Editorial for the ECIC Special Issue of the Electronic Journal of Knowledge Management

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In this special issue of the Electronic Journal of Knowledge Management (EJKM) it is our pleasure to introduce to you a selection of the most topical and insightful papers which were presented at the recent 6th European Conference on Intellectual Capital ECIC 2014. The conference this year was host by the Institute of Industrial Engineering and Management, Faculty of Materials Science and Technology in Trnava, Slovak University of Technology in Bratislava, Slovakia.

As co-chairs of the conference and members of the organising committee it was with great satisfaction that we had the opportunity to meet individuals from across the Knowledge Management community. In particular the presenters who provided us with the latest research and introduced a wide range of academic and professional approaches. Also to the audience members who added to active discussions regarding the recent developments and the outlook for the future of intellectual capital and knowledge management.

We would now like to take this opportunity to introduce a range of articles which have been selected for this special issue of the EJKM. The chosen articles, in our opinions accurately reflect the diversity of content and current trends in the intellectual capital and knowledge management areas. Moreover, the articles successfully pose topical questions and outline fundamental areas for future research. As a result, the articles not only clearly illustrate the current state of the art in the field but they also contribute to defining the future knowledge management agenda.

During the 6th ECIC conference, 122 abstracts were received. After the double blind, peer review process there were 42 academic papers, 8 PhD papers and 1 Masters research paper published in the Conference Proceedings. As co-chairs, our professional research interests are in the cross-disciplinary areas of intercultural/multicultural competences and performance management. Therefore it was particularly satisfying to observe the truly global reach of the conference which clearly illustrates that knowledge management remains highly relevant within an increasingly globalised landscape.

During the conference authors from some 21 different countries presented their research, including participants from the Czech Republic, Estonia, Finland, Germany, Hungary, Iran, Italy, Lithuania, Malaysia, Poland, Portugal, Qatar, Romania, Russia, Serbia, Slovakia, South Africa, Spain, USA, and the UK.

Articles included within the ECIC Special Issue

In the first article, Klaus Bruno Schebesch, Eduardo Tomé and Horățiu Şoim adopt a cross regional approach to intellectual capital formation, drawing on their own past research which characterises the features of cross border regions located in the south (between Spain and Portugal) and in the East (between Hungary and Romania). The authors suggest that whilst urban centres are widely renowned for IC creation, in contrast, border regions are areas of hidden potential.
In the second article, Marcin Relich, Krzysztof Witkowski, Sebastian Saniuk and Paweł Kużdowicz, focus on the issues of measuring intellectual capital in the context of new product development (NPD). The article highlights the fact that intellectual capital is often difficult to measure, however the authors successfully propose a systematic and practical methodology adopting a fuzzy logic approach to evaluate each intellectual capital dimension.

In the third article, written by Dagmar Cagáňová, Miloš Čambál, Katarina Stachová and Zdenko Stacho the importance of organisational learning is highlighted as a key driver of innovation and performance enhancement. In a wide-ranging study, respondents from 340 organisations in Slovakia were selected for analysis and the subsequent research proposes recommendations for the enhancement of organisational learning practices.

In the fourth article written by Ute Vanini and Saskia Bochert investigate the issue of whether knowledge management maturity models can be applied on a corporate level. The research aims to address the fundamental key issue of which level of knowledge management application is effective and efficient for a company.

Taina Savolainen, Palmira Lopez-Fresco and Mirjami Ikonen, in the fifth article address the highly topical issue of trust within workplace relationships. The article studies the notion of the trust-communication dyad and presents qualitative findings regarding trust violation and breach.

The sixth article written by Jaromíra Vaňová and Zdenka Gyurák Babešová draws correlations between corporate culture and key business performance indicators. The findings propose a model which establishes a set of indicators.

The seventh article by Eduardo Tomé and Miguel Gonzalez-Loureiro aims to establish a model for the valuation of intangible assets within organisations. The article focuses on a highly topical area of IC regarding the measurement of intangible assets and in doing so introduces the innovative notion of the intangible cube.

The final article, written by Marian Holienka and Anna Pilkova deals with the impact of intellectual capital and its components on firm performance before and after crisis.

In conclusion, it is evident from the selected articles that the fields of intellectual capital and knowledge management remain diverse and are becoming ever increasingly relevant in the context of competitive global environments. The articles clearly illustrate the significant diversity of the field with research on an operational level encompassing practical topics including new product development and trust and communication, also on a corporate level with research focusing upon multicultural management and performance enhancement. And finally research on a national and cross-national level to ensure the effective measurement of intellectual capital and knowledge management.

Once again we would like to express our sincere thanks to all the authors and audience participants who attended the ECIC conference in Trnava Slovakia and also the authors who have contributed to the creation of this special issue of the EJKM.
Regional Intellectual Capital Formation: A Computational Approach

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Abstract: The purpose of this paper is to test empirically the potential of Intellectual Capital (IC) as a driver of formation of cross-border coalitions in European Union (EU) regions. The question is important given that, at present, economic and social cohesion is a major factor of stability in the EU. We use a computational model based on different similarity matrices, for the cross-border cases of Portugal and Spain and for Hungary and Romania, respectively. We find that the results differ with the form of attraction we suppose between the regions, namely driven by diversity or conservative. At least the potential for attraction between such regions, based in IC, may be a useful approach for modeling. We believe that our model should be replicated in other EU regions, and thereby increased in depth. However, we regard our results as a promising step towards understanding some important organizing principles for the multi-regional economics of the 21st century.

Keywords: Metro-regions, cross-border regions, intellectual capital, innovation, complementarities and cooperation, cultural settings

1. Literature review and theoretical model

Intellectual Capital (IC) is a considered to be a relatively new concept (Edvinsson and Malone 1997) intended solve the increasingly complex problem of the definition of the value of companies and organizations which have many knowledge-related activities, mainly within our so called Information Society. IC is also related to the Knowledge cycle in organizations (Nonaka and Takeuchi, 1995). A multitude of measurement methods for IC were presented (Sveiby, 2012), and the models were applied to countries (Bounfour and Edvinsson, 2005; World Bank, 2012) and cities (Rodrigues and Tomé, 2010) as well. Regional development pursued by regional policy, for instance with the creation of “poles of development” was put forwards already in the sixties (Hansen, 1967), and regional studies received increasingly more attention from scholars following the studies of Krugman (1991) on economic geography. The localization of successful businesses requires the local availability of IC assets, in its various forms. Positive, virtuous cycles of prosperity and vicious cycles of decay and poverty are generated by the existence or inexistence of IC in a given region.

Accordingly, in this paper we aim at bridging a “research gap” between common studies about IC in companies and countries (Bounfour and Edvinsson, 2005) and regional IC as a promoter of the region’s success – especially when focused on various cross-border regions. This is our goal and our research question. The problem is important because such regions are both abundant and widely scattered all over the European Union (EU). We believe that in the current phase of the evolution of the EU, the regional dynamics is decisive for balancing the Eurozone trend. Therefore, at the EU level, such and related studies are and will be highly relevant. Considering various NUTS-based (or otherwise elaborated) regionalization schemes for the EU one may observe that regions, including many adjacent regions, are indeed differing with respect to a series of important aspects and that they do so in more or less unexpected ways. Transforming a status quo into a more advantageous situation in terms of IC potential – for instance by reviving past (forgotten) industrial-intellectual traditions in some cross-border regions – would require bold approaches, which must be based on high acceptance levels of the region’s citizen.

In order to answer our research question we take several steps. In section 2 we review the literature on IC and regions and discuss a qualitative scheme for connecting cultural settings with the formation of IC via innovation and successful economic utilization allowing different functional and content-based points of view, which may also imply a critical role of regions in the process. Then in section 3 we summarize some known studies on the matter. In section 4 we define the computational model we used for assessing chances of cooperation between our regions. Section 5 presents the results of our analysis, which are further discussed in section 6. Section 7 ends the paper, with the presentation of its conclusions, limitations, implications and some ideas for future related research.
2. Literature review and theoretical model

2.1 Regional IC as a promoter of long term success?

Historically, Europe has seen many regions (including metro- and cross-border ones) rise and fall. We do not expect this to be fundamentally different for the south and south-east European regions, especially owing to the fact that modern societal progress is to a lesser degree tied to Intellectual Capital which derives from extremely capital intensive and high-tradition, knowledge-oriented industries (big science, defense, etc.), but depends more readily on certain types of socio-technological flexibility and (learned, inherited) creativity within the local populations. In fact, this evolution comes very much to the advantage of hitherto less developed and sometimes “marginalized” European regions. One may observe, in addition, that south European cities enjoy features which are often much closer to what one may term “agreeable urbanism” then their north European cousins (both in aesthetic and in functional terms). Potential complementarities may be exploited, thus developing more and also new forms of regional IC. Such regional IC is in turn closely related to the influence of local entrepreneurship and local innovation capacity (Audrescht et al. 2005, Cook 2007, Chaung et al. 2012).

Intellectual Capital (IC) may be formed with an accelerated rate in and around urban centers but also in other designated locations like cross-border regions. IC formation is very probable in high growth cities while the case of IC growth in cross-border regions remains less probable; it is uneven and it deserves more investigation. Within cross-border regions there is also a tendency for people to migrate towards important national urban agglomerations. The chances of effective IC formation in cross-border EU-regions must thus be weighed against the respective outward migration tendencies.

2.2 Theoretical model: Co-determination of IC formation by particularistic, systemic and cultural factors

We think of a dependency chain which starts with the cultural settings (mind-sets) in a population (Figure 1). These settings are themselves long term and therefore the least removable. They include many behavioral and valuation features in the (regional) population, depending ultimately on religious imprinting and deep rooted tradition, which influence the ease and the intensity of canalizing individual and group problem solving potential into effective innovation and, eventually, into lasting IC.

![Figure 1](image)

*Figure 1: A qualitative scheme for linking cultural settings to innovation and to IC formation. Within these nested cycles the role of regions can be critical*

Filter A, acting on the forwarding of new ideas and solutions is a result of the culturally conditioned trust relations prevailing between persons, their credible commitments and their risk perception, which tend to “control” what is
considered worthwhile to be pursued by innovation and imitation. Adopting new ideas, techniques, etc., by means of innovation and imitation then leads to - more or less successful - economic and social utilization. Being at this point part of a particular region can have catalytic or detrimental effects, depending on the region’s characteristics. Filter B may be thought of as selecting those outstanding (i.e. remarkable, successful) innovations which may integrate more easily into an existing edifice of IC. With some delay (R) intellectual capital will feed back into the innovation and imitation block, possibly enhancing these further. The formation of IC itself is enhanced by successfully building standards and cooperation. Hence, it seems worthwhile to study condition under which cooperation may occur more frequently. This can be done by considering socio-economic agents, like firms and consumers, but also by considering regions and certain inter-regional flows of information and innovation (see the examples in Varga 2007). Other factors and relations of interest are instances of inter-regional co-innovation (Chessa et al. 2013).

Finally, the notoriety and success of IC may find its way back into regional culture itself, albeit with a longer time delay (S), gradually changing some of the cultural settings. They in turn will influence the filters but also the delays. Cultures and regions may actually differ a lot by such entities, like gestation delays. For instance, countries like the USA may have relatively short delays $S > R > 0$, while others may have much more restrictive filters and longer delays, the latter spanning over many generations.

2.3 Theoretical model: Possible role of a multi-disciplinary recommender system: A test for regional IC

If we are thinking about using recommender systems in the wider context of regional IC formation, one would attempt to develop mechanisms by which recommendations may lead to a significant probability of influencing (i.e. “convincing”) a critical mass of persons to adopt potentially useful new socio-technological procedures. In order to gain acceptances and to increase trust such recommendations cannot as aggressive as the usual commercial variants may be. They may find ways to display complementarities, which are, almost as a rule, multi-disciplinary by nature. By now there is considerable experience with purely commercial recommenders (Ricci et al. 2011) but also with other, more explorative variants like, for instance, educational recommender systems. Furthermore, the recommender must find adequate ways to address the specific interests of all those who can benefit from enhanced regional IC formation:

- ventures capitalists investing in innovative regional (e.g. cross-border) services and technologies;
- policy makers designing guidelines for metro-region & cross-border development policies;
- employers’ federations and citizens’ interest groups.

Finally, the recommender may integrate innovation contests (Malone et al. 2010) and prediction markets (Pennrock et al. 2001). Both are internet-based coordinated activities which try to interfere with often highly non-standardized complex socio-technological networks and processes. Massively data based recommenders may reach superior results in terms of anticipating (i.e. correctly forecasting) and influencing, especially when compared to the case of using a few domain experts.

3. Known studies: First steps towards mapping regional IC – different resolutions on accessible data

Each cross border region has its own historical (and hence also “path dependent”) development trajectories, which may explain a larger part of its development success (or its relative backwardness) by means of specific patterns of political and economic interpersonal relations and random events. However, one should not completely exclude the action of systemic forces, a situation which may indeed be modeled by more or less formal approaches. For instance, successful generators of IC based on export-oriented, locally clustered industries are the regions containing the so called “Hidden Champions” (Simon 2009) of traditionally capitalist Western Europe. They form an interesting category of regionally clustered firms, having i) a strong “personalized” tradition, ii) a strong tendency towards exports, and iii) certain dominating, not marketing-centered, process and product quality concerns. Work on appropriate conditions for internationalization and regional innovation systems in Hungary is Lengyel and Leydersdorff (2011) and whether they guide IC formation within cross-border or other specific regions remains an interesting question. In the sequel we aim at determining some less specific systemic factors which may contribute to regional IC formation. To this end we use selected data from The Global Competitiveness Report 2012-2013 of the World Economic Forum (Schwab and Sala-i-Martín (2013)). From this rather extensive, world covering data base we first select 21 European countries which are contained within the trade corridors of figure 2 or which may be in general interesting cross-border and metro-region candidates.
4. Methods

We perform two related studies, the first based on subsection 4.1 and presented in subsection 5.1, the second based on subsection 4.2 and presented in subsections 5.2, 5.3 and 5.4, respectively.

4.1 First study

In order to compare EU countries with common borders and without, we select the data representation in terms of global rankings from the Global Competitiveness Report referred to in section 3. The rankings in these data from this report rankings of over a larger set of countries which contain all EU countries, hence the worst ranking happens to be 144 and the best one is 1. We compare the selected EU countries by computing linear correlations over all country pairs on 40 selected influence factors. We conjecture that these influence factors contribute to a significant degree to the eventual formation of regional IC. They are, respectively, 9, 7, 7, 8, and 9 different rank variables (variable blocks) from the following five major influence domains: (1) Business sophistication, (2) Technological readiness, (3) Innovation, (4) Higher education and training, and (5) Quality of infrastructure. The results of this analysis are shown in section 5.1.

4.2 Second study

As described in Schebesch and Tomé (2013) we use tree matrices describing relations between the respective eight urban centers of each county (region) within the two cross-border regions (super-regions): A symmetric matrix $D_0 \geq 0$ for the transport distances between the cities. A symmetric matrix $D_1 \geq 0$ describing similarities between these cities in terms of several measures related to economic performance and quality of life (roughly a subset of measures from figure 3) and a symmetric block diagonal matrix $D_2 \geq 0$ accounting for country specific performance. The final influence matrices, one for the PT-SP and one for the HU-RO case is then given by $M(\alpha, \beta) = -D_0 + \alpha D_1 + \beta D_2$, with parameters $\alpha, \beta \geq 0$ for scaling the influence of the two last matrices. This
influence matrix will be used in two interpretable variants: A very optimistic view is “attraction by diversity” (see also subsection 4.1) and a more constrained view is “conservative attraction” (or asymmetric trust, see also subsection 4.2). Attraction by diversity simply assumes that two sub-regions will be attracted proportional to their distance $d(i, j)$ in their measurements $y_i$ and $y_j$, which are contained in $D_i$. This reflects the ability to exploit differences as useful complementarities within regional cooperation. The variant of conservative attraction is using $D_g = d(i, j)$ if the difference in associated measurements $y_i$ and $y_j$ is positive when the measurements are being normed, i.e. if we have $||y_i|| > ||y_j||$, and it is using $D_g = -d(i, j)$ otherwise, reflecting the proposition that those regions will be attracted towards cooperation, which have in the above sense superior performance measurements while their candidate partner (i.e. partner $j$) will be restrained from seeking cooperation. These are obviously very crude assumptions, which underline just basic forces. There are more possibilities of defining propensity towards cooperation; however, they need more refined assumption about the role of culture and innovation as depicted in figure 1 (of section 2).

Equipped with these preliminary influence matrices and with the two views on regional cooperation formation we now specify a simple rule which valuates inter-regional cooperation and which pre-selects only such coalitions (for cooperation between regions) which are stable against simple coalition switching. This mechanism was first used in Axelrod et al. (1995), and we outline it here for convenience: as both cross-border cases (HU-RO and PT_SP) happen to have eight counties with their urban centre, a county $i \in \{1, \ldots, 8\}$ may or may not be in one of the coalitions $x \in \{0,1\}^8$. It is part of a coalition if $x_i = 1$. In such a situation there is obviously a payoff (here a propensity for cooperation) of $\sum M_x (% \alpha, \beta) x_k$. Such a coalition $x$ is said to be stable if no other county from coalition $x$ can improve its payoff by switching to the counter-coalition $1 - x$ (e.g. with $x$ and $1 - x$ being like $[00110001]$ and $[11001110]$, respectively).

Data sources for computing the similarities in order to build the three matrices $D_0, D_1$ and $D_2$ for describing pairwise attraction (or repulsion) between the involved metro-regions or the counties’ urban centers are UNDP (2012) country profiles, EU (2012) operational programs for cross-border cooperation (for the PT-SP and HU-RO cases respectively) as well as Corruption Index (2012). Details for building these matrices can be found in Schebesch and Tomé (2013). The results of the simulations based on this computational model are shown in sections 5.2, 5.3 and 5.4.

