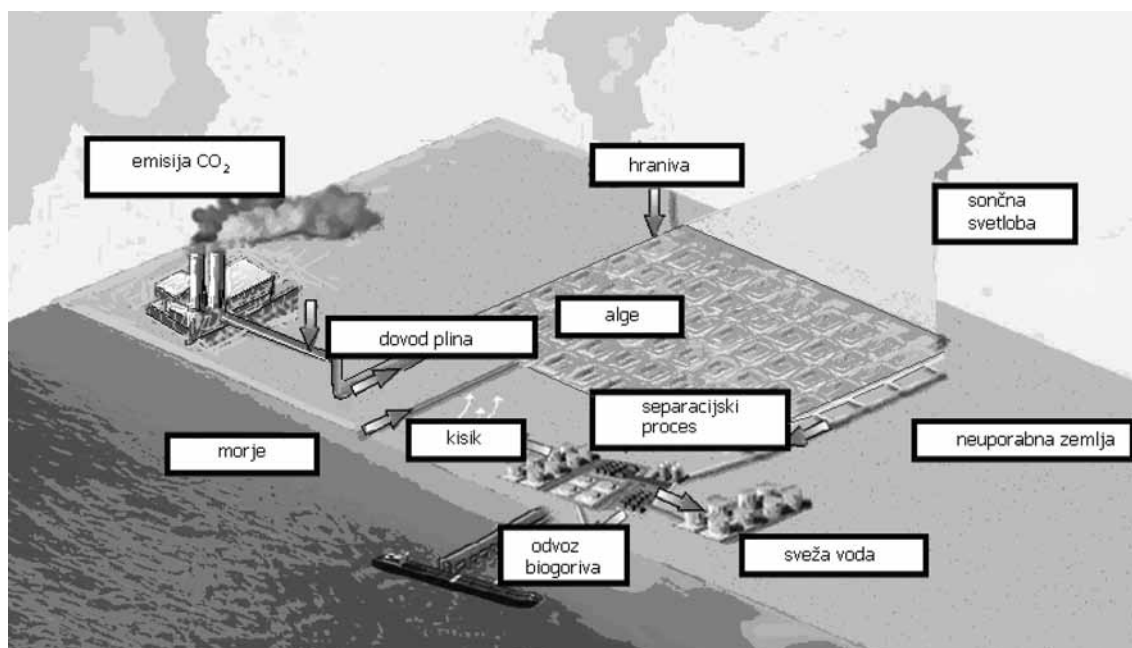
### 3 Pregled tehnologije

#### 3.1 Pregled najnovjših tehnoloških postopkov za odstranjevanje CO<sub>2</sub> iz zraka

Narava ima zelo dober postopek za odstranjevanje CO<sub>2</sub> iz zraka (Lucius, 2005). To je fotosinteza, ki poteka pri rastlinah. Pri fotosintezi lahko iz vode in ogljikovega dioksida nastane sladkor, škrob, celuloza, itd..



Žal je človeštvo porušilo naravno ravnotežje, pri katerem rastline dovolj učinkovito odstranjujejo CO<sub>2</sub> iz zraka. Pri tem se lahko vprašamo, zakaj ne bi razvili tehnološkega postopka, ki bi po vzoru naravnih procesov bistveno pospešil vezavo CO<sub>2</sub> iz zraka. Zelo spodbudni rezultati raziskav se kažejo pri uporabi alg, ki zelo učinkovito vežejo CO<sub>2</sub> iz zraka (Power



Slika 3: Prikaz možne tehnologije za odstranjevanje CO<sub>2</sub> iz zraka s končnima produktoma biogorivo in sveža voda

Plant Emissions to Biofuels, 2008). Kot končni produkti so lahko strateške surovine bioalkohol ali biodizel.

Poskusi pridelave kmetijskih pridelkov za bioalkohol ali biodizel so po našem mnenju neustrezna rešitev, saj s tem po nepotrebnem zmanjšujemo razpoložljive površine polj za pridelavo hrane. Če bomo želeli imeti v prihodnosti ekološko pridelavo hrane, bomo omejeni z razpoložljivimi površinami polj. Poleg tega pa se še ni ustavil svetovni trend rasti prebivalstva in s tem tudi potrebe po povečani količini hrane.

Prikazana shema obrata za čiščenje  $\text{CO}_2$  iz zraka (slika 3) s končnima produktoma biogorivo in sveža voda je v tem trenutku še futuristična tehnologija, ki se morda ne bo uresničila. Vendar pa rezultati različnih laboratorijskih in pilotnih raziskav kažejo na to, da obstaja velika verjetnost, da bodo v bližnji prihodnosti takšni obrati resnično obstajali.

Izvajajo se tudi razne druge raziskave odstranjevanja  $\text{CO}_2$  iz zraka na ta način, da se le ta veže na vodo v podtalnico in zemeljske plasti (Freese, 2008). Takšne in podobne rešitve so tehnološko izvedljive, vendar pa so zaenkrat še ekonomsko nesprejemljive. Posebno velja to za Slovenijo, kjer je že v naravi veliko izvirov termalnih voda s povečano vsebnostjo  $\text{CO}_2$ .

Maksimalna količina  $\text{CO}_2$ , ki se lahko raztopi, je določena s Henryevim zakonom. Henryjev zakon pravi, da je pri dani temperaturi količina plina, ki se raztopi v tekočini, premo sorazmerna njegovemu tlaku (slika 4).

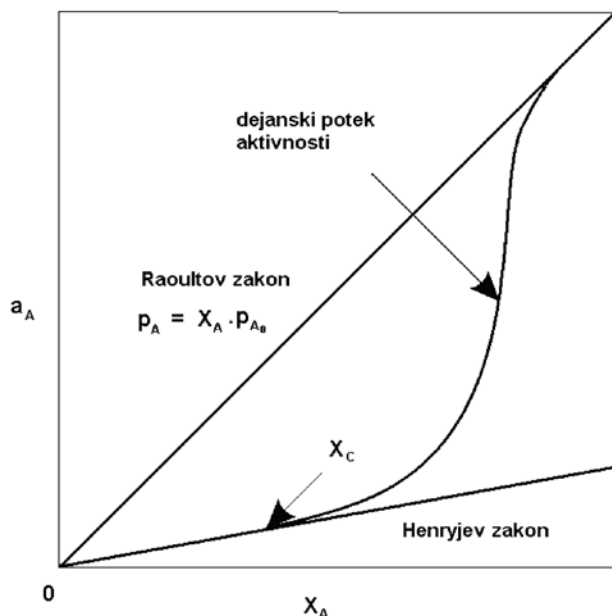
$$p_i = K_i x_i$$

Tu pomenijo:

$x_i$  - količina plina, ki se raztopi v tekočini [mol/m<sup>3</sup>]

$K_i$  - konstanta Henryjevega zakona [mol/Pa · m<sup>3</sup>]

$p_i$  - parcialni tlak plina [Pa]



Slika 4: Prikaz topnosti plina ( $\text{CO}_2$ ) v vodi po Henryjevem zakonu in primerjava topnosti za idealne raztopine po Raoultov zakonu

Takšen postopek raztapljanja  $\text{CO}_2$  v vodi bi bil ekonomsko povsem nesprejemljiv, razen v primeru, da bi povečana

koncentracija povzročila večjo hitrosti fotosinteze alg v vodi, pri čemer bi se izločal ogljik iz vode v obliki koristnega proizvoda (bioetanol, biodizel, itd.). Tehnološki postopki, ki bi izločali  $\text{CO}_2$  iz zraka in ustvarjali koristne proizvode (bioalkohol, biodizel), imajo veliko bodočnost. Žal današnje stanje tehnike teh procesov še ne obvladuje bolje od zelenih rastlin. Če bi imeli v bližini velikih izpustov  $\text{CO}_2$  (termoelektrarne, toplarne) ustrezne industrijske obrate, v katerih bi predelali  $\text{CO}_2$  v koristen proizvod, bi bistveno zmanjšali onesnaženost zraka s toplogrednimi plini.

Za odstranjevanje  $\text{CO}_2$  iz zraka pa ni nujno, da se uporabijo izključno biološki tehnološki procesi (Jitaru, 2007: 333-344). Lahko gre za povsem kemijske postopke, ki so prikazani v tabeli 2 in na sliki 5, ali pa za kombinirane fizikalne, kemijske in biokemijske postopke, ki so prikazani na sliki 6. Pri takšnih in podobnih postopkih je pomembna pozitivna energetska bilanca in ekonomska sprejemljivost. Zelo visoke takse za obremenjevanje zraka s  $\text{CO}_2$  bodo aktualizirale tovrstne tehnologije. Če pa bodo prisotne še ustrezne finančne spodbude, je izgradnja takšnih obratov zelo verjetna. Gre torej za izvajanje ustreznega eko-managementa na državnem in podjetniškem nivoju.

Iz slike 6 je razvidno, da so možne različne kemijske vezave  $\text{CO}_2$  iz zraka, pri čemer lahko nastanejo tudi uporabni proizvodi. V shemi sta prikazani dve glavni skupini tehnoloških postopkov vezave  $\text{CO}_2$  iz zraka: biokemijski (fotosinteza) in kemijski (Jitaru, 2007, 334). Tudi tehnološki postopek, ki je prikazan na sliki št. 3, je vključen v to shemo v skupini fotosinteze. Manjka samo fizikalno vezanje  $\text{CO}_2$  v vodo, ki je prav tako ena izmed možnih tehnoloških rešitev. Vode je na Zemlji relativno veliko. Večina vodnih teles (morja, reke, jezera) nima raztopljenih takšne količine  $\text{CO}_2$ , ki bi povzročala negativne vplive na okolje. Če bi raztapljali  $\text{CO}_2$  v vode iz vodnih teles z velikimi akumulacijskimi sposobnostmi, bi ne nastale znatne negativne posledice za ta vodna telesa (Pörtner, 2006: 1-68). Pri povečani vsebnosti  $\text{CO}_2$  in ustreznih količinah hranil bi nastalo precej alg. Ker so alge sestavni del prehranske verige v naravi, bi za njihovo odstranjevanje poskrbele ustrezne živalske vrste. V primeru, da bi bili omejeni na relativno majhno vodno telo, bi morali odstranjevati odvečne alge iz procesa. S tem bi se približali tehnološkemu procesu, ki je prikazan na sliki št. 3.