5. Results

5.1 First steps towards mapping regional IC – different resolutions on accessible data

As stated in subsection 4.1 we first compute the correlation structure between the IC-relevant variables between all the 21 selected EU countries (with and without common borders). Sorting the $21^2-21$ linear correlation coefficients obtained for all country pairs (see figure 3) one first observes that the (outstanding) extreme cases are furnished by non-cross border cases. Actually, the maximum positive correlation occurs between Italy and Lithuania, which from the point of view of regional IC seems to be a random event. The second largest point in figure 3 (above 0.8, not labeled) refers to the pair of Romania and Bulgaria. While certainly obeying a logic of structural similarity between the two countries, this case does not seem worthwhile to follow for now, owing to the possibility of merely describing a latent “underdevelopment trap”. At the other side of the correlation spectrum we have the somewhat surprising pair of Germany and Hungary (the value above -0.4 from figure 3). A certain logic may here still be found in this case by considering the chain of neighbors Germany – Austria – Hungary with decreasing pair-wise correlation, possibly indicating complementary relations within the east-west trade corridor (see figure 2). In the following two subsections (5.2 and 5.3) we choose to further investigate the structurally different cross-border cases, namely that of Portugal and Spain, being a pair with high positive correlation, as well as the moderately correlated pair of Hungary and Romania, a pair with many cultural differences. In figure 4 we also contrast these two selected pairs with two further, in other ways rather different cross-border country pairs, which are both weakly positively correlated and highly asymmetrical, namely Italy and Slovenia, and Finland – Estonia, respectively. As the figures 3 and 4 indicate, altogether these four cross-border cases describe rather different European cross-border situations. Hungary and Romania (Figure 4, upper left) are moderately correlated with Hungary outranking Romania in most variables, Portugal and Spain (Figure 4, lower left) are more correlated and enjoy much better rankings then HU-RO. These two countries are culturally more homogeneous and have both long colonial histories as well as deeply rooted traditions. Despite the visual impression one may get from inspecting figure 4, Slovenia and Italy (upper right) are weakly
correlated, and, finally, Finland is strongly outranking Estonia (Figure 4, lower right). This pair has the weakest correlation of all country pairs highlighted in Figure 4.

![Correlation coefficients between 21 EU countries](image)

**Figure 3:** Correlation coefficients between the 21 selected EU countries computed by with selected features from WEP 2012/13 (see also figure 4) relation to competitiveness, flexibility, innovation, education and quality of infrastructure

The latter two country pairs (Italy-Slovenia and Finland-Estonia) present a simpler picture and they are certainly more attractive regions, to foreign investment, to immigrants and also to the local population. This may be attributed to the power (weight) and/or the absolute ranking of at least one of the countries and also partially to the relative vicinity of important modern metro regions.

The former country pairs (PT-SP and HU-RO) differ in less clear ways and they also seem to act more like repellers to foreign inflows and local populations. One might be tempted to ask whether this situation can be reversed, and at what cost. While the present paper cannot find definitive answers to this question it still attempts to identify factors which may influence this situation. Upon accepting innovation-imitation as a path to IC formation as sketched in figure 1, one is next lead into asking for factors which determine innovation success in a regional setting. According to McCann and Ortega-Argilés (2013) a list of "broadly accepted evidence" regarding innovation and innovation policy outcomes, containing factors which are sources of successful innovation, is the following:

- internationalization and foreign direct investment,
- collaboration between firms,
- public funding,
- combined product and process innovations as opposed to product or process innovation,
- innovation-related sales which lead to higher firm survival prospects,
- technology frontier firms which enjoy higher returns to innovation,
- size and innovation: the most innovative are small and large firms,

and to name a few. All the above statements are based on the notion of outperforming the counter-variant in probabilities. Significant such performance increases in the range of 20% to 70% over the counter-variant are reported, largely being measured in OECD countries.
Figure 4: Difference of four cross-border country pairs in terms of 40 selected rankings from The Global Competitiveness Report 2012-2013 of the World Economic Forum. The five abbreviations for variable blocks (1) BuSo, (2) TeR, (3) Inno, (4) HiEd and (5) Infr are explained in the main text of subsection 4.1.

Furthermore, with the classification into (i) World-class performing regions, (ii) Industrial employment focus and (iii) Science and service regions, for our selected country pairs from figures 2 and 4, we find that none is in (i). Eastern Finland, Valencia and Catalonia are examples for regions in (ii) and Rome, Central Hungary, Lisbon are (as non-cross border) regions in (iii); However in (i) we find South East England, the Capital Region of Denmark and Upper Austria. They are not part of our selection but they are clearly (part of) cross-border and metro-regions.

5.2 First steps towards creating a recommender: A mapping of possible region-coalitions

As stated in the introduction and in section 2 a practical tool for assessing regional IC would be to design a recommender for the different stakeholders (investor, agencies, the political public, etc.). In order to meet this end one would start by mapping possible region-coalitions, which may form a basis for evaluating the probability a region may tolerate, block or encourage IC formation. Obviously the approach presented here is stylized (although data oriented), meaning that in may be strongly refined and updated by including more concepts, data and filter rules (see section 2). The computations presented in the sequel are limited to two EU cross-border cases, namely Hungary-Romania (HU-RO) and Portugal-Spain (PT-SP), which happen to have four cross-border counties each with eight metro- or metro-like sub-regions respectively (for details see Schebesch and Tomé 2013). Otherwise these two cross-border cases differ quite a lot, as may be read off from the different rank variables of figure 4, which refer to aspects of business sophistication, technological readiness, innovation, higher education and training, and quality of infrastructure.

5.3 A simple form of attraction by diversity: Cross-border cases HU-RO and PT-SP

Figure 5 below shows the result of the simulations based on the model which is described in subsection 4.2. Each of the columns of plots in the figure represents a cross-border region (left column stands for the case of Portugal and Spain and the right column for Hungary and Romania). The upper row contains the 256 possible coalition in the natural binary ordering, for instance [0110 0000] contains no cross-border coalition and [0010 1000] contains a cross-border coalition between county 3 of country 1 (HU) and county 1 of country 2 (RO). In practice such coalitions may come about between the important urban centers and subsequently by drawing in their surrounding counties (i.e. a total of 2x4 such counties for HU-RO and PT-SP, respectively). The spikes are the payoffs of the stable cross-border coalitions in the sense described above and the dark line are those same payoffs sorted. The relatively large number of stable coalitions forms here due to the liberal “attraction by diversity” assembly rule for matrix $M$. Coalitions far to the right can contain few members, as e.g. [1100 1000] might illustrate. In any case one would “recommend” small cross-border coalitions with high payoffs which are associated with larger probabilities of realization. Using payoff
thresholds would suitably decimate the number of remaining coalitions. In this sense PT-SP shows a somewhat larger number of high payoff coalitions than HU-RO. The next two lines of plots from figure 5 refer to a sensitivity experiment which is done by varying the relative weight of the three influence matrices leading to $M$: Within the simplex of convex combinations between the three influence matrices, 2500 random draws were evaluated and the number of stable coalitions which formed in each situation was retained. The runs with matrix combination located at the barycenter ($1/3,1/3,1/3$) of this simplices (the lower plot) is exactly that depicted in the upper plots. As can be seen from the middle and the lower plots, respectively, each country pair attains a different number of coalitions according to relative importance given to the three matrices $D_0, D_1$ and $D_2$ (e.g. vertex $D_2$ of the simplex means that $(0,0,1)$ is used, etc.). Chances for finding a stable cross-border coalition are high in both cases.

Figure 5: The HU-RO case (left column) and the PT-SP case (right column). Upper plots: the number of times a coalition (out of 256) was chosen. Middle plots: frequency of a cross-border coalition (vertical lines denote averages). Lower plots: zero, below- and above-average coalition numbers for different matrix weights.
Points with dark color in a simplex of figure 5 (lower plots) mean that the number of cross-border coalitions is above average (dark or red) and below average (medium dark or green). Light shade (yellow) means no cross-border coalition is found. The differently colored points within each simplex represent different relative influences on potential coalition formation of the three respective similarity matrices described above.

5.4 A simple form of conservative attraction: Cross-border cases HU-RO and PT-SP

![Figure 6](image)

**Figure 6:** The HU-RO case (left column) and the PT-SP case (right column). The meaning of the single plots is the same as that from figure 5.

Changing the mode of assembling matrix $M$ from “attraction by diversity” to “conservative attraction” (depicted in figure 6) strongly reduces the number of the cross-border coalitions for both country pairs and it also partially affects the composition of the few coalitions with the largest payoffs. Most notably it reduces the chances of finding any coalition in the HU-RO cases. The coloring of the simplices also reveals that changing the composition of the single
matrices $D_0$, $D_1$ and $D_2$ has a nonlinear effect upon the number of cross-border coalitions produced. One may interpret the utility of such computations as follows: urban county centers which are part of more stable coalitions (over different attraction rules and different combinations of influence matrices) can be thought of as contributing more intensively to IC formation. Coalitions with high payoff (assuming that these are also contributing with a higher probability to eventual IC formation) can be siphoned out by more complex rules. However simply putting thresholds on the payoff in order to acts as filters, may also do well. As is the case with any strongly data dependent (commercial) recommender, the results of a recommender using information as provided in this section will also improve by continuously updating its data-base and by continuously re-computing any implied relations between the data, like, for instance, the stable cross-border coalitions discussed in the present section.

6. Discussion

While we are aware of the importance of highly specific and “path dependent” sequences of historical events which co-determine effective IC formation in a cross-border region, we also think that a list of more “systemic” features should be included, which, in a very wide sense, are more amenable to measurement and modeling.

The degree to which (regional) IC formation is co-determined by particularistic factors or by systemic factors may vary in practice from region to region and is a result of more or less hidden cultural factors. Indeed, IC formation in different cross-border regions like those exemplified, i.e. between Hungary and Romania and Portugal and Spain, respectively, faces very different systemic and cultural barriers. In order to address a wide spectrum of such particular differences (in other EU regions as well) we address a simpler but related problem: to find ways to express cooperation modes between urban centers of cross-border regions attainable with non-negligible probabilities. In order to process such situations one can by now rely on a series of high-quality IC-related data sources at the country level. However in searching for regional information, finding adequate data proves to be much more difficult and several proxies need to be constructed, partly in order to produce comparisons in analogy to those at the country level.

Our model succeeds in showing that mechanisms of “pure” market forces, like those preferred by liberal economists would generate much more (IC-induced) coalitions that a much more conservative way of looking at coalition formation. This indicates that policies might be developed in order to help transform the conservative solutions into the liberal solutions, because the liberal solutions may not be “naturally” achievable, owing to societal resistance to accept pure market forces or owing to market failures. Those policies would enable the cross border regions to reach the potential of growth they implicitly have, especially that owing to underutilized regional IC. Such policies could be more active – making interventionist efforts, or more passive – liberating hidden societal forces to foster efforts with similar results.

The next issue concerns the relation between policy recommendation the formation of regional IC and possibilities to effectively turn this relation into an instrumental research and assessment program involving effectively implementable information technology (IT) based recommenders. A faint analogy would be that of participative commercial (peer-2-peer) product recommenders used today in e-commerce (Ricci et al. 2011).

However, in our context, there is much more to the design of recommenders than that of using collaborative filtering as used by many clients for many products. An overview concerning a “non-cultural” viewpoint of extended recommenders, which emphasizes creativity, context awareness and explicit knowledge in the context of educational recommenders may be gained from the collection of works in Santos and Boticario (2012). From a conceptual point of view these edu-recommenders are an intermediate concept between the widely utilized commercial variety and our intended IC-related policy recommenders.

Here we like to highlight that IC-related recommenders should include a component which evaluates the culturally determined propensity for (cross-border) cooperation and eventually the shaping of the filters and he assessment of the delays in the regional IC formation process (see figures 1 and 7). Figure 7 is a regional cross-border re-formulation of figure 1. It includes links to items borrowed from collective learning, which are more instrumental at a much “smaller” organizational level (e.g. for firms, schools, cities, etc.).
Finally, we think that a more stringent link to concrete socio-technological solutions with high regional impact should be fostered. For instance, in analogy to the recommendation of different strategic "energy solutions" described in Schebesch (2013), one may propose, say, common technological recipes for advanced housing and energy use, advanced educational or vocational activities, new types of "industrial" agriculture, etc., well adapted to the needs and the IC potential of a cross-borders region. Such solutions would involve a mix of new concepts and technologies which would have to be ordered and interconnected according to depth and breadth of regional IC. Hence an IC-based policy recommender should be able to integrate the aspect of regional (cross-border) IC formation as indicated in figure 7 with such socio-technological aspects. In order to achieve this based on empirical data and participative evaluation, one may rely on using some existing IT tools, as for instance innovation contests or "prediction markets", which can all be organized as online solutions. Consequently, they would be largely based on appropriate variants of "crowd-sourcing" which are practically achievable by IT-means. Figure 8 depicts a dependency loop which would arise in such a situation of collecting data and evidence on one (or more) high impact technologies from two bordering countries and eventually transforming them into policy recommendations.

**Figure 7:** Two bordering countries (may) contribute the common IC formation

**Figure 8:** The link between country-level factors, technology preference, proposing new solutions and recommending policies for implementing most agreeable new technological solutions in a cross-border region
While the discussion of the integrative aspect of policy recommenders is mainly conceptual, each element contained can be effectively realized and adapted in terms of suitable IT technology. Henceforth, in principle, the decision of whether to use a more active or a more passive variant of policies in order to foster a regional development which is better reflecting the potential of regional IC would be now relegated to the outcome (e.g. the result a of majority vote) produced by such a participative recommender.

7. Concluding comments

We created a computational model to explain attraction between cross border regions due to IC-related factors, which is based on empirically constructed similarity matrices for the cases of two rather different sets of countries with cross-border regions – Portugal and Spain, and Hungary and Romania, respectively. We concluded that liberal coalitions are much easier to achieve than coalitions that form in other, more stringent context. However liberal coalitions are less plausible from a societal and cultural viewpoint. In policy matters this means that we may have to adopt active or passive policies in order to “lift” the economy at the level of market efficiency. The main limitation of the study is the small number of cases involved. To improve this study we hope to replicate it soon for other cross border regions like Finland and Estonia or Italy and Slovenia.

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Intellectual Capital Evaluation: A Project Management Perspective

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Abstract: Intellectual capital has prevailed as a measure of core competency and competitive advantage which explains the gap between the market value and book value of a company. Given the fact that the nature of intellectual capital is abstract, intangible, and difficult to measure, a challenge has arisen for managers to evaluate intellectual capital performance effectively. Despite the fact that several methods have been proposed to assist managers in this area, there is still a scarcity of approaches that are able to combine accurate data from financial reports and subjective judgments by experts, and that are dedicated to measuring intellectual capital in the context of choosing a set of the most promising new products. This forms the motivation to propose a method for intellectual capital performance evaluation in the field of product development projects that is based on a fuzzy logic approach. Intellectual capital includes many intangible factors, and as a result, it is difficult to evaluate intellectual capital performance using only traditional crisp values. Therefore, an evaluation of intellectual capital is proposed according to linguistic variables used by experts. The proposed fuzzy logic approach applies fuzzy linguistic variables to express the level of qualitative evaluation of each intellectual capital dimension in the context of project management. The use of the proposed approach can support the decision-makers in the choice of a set of new products that are most promising, improving the planning and implementation of intellectual capital management, aiding companies in building their competitive advantages, and helping companies achieve sustainable development. The feasibility of the proposed approach is illustrated by the result of intellectual capital performance evaluation for a sample set of projects.

Keywords: Intellectual capital, measurement, new product development, linguistic variable, fuzzy numbers

1. Introduction

World economy is changing, with knowledge now being the primary value of a company. In this era of the knowledge economy, intellectual capital appears to be the most important competitive factor for any company. Over the last three decades there have been major changes in the global economy with the gradual decline of the industrial sector and substantial increases in the number of companies working in the service sector and using knowledge as their primary source of competitive advantage (Wall et al., 2004). The major driver behind the rise of the knowledge-based economy is the combination of three trends: globalization, the far-reaching deregulation in key economic sectors such as telecommunications, transportation, energy, and financial services, and the exponential growth of technological change, especially the emergence of new information and communication technologies (Andriessen, 2004).

The origins of the intellectual capital approach can be found in the quest to understand, mobilize, and measure the intangible or “invisible” aspects of companies. In today’s knowledge-based economy, these are seen as the main drivers of value creation (Peppard, 2005). The market value of leading companies continues to be far higher than the value of their tangible assets and this has led to calls for intellectual capital, as opposed to intellectual property, to be included on balance sheets to give a more accurate impression of company value (Wall et al., 2004). The greatest challenge facing the accounting profession is understanding the huge difference between its balance sheet and market valuation. This gap represents the core value of company (Seetharaman et al., 2002).

Considering the research by method and purpose, there are two perspectives to studying intellectual capital – empirical tests based on financial accounting and practical development and adaption of intellectual capital reports (Han and Han, 2004). The first perspective focuses on decreasing value relevance of current financial reports or examination of IC related variables to substitute for current financial measures. In turn, the second approach concerns intellectual capital models and frameworks, as well as case studies for intellectual capital reporting.

The implication of intellectual capital (IC) is different from traditional capital in accounting terms. Therefore, it is a significant challenge for business managers to evaluate the performance of intellectual capital based on financial reports (Han and Han, 2004; Sveiby, 2005; Watson et al., 2005). In order to evaluate the performance of intellectual capital more appropriately, it should considered not only in terms of quantitative indexes but also qualitative dimensions or factors that are evaluated by experts (Tai and Chen, 2009). This paper investigates the intellectual capital performance evaluation in the context of project management and the use of fuzzy logic to assess the intellectual capital for diverse projects.
The rest of this paper is structured as follows: Section 2 presents the concept and evaluation of intellectual capital, including the dimension of human, structural, and customer capital, in the context of product development projects. In section 3, the proposed methodology for evaluating intellectual capital in a set of projects is illustrated. An example of the proposed methodology is presented in section 4. The final section summarises the paper and discusses the main findings.

2. Definition and components of intellectual capital

Intellectual capital plays an important role in improving financial performance and maintaining competitive advantage in a company. The value of a company includes its financial capital as well as its intellectual capital. Financial capital represents the company’s book value and contains the value of its financial and physical assets (Joia, 2000). Intellectual capital can be summarised as the sum of intangible assets. It can create a competitive advantage for a company, efficiently organise the company’s information, and create value (Lin et al., 2011). Stewart (1998) characterizes intellectual capital as “intellectual material – knowledge, information, intellectual property, experience – that can be put to use to create wealth”.