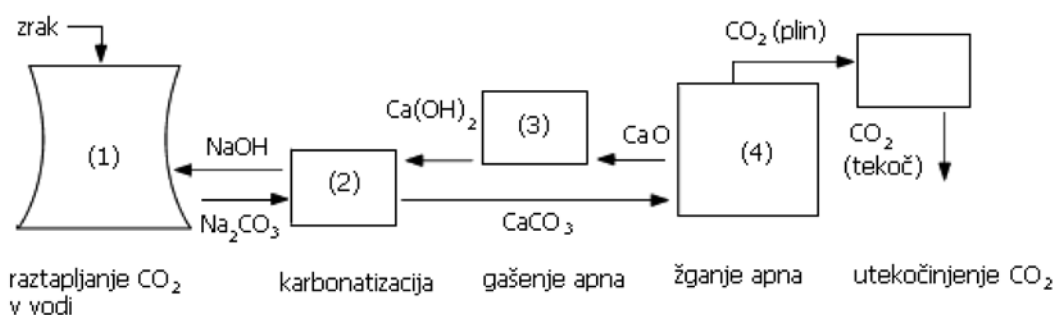
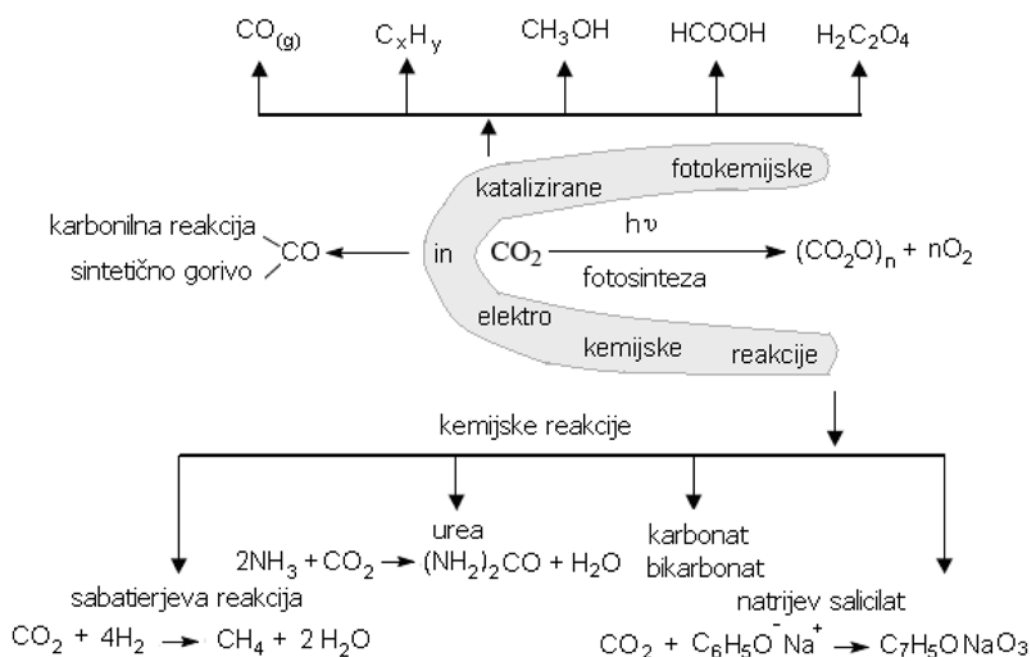
Prikazana tehnološka shema na sliki 7 ne predstavlja kakšnega futurističnega obrata, saj gre za povsem običajne kemijsko – fizikalne procese (Stolaroff, 2008: 2728-2735). Če bodo ustrezne politično – ekonomske razmere, lahko takšne obrate pričakujemo že v bližnji prihodnosti (Rubin, 2008: 311-317).

Tehnologijo s slike 7 bi lahko uporabili tudi v motornih vozilih in s tem praktično eliminirali emisije  $\text{CO}_2$  iz vozil, saj bi  $\text{CO}_2$  ulovili v NaOH ali LiOH, ki bi ga nato na bencinski črpalki izčrpali in odpeljali v tovarno, kjer bi izplenili  $\text{CO}_2$  ter ga porabili za produkcijo biodizla ali bioalkohola. Na ta način bi bil krog  $\text{CO}_2$  popolnoma sklenjen brez prehoda v atmosfero.

Poleg zgoraj naštetih idejnih tehnoloških rešitev odstranjevanja  $\text{CO}_2$  iz zraka obstaja še vrsta drugih tehnoloških možnosti in idej – nekatere so realne, druge pa verjetno neuresničljive (Power Plant Emissions to Biofuels, 2008). V zadnjem delu tega članka navajamo nekatere »teoretične«

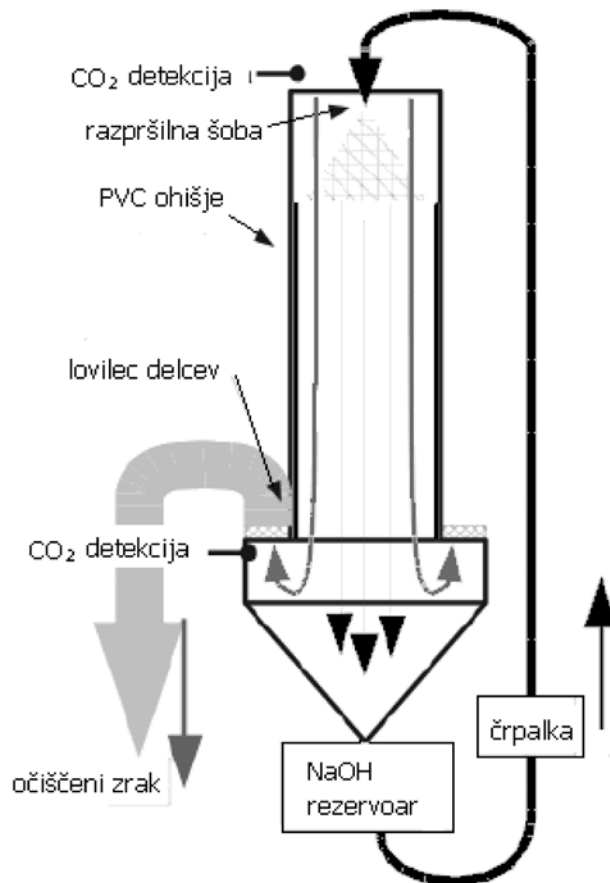
Tabela 1: Prikaz kemičnih reakcij vezave CO<sub>2</sub> iz zraka

| reakcije |   | ΔH       |        |
|----------|---|----------|--------|
|          |   | kJ/mol-C | GJ/t-C |
| 1        | $\text{CO}_2 \text{ (plin)} + 2\text{Na}^+ + 2\text{OH}^- \rightarrow \text{CO}_3^{2-} + 2\text{Na}^+ + \text{H}_2\text{O}$ | -110     | -9     |
| 2        | $\text{CO}_3^{2-} + \text{Ca}^{2+} \rightarrow \text{CaCO}_3 \text{ (trden)}$   | 12       | 1      |
| 3        | $\text{CaO (trden)} + \text{H}_2\text{O (tekoč)} \rightarrow \text{Ca}^{2+} + 2\text{OH}^-$                                 | -82      | -7     |
| 4        | $\text{CaCO}_3 \text{ (trden)} \rightarrow \text{CaO (trden)} + \text{CO}_2 \text{ (plin)}$                                 | 179      | 15     |