Scholars consider the content and composition of intellectual capital in various ways. Sveiby (1997) divided intellectual capital into employee competence, internal structure, and external structure. Edvinsson (1997) classified intellectual capital as structure capital, organization capital and customer capital. Subramaniam and Youndt (2005) consider intellectual capital from the following perspectives: human capital, organizational capital, and social capital. In turn, Maeques et al (2006) divide intellectual capital into three dimensions such as human capital, structural capital, and relational capital, based on the knowledge source and structure. Another classification identifies human capital, structural capital and customer capital (Stewart, 1998; Tai and Chen, 2009; Lin et al., 2011). This last classification is further considered in the paper.

Human capital comprises of all individual knowledge, both tacit knowledge (knowing how) and explicit knowledge (knowing what) (Tsui et al., 2014). Joshi et al (2013) claim that the value creation capability is highly influenced by human capital. Structural capital composes of company’s routines, procedures, strategies, and policies that are in charge of company’s daily operations whereas organizational capital is the collective and institutionalized knowledge and experience residing within and utilizing through databases, patents, manuals, structures, systems, and processes in a company. Relational capital refers to all knowledge acquired by companies because of their interaction with the external environment such as competitors, partners, government, and customers (Pandey and Dutta, 2013; Tsui et al., 2014).

The performance or value of intellectual capital can be evaluated with the use of countless methods. They can measure the intangible capital in accordance with tangible aspects of the subject resource based on discounted cash flow. Financial report methods can determine the value of intangible capital but they are inadequate and inappropriate as tools for business managers to recognize the performance of intellectual capital in a company. It is also essential to consider the multiple dimensions or factors that are assessed by experts in the evaluation processes of intellectual capital. Therefore, qualitative evaluation methods of intellectual capital have been proposed to tackle the existing problems of traditional financial report methods such as analytic hierarchy process, balanced score card and value-chain scoreboard (Eckstein, 2004; Han and Han, 2004; Tai and Chen, 2009).

Intellectual capital includes many intangible factors and items, and as a result, it is difficult to evaluate IC performance using only traditional crisp values. Therefore, the evaluation of intellectual capital according to data from financial and operational reports is proposed, incorporating expert judgements. The presented measurement model of intellectual capital is adapted to new product development. The phases of product development depend on the characteristics of the product, and the company in which it is designed. However, some common phases can be distinguished, such as concept initiation, program approval, prototype, pilot, and launch (Relich, 2014). These phases are usually performed in an R & D department but include processes concerning sales, logistics, production, and purchasing.

Business processes can be reflected in a company’s information system, e.g. Enterprise Resource Planning (ERP) system that stores data about the previous transactions, including product development projects (Relich, 2013). An ERP database can be used to determining objective indices of intellectual capital. In this study, the dimensions of intellectual capital contain human capital, structural capital and customer capital. In turn, each dimension consists of four components that include the indicators. Moreover, the indicators have been divided into two groups: objective
indices and subjective judgements. An example of hierarchical structure for measuring intellectual capital is presented in Table 1.

**Table 1:** Indicators for evaluating IC in the context of product development projects

<table>
<thead>
<tr>
<th>Dimension of intellectual capital</th>
<th>Item</th>
<th>Indicator</th>
<th>Type of indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human capital</td>
<td>Employee knowledge</td>
<td>1. The learning ability of project team members.</td>
<td>Subjective judgement</td>
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<td></td>
<td></td>
<td>2. Familiarity with information technology in R &amp; D employees.</td>
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<td></td>
<td></td>
<td>3. Proportion of staff with a university degree.</td>
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<tr>
<td></td>
<td></td>
<td>4. Total training costs / total payroll expenses.</td>
<td>Objective index</td>
</tr>
<tr>
<td></td>
<td>Satisfaction</td>
<td>1. Work attitude of R &amp; D employees.</td>
<td>Subjective judgement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. R &amp; D employee confidence in the company’s management team.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Proportion of generally satisfied employees of R &amp; D.</td>
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<td></td>
<td>4. Work area per employee in R &amp; D department.</td>
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<td></td>
<td></td>
<td>5. Number of days absence / total working days.</td>
<td></td>
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<td></td>
<td></td>
<td>6. The response rate in staff satisfaction survey.</td>
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<tr>
<td></td>
<td>Innovativeness</td>
<td>1. How often R &amp; D employees work to provide suggestions and proposals for new products.</td>
<td>Subjective judgement</td>
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<tr>
<td></td>
<td></td>
<td>2. Number of new products introduced during the last year / total products.</td>
<td>Objective index</td>
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<tr>
<td></td>
<td></td>
<td>3. Percentage of existing parts used in new products.</td>
<td></td>
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<td></td>
<td></td>
<td>4. Average number of distinct products per design platform.</td>
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<td></td>
<td>Employee turnover rate</td>
<td>1. Number of employees leaving the company / total employees.</td>
<td>Objective index</td>
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<td></td>
<td></td>
<td>2. Fairness of employees’ total number of seniority / total employees.</td>
<td>Subjective judgement</td>
</tr>
<tr>
<td></td>
<td>Corporate culture</td>
<td>1. Employees of R &amp; D on average identified with the company’s perspective.</td>
<td>Objective index</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Having values, faith and behaviour criterions, which are approved and shared by all the staff, is of considerable importance for company.</td>
<td>Subjective judgement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. An innovative culture within the company.</td>
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<td></td>
<td>Information system</td>
<td>1. Proportion of updated knowledge documents on the company intranet.</td>
<td>Objective index</td>
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<tr>
<td></td>
<td></td>
<td>2. The company focuses on the effective integration of information systems.</td>
<td>Subjective judgement</td>
</tr>
<tr>
<td></td>
<td>Trademark</td>
<td>1. The company has a distinctive sign or indicator to distinguish its products or services from those of other entities.</td>
<td>Subjective judgement</td>
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<td></td>
<td></td>
<td>2. The company effectively uses its developed patents.</td>
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<td></td>
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<td>3. The company focuses on the protection of patents.</td>
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<td></td>
<td>Operation process</td>
<td>1. Proportion of procedures or instruction described.</td>
<td>Subjective judgement</td>
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<tr>
<td></td>
<td></td>
<td>2. Standard operating procedure is of considerable importance for company.</td>
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<td></td>
<td></td>
<td>3. The company focuses on the quality management policy.</td>
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<td></td>
<td></td>
<td>4. The company focuses on the speed of development and design of new products.</td>
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<tr>
<td></td>
<td></td>
<td>5. The company has the key technologies required for production.</td>
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<td></td>
<td></td>
<td>6. The average time for product design and development in the company is faster than those of others in the same industry sector.</td>
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<tr>
<td></td>
<td></td>
<td>7. The R &amp; D investment in basic research and development is higher than those of others in the same industry sector.</td>
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<tr>
<td></td>
<td></td>
<td>8. The R &amp; D investment in product development is higher than those of others in the same industry sector.</td>
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<tr>
<td></td>
<td></td>
<td>9. The R &amp; D investment in product application is higher than those of others in the same industry sector.</td>
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</tbody>
</table>
The objective indices presented in Table 1 can be specified in a precise form from financial statements, production orders, etc. In turn, the subjective judgements depend on the employee’s (expert’s) knowledge and experiences and they are usually specified in the imprecise form, for example, as the following phrases: “strongly agree”, “agree”, “neither agree nor disagree”, “disagree”, “strongly disagree”. An expert can choose one or more of these linguistic variables. In the second case, one of the methods which can be used for evaluating dimensions of intellectual capital is fuzzy logic.

### 3. Proposed methodology for evaluating intellectual capital

Intellectual capital and project environment is difficult to evaluate using only traditional crisp values. Therefore, the evaluation of IC ratings is proposed according to linguistic variables used by experts that can be specified in terms of fuzzy logic. The design of traditional questionnaires concerning intellectual capital usually include a checklist for answers, and allow the respondent to choose only one answer for each item. However, problems arise when the respondent has more than one answer. Asking the respondent to make only one decision for each item may result in the data becoming inaccurate. Hence, to improve the traditional survey, this research proposes the use of fuzzy logic. An improvement over the shortcomings of the original scale is that the respondent can make several answers for each item, and can give each answer as a percentage. If the respondents can express their judgement as a degree of membership corresponding to the linguistic variables, it becomes possible to give a real number between 0 and 1.

Fuzzy logic is based on the concept of fuzzy set membership, where the membership functions are used to calculate the degree of membership of a fuzzy IC indicator to different sets, expressed by linguistic terms, e.g. low, medium, and high (see Figure 1). The shape of a fuzzy number and the scale of a linguistic variable depends on the user’s needs. In this study, a subjective judgement concerning level of indicator is assigned to the scale from 0 to 10. Compared to traditional binary sets (where variables may take on true or false values) fuzzy logic variables may have a value that ranges in degree between 0 and 1. Fuzzy logic has been extended to handle the concept of partial truth, where the value may range between completely true and completely false. The notion of truth can be considered as a means of representing and reasoning with partial knowledge (Sitek and Wikarek, 2013).
Taking into account the hierarchical structure of IC evaluation (see Table 1) and fuzzy numbers to describe the subjective judgements, a proposed approach consists of the following stages:

- Determine the rule base
- Determine subjective level of indicator by project team members (employees of R & D that develops new product)
- Defuzzify the values for item of IC dimension, e.g. Employee’s knowledge, for each project
- Calculate the average of each IC dimension, e.g. Human capital, for each project
- Calculate the average of intellectual capital for each project

The rule base is determined from the experts, and its aggregation rules are in the form of IF … THEN rules. The aggregation rules reveal the value of an output variable (IC item) if values of input variables (indicators) are expressed by different linguistic terms. An example of decision matrix is depicted in Figure 2.

The above example concerns the impact of “Learning ability of project team members” and “Familiarity with information technology in R & D employees” on IC item “Employee knowledge”. As an example, three of nine fuzzy rules for “Employee knowledge” are given below:

IF “LA” is low AND “FIT” is low THEN “Employee knowledge” is low.
IF “LA” is low AND “FIT” is high THEN “Employee knowledge” is medium.
IF “LA” is high AND “FIT” is medium THEN “Employee knowledge” is high.

The proposed approach enables the description of subjective judgements and objective indices taking into account the crisp and fuzzy numbers. For instance, the proportion of staff with a university degree may be described in the accurate form, whereas the learning ability of project team members may be described in the fuzzy form. As a result, the evaluation of intellectual capital for a new product seems to be more complete and suitable. The application of fuzzy numbers allows the linking of numeric information (gained from financial statements, production reports, etc.) with linguistic information (gained from project team members). The next section presents an example of the use of fuzzy numbers to evaluate the intellectual capital in the context of products that are in the development process.

4. Proposed methodology example

The proposed methodology has been applied to the evaluation of intellectual capital in four product development projects. Each project has different human and structural capital, whereas customer capital is the same for all
projects. Subjective level of indicator is from 0 to 10, where 0 depicts the lowest level of indicator and 10 – the highest level of indicator.

The determination of IC item has been calculated with the use of Fuzzy Logic Toolbox Matlab® software. After converting the linguistic variables (subjective statements) into triangular fuzzy numbers, the centroid of area method was performed for defuzzifying the triangular fuzzy numbers into corresponding non-fuzzy performance values. Figure 3 presents the employee’s judgements concerning the indicators of human capital dimension. IC items (i.e. employee’s knowledge, satisfaction, innovativeness, and employee turnover rate) are determined according to the assumed membership function and rule base. In turn, the score of human capital is calculated as the average of IC items.

**Figure 3:** Evaluating human capital

The last stage of the proposed approach relates to the calculation of the intellectual capital for all projects. The comparison of IC level for four considered projects (product lines) is shown in Figure 4.

**Figure 4:** Evaluating intellectual capital

Projects 2 and 4 have the greatest IC value, whereas project 1 has the worst result. The comparison of scores for the intellectual capital can facilitate the decision-makers to select a set of the most promising projects and identify the projects that require more attention. Moreover, the obtained scores can reflect the attitudes of project team members and indicate which new products have the greatest chance for successful completion.
5. Conclusions

Nowadays, there is an increasing demand for the identification of a company’s intellectual capital for decision support and providing important managerial insights in knowledge-intensive industries (Tsui et al., 2014). The present economy is full of turbulent changes, both social and technological, which create completely new conditions for a company’s activity (Caganova et al., 2012; Cambal et al., 2012; Sujanova et al., 2012). Today’s company has to choose an optimal set of new products and develop these products simultaneously in order to minimise cost and sustain competitiveness. The set of product development projects can be determined with the use of time-cost analysis as well as the level of intellectual capital that corresponds with a project.

The nature of intellectual capital is abstract and difficult to measure in a precise form. Intellectual capital indicators are usually vague and defined by subjective judgements rather than objective data (Relich, 2012). Also, project management includes fields (e.g. communication, leadership, culture within the project team) that can be described with the use of linguistic variables, and specified in the form of imprecise, fuzzy numbers (Relich, 2010; Relich and Jakabova, 2013; Samakova et al., 2013; Woolliscroft et al., 2013). The weight corresponding to a linguistic variable is different among employees, since personal preferences are subjective and fuzzy according to complicated, diverse, and indeterminate human behaviour. The use of fuzzy numbers provides a promising tool to quantify employees’ knowledge in an explicit manner through the measurement of IC indicators that are typically vague and defined by subjective judgments rather than objective data.

The proposed approach enables the description of subjective judgements and objective indices taking into account both crisp and fuzzy numbers. The evaluation of intellectual capital uses the fuzzy logic methodology and is considered as a hierarchical structure. This approach allows managers to understand the performance of intellectual capital and its components in the context of new products. The presented approach can be a suitable tool for company to discover their core competitive advantage and plan future directions for business development. Furthermore, managers can handle and improve existing intellectual capital in accordance with the differing performance level of each dimension of intellectual capital, items and projects. The disadvantage of the presented approach lies in the capturing of knowledge from experts. This obstacle leads to an increase of interest for further research in the field of automatic knowledge discovery, for instance, with the use of statistical analysis or artificial intelligence techniques, such as case-based reasoning, neural networks, or hybrid fuzzy neural system.

References


Education of Employees in Organisations Operating in Slovakia

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Abstract: Education of people is among the basic goals as well as outcomes of modern society. It is conditioned by the current demanding and turbulent environment requiring constant improvement, enhancement, adaptation and development of the level of education. It means that education needs to be permanent, reflecting all current needs resulting from the reality of changes. Education of employees can be characterised as a permanent process in which adaptation and changes of work behaviour, level of knowledge, skills and motivation of employees of an organisation by means of learning on the grounds of using various methods occurs. It results in reducing the difference between the current competence of employees and requirements posed on them. The objective of the article is to characterise the level of the focus of organisations operating in Slovakia on continuing education and development of employees. This article aims at presenting the results of research conducted in 2012 at the School of Economics and Management in Public Administration in Bratislava and at the Institute of Industrial Engineerering and Management, the Faculty of Materials Science and Technology in Trnava. The set of respondents comprised 340 randomly selected organisations operating in Slovakia. The key condition posed on them was the size of at least 50 employees. The analysis was used for information collected from literary sources or questionnaires. All the knowledge was dealt with in smaller parts in order to enable a more detailed focus. As to statistical methods, distribution characteristics were used to express the median. Most of the collected values were expressed in % upon the results summarisation. The methods of induction and deduction were used in the article upon deriving the conclusions. The method of comparison was used upon the evaluation of the present state, comparing organisations paying sufficient attention to human resources management and organisations not dealing with it at all. To evaluate the data, the SPSS 19 statistical programme and MS Excel 2007 were used. However, the research showed that only 9 % of respondents are heading towards the learning organisation successfully, i.e. 8 % of organisations apply the approach of targeted educational concept, and 1 % of organisations declared their approach to education to be the learning organisation concept. Unfortunately, more than 60 % of respondents are at the very beginning in the sphere of education, as they only restrict their educational activities to compulsory trainings enforced by legal regulations and to unscheduled courses.

Keywords: Education of employees, development of employees, learning organisation, human resources management, organisations operating in Slovakia

1. Education of Employees

Each organisation seeks to ensure appropriate workforce potential. Workforce potential organisations manage decides about success of each organisation. Workforce potential is a basic precondition of fulfilling the current and future tasks of an organisation in market economy. Workforce potential means not only the number of employees but also their knowledge, abilities, skills, intelligence, talent and personal characteristics necessary to meet set goals and mission of an organisation. To recruit these employees is therefore among the most important and permanent activities of personnel management. (Kachaňáková 2008). However, it is important to realise that not only the use of external sources but frequently primarily the use of internal sources is concerned at recruiting. The use of internal sources is evaluated very positively by employees, and such behaviour of an organisation motivates them. In order for an organisation to be able to focus on internal sources at recruitment, continuous education of employees is necessary.

Trends in the education of employees are directed towards the development and education of employees leading to performance increase and quality efficiency measurement under the impact of the increasing pressure on constant change of environment (Saniuk et al, 2013, Saniuk et al, 2012). That results in the need of a change from occasional, respectively unscheduled education (i.e. education when necessary courses and trainings are only carried out on the basis of the need to obtain the given knowledge, respectively experience) (Stachová, Stacho 2013, Samáková et al, 2013) to the general approach to education, i.e. to so called learning organisation. The aim of the learning
organisation is to achieve the permanent education of employees focused on performance increase immediately but also in a longer time horizon on the basis of continuously provided feedback.

Organisational learning predominantly concerns learning on the move, learning from own experience and searching for new possibilities. In order for organisations to learn, they need to operate as an open and dynamic system. It needs to be open to external as well as internal impulses. It needs to create the environment without barriers and boundaries of “us and them” type (Hronik 2007).

Learning organisations purposefully use the learning process at the level of an individual, a group as well as a system as a whole towards the gradual transformation of the organisation in a direction satisfying interest groups in an increased extent. (Tidd 2007, Bureš 2007).

Hronik, F. identified several characteristics differentiating between education in a learning organisation, characteristic of innovative organisations, and traditional education. These characteristics are graphically shown in figure 1.

Considering investments in people, many managers worry that they will sooner or later lose these people. However, there is a worse thing than investing in training and education of employees and losing them – not investing in their education and development and keeping them. To gain and keep top people in an organisation is one of the key tasks of management in organisations focused on innovations nowadays (Wang 2012, Cagáňová et al, 2012, Urbancová 2010, Babeťová 2010).

Learning at the organisational level is supposed to equip the organisation with preconditions by means of which it will be able to handle tasks it sets itself and those resulting from the rapidly changing external environment.