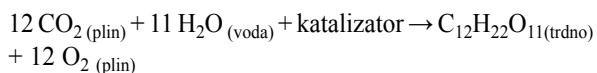
Slika 5: Primer tehnološkega postopka odstranjevanja CO<sub>2</sub> iz zraka (Keith 2005, 21)Slika 6: Prikaz možnih kemijskih pretvorb CO<sub>2</sub> iz zraka v koristne proizvode (Jitaru 2007: 334)

možnosti eko – tehnologij, ki jih še teorija v celoti ne dopušča. Navajamo jih le zato, ker so lahko zelo poenostavljene »bližnjice« v eko-tehnoloških postopkih. Vendar pa takšnih tehnoloških postopkov zaenkrat še niso razvili. Zelo zanimiv

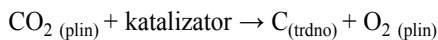
tehnološki postopek bi bil tisti, ki bi posnel fotosintezo v industrijskem obratu. Na primer nastanek sladkorja z vezavo ogljikovega dioksida in vode ob prisotnosti ustreznega katalizatorja .



Slika 7: Na sliki je prikazana pilotna naprava, na kateri se izvajajo preskusi odstranjevanja CO<sub>2</sub> iz zraka ( J.Stoloroff in Carnegie Mellon)



Takšen postopek zaenkrat obvladajo le rastline, znanstveniki in tehnologi pa žal še ne. Naslednji teoretični postopek je lahko razgradnja ogljikovega dioksida v ogljik in kisik.



Pod izjemnimi pogoji je takšna reakcija sicer možna, ni pa še razvitega ustreznega tehnološkega postopka, ki bi bil uporaben za odstranjevanje CO<sub>2</sub> iz zraka. Morda ne bodo nikoli razvili takšnih in podobnih tehnoloških postopkov, ki bi bili uporabni v praksi.

V zadnjem času se pojavljajo na področju okoljskih tehnologij določena spoznanja, ki lahko bistveno zamajajo obstoječe poglede na procese čiščenja (Shao 2009). Različne raziskave biokemijskih procesov v živih organizmih dopuščajo možnost, da Lavoisierjeva teorija ne drži v celoti. Obstoji domneva, da je možna transformacija atomov tudi pri normalnih pogojih. Takšne transformacije bi naj bili sposobnost nekateri živi organizmi (rastline, mikroorganizmi). Znanost še

nima ustreznih dokazov, da so takšne transformacije možne pod normalnimi pogoji.

Ker veliko ekoloških tehnologij še ni razvitih do te stopnje, da bi jih lahko uporabili v praksi, mora eko-managment upoštevati razvoj novih tehnologij. Približno tako je zastavljen eko-managment pri onesnaževanju voda. »Operativni program odvajanja in čiščenja odpadnih voda« temelji predvsem na izgradnji kanalizacijskih sistemov in čistilnih naprav in ne govori o prepovedih emisij snovi v vode. Zaradi zaščite voda prav tako veljajo omejitve in takse, vendar pa je povsem enakovredna opcija omejevanju tudi izgradnja kanalizacijskih sistemov in čistilnih naprav. Važno je, da so na koncu vodna telesa čista (podtalnice, reke, jezera, morje). Na primer »Operativni program zmanjševanja emisij toplogrednih plinov«, ki predstavlja državni eko-managment na področju onesnaževanja ozračja s CO<sub>2</sub>, pa ne obravnava kompletnega ciklusa kroženja CO<sub>2</sub>, temveč se omejuje la na emisije. Ustrezen eko-managment mora obravnavati kompletni cikel kroženja CO<sub>2</sub> v ozračju in ne le eno polovico. V takšnem programu manjkajo spodbude za razvoj novih tehnologij vezanja CO<sub>2</sub> iz izpušnih plinov, ter tudi spodbude za povečanje zelenih površin ali vodnih površin z algami, ki odstranjujejo CO<sub>2</sub> iz zraka.

## 3.2 Pregled normativnih aktov za zmanjšanje toplogrednih plinov

### Normativni akti na nivoju Evropske unije

Evropska unija je vzpostavila mehanizem, ki redno spremlja obseg izpustov toplogrednih plinov in njihovo absorpcijo. Kot del prizadevanj za zmanjšanje izpustov je uvedla sistem trgovanja z izpusti toplogrednih plinov in sprejela pravila o fluoriranih toplogrednih plinih:

- Direktiva 2009/29/ES Evropskega parlamenta in Sveta z dne 23. aprila 2009 o spremembi Direktive 2003/87/ES z namenom izboljšanja in razširitve sistema Skupnosti za trgovanje s pravicami do emisije toplogrednih plinov (1) (Uradni list L 140/63)
- 2006/944/ES: Odločba Komisije z dne 14. decembra 2006 o določitvi ravnih emisij, ki se dodelijo Skupnosti in vsaki od njenih držav članic v okviru Kjotskega protokola v skladu z Odločbo Sveta 2002/358/ES (notificirano pod dokumentarno številko C(2006) 6468) (Uradni list L 358, 16/12/2006 str. 0087 – 0089)
- 2006/780/ES: Odločba Komisije z dne 13. novembra 2006 o izogitvi dvojnemu štetju zmanjšanja emisij toplogrednih plinov v okviru sistema Skupnosti za trgovanje z emisijami za projektne dejavnosti iz Kjotskega protokola v skladu z Direktivo 2003/87/ES Evropskega parlamenta in Sveta (notificirano pod dokumentarno številko C(2006) 5362) (Besedilo velja za EGP) (Uradni list L 316, 16/11/2006 str. 0012 – 0017)
- Odločba št. 280/2004/ES Evropskega parlamenta in Sveta z dne 11. februarja 2004 o mehanizmu za spremljanje emisij toplogrednih plinov v Skupnosti in o izvajanju Kjotskega protokola (Uradni list L 049 , 19/02/2004 str. 0001 - 0008, posebna izdaja v slovenščini poglavje 15 zvezek 08 str. 57 – 64)
- Direktiva 2004/101/ES Evropskega parlamenta in Sveta z dne 27. oktobra 2004 o spremembah Direktive 2003/87/ES o vzpostavitvi sistema za trgovanje s pravicami do emisije toplogrednih plinov v Skupnosti glede na projektne mehanizme iz Kjotskega protokola. Besedilo velja za EGP (Uradni list L 338 , 13/11/2004 str. 0018 – 0023)
- Priloga 1 Kjotski protokol k okvirni konvenciji Združenih narodov o spremembi podnebja (Uradni list L 130, 15/05/2002 str. 0004 – 0020, posebna izdaja v slovenščini poglavje 11 zvezek 42 str. 27 – 43)
- Odločba Sveta z dne 25. aprila 2002 o odobritvi Kjotskega protokola k Okvirni konvenciji Združenih narodov o spremembi podnebja v imenu Evropske skupnosti in skupnega izpolnjevanja iz njega izhajajočih obveznosti (Uradni list L 130 , 15/05/2002 str. 0001 – 0003, posebna izdaja v slovenščini poglavje 11 zvezek 42 str. 24 – 26)
- 2006/780/ES: Odločba Komisije z dne 13. novembra 2006 o izogitvi dvojnemu štetju zmanjšanja emisij toplogrednih plinov v okviru sistema Skupnosti za trgovanje z emisijami za projektne dejavnosti iz Kjotskega protokola v skladu z Direktivo 2003/87/ES Evropskega parlamenta in Sveta (notificirano pod dokumentarno številko C(2006) 5362) (Besedilo velja za EGP) (Uradni list L 316, 16/11/2006 str. 0012 – 0017)
- Uredba (ES) št. 842/2006 Evropskega parlamenta in Sveta z dne 17. maja 2006 o določenih fluoriranih toplogrednih plinih (Besedilo velja za EGP) (Uradni list L 161, 14/06/2006 str. 0001 – 0011)
- 2005/381/ES: Odločba Komisije z dne 4. maja 2005 o uvedbi vprašalnika za poročanje o uporabi Direktive Evropskega parlamenta in Sveta 2003/87/ES o vzpostavitvi sistema za trgovanje s pravicami do emisije toplogrednih plinov v Skupnosti in o spremembi Direktive Sveta 96/61/ES (notificirano pod dokumentarno številko K(2005) 1359) (Besedilo velja za EGP) (Uradni list L 126, 19/05/2005 str. 0043 – 0054)
- 2005/166/ES: Odločba Komisije z dne 10. februarja 2005 o določitvi pravil za izvajanje Odločbe št. 280/2004/ES Evropskega parlamenta in Sveta o mehanizmu za spremljanje emisij toplogrednih plinov Skupnosti in o izvajanju Kjotskega protokola (notificirana pod dokumentarno številko K(2005) 247) (Uradni list L 055 , 01/03/2005 str. 0057 – 0091)
- Odločba Komisije z dne 29. januarja 2004 o določitvi smernic za spremljanje in poročanje o emisijah toplogrednih plinov v skladu z direktivo 2003/87/ES Evropskega parlamenta in Sveta (notificirano pod dokumentarno številko C(2004)130)Besedilo velja za EGP. (Uradni list L 059, 26/02/2004 str. 0001 – 0074, posebna izdaja v slovenščini poglavje 15 zvezek 08 str. 100 – 173)
- Direktiva 2003/87/ES evropskega parlamenta in Sveta z dne 13. oktobra 2003 o vzpostavitvi sistema za trgovanje s pravicami do emisije toplogrednih plinov v Skupnosti in o spremembi Direktive Sveta 96/61/ES, Besedilo velja za EGP.(Uradni list L 275, 25/10/2003 str. 0032 – 0046, posebna izdaja v slovenščini poglavje 15 zvezek 07 str. 631 – 646)
- 93/389/EEC: Council Decision of 24 June 1993 for a monitoring mechanism of Community CO<sub>2</sub> and other greenhouse gas emissions (Uradni list L 167, 09/07/1993 str. 0031 – 0033)
- Council Resolution of 21 June 1989 on the greenhouse effect and the Community (Uradni list C 183 , 20/07/1989 str. 0004 – 0005)

Če pregledamo navedene predpise, lahko ugotovimo, da so usmerjeni le v zmanjšanje emisij toplogrednih plinov v ozračje. To pomeni, da ne podpirajo kompletnega ciklusa kroženja CO<sub>2</sub> v naravi in zato ne zagotavljajo pogojev za optimalni eko-management.