Education of people is among the key objectives and consequences of the modern society at the same time. It is conditioned by the present demanding and turbulent environment, requiring constant enhancement, deepening, adaptation and development of the educational attainment of people. It means that education needs to be permanent and should reflect all current needs brought about by the reality of changes. Employee education can be characterised as a permanent process in which the adaptation and change of working behaviour, the level of knowledge, skills and motivation of employees take place on the grounds of learning based on using different methods. It results in a decrease of the difference between the present competences of employees and requirements posed on them.

The key objective in employee education is to create conditions for the effective fulfilment of organisation’s tasks through the purposeful and permanent formation of working potential. Investing in human resources leads towards their overall appreciation, particularly reflected in the increased performance of employees and the level of provided services, the possibility of using own resources to cover employee needs, self-realization and customer satisfaction, their loyalty to the organisation, time and financial savings in the positioning of employees (within adaptation, a functional procedure, transfer, etc.).
2. Materials and Methods

The analysis was carried out on how organisations operating in Slovakia approach human resources management. It had the form of questionnaire research conducted over 2012, from February to May at School of Economics and Management in Public Administration in Bratislava and at the Institute of Industrial Engineering and Management in Trnava. Questionnaires were distributed in organisations with 50 and more employees. Upon determining the target group, depending on the size of organisation from the viewpoint of the minimum number of employees, we presupposed that organisations with the number of employees lower than 50 do not have a standardized and formally defined approaches to human resources management and to its individual functions. The collection, sorting and subsequent summary of information obtained from the researches were carried out from June to September.
The systemic approach for the objective evaluation of human resources management and their nature and for the elimination of details resulting from random events was used upon the article creation and the research evaluation. The analysis was used for information collected from literary sources or questionnaires. All the knowledge was dealt with in smaller parts in order to enable a more detailed focus. As to statistical methods, distribution characteristics were used to express the median. Most of the collected values were expressed in % upon the results summarisation. The methods of induction and deduction were used in the article upon deriving the conclusions. The method of comparison was used upon the evaluation of the present state, comparing organisations paying sufficient attention to human resources management and organisations not dealing with it at all. To evaluate the data, the SPSS 19 statistical programme and MS Excel 2007 were used.

340 respondents from the Slovak Republic participated in the research. The summary size structure of interviewed organisations is shown in Figure 2, implying that organisations with the number of employees between 50 and 249 were mostly represented in the research.

![Figure 2: The size structure of analysed organisations](image)

Source: Own research

The characteristics of the whole set of respondents within individual branches is shown in Table 1.

<table>
<thead>
<tr>
<th>Branch</th>
<th>The number of organisations</th>
<th>share in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>134</td>
<td>40%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>16</td>
<td>5%</td>
</tr>
<tr>
<td>Energetics and water management</td>
<td>12</td>
<td>4%</td>
</tr>
<tr>
<td>Services</td>
<td>103</td>
<td>30%</td>
</tr>
<tr>
<td>Banking, finance, insurance industry</td>
<td>11</td>
<td>3%</td>
</tr>
<tr>
<td>Public administration</td>
<td>56</td>
<td>16%</td>
</tr>
<tr>
<td>Others</td>
<td>8</td>
<td>2%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>340</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Own research

3. Analysis and Evaluation of Present State of Focus of Organisations on Education and Development of Employees

Our research focused on the education of employees, as appropriate education ensures that employees have knowledge and abilities necessary to carry out their work, not only the present one but also a future one. The level and intensity of education in individual organisations differs according to particular needs, set out goals and possibilities of an organisation. Generally, in order for education to be effective, it needs to be well arranged and systematic, and needs to be continuous within a repeating cycle. Analysing the process of employee education, we found out that organisations most frequently provide basic unplanned education, when courses necessary for desirable performance at the given position are carried out at the moment of finding a deficiency, respectively a change - so called random approach. The second most frequently implemented approach is organised approach, within which educational activities are planned and requirements for courses are precisely specified according to the
requirements and needs of an organisation. However, quite high number of organisations marked the level of their education as so called zero approach, when organisations only educate their employees in the compulsory, i.e. statutory sphere (Figure 3).

![Pie chart showing the distribution of educational approaches in organisations](image)

**Figure 3:** The course of education in the interviewed organisations

*Source: Own research*

We also analysed the effects of the place of headquarters of an organisation on the process of employee education. Results are shown in Table 2 and Figure 4. Results obtained from the 2012 research comply with the results of a research conducted by the Business Alliance of Slovakia, which implied that mostly educated are citizens working in four Bratislava districts, and the level of education is decreasing eastwards (Hajko, 2011). Our research also showed that organisations themselves mostly educate employees working in organisations operating in Bratislava, however not even at an average level of 2.46, as the range of the level of education is set out at five levels on the grounds of five approaches of organisations to education, from so called zero approach, having value 1 up to a learning organisation with value 5. Slightly above average approach to employee education was only reported by organisations with nationwide operation, achieving the average level of 2.83.

**Table 2** Impact of the place of headquarters of an organisation on the education process in 2012

<table>
<thead>
<tr>
<th>Education provided in your organisation (2012):</th>
<th>Headquarters of organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>only compulsory trainings</td>
<td>BA</td>
</tr>
<tr>
<td>not scheduled but necessary courses,</td>
<td>19</td>
</tr>
<tr>
<td>scheduled, educational activities are not scheduled for a period,</td>
<td>11</td>
</tr>
<tr>
<td>scheduled, educational activities are scheduled for a certain period,</td>
<td>19</td>
</tr>
<tr>
<td>permanent education</td>
<td>9</td>
</tr>
</tbody>
</table>

*Source: Own research*
**Figure 4:** Impact of the place of headquarters of an organisation on their approach to employee education

*Source: Own research*

To make the learning organisation concept implementation possible, it is necessary to establish so called personal perfectness, i.e. the employees should be aware of the need to improve and educate themselves continuously. Our research showed that 70% of the interviewed (see Table 3) use self-education as an educational method (sometimes supported by lectures, seminars and handbooks), which of course sounds more than positive at the first sight. However, majority of these organisations leave the whole educational burden on individuals, while they do not realize that self-education is appropriate for obtaining new knowledge, but only to a limited extent for obtaining new skills obtainable mainly on the basis of active educational methods. However, the research showed that educational methods supporting education by the situation experiencing form are rather little used in the interviewed organisations, e.g. outdoor learning is used in 15%, a stay in a subsidiary abroad in 10%, mentoring in 13%, and the assessment centre only in 4% of the interviewed organisations, while the mentioned methods are efficient for the model situation training.

**Table 3: Methods used for the education of employees**

<table>
<thead>
<tr>
<th>Which of the educational methods are used in the interviewed organisations:</th>
<th>[%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, seminars, handbooks</td>
<td>72%</td>
</tr>
<tr>
<td>Self-education</td>
<td>70%</td>
</tr>
<tr>
<td>Internet</td>
<td>38%</td>
</tr>
<tr>
<td>Work on projects</td>
<td>29%</td>
</tr>
<tr>
<td>Rotation at workplace</td>
<td>26%</td>
</tr>
<tr>
<td>Electronic media (e-learning)</td>
<td>22%</td>
</tr>
<tr>
<td>Coaching</td>
<td>21%</td>
</tr>
<tr>
<td>Outdoor learning</td>
<td>15%</td>
</tr>
<tr>
<td>Mentoring</td>
<td>13%</td>
</tr>
<tr>
<td>Stay in a subsidiary abroad</td>
<td>10%</td>
</tr>
<tr>
<td>Video conferences</td>
<td>6%</td>
</tr>
<tr>
<td>Assessment centre</td>
<td>4%</td>
</tr>
</tbody>
</table>

*Source: Own research*

To gain the learning organisation characteristics, it is necessary to create the atmosphere of permanent educational development which is directly conditioned by team learning and thus mainly by the full knowledge sharing within the organisation, emphasizing the team. However, the research showed that only 12% of the interviewed organisations share knowledge fully (see Table 4), while most organisations claimed that its sharing is not rewarded, respectively
that they follow neither the amount nor the quality of shared knowledge (see Table 5). Knowledge sharing can be supported by rewarding employees for such behaviour, however most organisations follow in detail neither the amount nor the quality of shared knowledge for which an employee could be possibly and appropriately rewarded. (Šujanová 2012, Urbancová 2012, Wood 2013)

**Table 4: The extent of knowledge sharing in the interviewed organisations**

<table>
<thead>
<tr>
<th>The extent of knowledge sharing</th>
<th>[%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only the knowledge necessary for work is shared</td>
<td>48%</td>
</tr>
<tr>
<td>Knowledge is rather shared</td>
<td>37%</td>
</tr>
<tr>
<td>Knowledge is fully shared</td>
<td>12%</td>
</tr>
<tr>
<td>Knowledge is the means of securing monopoly</td>
<td>2%</td>
</tr>
<tr>
<td>Knowledge is the means of securing power</td>
<td>1%</td>
</tr>
</tbody>
</table>

*Source: Own research*

**Table 5: Form of evaluating and rewarding knowledge**

<table>
<thead>
<tr>
<th>What is the form of evaluating and rewarding knowledge?</th>
<th>[%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>it is not rewarded,</td>
<td>66</td>
</tr>
<tr>
<td>the amount and quality of shared knowledge is monitored in detail, and employees are financially remunerated for it,</td>
<td>21</td>
</tr>
<tr>
<td>the amount and quality of shared knowledge is monitored in detail, and employees are non-financially remunerated for it,</td>
<td>9</td>
</tr>
<tr>
<td>other</td>
<td>4</td>
</tr>
</tbody>
</table>

*Source: Own research*

Permanent evaluation of the employee education efficiency has an impact on reaching and sustaining of the learning organisation environment, while this evaluation is at the same time the basis for other educational needs identification. The evaluation should be an answer to the question to what extent declared educational objectives have been fulfilled. When we compare the results of our research to researches conducted in 1998 and 2000 at the University of Economy in Bratislava (researches were conducted on comparable respondent samples) (Kachaňákova 2002), we can see that the number of organisations systematically evaluating their employee education efficiency has currently decreased (see Table 6).

**Table 6: The evaluation of employee education efficiency**

<table>
<thead>
<tr>
<th>Do you systematically evaluate your employee education efficiency:</th>
<th>[%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of organisations in % in 1998</td>
<td>66</td>
</tr>
<tr>
<td>Share of organisations in % in 2000</td>
<td>70</td>
</tr>
<tr>
<td>Share of organisations in % in 2010</td>
<td>56</td>
</tr>
<tr>
<td>Share of organisations in % in 2012</td>
<td>41</td>
</tr>
</tbody>
</table>

*Source: Own research*

Organisations systematically evaluating education effectiveness most frequently use the method of evaluating responses of employees immediately after education and the method of evaluating the fulfilment of goals set out in the education plan of employees. Evaluation should be a response to the question to what extent defined goals of education have been fulfilled. Detailed analysis showed that at education evaluation, organisations prefer rather formal methods and evaluating an actual change in performance before and after education is only used in a small extent (see Table 7).
Table 7: Evaluation methods of employee education effectiveness

<table>
<thead>
<tr>
<th>Which of the evaluation methods of employee education effectiveness is used in your organisation?</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting the overall number of education days of an employee</td>
<td>28</td>
</tr>
<tr>
<td>Evaluation of the fulfilment of goals set out in the education plans of employees</td>
<td>53</td>
</tr>
<tr>
<td>Evaluation of responses of employees immediately after education</td>
<td>57</td>
</tr>
<tr>
<td>Performance measurement before and immediately after education</td>
<td>11</td>
</tr>
<tr>
<td>Performance measurement before and after education (following several weeks or months)</td>
<td>11</td>
</tr>
<tr>
<td>Informal feedback from direct superiors</td>
<td>35</td>
</tr>
<tr>
<td>Informal feedback from employees</td>
<td>40</td>
</tr>
<tr>
<td>Observation at work</td>
<td>27</td>
</tr>
</tbody>
</table>

Source: Own research

Analysing the part focused on education and development of employees, we were also interested in the opinions of managing employees concerned with the given sphere in analysed organisations. In this relation, we asked them about their personal opinion on what they consider to be three key spheres of education in the period of upcoming three years. Table 8 shows the most frequently repeated education spheres marked by managing employees as prospective in the period of upcoming three years.

Table 8: Spheres of education considered by organisations to be prospective in the period of upcoming three years

<table>
<thead>
<tr>
<th>Which spheres of education do you consider to be prospective?</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managerial skills</td>
<td>40</td>
</tr>
<tr>
<td>Higher level of education qualification (university, school-leaving examination),</td>
<td>15</td>
</tr>
<tr>
<td>Economics and marketing</td>
<td>20</td>
</tr>
<tr>
<td>Technical and technological spheres of education</td>
<td>25</td>
</tr>
<tr>
<td>Foreign languages</td>
<td>50</td>
</tr>
<tr>
<td>PC skills</td>
<td>22</td>
</tr>
<tr>
<td>Legislation</td>
<td>4</td>
</tr>
<tr>
<td>Creation and usage of European funds</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: Own research

4. Recommendations for present state improvement

With regard to the findings, we proposed a set of questions with a range of closed responses for the analysis and implementation of the environment of so called learning organisation, on the grounds of which, in combination with using a summary table, an organisation can find its bottlenecks.

For the purpose of analysis of the level of establishing so called learning organisation environment, we compiled a question summary for organisation to answer (Table 9).

Table 9 Questions analyzing the sphere of learning organisation implementation, with scoring evaluation

<table>
<thead>
<tr>
<th>QUESTIONS AND ANSWER VARIANTS</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are company employees willing to learn?</td>
<td></td>
</tr>
<tr>
<td>a) yes, they suggest courses themselves</td>
<td>15</td>
</tr>
<tr>
<td>b) yes, but courses have to be suggested by company</td>
<td>10</td>
</tr>
<tr>
<td>c) no, they aren’t, and they avoid courses</td>
<td>5</td>
</tr>
<tr>
<td>d) no, they aren’t, and the company is not interested in their education</td>
<td>0</td>
</tr>
<tr>
<td>2. Knowledge in company is:</td>
<td></td>
</tr>
<tr>
<td>a) fully shared</td>
<td>15</td>
</tr>
<tr>
<td>b) rather shared</td>
<td>10</td>
</tr>
<tr>
<td>c) only knowledge necessary for work is shared</td>
<td>5</td>
</tr>
<tr>
<td>d) a means of securing power, respectively it is not shared for fear of working position loss</td>
<td>0</td>
</tr>
</tbody>
</table>
3. **Company uses mainly these educational methods:**

<table>
<thead>
<tr>
<th>Method</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) self-education, e-learning, outdoor learning, internship in a foreign subsidiary, couching, rotation at workplace, mentoring, lectures, work on projects, videoconferences, assessment centre</td>
<td>15</td>
</tr>
<tr>
<td>b) self-education, e-learning, outdoor learning, mentoring, rotation at workplace, lectures, work on projects</td>
<td>10</td>
</tr>
<tr>
<td>c) self-education, e-learning, rotation at workplace, mentoring, lectures</td>
<td>5</td>
</tr>
<tr>
<td>d) self-education, lectures</td>
<td>0</td>
</tr>
</tbody>
</table>

4. **How is employee education interconnected with carrier growth strategy?**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) It is exactly specified which courses, certificates and trainings employee has to attend and complete in order to have an opportunity of carrier growth.</td>
<td>15</td>
</tr>
<tr>
<td>b) It is only generally defined what type of courses, certificates and trainings employee should attend and complete in order to have an opportunity of carrier growth.</td>
<td>10</td>
</tr>
<tr>
<td>c) It is not defined which courses or certificates employee needs for carrier growth.</td>
<td>0</td>
</tr>
</tbody>
</table>

5. **How is education carried out in your company?**

<table>
<thead>
<tr>
<th>Method</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) permanent education</td>
<td>15</td>
</tr>
<tr>
<td>b) organized educational activities planned over whole year</td>
<td>10</td>
</tr>
<tr>
<td>c) trainings and courses in case they are needed</td>
<td>5</td>
</tr>
<tr>
<td>d) only compulsory trainings</td>
<td>0</td>
</tr>
</tbody>
</table>

6. **Does your company evaluate education effectiveness?**

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) yes, education is systematically evaluated</td>
<td>15</td>
</tr>
<tr>
<td>b) yes, but we do not have an elaborated evaluation system</td>
<td>5</td>
</tr>
<tr>
<td>c) no</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: (Stacho, 2012)

On the grounds of provided answers, individual values of these answers are counted up. Individual point ranges, on the grounds of which a particular level at which an analysed organisation is, are stipulated in Table 10.

**Table 10: The level of learning organisation implementation on the grounds of summary point evaluation of individual questions**

<table>
<thead>
<tr>
<th>Feature of an innovative industrial enterprise</th>
<th>Your result</th>
<th>Level of your organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning organisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 – 80</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>79 – 55</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>54 - 20</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>19 - 0</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author

Organisations were divided into the following four possible levels within the “learning organisation” sphere:

A. Organisation educates its employees permanently and purposefully, while education is based on actual needs of a company and employees. Between individual courses, employees have to fulfil educational tasks. Employees are thus continuously in the process of learning. Besides specialised trainings and courses, education is also carried out at workplace by means of mentoring and coaching. New experience is subsequently consulted within working teams. Such education is supported at all levels of organisational management. The effectiveness of such education is obvious; employees as well as organisation advance and create a stronger position in the competitive business environment.

B. Organisation has established an organised approach to employee education; it has arranged specialised educational courses for a certain period and in a certain extent on the grounds of the analysis of educational needs of individual employees and the analysis of offers of educational agencies. Education is supported by line managers, who arrange and propose courses for employees themselves, and employees are willing to attend proposed courses, as they are aware of subsequent career growth possibility.
C. Organisation has not compiled an education plan. Employees attend courses necessary at the given moment to fulfill their tasks in educational agencies providing the best offer at the given moment. Effectiveness of such education is minimum, employees are only educated with regard to their present position, and thus education does not help them in possible career growth either.

D. Organisation does not support employee education. It is restricted to such an extent that only trainings required by legislation, decrees or professional regulations are carried out. Employees can educate themselves above this framework, however on their own initiative, on their own costs and in their free time.

Table 11 was prepared to reveal bottlenecks in the “learning organisation” sphere, from which the interviewed can particularly define which part within the learning organisation sphere is necessary to focus on in order to reach a higher level in this sphere.

Table 11 Table revealing bottlenecks in the sphere of learning organisation implementation

<table>
<thead>
<tr>
<th>No. of question / answer</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>very well</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>above standard</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>below standard</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>bad</td>
<td>d</td>
<td>d</td>
<td>d</td>
<td>c</td>
<td>d</td>
<td>c</td>
</tr>
</tbody>
</table>

Source: (Stacho, 2012)

5. Conclusion

In order to overcome the negative effects of the crisis and to sustain competitiveness on the European market in the future, organisations in Slovakia need to adopt the idea that permanent education and employee development are necessary, and that they can only succeed with qualified workforce. It is also the initiative of the EU policies in the given field focused on the increase of investments in human resources and in emphasizing the lifelong education priority. However, Slovakia is still a country where organisational managements have not realised the importance of the education of their employees. In the situation when organisations try, as a result of the crisis, to make all their activities more effective the threat of savings in employee education is becoming real. Such solution would be very short sighted. Employee education is a necessity and knowledge is the key factor of economic prosperity. If organisations understand this and if they manage to survive on the market during the crisis thanks to good management, they should also consider scenarios topical after its weakening. However, it is all conditioned by the existence of efficient and qualified employees bringing forward creative ideas and having the courage to experiment. Like all the activities of human resources management, the education and development of employees also have to be well-grounded and effective, i.e. interrelated to performance objectives. Therefore, the concept of performance management is becoming topical in organisations, suggesting the interconnection of performance evaluation and the employees’ further education and development. It means that the results of evaluated employees are the basis upon determining the objectives for the upcoming period, where performance objectives and objectives in education and development are interconnected. However, the research showed that more than 60 % of organisations are at the very beginning with regard to education, as they only restrict their educational activities to compulsory trainings enforced by law and regulations and to unscheduled courses which need to be carried out at the given moment.

We see justification of the given research part in practice particularly in revealing irresponsible behaviour of organisations operating in Slovakia in directing and advancing in the sphere of education. On the basis of our presentation of obtained results, organisation managements can compare their own present state within the given sphere to state that interviewed organisations declared, and subsequently consider options of its enhancement. We also consider as contribution the compilation of a block of questions for both analyzed characteristics in combination with the summary table, based on which organisations can find their bottlenecks in individual spheres. At the same time, we consider as necessary to continue in this research in order to improve, modify, enhance and develop individual approaches on the basis of new information obtained from interviewed organisations.

Acknowledgement

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Republic, VEGA No. 1/0079/14 Barriers of competitiveness (organisations operating in Slovakia) growth with regard to the development of human capital innovation potential as well as to VEGA project No. 1/0787/12 The identification of sustainable performance key parameters in industrial enterprises within multicultural environment.

References


An Empirical Investigation of Maturity Levels in Knowledge Management

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Abstract: The purpose of this paper is to analyse if knowledge management maturity models can be applied in corporate practice. Therefore, a thorough KM application is recommended. Little attention has been paid to the question which level of KM application is effective and efficient for a company. This paper tries to close this gap using the concept of KM maturity. It investigates if different KM maturity levels can be identified in corporate practice and in how far they are influenced by specific factors, e.g. company size. To answer the research questions, exploratory case studies were conducted through semi-structured qualitative interviews with representatives from ten northern German companies. The results show that the practical applicability of KM maturity models (KMMM) is still limited. None of the companies can be categorized to have a high KM maturity level despite their multiple use of KM tools. As influence factors the size of a company and an externally certified quality management were identified. To validate these findings an additional online survey was conducted with 79 participants. The results of this survey support the general statements above, but also show a significant relation with the KMM level and employees' participation in knowledge management and the innovation success of a company compared to its main competitor. The paper contributes to the understanding of KM maturity and its influence factors and thus provides the foundation for further empirical research. Moreover, the findings help organisations to position their KM efforts.

Keywords: knowledge management, maturity levels, influence factors, success factors, case study research, online survey

1. Introduction

The resource-based view (RBV) of the firm is characterised by the idea that rare firm-specific resources which can’t be easily adapted or imitated by competitors, e.g. machine capacity, production experience or customer loyalty, are the main success factors for competitiveness, growth and profit of a company. During the last decades, the awareness of knowledge as probably the most important firm-specific resource has led to the development of the knowledge-based view (KBV) of the firm. Knowledge is a specific resource in comparison to financial or physical resources. It does not depreciate and “can generate increasing returns even when it is shared” (Curado and Bontis, 2006, p. 375). Knowledge is subject to economies of scale and scope and thus implies increasing returns, especially in knowledge-intensive industries. Therefore, a company has to create, apply, integrate and document its organisational knowledge carefully in order to gain competitive advantages (Wernerfelt, 1984, Wernerfelt 1995, Grant, 1996, Grant, 1997, Grant, 2002).

As companies have realized that the effective use of their knowledge can grant them an advantage over their competitors, knowledge management (KM) has become increasingly important (Nonaka/Takeuchi, 1995). KM comprises the systematic creation, application, integration, and documentation of organisational knowledge. During the recent years, it has run through a life cycle. At the beginning of the nineteen nineties the primarily technology-driven euphoria has led to a KM hype. KM was implemented in various organisations using a selection of different frameworks and approaches. Heisig (2009) reviews and compares about 160 different KM frameworks from science, practice, associations, and standardisation bodies. Considering the sharply increasing numbers of publications KM was established as an own academic research discipline. However, the euphoria was soon followed by harsh criticism and disillusion. As KM was mainly considered as an IT problem, its implementation often only increased IT spending and led to a mass of unused data and an information overload. Some even consider KM as an organisational fashion. It is assumed that only one sixth of all KM initiatives have significantly contributed to corporate success within the first two years after their implementation and that the majority of KM initiatives are abandoned (Kay, 2003; Meier/Weller, 2012).

The primary motivation for KM implementation must be to improve business performance. Nevertheless, only a few empirical studies have examined the effect of KM on corporate success so far: Choi and Lee (2003) analyse the effects of different KM styles on corporate performance on the basis of a questionnaire. Their analysis of 54 large South-Korean firms reveals that KM methods can be categorised into four styles: dynamic, system-, human-oriented and passive. The dynamic style results in higher corporate performance, the human- and system-oriented styles do not show any difference in terms of corporate performance, whereas the passive style is less effective. Corporate performance was measured from a non-financial perspective and consists of items such as overall success, market share, employees' satisfaction and innovation.
share, growth rate, profitability, innovativeness and business size compared to key competitors which are valued on a six point Likert scale. Darroch (2005) examines the relationships between knowledge management, innovation and firm performance in 443 companies with more than 50 employees in New Zealand. Her results support the view that firms with KM capabilities use resources more efficiently, are more innovative and perform better than companies without a developed KM. Kruger and Johnson (2011) examine the correlation between KM maturity and organisational performance (OP) for nine South-African organisations in three industries. The study is based on 434 interviews of managers located at three different group levels (operational, middle and senior management) over a five-year period. They come to the conclusion that companies reporting a higher OP recorded higher KM maturity as well. But findings also indicate that there are conditions under which companies with higher OP scores recorded lower KM maturity. Pawlowsky et al. (2011) examine the state-of-the art and possible KM success factors and the relevance of KM activities for corporate success in German companies. They conduct a survey of 3,401 German companies in 2010/2011. As a result they find a medium level of KM activities. Whereas company size and industry have no statistically significant influence on the level of KM activities, market challenges as a lack of qualified employees or a highly dynamic market and corporate strategy have a statistically positive correlation with the level of KM activities. In addition the level of KM activities has a strong positive impact on the level of employee motivation, innovative capabilities, competitiveness and financial success. López-Nicolás and Merono-Cerdán (2011) also find a strong positive impact of KM strategy on innovation and organisational performance for 310 Spanish companies. Moreover, KM strategies indirectly (through an increase on innovation capability) impact on performance, thus reinforcing the total effect of KM strategies on performance.

Overall, some studies support the view that companies with an elaborated KM are more innovative and competitive and have a better financial performance. Most studies assume that more KM activities lead to an improved corporate performance. On the other hand, the nature of this relationship and possible influence factors are not really addressed. Especially, it is unclear if the scope of applied KM activities is influenced by specific factors, such as company size.

During recent years various KM maturity models have been developed in order to structure the KM implementation process. The idea originated from maturity models mainly created for the software development processes (Carnegie Mellon University 1994; Dayan/Evans 2006). KM maturity can be defined “as the extent to which KM is explicitly defined, managed, controlled, and effected. It describes stages of growth of KM initiatives in an organization” (Pee/Kankanhalli, 2009, p. 81). Most KM maturity models (KMMM) have been criticised as ad-hoc in their development and not empirically validated. In addition, some researchers have severe concerns about the practical applicability of these models and the extent to which they reflect actual corporate KM practice (Kulkarni/St. Louis, 2003). In addition it is proposed that the influence of situational factors on KM maturity has to be addressed by future research and integrated into the models (Pee/Kankanhalli, 2009).

Thus, the main aims of this study are to examine in how far different KM maturity levels can be identified in corporate practice, which factors influence the KM maturity level of a company and if there is a relationship between KM maturity levels and corporate success. This paper contributes to KM research by extending our understanding of the practical applicability of KMMMs and of influence factors concerning the KM maturity level. In addition KMMMs provide a template against which organisations can map their KM progress. The original value results from the application of the KM maturity concept in various companies of different sizes and in different industries. For this first explorative research the KM maturity model of Pee and Kankanhalli (2009) is used. The model is explained in the second section of this paper.

The rest of the paper is structured as follows: In the second section basic notions are defined and a framework for KM maturity is introduced. Then the data and the methods of the conducted case studies and the online survey are described, before the empirical results are reviewed. Finally, implications for further research and corporate practice are drawn and limitations of the paper discussed.

2. A framework of KM maturity and its influence factors

There is no generally accepted definition of knowledge in theory and practice, leading to considerable confusion about what can be summarised as knowledge and how knowledge can be separated from the related concepts of competencies and capabilities. In corporate practice, often all data, information, know-how, routines, and processes of a company are summarised as organisational knowledge. With such a broad definition, KM can hardly be distinguished from information and data management (Heisig, 2007; Meier/Weller, 2012). Some researchers define...
knowledge as a justified belief that increases an entity’s capacity for effective action (Alavi/Leidner, 2001; Nonaka, 1994). It is justified because it is grounded in information as well as in the values and prior understandings of the holder, which means that knowledge is relational and context-specific. To separate knowledge from data and information it is required that knowledge can be converted into an improved corporate competitiveness or corporate value.

Knowledge is often described in terms of dichotomies e.g. implicit/tacit versus explicit knowledge or individual versus organisational/collective knowledge. The distinction between explicit and implicit/tacit knowledge is widely accepted. Explicit knowledge can be articulated and easily communicated between individuals and organisations. Tacit knowledge (skills, know-how, and contextual knowledge) is manifested only in its application – transferring it from one individual to another is costly and slow (Nonaka, 1994, Alavi/Leidner, 2001). Explicit knowledge is subject to economies of scale as it is costly to create but cheap to replicate, whereas tacit knowledge is more subject to economies of scope (Grant, 2002). Another commonly used classification is the differentiation in individual and organisational knowledge. Individual knowledge consists of the know-how, skills, and competencies of the employees and can be transferred into organisational knowledge. Organisational knowledge is manifested in internal processes, external co-operations with customers, suppliers and other partners or the technologies of a company. Organisational knowledge is at least partly documented in IT-systems or paper-based documents (Nonaka, 1994, Davenport/Prusack, 2000). Another classification differentiates knowledge in human knowledge (skills, competencies, and abilities of individuals and groups), relational knowledge (about relationships with suppliers, allies, and customers), and structural knowledge (knowledge that is company property, e.g. patents, copyrights, and trademarks; processes, methodologies, models; documents and other knowledge artefacts as computer networks and software) (Stewart, 1997).

As there is no commonly accepted definition of knowledge, there also isn’t one for KM. It is unclear if KM only deals with the creation and dissemination of new knowledge or with the systematic administration of existing knowledge as well. Often, it is defined as a process consisting of not necessarily sequential KM activities. We understand KM as a systematic process for identifying, creating, acquiring, sharing, and documenting individual and organisational knowledge in order to improve a company’s competitiveness and performance (Davenport/Prusack, 2000, Alavi/Leidner, 2001). It is “the systematic effort to capture, store, retrieve, reuse, create, transfer and share knowledge assets within an organization, in a measurable way completely integrated in its operational and business goals, in order to maximize innovation and competitive advantage” (Dayan/Evans, 2006, p. 70). Because of the multi-facet concept of knowledge, KM is a multi-discipline approach as well. It covers aspects of human resource management, process management, innovation and technology management, and information and IT management (North, 2013). Therefore, existing KM models are founded on different theories and methods and vary greatly in terms of focus and scope. In general, they can be categorised as process-oriented, human-oriented and technology-oriented (Alavi/Leidner, 2001).

In order to structure the KM implementation process, KMMMs have been developed during the last years. They are based upon the idea of capability maturity models (CMMs). The most famous model was developed by the Software Engineering Institute of the Carnegie Mellon University in collaboration with the software community. Since its publication in 1991 the model has become a de facto standard for assessing and improving software engineering processes (Carnegie Mellon University, 1994; Dayan/Evans, 2006). As software engineering and KM are both assumed to be based on a standard set of prescribed activities, researchers and practitioners have tried to transfer the basic concept in order to develop a KM maturity model (Dayan/Evans, 2006). KM maturity models state that the implementation of KM approaches follows an ideal evolutionary path (Kulkarni/St. Louis, 2003). In addition, it is assumed that

- the entity’s development can be simplified and described with a limited number of maturity levels (usually four to six),
- the levels can be ordered sequentially and characterised by certain requirements which have to be completely fulfilled in order to reach a certain level and
- the entity progresses from one level to the next without skipping any level (Pee/Kankanhalli, 2009.)

Pee and Kankanhalli (2009) provide a thorough review and comparison of KMMMs and integrate the different concepts. Overall, the majority of the reviewed KMMMs differentiate between five maturity levels starting from an initial level 1 where the organisation suffers from a lack of awareness of the need for a systematic KM and ending at an optimised level 5 where KM activities are deeply integrated into the organisation and continually improved upon.
Based on their review, the authors integrate the different KM maturity concepts and develop an own model named General KM Maturity Model (G-KMMM). Supported by the idea of KM being a multi-discipline approach, in their model KM maturity is assessed from different perspectives. These perspectives, namely HR management, process management and technology management, lead to the three key process areas people, process and technology. In addition five different maturity levels are specified. For each maturity level, requirements for the three key process areas are derived (see table 1). An organisation reaches a maturity level if it fulfils all requirements for this level and the levels below.

**Table 1: Maturity levels and key process areas of the G-KMMM**

<table>
<thead>
<tr>
<th>Maturity level</th>
<th>General description</th>
<th>Key process areas</th>
<th>People</th>
<th>Process</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Initial</td>
<td>Little or no intention to formally manage organisational knowledge</td>
<td>Organisation and its people are not aware of the need to formally manage its knowledge resources</td>
<td>No formal processes to capture, share and reuse organisational knowledge</td>
<td>No specific KM technology or infrastructure in place</td>
<td></td>
</tr>
<tr>
<td>2 Aware</td>
<td>Organisation is aware of and has intention to manage its organisational knowledge but it might not know how to do so</td>
<td>Management is aware of the need for formal KM</td>
<td>Knowledge indispensable for performing routine task is documented</td>
<td>Pilot KM projects are initiated (not necessarily by management)</td>
<td></td>
</tr>
<tr>
<td>3 Defined</td>
<td>Organisation has put in place a basic infrastructure to support KM</td>
<td>Management is aware of its role in encouraging KM</td>
<td>Basic KM training and content and information management is formalized</td>
<td>Processes for content and information management is formalized</td>
<td>Basic KM infrastructure in place (e.g. single point of access)</td>
</tr>
<tr>
<td></td>
<td>KM initiatives are well established in the organization</td>
<td>Common strategy and standardised approaches towards KM</td>
<td>Quantitative measurement of KM processes (i.e. use of metrics)</td>
<td>Existing KM systems are fully in place</td>
<td>Some enterprise-level KM projects are put in place</td>
</tr>
<tr>
<td>4 Managed</td>
<td>KM is deeply integrated into the organization and is continually improved upon</td>
<td>KM is incorporated into the overall organisational strategy</td>
<td>KM processes are constantly reviewed and improved upon</td>
<td>Enterprise-wide KM systems are fully in place</td>
<td>Usage of KM systems is at a reasonable level</td>
</tr>
<tr>
<td></td>
<td>KM is an automatic component in any organization processes</td>
<td>More advanced KM training Organisation KM standards</td>
<td>Existing KM procedures are an integral part of the organisation</td>
<td>Seamless integration of technology with content architecture</td>
<td></td>
</tr>
</tbody>
</table>

Although there are almost no studies identifying possible influence factors on KM maturity, it is obvious that not all companies can and should achieve the fifth level. Possible influence factors on KM maturity are:

- **Company size**: The larger a company is, the more difficult it is to identify knowledge in the organisation. On the other larger companies have more financial resources for a thorough KM implementation. Therefore, we expect larger companies to have a higher KM maturity than smaller companies.
- **Industry**: Companies in knowledge-intensive industries are expected to have a higher KM maturity than companies from less knowledge-intensive industries.
- **Innovation activities**: Here we expect that incremental innovations require a higher KM maturity concerning processes and technologies whereas radical innovations require a higher KM maturity with regard to the key process area people.
- **Existence of a certified quality management (QM) system**: As the certification of a QM system requires a thorough process management and documentation, we expect companies with a certified QM to have a higher KM maturity, especially with respect to the key process area “processes”, than companies without a certified QM system (for the relationship between QM and KM see Ribières/Khorramshahgol, 2004 and Jochem et al., 2011).

Relevance of different types of knowledge: Explicit knowledge requires a documentation and thus a higher KM maturity concerning the key process area “technology” can be expected. Tacit knowledge can only be transferred via direct collaboration and thus a higher KM maturity concerning people and processes is probable.