### Normativni akti na nivoju Slovenije

- Operativni program zmanjševanja emisij toplogrednih plinov do leta 2012 (sprejet na seji vlade RS, 30.7.2009)
- Operativni program zmanjševanj emisij snovi v zrak iz velikih kurilnih naprav (sklep vlade RS sprejet 9.2.2006)
- Resolucija o Nacionalnem programu varstva okolja 2005-2012 (sklep vlade RS sprejet 3.7.2008)
- Operativni program doseganja nacionalnih zgornjih mej emisij onesnaževal zunanjega zraka /Revizija operativnega programa doseganja nacionalnih zgornjih mej emisij

onesnaževal zunanega zraka iz leta 2005 (sklep vlade RS sprejet 4.1.2007)

- Sklep o določitvi cene za enoto obremenitve okolja z emisijo ogljikovega dioksida za leto 2009 (Uradni list RS, št. 16/09)
- Uredba o spremembah in dopolnitvah Uredbe o emisiji snovi v zrak iz malih in srednjih kurilnih naprav (Uradni list RS, št. 81/07)
- *Uredba o spremembi Uredbe o emisiji snovi v zrak iz nepremičnih virov onesnaževanja (Uradni list RS, št. 61/09)*
- *Uredba o emisiji snovi v zrak iz malih in srednjih kurilnih naprav (Uradni list RS, št. 34/07)*

Če pregledamo navedene predpise, lahko ugotovimo, da so usmerjeni le v zmanjšanje emisij toplogrednih plinov v ozračje. Ker ne podpirajo kompletnega ciklusa kroženja CO<sub>2</sub> v naravi, ne zagotavljajo ustreznih pogojev za optimalni eko-management.

### 3.3 Pregled podpornega okolja za eko-management na nivoju gospodarskih družb in gospodarskih združenj

Izraz eko-management zasledimo najpogosteje v Evropi kot EMAS - the Eco-Management and Audit Scheme. EMAS je orodje za upravljanje podjetij in drugih organizacij, z namenom, da ocenijo poročila in izboljšajo svojo okoljsko uspešnost. Shema je bila najprej na voljo sodelujočim podjetjem v projektu. Od leta 2001 pa je EMAS odprt za vse gospodarske sektorje, ki vključujejo javne in zasebne storitve. V EMAS sistemu se ocenjujejo okoljski vplivi na način, ki je prikazan v tabeli 1 (Regulation of the European parliament and of the council on the voluntary participation by organisation in a Community eco-management and audit scheme). Poleg EMAS združenja je na nivoju Evropske unije še več drugih strokovnih združenj, ki so namenjene za podporo gospodarskim družbam na področju eko-managementa.

Mednarodni tehnični odbor ISO/TC 207 (Environmental Management, 2009) se ukvarja s standardizacijo na področju sistemov ravnanja z okoljem in z orodji za pomoč pri trajnostnem razvoju (ISO 14000). To so standardi s področja eko-managementa. Ne pripravljajo pa standardov na naslednjih področjih:

- preskusne metode za merjenje onesnaženja, ki jih pripravljajo drugi tehnični odbori (ISO/TC 146 kakovost zraka, ISO/TC 147 kakovost vode, ISO/TC 190 kakovost tal in ISO/TC 43 akustika),
- ne postavlja mejnih vrednosti onesnaževalcev okolja,
- ne postavlja stopenj učinkov ravnanja z okoljem in
- ne pripravljajo standardov za proizvode.

Mednarodni standardi skupine ISO 14000 za ravnanje z okoljem obravnavajo organizacijo z vidika upravljanja z okoljem v gospodarskih družbah, javnih zavodih in drugih organizacijah. So relativno novi v primerjavi z drugimi standardi za vzorčenje, preskušanje in analitske metode za spremljanje in nadzor posebnih okoljskih vidikov. Standardi za ravnanje z

okoljem so uporabni za vse organizacije. Vsem organizacijam bi naj priskrbeli elemente učinkovitega ravnanja z okoljem. Sistem ravnanja z okoljem omogoča organizacijam vzpostaviti red in doslednost pri reševanju okoljskih vprašanj, primerno porazdeliti sredstva, določiti odgovornosti in stalno ocenjevati ravnanje, postopke in procese.

Mednarodni tehnični odbor ISO/TC 207 tesno sodeluje s tehničnim odborom ISO/TC 176, ki pripravlja standarde skupine ISO 9000. To sodelovanje je sedaj zelo intenzivno pri pripravi novih izdaj ISO 9000 in ISO 14000.

Evropski tehnični odbor CEN/SS S26 za ravnanje z okoljem aktivno spremlja delo mednarodnega tehničnega odbora ISO/TC 207 za ravnanje z okoljem. Pri standardih, ki so pomembni tudi za evropsko okolje sodeluje v paralelnih ISO/CEN javnih obravnavah in paralelnih ISO/CEN glasovanjih. Ne pripravljajo pa lastnih standardov.

Na nivoju Slovenije imamo prav tako določeno podporno okolje za optimalnejši eko-management. Od tega podpornega okolja imata verjetno največjo vlogo GZS in Eko sklad.

## 4 Zaključki in sklepi

Reševanje problematike onesnaževanja ozračja s prekomernimi količinami CO<sub>2</sub> je potrebno obravnavati celovito v smislu eko – managementa in ne le ozko, glede na trenutno aktualno politiko. Prav neupoštevanje naravnega ravnatežja je povzročilo prekomerno vsebnost CO<sub>2</sub> v ozračju. Pri tem je potrebno v veliko večji meri računati na nove tehnološke rešitve, ki lahko spremenijo politične in ekonomske probleme celo v ekonomske koristi. Takšne ekonomske koristi pa lahko nastanejo le pri razvoju učinkovitih tehnoloških rešitev za odstranjevanje CO<sub>2</sub> iz zraka. Glavna naloga eko – managementa na tem področju je organizacija vseh ekoloških, političnih, ekonomskih in tehnoloških potencialov. Eko-management naj omogoči tehnologom, da bodo imeli na razpolago ustrezne možnosti za razvoj novih tehnologij za odstranjevanje CO<sub>2</sub>. Tehnologije za odstranjevanje prekomernih količin CO<sub>2</sub> iz zraka naj bodo ena izmed glavnih prioritete znanstvenega in tehnološkega razvoja. Žal tudi novi predlog »Operativnega programa zmanjševanja toplogrednih plinov« v ničemer ne podpira razvoja novih tehnologij za odstranjevanje CO<sub>2</sub> iz onesnaženih plinov. »Operativni program za zmanjšanje toplogrednih plinov« ne zasleduje ciljev iz kompletnega ciklusa kroženja CO<sub>2</sub> v naravi, temveč se omejuje le na desno polovico ciklusa, ki je prikazan na sliki št. 1. Vendar pa tudi na desni strani ciklusa ne upošteva dovolj virov nastajanja toplogrednih plinov iz kmetijske proizvodnje.