Based on this KM maturity concept a semi-structured interview guideline was developed to see if maturity levels can be observed in practice. Besides looking at the use of KM tools the case studies also offer a first opportunity to check whether maturity stages are influenced by factors as corporate size, industry, innovation activities, the existence of an externally certified quality management (QM) system, or the relevance of different knowledge components. Based on the results of the interviews a questionnaire for the online survey was developed. For each KMM level one or two relevant items were selected.

### 3. Data and methods

To empirically check for possible KM maturity levels, a case study approach and an online survey were chosen. Case studies allow rich empirical descriptions of the subject of interest and help to understand complex social phenomena to a deeper extent than survey-based empirical studies (Yin, 2009, Eisenhardt/Graebrner, 2007). The case study approach focuses on contemporary events and enables a researcher to ask “how” and “why” questions which are explanatory in the context of KM (Yin, 2009). The following survey allows us to validate the results.

The case studies were mainly based on semi-structured qualitative interviews. In total case studies from ten different companies were documented. The participating companies were chosen with regards to their size and industry to enable a broader exploration of the research questions and theoretical elaboration. It also allows to search for patterns in KM regarding the above mentioned influence factors and enables an easier replication of the case studies (Eisenhardt/Graebrner, 2007). IT, Mechanical Engineering, and Energy were selected as industries because we assume that all three are knowledge-intensive and thus KM is an important management issue. From each of the three industries one small (< 250 employees), one medium (250 – 500 employees) and one large (> 500 employees) company were analysed. All companies are from the federal state of Schleswig-Holstein in Germany, as this research is part of an EU funded project concerning regional aspects of KM (for more information see www.win-vin.eu).

When comparing the innovation activities of the ten analysed companies, we find that all but one company conduct own R&D, but their R&D spending differ considerably from 0-5% to over 10% of sales. There is no obvious relationship between the R&D spending and the industry or the size of the company. The companies work on product and process innovations that are mainly incremental and market driven. Only three companies from the mechanical engineering sector state that their innovation activities are market as well as technology driven. Seven out of ten companies have a certified QM system. The existence of a certified QM system is clearly influenced by company size. Over a two months period one interview per company was carried out. Interview partners were top representatives, either on managing director level (5), from R&D or technical department (3), from Quality Management (1) or others (1). Once the interviews were documented, the documentation was sent back to the interview partners for validation. This process helped to eliminate possible misunderstandings or poor recalls of the answers given. The final versions of the documented interviews were then used to analyse the data. Where possible data was transferred into quantitative numbers (yes/no, ranking numbers, etc.) to facilitate an easier comparison between the different case studies. Also, additional information about the companies was collected from publicly available sources like the Internet, the company webpage or Youtube videos and analysed.
The results of the case study research were validated by an online survey. Based on the interview experience the questionnaire was further developed and modified. Finally, it consisted of eight parts covering the three KM key process areas. For each maturity level one or two questions were asked. The answers were nominally or ordinally scaled using a six point Likert scale (ranging from 1 = to a very low degree to 6 = to a very high degree). In addition, the companies were asked to evaluate their success. The success consists of three different items: employees’ participation in KM activities, innovation success compared to the main competitor and financial success compared to the main competitor.

The survey was conducted from March to May, 2014. 612 companies in the federal state of Schleswig-Holstein were addressed. 79 questionnaires were usable for the analysis, that means a response rate of about 13%. Over 70% of the companies have less than 100 employees; 11.5% have between 101 and 500 employees, the rest has more than 500 employees. Thus, small companies are a little bit overrepresented. 50% of the companies are in the manufacturing sector, 38% in the service sector, the rest is equally distributed over the other sectors. On average, the companies are 41.4 years old. The responding persons were mainly in the top management (72%), only three respondents consider themselves as knowledge managers. The other respondents are quality managers, IT managers, HR managers, or R&D managers. 71.9% of the companies have an externally certified quality management.

The G-KMMM is used as a framework for assessing the KM maturity of the analysed companies. Literature suggests to evaluate KM maturity with a questionnaire answered by the person responsible for KM in an organisation (self-assessment). The questionnaire is structured with respect to the different key process areas (people, processes and technology/systems). For each area and each maturity level different activities are described and it is suggested that the knowledge manager of an organisation has to assess in how far these activities are fulfilled (Kulkarni/St. Louis, 2003). In our study we choose a different approach. The KM maturity level was assessed by a researcher. Reliability was improved as the KM maturity assessment was replicated by a second researcher based on the documentation.

4. Empirical results concerning KMM levels

4.1 Relevance of knowledge components

The interviews reveal that most companies are aware of the importance of their knowledge base for their corporate success. Asked about the relevance of different knowledge components, the interviewees consider human knowledge as the most relevant component followed by relational knowledge. Structural knowledge and the technology base, although also important, rank lowest. Most interview partners state that all knowledge components are closely interlinked and show a lot of synergies. Although there is a general agreement on the ranking of the components some differences can be observed. Two IT companies do not consider their technology base as being very relevant, whereas two mechanical engineering companies rank this knowledge component first together with their human knowledge. Interviewees explained this with different durations of technology life cycles in their industry. The longer the life cycle and therefore the influential time span of a used technology, the more relevant the technology base seems to be.

Considering the human knowledge the motivation of the employees is regarded to be as important as their qualification. Two IT companies and one energy company even rank motivation higher than qualification. This is explained with short knowledge life cycles in their business. A basic qualification is always considered as prerequisite, but the faster the knowledge in the industry changes the more important it is for an employee to be motivated and flexible to embrace new knowledge. Three out of ten companies suffer already from a lack of qualified employees, all but one company expect such a lack in the future.

In general the relationship to customers is seen as the most important relational knowledge, followed by the relationship to suppliers, universities and research institutions. The structural knowledge was rated as less relevant than the other knowledge components. Structural knowledge involves the corporate culture, the organisational structures, and processes as well as the IT systems. The interviews do not deliver enough findings to differentiate between the elements of structural knowledge. Further research should focus on this in more detail, as for a long time the use of IT systems was regarded as especially important for KM (Kruger/Johnson, 2011) before companies and researchers adopted a more multidimensional approach (Pee/Kankanhalli, 2009). In addition, Stewart (1997) describes the structural knowledge as even more important than the human capital – at least from a management perspective. It requires organisational structures to convert human capital into economic success.
Interestingly there seems to be a relationship between the size of a company and its assessment of the relevance of explicit versus implicit knowledge. All large companies, and one medium sized, state that most of their knowledge is explicit. All small companies, and one medium sized, state that most of their knowledge is implicit. Reasons for this finding could be either that larger companies have a greater need to document their knowledge than smaller companies. Alternatively, it could be that larger companies have more financial and personal resources, which they invest in knowledge documentation.

4.2 KM activities

During the interviews some participants reported that they have already installed a variety of KM tools, others talked about their urgent need to install specific KM tools. All companies use a variety of methods to develop their knowledge, like internal R&D, personnel development, patent research, participating in networks, etc. It became clear that most of the methods and tools named were not immediately linked to KM. It is therefore assumed that the companies actually use an even wider variety of instruments without considering them as being part of KM.

Knowledge is mainly internally shared via meetings, specific information events for employees, and the intranet. Instruments used for external knowledge sharing are more heterogeneous and range from fairs and exhibits, internet activities, personal interactions with sales staff, to networking activities. All companies with a higher perceived relevance of explicit knowledge use an intranet to share knowledge internally. On the other hand, the use of knowledge sharing methods is not linked to the industry or R&D spending. All companies participate in networks as a way of knowledge sharing, although to a different degree and on different levels. Usually top management plays the leading part in networking or initiating networking. Although networks are considered as being important, none of the companies offer incentives for employees to participate in networks. Nevertheless most companies participate actively in networks (offering training, organizing events, etc.). As reasons for a non-active participation either a lack of KM or the very young age of the company are named. Not all the companies participating actively in networks judge their network activities as exceptionally positive. Depending on their specific company history or the stage of their organisational development they profit differently from networks. While some use the active networking to transfer, and therefore manage knowledge, others only participate in active networking because ‘it belongs to doing business’ but has no direct influence on their KM.

All companies use at least one method to document their knowledge. As documentation tools QM manuals, Wikis, Intranet, CRM tools as well as document sharing and document management tools are listed. The level of documentation activities is clearly influenced by the perceived ratio of relevance of explicit versus implicit knowledge. Companies reporting to use more explicit knowledge report noticeably more documentation tools and IT systems used for KM than the ones that report more implicit knowledge in their organization. The often assumed positive relationship between the use of KM tools in terms of IT systems and the quality of KM is not necessarily supported. The heavy use of software systems sometimes even leads to an ‘information/knowledge overload’. This is often the case when companies have introduced a number of different tools assuming these would support their KM process, but have not matched and synchronized the systems. It seems to be a maturing process, as several companies have reported to use a number of uncoordinated systems, which need to be consolidated. Additionally the interviews show that the installed systems are sometimes not actively used by the employees. It seems that the KM implementation is often focused on IT systems without installing the necessary processes to effectively use these systems beforehand.

The results are supported by the online survey. In the majority of the companies, there are several loosely coupled KM activities, but not an integrated and formalised KM system. Concerning the key process area “people”, 28.6% of the responding companies have defined KM positions with respective decision authorities. Three companies label this position as knowledge manager, in the other companies the position is located at the board of directors, the innovation or R&D department or within quality management. 27.1% of the companies offer mostly non-financial incentives for knowledge documentation and knowledge sharing to their employees, and four companies reward their employees financially for KM activities. 26.8% have integrated KM aspects in their business strategy to a high or very high degree. On the other hand, only 7.6% of the companies have implemented a budget for KM activities and 10.9% agree that KM has a lead to a knowledge-sharing culture in their companies.

The key KM process area “processes” is not quite as well developed in the responding companies. Only 29.7% of the companies agree that the knowledge indispensable for routine tasks is documented to a high or a very high degree, and only six companies document lessons learned from projects to a high or very high degree. The mean rate of approval for the effective usage of KM systems is 3.52, respective 3.82 for the continuous improvement and adaption
of KM processes to changes in the business environment. In addition, only 7.6% of the companies measure or benchmark their KM activities on the basis of specific metrics.

As in the interviews, the key process area “technology” is the most developed element of a KM system. All companies use IT to support their KM activities, among which internal search engines (81.3%), Wikis (67.2%), document management systems (65.6%), groupware systems (62.5%), project databases (53.1%) and the intranet (50%) are the most used systems or tools. On the other hand, the companies consider the degree of integration of their tools as barely medium, with a mean of 2.98.

### 4.3 KM maturity levels

To test the practical application of the KMM all companies were classified into the five maturity levels.

Concerning the three different key process areas, the results of the interviews indicate that the companies achieve the highest maturity level looking at the use of KM technologies (see table 2). Five out of ten companies reach the third maturity level “Defined” with either basic KM systems (e.g. Wikis, intranet, document management systems) or even an integrated system of several tools in place. The lowest KM maturity level is achieved concerning the key process area “people”. The majority of the interviewed managers are aware that KM is an important success factor for their company and that a formal KM would be necessary but consider KM mainly as an IT management problem. The results concerning KM processes are mixed. Some of the interviewed companies have no formal processes for knowledge documentation and sharing implemented in their organisations whereas others have clearly defined procedures for content and information management. Overall, larger companies achieve a higher KM maturity level than smaller companies, but neither of them can be categorised on a level higher than “Defined”. Even large companies, although showing a general awareness of the necessity of KM and already using a variety of KM tools, seem to consider KM as being one of many prerequisites for the main business areas; its installation and development being a trade-off between costs and benefits. Therefore, quantitative measurements of KM processes, which are expected for higher maturity levels, are usually not in place.

**Table 2:** Classification of KM maturity levels for the participating companies

<table>
<thead>
<tr>
<th>Case studies / Key Process Areas</th>
<th>People</th>
<th>Process</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (small)</td>
<td>Aware</td>
<td>Initial</td>
<td>Aware</td>
</tr>
<tr>
<td>B (small)</td>
<td>Aware (on the transition to Defined)</td>
<td>Initial</td>
<td>Initial</td>
</tr>
<tr>
<td>C (small)</td>
<td>Aware</td>
<td>Initial (parts of Aware)</td>
<td>Initial</td>
</tr>
<tr>
<td>D (medium)</td>
<td>Aware (very first parts of Defined)</td>
<td>Aware (parts of Defined)</td>
<td>Aware</td>
</tr>
<tr>
<td>E (medium)</td>
<td>Initial</td>
<td>Aware (parts of Defined)</td>
<td>Aware</td>
</tr>
<tr>
<td>F (medium)</td>
<td>Defined</td>
<td>Defined</td>
<td>Defined (in parts Managed)</td>
</tr>
<tr>
<td>G (large)</td>
<td>Aware (on the transition to Defined)</td>
<td>Defined (with parts of Optimizing)</td>
<td>Defined (on the transition to Managed)</td>
</tr>
<tr>
<td>H (large)</td>
<td>Aware (on the transition to Defined)</td>
<td>Defined</td>
<td>Defined (on the transition to Managed)</td>
</tr>
<tr>
<td>I (large)</td>
<td>Aware (on the transition to Defined and with parts of Optimizing)</td>
<td>Defined</td>
<td>Defined (on the transition to Managed)</td>
</tr>
<tr>
<td>J (large)</td>
<td>Initial (on the transition to Aware)</td>
<td>Defined</td>
<td>Defined</td>
</tr>
</tbody>
</table>

The results also show that it is often impossible to classify the companies on the same level in each key process area. For example, large companies often have a basic KM infrastructure in place or even enterprise-wide KM systems. Therefore their maturity level in the area of technology is fairly high. On the other hand, most companies do not have an explicit KM strategy as an integral part of the overall organisational strategy, which prevents them from reaching one of the higher levels in the people area.

Looking at the maturity level in the area of processes all companies having a certified QM system reach higher levels than the ones without a certification. An external certification forces the organisations to set up and describe formal
processes including KM processes. The necessity of describing the corporate processes leads to a higher awareness and documentation of the knowledge available in the company, therefore the majority of certified companies also report to have more explicit, than implicit, knowledge.

Findings also indicate that there is reason to believe that KMMM should be worked with differently depending on the size of an organisation or its stage of organisational growth. Large companies often have a greater need for KM documentation and thus provide additional financial and personal resources for the implementation of KM. For small companies it might not be reasonable to strive for the highest level in these models, as the costs for further developing their KM might exceed the benefits. This seems especially true for the technology area where companies seem to go through a learning process.

The results of the interviews are validated on the basis of the online-survey. The following table shows the number and the percentage of companies reaching a specific KMM level.

<table>
<thead>
<tr>
<th>KMM level</th>
<th>People</th>
<th>Technology</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>29 (45.3%)</td>
<td>4 (6.3%)</td>
<td>28 (43.8%)</td>
</tr>
<tr>
<td>Aware</td>
<td>21 (32.8%)</td>
<td>22 (34.4%)</td>
<td>18 (28.1%)</td>
</tr>
<tr>
<td>Defined</td>
<td>7 (10.9%)</td>
<td>8 (12.5%)</td>
<td>5 (7.8%)</td>
</tr>
<tr>
<td>Managed</td>
<td>2 (3.1%)</td>
<td>9 (14.1%)</td>
<td>3 (4.7%)</td>
</tr>
<tr>
<td>Optimising</td>
<td>5 (7.8%)</td>
<td>21 (32.8%)</td>
<td>10 (15.6%)</td>
</tr>
</tbody>
</table>

As a higher level is only attributed to a company if all the requirements of that level are fulfilled, we have to add that 33 companies have achieved parts of higher levels for the key process area “people”, 9 for the key process area “technology” and 31 for the key process area “processes”.

Overall, the participating companies of the online survey reach higher KMMM levels than interview companies. Like in the case studies the highest KMM levels are reached for the key process area “technology”, whereas the key process area “people” is ranked lowest. The average KMM level for the key process area ‘people’ is 1.95 (aware), with only seven companies reaching the levels ‘Managed’ or ‘Optimising’. For the key process area “processes” the average level is 2.2 (aware), with 13 companies reaching levels ‘Managed or ‘Optimising’. On the other hand, concerning the key process area “technology” the average KMM level is 3.33 (defined) and 30 companies are reaching the levels ‘Managed’ and ‘Optimising’. These results indicate a clear technology focus concerning knowledge management in the majority of the companies.

Contrary to the interviews, there is no statistically significant correlation between the KMM level and the size of a company.

Finally, a correlation analysis between the achieved KMM levels and the three success items was executed in order to identify relevant aspects in terms of success of KM (see table 4).

<table>
<thead>
<tr>
<th>KMM level “People”</th>
<th>Degree of employees’ participation in KM</th>
<th>Innovation success relative to main competitor</th>
<th>Financial success relative to main competitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>corr = 0.368 p = 0.003</td>
<td>corr = 0.241 p = 0.095</td>
<td>corr = 0.059 p = n.s.</td>
<td></td>
</tr>
<tr>
<td>KMM level “Technology”</td>
<td>corr = 0.350 p = 0.008</td>
<td>corr = 0.291 p = 0.042</td>
<td>corr = 0.220 p = n.s.</td>
</tr>
<tr>
<td>KMM level “Process”</td>
<td>corr = 0.501 p = 0.000</td>
<td>corr = 0.289 p = 0.044</td>
<td>corr = 0.143 p = n.s.</td>
</tr>
</tbody>
</table>

With: corr = correlation coefficient, p = probability, n.s. = non significant

First, Pearson’s correlation coefficients were calculated and then checked by calculating Kendall’s Tau. There are highly significant positive correlations between all achieved maturity levels and the degree of employees’ participation in KM, and significant respective weakly significant positive correlations with innovation success relative to main competitor. These results support the findings of former studies concerning the relationship between KM and
innovation success (e.g. Darroch, 2005, Pawlowsky et al., 2011). Unfortunately, there is only little and statistically non-significant correlation with the financial success.

5. Discussion and implications

Both the interviews and the online survey reveal a limited practical applicability of KMMMs. Firstly, there often is no common understanding of knowledge and KM activities in companies. Most interviewees had some understanding, but it did not necessarily match the scientific concepts or those of other practitioners. This means that KM maturity based on self-assessment as proposed by many KMMMs can lead to severe problems of misunderstanding and misinterpretation in practice.

Secondly, KM activities cover a wide range of concepts, instruments, and tools that are widely spread throughout an organisation. Some companies have installed a specific knowledge manager, whereas in others the quality manager or a senior manager is in charge of KM. The different understandings of knowledge and KM and the various KM responsibilities can cause severe problems during the self-assessment, as it is unclear who should be addressed in the company.