Eko – management mora dati veliko večjo težo levi polovici ciklusa kroženja CO<sub>2</sub> v naravi. Zgoraj opisane možne tehnološke rešitve so lahko pri tem velika pomoč pri vzpostavitvi ugodnejšega naravnega ravnatežja z bistveno manjšo vsebnostjo CO<sub>2</sub> v zraku. Verjetno obstajajo velike možnosti tudi za spodbujanje povečane naravne sposobnosti vezanja CO<sub>2</sub>. Takšne možnosti so na primer: povečanje zelenih površin, povečanje alg v vodnih telesih, itd. Na zazidanih površinah bi lahko bilo veliko več rastlinja, ki odstranjuje CO<sub>2</sub> (zelena parkirišča, zelene strehe, itd.). Morda je možno razviti takšne rastline, ki bodo namenjene

učinkovitemu odstranjevanju CO<sub>2</sub> iz zraka in ne le konkretnim drugim gospodarskim koristim – pridelku. Rezultati določenih raziskav, ki so v teku, potrjujejo to možnost. Iz vidika strategije zmanjšanja toplogrednih plinov je potrebno realno ovrednotiti tudi rastlinske in živalske vrste in se ne omejevati le na izpuste iz industrijskih virov, kurišč in transportnih sredstev. Poznano je, da goveja živina povzroča bistveno večje emisije toplogrednih plinov na kilogram priraje mesa kot nekatere druge živali (desna stran ravnotežnega diagrama). Še bistveno večja razlika obstaja pri vezavi CO<sub>2</sub> na različne rastline, ki so posajene na hektarju površine (leva stran ravnotežnega diagrama).

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**Danijel Pučko, Tomaž Čater**

## Cultural Dimensions and Leadership Styles Perceived by Future Managers: Differences between Slovenia and a Cluster of Central European Countries

The article contributes to the body of knowledge about the perceptions of future managers (i.e. business and engineering students) in both Slovenia and a cluster of Central European (CE) countries regarding actual cultural practices in their social environments, the value systems they possess and their attitudes to leadership styles. The main question addressed is whether future Slovenian managers are good representatives of the average future manager from CE (transitional) countries as far as their value system and attitudes to individual leadership styles are concerned.

The research results confirm that the Slovenian (potential) future managers perceive actual cultural practices in their environment rather differently from their counterparts from the cluster of CE countries. Two decades of transition from socialist/communist socio-economic systems were apparently not long enough periods to achieve a higher level of harmonisation of existing cultures. The relevant value systems held by the Slovenian (potential) future managers and the CE cluster's future managers still differ significantly. The Slovenian future managers have (statistically) significantly different attitudes to individual leadership styles than their counterparts in the CE countries' cluster. The smallest differences in perceptions between the two stated groups of (potential) future managers exist regarding their views on what are the most important traits and skills of managers.

**Keywords:** culture, value system, leadership style, Slovenia, Central European (transitional) countries

**Włodzimierz Sroka**

## Problem of Trust in Alliance Networks

At a time of growing globalization, we can observe the increasing role of cooperative strategies among companies, including alliances, joint ventures, and networks. Trust is one of the most important factors of success for any business activity. It relates especially to alliance networks because it can lower transaction costs, increase productivity and innovativeness, facilitate inter-organizational relationships and resolve conflicts. Therefore the article comprehensively discusses the problems of trust in alliance networks. The conclusion of the text is that trust building in alliance networks has an influence on the effectiveness of the whole network. The text is based on the latest world literature as well as the personal experience of the author in creating effective cooperative network agreements.

**Keywords:** Trust, Cooperation, Partnership, Relationships, Alliance networks, Opportunism;

**Anton Petrič, Boštjan Gomišček**

## Upgrading of the Management Review on the Basis of the EFQM Excellence Model

Suppliers in the automotive industry can use for strategical planning a number of different approaches and tools, which can upgrade the quality management systems (ISO 9001, ISO/TS 14696) to achieve the breakthrough power to meet needs in order to achieve a significant role in the automotive supplying chain. One of the very popular and positively accepted tools to achieve continually improving is implementing of the principles of excellence, according to the EFQM model.

On the basis of case studies is in the article analysed and represented a useful value of the implementation of the quality management system audits and manage-

ment review according to ISO/TS and their positive impact on the development of key indicators of the company TPV d.d. from Novo mesto, which is mounted as a development supplier in the automotive industry. With the implementation of self assessment according to the model of excellence EFQM we demonstrate the added value of the take up of the principles of excellence, according to the present system auditing according to ISO standards and the implementation of management review according to ISO/TS requirements.

We upgraded in the existing management system performing of management review as manager's tool, which came directly from the requirements of standard ISO/TS, on to the level of the fundamental principles of excellence by EFQM model and mark it as one of the more effective managers tools with which you can still effectively introduces the leadership of the continuous improvements and strategically manages the company.