Thirdly, maturity models assume that all companies should follow an ideal path when implementing KM and develop successively from one maturity level to the next. The results show that not all companies follow this ideal implementation path. The findings rather indicate that the scope of KM activities seem to be influenced by specific factors such as the existence of a certified QM system, which is positively linked to a KM maturity especially with respect of the key process area “processes”. Moreover, company size indicates the necessity of a systematic KM and is – at least in the case studies - also positively related to KM maturity. In addition, larger companies have more financial resources for KM activities.

The findings also suggest that there are only a few general recommendations regarding KM. Foremost it is the basic understanding that there is no “one system fits all“-approach. For companies just starting with KM it is advisable to begin with an external QM certification, because it can help organisations to structure their processes, which is an integral part of KM. Overall, companies should not use KMMMs as a template, but customise them with respect to their specific requirements.

Overall, KMM seems to be positively linked to the degree of employees’ participation in KM and to innovation success. As the key process area “technology” appears to be quite well developed in a range of companies, these firms should concentrate on the further development of the areas “people” and “processes”. It also seems quite important to define KM responsibilities and budgets for KM activities, with the KM being integrated in the corporate strategy and KM processes are defined, implemented and measured. For companies starting with KM the focus should be put on basic KM training for the employees, the implementation of a basic IT infrastructure for KM, and a basic process for the documentation and storage of knowledge.

6. Limitations and future research

Some limitations of our approach have to be addressed: Because of the restricted number of analysed companies, our results can only be moderately generalised. Thus, large-scale research has to be executed. Furthermore, only one person per company has answered the questions during the semi-structured interview in the case studies or during the online survey. The results clearly indicate that different KM areas have to be assessed by different people in an organisation (Kulkarni/St. Louis, 2003). Often, the position of a knowledge manager is not established, so it is recommended that the key process area “people” should be assessed by the top management or the head of human resources, the area “process” by the quality manager and the area “technology” by the IT manager or the head of the R&D department. Although survey-based self-assessment of KM maturity is suggested, the evaluation was executed by the researchers. As there is no common understanding of knowledge and KM, we doubt that a valid and reliable self-assessment is currently possible. Therefore, we suggest a further development of maturity metrics and scales to enable a thorough self-assessment. We have only examined a few selected influence factors on KM maturity. A significant influence of the industry and the innovation activities have not been found, the influence of company size is not clear but this may be due to the selected companies. Certainly, more influence factors should be taken into consideration and possibly be integrated into KMMM.

References


Trust-Communication Dyad in Inter-Personal Workplace Relationships – Dynamics of Trust Deterioration and Breach

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Abstract: Trust has become an important intangible asset in organizations as a foundation for cooperation in workplace relationships. The paper discusses and examines development of trust in relation to communication within work relationships. More specifically, the dynamics of trust deterioration and trust breach is studied empirically. The paper examines the interplay between communication and trust and how building, violation, breaches and restoration of trust develop in inter-personal workplace relationships. The aim of the paper is to provide new knowledge and insights of the dynamics between communication and trust and make practical implications to leadership and HRM for human capital development. By presenting the empirical findings from a qualitative case study with other complementing data the paper also aims to shed more light on how poor communication, in particular, affects trust development between actors involved. The paper advocates the importance of developing trust and communication for intangible intellectual asset in workplaces and their management. Originality of the paper is based on the idea of exploring the relation between trust and communication, specifically in the situation of trust violation and breach. The paper provides a still under researched issue of intangible assets, since relational resources such as trust and communication have not been widely examined in the context of trust breach, in specific. In the theoretical discussion, trust and communication are seen interwoven in interpersonal work relationships. Trust is looked as intangible asset and skill and communication a means and antecedent for trust. The findings show that poor communication plays an important role in deterioration and breaches of trust. Distrust may permeate widely within the organization and beyond the original parties involved. If space is left to the low trust climate to develop the consequences may be unfavorable, harmful and even damaging to the organization. Trust violation and breaches seem to be connected with workplace bullying with harmful consequences.

Keywords: communication, case study, intangible assets, inter-personal trust, narratives, work relationship, trust breach, qualitative method

1. Introduction

In human activity interaction, communication and co-operation form the essential processes of workplace behaviors. Resources and capabilities are mainly human and intellectual since organizations have become more knowledge intensive (cf. Wright & McMahan, 2011). In the knowledge era, need for renewing of human intellectual capacity in organizations has increased significantly. Ability to implement strategy and respond to continuous organizational change has become more and more important for sustaining competitiveness (Slocum et al., 2008). Trust in organizations forms intangible, collaborative and relational asset and foundation for the processes mentioned above. Trust is a significant asset, built, sustained, broken and restored by and between people and largely through communication. Trust is important in many different ways in organizations and their HRM (Savolainen, 2011; cf. Innocenti et al., 2011) in promoting collaboration, motivation, improving competence development, knowledge sharing, initiation and innovativeness (Mayer, Davis & Schoorman 1995; Lewicki, Tomlinson & Gillespie 2006, Savolainen, 2008). In interpersonal work relationships, job satisfaction and performance are closely linked to the quality of relationships in which communication and trust play a role. While work relationships may be the source of positive effects, they also bring challenges, difficulties and problems which are likely to be stressful both to the individual and relationships affecting atmosphere and work performance eventually.

This paper adopts a relational view of trust. Communication is seen as an antecedent of trust. Trust is seen as an intangible, relational asset in co-operation between people (Savolainen, Lopez-Fresno, 2013). Relational view on trust means that it develops in interaction and reciprocal activity between individuals, within groups and in organizations. Workplace activity is largely about interaction, which occurs through communication and trusting between people. The paper brings a new perspective into discussion by adopting a resource-based and relational view on examining trust-communication dyad as intangible, forceful asset in workplace relationships. The empirical study examines how communication (poor or even lacking) affects trust development, i.e., building, maintaining, deterioration, and...
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breaking of trust. While the role of trust as a collaborative mechanism and in conflict resolving has been recognized, communication as an antecedent for trust, and distrust in particular, has not been commonly brought into discussion. The lessons may be learned of how to develop intangible workplace resources such as trust and communication by gaining better understanding and new knowledge for improving capabilities and skills.

The aim of the paper is to provide new knowledge of the dynamics between communication and trust and make practical implications to leadership and HRM for human capital development. The paper advocates that, in order to retain and develop human relational assets, it is necessary to understand communication capital (Jeffres, Jian, & Yoon, 2013) and trust. Adding to discussion about the inter-relation between communication and trust the paper presents empirical findings from a qualitative case study in the project context and from some narrative data gathered from workplaces.

2. Theoretical discussion

The literature review deals with the concepts of trust and communication. Trust has been identified as one of the most frequently examined constructs in the organizational literature lately (Burke et al., 2007). It is a multi-faceted and multi-disciplinary issue that has been widely studied in different fields of science over the last few years (Ebert, 2009) involving several theoretical approaches, definitions, factors, and models (Rousseau et al., 1998). As competition challenges organizations to renew their intangible assets, human intellectual resources such as trust, communication, co-creation, etc. become stressed. In organizational leadership trust building is seen essential and is listed as one of the main tasks of leaders (Yukl, 2010, cf. Dirks, 2006). For leaders trust is a way of influence (Savolainen, 2011), and leaders influence largely through communication. Trust development is a reciprocal process between leaders and followers with the aim of mutual co-operation and making people to give their best at work. Communication is also a multi-disciplinary and multi-dimensional concept, and a very vast and multiple research topics examined in different fields of science. In organization and management research, the gap of knowledge exists in how trust and communication are interrelated as dyad in workplace relationships, leadership and HRM.

2.1 Defining trust

Trust has been defined in many ways in prior research. Yet, the concept remains without a generally accepted definition (McEvily et al., 2003). In this paper, the relational perspective is in focus and the definition of trust is adopted from Mayer et al. (1995, 712) as follows: “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party”. Trust is in a way a person’s assessment of another’s trustworthiness. Mayer’s model looks at the formation of trust between actors in a relational context. This means that trust evolves over time through repeated interactions and information available which refer to communication between parties in trust formation. Three interaction types have been identified in trust development: trust between persons, between organizations, and between a person and an organization (Ebert, 2009). In studying trust and communication linkage, this paper focuses mainly on inter-personal trust as an important social resource that can facilitate cooperation and enable social interactions. Concepts of cooperation and confidence are closely linked with trust (see Schoorman et al., 2007). Intrinsically trust is a fragile intangible asset. It is built in the course of time. Yet, it can be lost quickly. Trust belongs to human intellectual capital which is interrelated combination of mental, structural and relational resources (Edvinsson & Malone, 1997). Individual level trust is intangible and invisible in nature, and even “tacit”, and easily breakable (Savolainen, 2011).

2.2 Defining communication

Countless number of communication definitions exists in literature presented by academics and practitioners for describing, predicting, and understanding communicative phenomena. A quite broad and inclusive definition describes communication as “information that enters a process and eventually leaves its inverse process. For example, information is transmitted by speaking and received after processing by its inverse, hearing” (Losee, 1999). Applicable to the perspective of this study communication is defined as the sharing of formal and informal, meaningful information (Zeffane et al., 2011) between people.

Pertaining to trust and communication dyad the latter definition is more close to the relational view of trust applied and a reciprocal process of communicating, in other words, sharing something meaningful in the context of work relationships. This definition is also linked with Rotter’s (1967) definition of inter-personal trust as “an expectancy held by an individual or group that the word, promise, verbal or written statement of another individual or group can be
Willemyns et al. (2003) discuss relational communication strategies in the context of manager–employee relationships as a recent addition to communication accommodation theory (CAT). These communication strategies indicate trust supporting behaviors such as empathy, inclusion, and valuing of the other person, for example, when making a mistake in providing negative feedback constructively.

3. Trust-communication dyad

3.1 Intangible, relational resources

The relational resources in organizations are created by human activity. The organization is built upon the people and their talents, knowledge and expertise. Trust has been identified as important relational resource in inter-personal relationships, for example, employees’ trust in managers (Willemyns et al., 2003) and as a leadership skill. Trust is manifested, for example, in open communication, ethical behavior and predictability (Lopez-Fresno & Savolainen, 2014). Respectively, influence of communication on trust is clearly recognized in some of the prior studies (e.g., Zeffane et al., 2011, Butler and Cantrell, 1994, Zand, 1972). The relation between communication and trust has been studied recently (see e.g., Ruppel & Harrington, 2000, Harry, 2006; Welch & Jackson, 2007). The direction of the interrelationship between trust and communication remains undefined (Anderson & Narus, 1990). While some of the research shows that communication affects trust development, (Wong, 2002; Thomas et. al, 2009) other studies suggest that trust requires effective communication and has strong influence on trust building (Chory & Hubbell, 2008). Hence, the relationship turns out to be complex (Zeffane et al., 2011).

Anderson and Narus (1990) suggest that the relation between trust and communication in building working partnership is an iterative process (expected reciprocity); Communication is seen as an antecedent to trust which in turn leads to better communication. This paper adopts a relational view of trust development and reciprocal nature of trust-building process between actors in interpersonal work relationships. Reciprocity in the trust-communication dyad is depicted more practically by Noreen (2013) “the lifeblood of any organization and the glue that holds us together”. Trust and communication are seen closely interwoven. By concluding, communication builds trust forming a basis for ‘sharing something meaningful between people’. Trusting in turn within work relationships is the key to open communication and building and maintaining trust.

3.2 Development of trust

Development of trust i.e., building maintaining, violating, breaking and repairing or restoring trust, have been examined in economic, behavioural, and transformational perspectives (Lewicki & Bunker, 1996, Lewicki et al., 2006). Trust is combined of several components – rational, cognitive and affective (McAllister, 1995). In the organizational context it has been researched from relationship-based and character-based perspectives (see, e.g., by Dirks & Ferrin, 2002, and Dirks, 2006). As this paper focuses largely on trust-communication dyad in trust violation and breach, the conceptual discussion of trust development is limited mainly to distrust, violation of trust and trust breaches. Communication is linked to trust to study more specifically how the quality of communication is related to low trust or trust breach.

3.3 Trust violation and breach

Distrust as a concept refer to declining, erosion or mistrust meaning lack of confidence in the other, a concern that the other may act in the way to harming one, intends to harm or be hostile (Grovier,1994). Distrust is also defined as negative expectations of the intentions or behavior of another (Lewicki et al., 1998) who see distrust as a separate but linked dimension to trust. The term violation refers to the emotional distress and feelings of anger and betrayal arising from acts of breaking trust. Trust breach refers to a cognition that a party has failed to fulfill an expectation (Chen et al., 2011). The term trust breach may also mean the actions or withholding of actions on the part of the trustee that constitute a failure to fulfill the positive expectations of the trustor.

According to Lewicki et al. (1998), distrust involves a lack of risk and no dependence on others. It is seen as a continuum with high trust to high distrust as endpoints. Distrust is viewed separate but linked to trust and not opposite ends of a single continuum which was the conception in the prior trust research (e.g., Rotter). Distrust may be caused or trust be threatened by the work-related and personal/relationship related factors shown, for example, in the superior-subordinate relationship in Table 1.
Table 1: Factors causing distrust (Häkkinen & Savolainen, 2008)

<table>
<thead>
<tr>
<th>Work-related factors</th>
<th>Relationship-related and personal factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Neglecting work tasks</td>
<td>- Unresolved conflicts</td>
</tr>
<tr>
<td>- Delayed schedule</td>
<td>- Personal insults</td>
</tr>
<tr>
<td>- Malpractice in work</td>
<td>- Talking behind one’s back and gossiping</td>
</tr>
</tbody>
</table>

Trust violations occur when the trustor’s (the victim’s) confident positive expectations of the trustee (i.e. the offender) are disconfirmed (Lewicki & Tomlinson, 2003). These violations result in lower trust, and may reduce the extent to which victims of these violations cooperate with the offender. The research within has shown that trust violations decrease support and information sharing, and exert negative effects on job performance, turnover, and profits. In some cases, a single trust violation may seriously damage or irreparably destroy trust while in other cases, one trust violation in isolation may not be that damaging (Lewicki & Tomlinson, 2003).

Trust breach refers to the reconsideration of and reduction in either trust beliefs or behaviors, or both (Lewicki & Bunker, 1996, Mayer et al. 1995, Chen et al. 2011). In the trust literature, trust break, erosion and decline are often used interchangeably as outcomes. The degree of trust erosion greatly influences trust reparability. The deeper and the broader the trust erosion, the less reparable the trust is (Chen et al. 2011). Kim et al. (2004) note that parties may often violate trust by intentionally exploiting dependencies or by neglecting to fulfill expectations.

Reina and Reina (2010) links trust breach with betrayal. Trust breaches may not be immediate or obvious. These authors above present that betrayal occurs on a continuum from unintentional to intentional and from minor to major. Major intentional betrayals are hurtful, ill-intended words or actions that break down trusting relationships. In workplaces, common, minor betrayals can be gossiping or talking behind the back.

As to restoring of broken trust, trust is fragile in nature and, thus, difficult to repair (Schweitzer et al., 2006). In order to repair trust, it is critical to first understand how it was damaged, since different means of damaging trust are likely to require different reparative response (Schoorman et al. 2007). Trust repair depends on the strength of the trustees’ efforts to promote the belief that they should be trusted. The potential outcomes of negotiation between trustee and trustor may vary from weak to strong depending on the input in the process (efforts and time).

4. Empirical study

4.1 Methodology and data

The case study focuses on trust breach and the role of communication in deterioration and break of trust in work relationships. A qualitative approach is employed in the empirical study, based on the abstract, depth and multidimensional nature of both of the issues and concepts of trust and communication. More specifically, a narrative approach and auto-ethnography method are used. The concepts are complex and even delicate in nature, especially trust breach, which is still scarcely studied empirically. Moreover, as explanation and generalization are not the purpose of this study, but rather gain a deeper and richer understanding of the inter-relation between the abstract concepts of trust and communication, the qualitative methodology is the most appropriate (Yin, 2000, Eriksson & Kovalainen, 2008).

The focus of the empirical part of the paper is in finding out how trust deteriorates and may be broken in workplace relationships through communication. The aim is to increase understanding of the dynamics and inter-relation between communication and violation of trust studied within the project work context. Qualitative data was gathered from several sources by the interview, participant observation and auto-ethnographic methods. In addition, stories (narratives) from workplaces were used and analyzed as complementary source of data. Narrative research analyses the life stories of the individuals as experienced by them and meanings they give to their stories.

Informants of the study (interviewees) were individuals involved in the project. Auto-ethnographic method was used, which clearly differs from theory-driven, hypothesis-testing research methods based on the positivist research paradigm. In this paper the auto-ethnography means that the researcher reports on his/her personal thoughts, feelings and experiences of the case and context studied, more specifically using written study memos and research diary that are written about and reflects on the project studied. In this sense, auto-ethnography is a social constructionist approach embracing both auto (or self) and ethno (or culture). A narrative approach is also applied by analyzing a few individual narratives on trust breaches. Three narratives were selected among the qualitative data of
the stories of trust breaches which were gathered from individual employees and managers from different organizations and workplace contexts in Finland. Moreover the data contain written project-related documents such as emails, reports and memos. They were also used as complementary source of the data in the study. Written documents are typically included in the data of qualitative studies.

The empirical research data and material was analyzed using the content analysis method. Qualitative or inductive materials analysis is roughly a three-way process: 1) data reduction, which means simplification, 2) material grouping into clusters, and 3) abstraction or the creation of theoretical concepts (Eriksson & Kovalainen, 2008). Narratives were analyzed through the ‘lenses’ of distrust and trust breach in the paper. As mentioned above, they contained also wider issues on trust development.

5. Findings

5.1 Case study of international project

Key findings are presented in this chapter, first from the case of trust violation and breach and after that from the narratives. The case study is focused in an international complex project to strengthen quality infrastructure in several countries. The case study focuses on trust breach in a working relationship in a major project, involving internal and external stakeholders and multicultural environment. The project has a considerable number of stakeholders in different countries. Among them, there are four main actors: the contracting authority; the consultancy firm that won the public tendering for managing the project; the donator; the project team leader. In the findings below quotations in italics from the informants’ perceptions and experiences illustrate the authentic communication in the process.