**Keywords:** quality management standard, EFQM Excellence model, auditing, self-assessment, management review

**Alenka Brezavšček**

## Simple Stochastic Model for Planning the Inventory of Spare Components Subject to Wear-out

We treat an industrial system which comprises of a number of identical components subject to wear-out. To support the system maintenance an appropriate inventory of spare components is needed. In order to plan the sufficient inventory of spare components, two variants of a simple stochastic model are developed. In both variants, the aim is to determine how many spare components are needed at the beginning of a planning interval to meet demand for corrective replacements during this interval. Under the first variant the acceptable probability of spare shortage during the planning interval is chosen as a decision variable. While in the second variant the adequate spare inventory level is assessed by taking into account the expected number



of component failures within the planning interval. A comparison of both variants of the model shows that calculations involved in the second variant are simpler. However, it can only be used when the inventory of spare components can be planned for a relatively long period of time.

The determination of an adequate number of spare components according to both variants of our model depends on the form of the probability density function of component failure times. Since the components are subject to wear-out, this function exhibits a peak-shaped form that can be described by different statistical density functions. Advantages and disadvantages of using the normal, lognormal, Weibull, and Gamma density function in our model are discussed. Among the probability density functions studied, the normal density function is found to be the most appropriate for calculations in our model. The applicability of both variants of the model is given through numerical examples using field data on electric locomotives of Slovenian Railways.

**Key words:** industrial system, wear-out, maintenance, corrective replacements, spare components, inventory planning, stochastic modelling

**Andrej Mihevc**

## The Influence of Broadband Regulation in EU on the Development of the Regulated Technology

The aim of the article is to answer the question if the level of intensity of "ex ante" regulation (also "regulation") imposed by NRA (national regulatory Authority or regulators) influence on the development of incumbent DSL technology against other Access technologies. There are several approaches which support the basic idea of regulation, that "ex ante" regulation promotes the competition. The approaches must be also based on the size of the market. In the internet world there are different access technologies. Open Access is crucial for the development of competition.

Regulators have to ensure, that also new entrants can reach end users through the facilities of the incumbent operator. Based on the approach of three criteria, European Commission defines two wholesale relevant access markets both based on DSL technology ("bitstream" access and unbundled local loop) susceptible to sector specific "ex ante" regulation. In the last stage also optical access is included on the relevant markets. Other technologies are still not equivalent to incumbent DSL technology according to the opinion of the commission. The intensity of regulation influences on the competition conditions. It influences on the level where and at which point of the investment ladder entrants will enter the market through wholesale inputs or through building its own infrastructure.

**Keywords:** regulation, market analyses, broadband, correlation, DSL technology

**Ana Arzenšek**

## Perceived Factors and Obstacles to Cognitive Schema Change during Economic Crisis

The main objective is to present the perceived factors in cognitive schema change as experienced by participants from two Slovenian sectors and to compare them with factors from schema change theory in order to evaluate specific circumstances and obstacles to effective cognitive schema change. 31 interviews with participants from six companies were conducted twice during the 2008 economic crisis. The prevalent perceived antecedents of schema change lie within an organisation and in the business environment. Stimulating factors are also economic and financial crises and personal characteristics. The prevalent obstacles to schema change, as perceived by participants, are stability of current cognitive schemas, personal characteristics of management, and rigidity.

**Key words:** cognitive schema, change, factors, obstacles, economic crisis

**Franč Brčar**

## The Perspective of Business Process Outsourcing in Slovenian Organizations

Business process management (BPM) and business process outsourcing (BPO) play an important role in organizations helping them ensure competitiveness and competitive advantages and increase efficiency and effectiveness. Our study analyzes the role of outsourcing in Slovenian organizations. Data was obtained through a survey and interpreted with descriptive statistics, frequency statistics and Wilcoxon's signed ranks test. According to the results of statistical analysis there is 95% reliability that the degree of outsourcing of business processes in Slovenian organizations will increase and this applies to most business processes. Thus we can conclude that Slovenian organizations are following the trends in global markets and are adjusting to them as well.

**Key words:** business process management, business process outsourcing, BPO, management, process

**Dana Mesner Andolšek,  
Stanislav Andolšek**

## Knowledge Sharing Through Social Exchange Theory Perspective

In the article authors research a process of knowledge sharing in organizations. Organizations pay a lot of attention to the processes of knowledge management although not every single aspect of it runs smoothly. Literature reveals many impediments in the process of knowledge sharing. The present article focused on individual unwillingness to share knowledge. The process of knowledge sharing is analysed as social exchange proces. They distinguish between social and economic exchange.

Social exchange could be subinstitutionalised where exchange processes emerge spontaneously among individuals without any rules governing their behavior. Or social exchange could be institutionalized and encouraged by organizations through rules, norms and values. The fundamental goal of the authors was to provide a conceptual framework for coherent relations between micro and macro levels of explanation of the process of knowledge sharing. The theory of social exchange offers a clarification of fundamental assumptions regarding individual action. These assumptions have not been researched in the literature of knowledge management up until now.

**Key words:** knowledge sharing in organizations, social exchange, (sub) institutionalized social exchange.

**Darko Drev, Duška Drev,  
Boris Kompare**

## **Solutions for Disposal of Carbon Dioxide from Air**

Excessive atmospheric greenhouse gas concentrations currently represent an insolvable problem, as their quantities being emitted into the atmosphere far exceed the planet's ability to extract them. In the realm of politics and the industry, management of this issue (eco-management) is being handled in what is a completely one-sided manner. The emphasis is almost entirely placed on ways to lower greenhouse gas emissions into the atmosphere, while the possibilities

of extracting excess greenhouse gases from the atmosphere are being overlooked. As a consequence, resources are being predominantly devoted to the development of new technologies that generate lower greenhouse gas emissions. While these technologies can provide immediate relief, there is no reason to believe they are the most economically efficient options available. There are myriad new technologies in various stages of development that will be capable of extracting excess greenhouse gas emissions from the atmosphere, much like water treatment plants extract excess pollutants from water.

**Keywords:** ecology, atmosphere, management, greenhouse gases, carbon dioxide

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