After the resignation of the project team leader, a public tendering process was open for hiring a new team leader. The main stakeholders, including the donator and the contracting authority requested the consultancy firm to assess if there was human capital internally to be appointed as team leader, as the project was almost finishing. In the public tendering five candidates were presented. After rigorous assessment, the committee chose the internal candidate, a consultant who had been working for the project for two years.

Since the beginning of the public tendering process, the candidate could perceive that the consultancy firm had no interest in him. During the whole process there was no any meeting, no any personal call; he just received an email asking for his CV and several later emails with the contractual conditions, with no margin of negotiation (fully asymmetric negotiation). He considered that this kind of communication was not appropriate for a position with such a responsibility and visibility. “We’ve been exchanging dozens of e-mails and we are not going forward. May we connect via Skype, at least to see each other’s face? This is a typical case where personal touch is needed” (A candidate to hiring consultancy firm).

During the period since the former team leader resigned, there was no communication from the consultancy firm with the project team, no telephone call or even an email. The lack of communication contributed to generate distrust on them, from the candidate and from the project team and contracting organization.

After three months, one of the directors from the consultancy firm travelled to visit the project team on site. He planned the visit when the candidate to team leader was not in the country, so they could not meet. Neither any of his emails were answered. All of that contributed to generate a trust breach among the candidate and the consultancy firm. “It is a pity that he will come when I’ll not be around, if as he said one of his goals is to really know the team and how the project is performing. This way of doing talks a lot about him” (A candidate to a colleague who helped to organize the agenda of the visit, following instructions of the consultancy firm).

The contracting authority made the decision to appoint the internal candidate as a project team leader. The decision was communicated by the consultancy firm to the candidate in an email addressed to the whole team, including him as the appointed project team leader. No any personal communication was held previously, by email or by telephone. “I’m travelling to attend an activity of the project, I’ve just opened my email and I found this story ... Honestly, this is not a proper way of doing things. So, in the case that I will accept the position, I know about the notice at the same time that the team to be managed under my responsibility? I do not know how you see it, but I would like to talk about it whenever possible for you” (A candidate to his boss at the time).
Even not any contract proposal was sent to him before, and contractual conditions were still pending. The only email received requested the candidate to prepare an extra work (report) even before he will initiate his new functions. That behaviour leded to a totally distrust towards the consultancy firm from the candidate (now formally appointed as project team leader), from the whole project team, and from the donator and the contracting authority, but also a trust breach appeared among the team and other stakeholders. “In other circumstances I should help you, as I did during these years for my colleagues and previous boss. But at the moment I do not have in hand any single element to trust you. There are many evidences accumulated during these months that made me to lose any possible trust on you and your organization, I couldn’t find any single example of respect. Communication was defined by your silence all this time” (A candidate – now appointed as a team leader by the donator- to the consultancy firm).

The situation developed into total breakdown in communication and trust breach followed towards the consultancy firm, by all internal and external stakeholders. For five months the project had no team leader and not any communication from the consultancy firm in charge. Deep uncertainty was experienced by all stakeholders involved. “The consultancy firm doesn’t care about the project or the team. They just want the money. They never showed interest neither care” (A project team member).

In that context, the contracting authority intervened and forced the main actors to find a solution. One of the directors of the consultancy firm got in contact with the candidate; it was the first telephone call he received in months. “Let me tell you that the way you managed the situation was awful. This is the first phone call I received since the contacts started, five months ago, even when I requested a personal contact, and you came visit the project when I was travelling. Along this time I couldn’t find a single signal of respect to me, and the only thing you did was requested me extra work even before the contract will be signed. Sorry to say you this, and will all my respects, but I fully distrust you” (A candidate to the consultancy firm – first phone call).

After that phone call, communication improved a bit, and two months later a person from the consultancy firm visited the project. Personal communication clarified some misunderstanding and laid the foundations to restore relationships. “Communication failed since the beginning. Too many actors implied with partial information in all sides... that derived in assumptions by all actors, you, us, the donator...When you do not have communication everything is potentially misunderstood” (The representative of the consultancy firm to the candidate, first meeting).

When communication improved, trust repair could begin. However, it will take time to restore trust among all actors, mainly with the consultancy firm. Distrust affected moral, productivity and cohesion among the team (workplace environment) and also relationship among stakeholders. “I really appreciate your visit, it should be taken a long time ago. Communication is always a sensible issue. There are circumstances in which personal verbal communication will never be substituted by written communication, and this is one of them. I lost any sign of trust on your organization, in the personal and professional sides. We need transparency and agreed objectives to build up trust, but it will take a time, a long time...” (The candidate to the representative of the consultancy firm, first meeting).

5.2 Findings from narratives

Four narratives, two from the subordinates and one from the supervisors, show how distrust develops and trust breach occurs and what role communication plays in it. In the first narrative of subordinate, rumors caused a negative atmosphere at work and violated trust. Poor, insufficient communication played a role in that. Narrative 1: “At some point, rumors started to arise in the work community about the possible future changes in the company.” According to the subordinate, there was a point when the relationship with the supervisor became filled with distrust as a consequence of several consecutive issues. Narrative 1 continues: “It is very apparent that these organizational change options were handled in the top management much earlier than rumors started to spread among the employees. My supervisor’s actions in the situation continued and kept repeating itself case after case, trust declined and distrust developed.”

The other narrative of a subordinate is an example of a manager who had emailed confidential information to her own supervisor. Narrative 2: “He forwarded my email to a large group. At the moment there was a lump in my throat. I tackled him about it but he didn’t even realized his misbehaving. So I decided not to trust him anymore.” Misunderstandings in communication may lead to serious trust breaches notably, when construed intentional as in this narrative.
In the first supervisor’s narrative giving promises was an issue leading to trust breach. Continuous change in the workplace gave a challenge to the supervisor who gave promises to the subordinates that he could not fulfill due to unexpected and sudden changes. Breaking the promises usually leads to trust breach. Narrative 3: “I had been talking with my boss and was assured that my employees’ jobs are definite. So I promised of course to the temporary workers that their job would continue. We were not allowed to hire new personnel. Unfortunately, I couldn’t keep the promises I gave to my team and subordinates, I was no more trustworthy and they lost trust in me.” Communication played again the role in this, as unreliable words caused declining of trust in the supervisor.

The narrative from another supervisor shows how crucial the role of communication may appear. Narrative 4: “Trust means also that we can share positive ideas and encourage each other but also give critical feedback and developing suggestions without taking offence. In my case, I gave critical feedback and then my subordinate just lost his temper. I think that our relationship wasn’t trustworthy.” Obviously, trust deterioration occurred due to lack of communication skills of expressing and receiving feedback which are quite essential skills in supervisor-subordinate relationship.

6. Discussion and conclusions

The findings show that poor communication plays an important role in emerging distrust and trust breaches. It is notable that distrust may permeate widely within the organization and beyond the original actors and parties involved. If space is left to the low trust climate to develop the consequences may be unfavorable, harmful and even damaging to the entire organization. Trust violations may lead to the breaking point of a trusting relationship and finally to the ending of the relationship unless the trust can be restored.

In conclusion, the findings indicate that trust violation seem to be connected with workplace bullying. Further, the entire data show that conflict situations, caused by trust violations and breaches, are quite often solved by changing the workplace. Taking a distance is perceived to be the easiest solution or option when trust breach cannot be handled constructively and trust restored. This supports the earlier findings of trust research that ‘the silence’, i.e., lack or very poor communication creates distrust and sooner or later leads to trust breach and needs for trust restoration (Ikonen, 2013; Csik, 2012).

The project work case implies to managers that in daily practices, leaders should adopt and use relational communication strategy (Willemyns et al., 2003) to openly inform about, e.g., changes and daily issues. They also need to be aware how they could show trustworthiness in daily work. Communication plays a crucial role in restoration of trust. HRM practitioners should provide new skills development for managers in building and repairing trust (Willemyns et al., 2003). If the organization’s vitality is maintained through effective communication, conflicts and tensions can be decreased. Trusting relationships can empower people for success even in a time of great uncertainty. When people trust each other, their energy can be focused on the core activity instead of games, politics, and control (Savolainen, 2011). The development of this positive ‘cycle’ requires proper and constructive communication.

Further, the findings from both the case and narratives imply for leaders that openness, honesty, and transparency are important for building and sustaining trust as well as restoring trust. No unfulfilled promises should be given. The practical implication for group leaders is to understand how important it is to develop communication skills to sustain trust in group relationships (Savolainen, 2008). For leadership work these findings imply that it is the small daily deeds that make a difference in building and maintaining trust - and not the great promises!

Finally, the empirical findings show that communication and trust (trust-building or trust breach) are inter-related. To avoid harmful consequences of trust violation and breach Noreen’s (2013) suggestion is in place, “once you lose trust, you lose your ability to communicate and lead.” It is important to develop leaders’ communication skills for trust-building. This paper has made an attempt to add to the knowledge of the interrelation between communication and trust and the dynamics of trust deterioration and breach in workplaces. In further research, the relation emerging in the findings between workplace bullying and trust breaches need to be studied in more detailed.

References


Crucial Role of Corporate Culture to Align Organizational Goals with Economic Success

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Abstract: The success of enterprise is bounded with achievement of the set targets and progress of enterprise in accordance with its mission. Performance of any enterprise is determined by the level of performance of individual employees. Starting from setting the objectives, from the strategic to the operational, procedures for their achievement, and the criteria for their evaluation, is the issue of performance management which is in consideration of industrial enterprise management in their day to day activities. Access to this issue affects the success of the enterprise on the market and its competitiveness. Objective indicators are supplemented by subjective evaluation of the representatives of the enterprise. Main challenge is to measure performance in the context of corporate culture, respectively to discover relations between corporate culture and the success of the enterprise. On the basis of the partial findings in this area, we have come to the conclusion about importance of relationship of corporate culture and the success of the enterprise and the suitability to continue its investigations in more details. In this article we present results of our previous researches. Outcomes and conclusions, which we present in the paper, are based not only on theoretical knowledge, theories and results of published studies as well as several already completed results published under researches carried out by our institute but also on our researches focused on organizational performance. This contribution is a particular outcome of research project VEGA 1/0787/12 “The identification of sustainable performance key parameters in industrial enterprises within multicultural environment” and research project VEGA 1/0055/13 “Systematization of the impact of factors and conditions of knowledge management in the context of business strategy on work incentives and its reflection in growth efficiency, respectively sustainable level of business”.

Keywords: corporate culture, effectiveness measurements, indicators, performance management

1. Introduction

The market environment, which is now full of turbulent changes in all fields of social life and influenced by globalization, creates a completely new set of conditions for industrial enterprises and their activities. To ensure that enterprises are able to respond to the changes and to secure long-term sustainable development, it is necessary to optimize their performance significantly. In addition, finding a satisfactory solution for this problem is complicated because of the fact that the growing influence of globalization not only refers to the macro-economic environment, but it also influences significantly processes inside organization.

Enterprises in Slovakia are constantly facing to challenge to be competitive and to improve their performance. It is management of the enterprise who is responsible for adequate response to changes in market and so to ensure sustainability of enterprise performance. But, what is more, is long term successful businesses, managements of enterprises not only respond to the changes but they ourselves are initiating them.

One of the key factors of industrial enterprises success is their sustainable performance. Therefore, the attention of the owners and managers is aimed at increasing competitive advantage through attractiveness and quality of the products, as well as competitive prices. It means to continuously improve processes and technologies. The quality of the processes and technologies can be improved constantly and increase their effectiveness. Crucial for overall performance of the enterprise is than employee performance.

2. Theoretical and empirical background

As written by Míkva (2013), performance is an economic category which is closely linked to the systemic view of its measurement and evaluation. The system whose performance is to be measured and evaluated corresponds to its internal structure.

To measure the performance of the enterprise is, therefore, necessary to know which (and also how) subsystems of its internal structure contribute to the overall performance. One of these subsystems is workforce, which significantly influence whole performance of enterprise.
Trebuña (2011) defines work performance as a result bounded with strategic objectives of organization, combined with the satisfaction of customers that contributes to the economic result. Management of employees is based on rewarding their contribution and targeted development of their potential in modern business. Precondition of objectives fulfillment is ongoing monitoring and evaluation of work, removing undesirable discrepancies, addressed rewarding and employees’ development.

Therefore, just the work performance contributes to customer satisfaction and economic results. As performance of employees directly affects the performance of the enterprise, the effectiveness of workforce performance management is the limiting factor to the enterprise success. Workforce performance management must therefore be systematic and comprehensive.

Workforce performance will not increase, if:

- we do not have clearly defined corporate objectives and strategy,
- we frequently change corporate strategy and objectives,
- we do not have clearly discussed strategy and objectives of the enterprise also with employees,
- we have implemented multistage and confusing organizational structure,
- we have a tenuous flow of relevant information,
- we have applied only authoritative control that commands and shows only the failures of employees, we have in the enterprise groups and individuals who do not respect generally accepted rules and standards.

(Team of authors, 2009)

As Sakál confirms, to ensure continuous performance improvement in the present time, in increasingly demanding conditions of global and domestic market economy, requires to master and develop modern methods of management. (Sakál 2013)

As discussed elsewhere (Čambál et al 2012), to reach the required organizational performance, many different performance management models have been created recently. In spite of the fact that it is possible to identify different approaches, all of these models contain one clear element and that is the individual employee, employee with his abilities, skills, knowledge, personal characteristics, attitudes, inner motivation, effort to work and willingness to deliver certain performance and reach certain level of performance.

It also confirms the norm ISO 9004: 2009, which states that total potential of employees can be used to enterprise profit through shared values, by forcing mutual trust and facilitating initiatives. Staff involvement and communication with employees enables to use their skills to bring profit for organization.

Some authors are of the opinion that a certain type of corporate culture can help to maintain the long-term performance of the enterprise and be a source of competitive advantage.

That is why we also carried out secondary research of existing available studies from subject area, in addition to the structured interviews and questionnaire survey as a part of our project.

Many authors tried to prove a connection between corporate culture and enterprise success. Carried out surveys and studies (e.g. Peters and Waterman, 1982) focused on successful enterprises and their characteristics in the United States. Later other authors included into their research portfolio even less successful businesses (e.g. Kotter and Heskett, 1992). Long-term studies revealed differences in the selected factors influencing enterprise success, these showed mutual interdependence with various characteristics of the corporate culture.

Existing differences are in social programs, continuous education, as well as in status equality.

Other significant differences can be found in information and communication, e.g. regular information of all employees by management, open communication, more opportunities for independent action and decision making for staff, more responsibility, favorable business climate and social commitment have been identified in more successful enterprises.
3. Research and Results

The success of any enterprise can be measured in different ways. Generally, we can talk about the social and economic success. As social success we can understand better material and nonmaterial conditions of human work. As to measure economic success are usually perceived monetary indicators (profit, turnover and nonmonetary indicators (quality, market share). Monetary variables are preferred in business practice.

An enterprise management should define what is understand and considered to be a success, and how to measure it, to establish a clear process steps, incentives and resources to consolidate best practices. The enterprise success cannot be measured by only a single variable but have to be evaluated by set of variables.

These variables have to describe economic dimensions of success as e.g. profit, value creation, turnover, return on equity, on the one hand. These variables also can be expanded, for example with indicators of absences and fluctuations. Topic of importance of social, psychological, not economic or monetary dimensions of success is often discussed in the literature.

Research, which we present in the paper, is based not only on theoretical knowledge, theories and results of published studies but also on several already completed results published under researches carried out by our institute.

In presented research, aimed at exploring the parameters of sustainable performance was used a questionnaire as data collection technique.

There were involved 142 enterprises from Slovakia, from various sectors of the industry into research. 65% of these enterprises have a management or a regional subsidiary abroad. Partial results of the research have pointed out that the managements of these enterprises are actively engaged in the issue of enterprises performance management and measurement.

The results showed that only the minimum number of representatives of enterprises associated enterprise performance with the performance of its staff. The missing link between the performance of the employees and performance of whole enterprise may cause serious lacks in performance management of the enterprise as a whole.

One of the findings, which brought partial results of carried out research was that some companies use a combination of financial and non-financial indicators, when monitoring enterprise performance, although this combination of indicators is used by only half of represented enterprises. The measured financial indicators are shown in figure 1.

![Figure 1: Measured financial indicators (own source)](figure1.png)

Where:
EBIT /EBITDA are Earnings Before Interests and Taxes/Earnings Before Interest, Taxes, Depreciation and Amortization.
ROI is Return on Investment.
ROE is Return on Equity.
EVA is Economic Value Added.
Answers from the additional field were ORF – Order Request Fulfillment, reduction of prices for the customer, the number of complaints, the level of stocks and earnings on m2 of sales area.

Financial characteristics are very useful because they are quite easy to count, compare and specify. Their measuring has undeniable importance in evaluation of the effectiveness of consumed resources and the financial health of the enterprise. Measuring of financial indicators is relatively easy due to the fact that their counting is clearly determined and these financial indicators can be easily calculated from data in the financial statements. Harder it is to keep track of non-financial indicators, although even there are certain norms, which can be used as basis for their formulation. For example, requirements which directly results especially from the quality system standards (ISO 9001:2008), refers to the need to measure and monitor the performance of business processes.

Financial indicators describe only part of the reality, because they can be created in different ways. Measurement of corporate performance with only financial indicators is then often subject to criticism. Objective indicators are supplemented by subjective evaluation of the representatives of the enterprise. Main challenge is to measure performance in the context of corporate culture, respectively to discover relations between corporate culture and the success of the enterprise.

As already mentioned above, they measure their performance using also non-financial indicators only in half of the enterprises using financial indicators. Measured non-financial indicators are reported in Figure 2.

![Figure 2](image)

**Figure 2**: Measured non-financial indicators (own source)

Data detected by using this indicators, are used primarily for determining the further target values for the next period (87,9%), department or workforce assessment and evaluation (69,7%) and activities or processes improvements within individual departments (69,7%).

85,1% of enterprises carries out a regular assessment of employees’ performance and the frequency of measurement and evaluation of performance of employees most often annual (34,7%) or monthly (32,7%).

Most commonly are used assessment interviews (52%) and standardized forms for employees (41,8%) when evaluating performance of employees.

Competition ability of enterprise is necessary to ensure by alignment and balance between growth oriented efficiency, humanity, social responsibility. Previous studies have shown that humane and efficient formulated corporate culture, as well as exemplary management behavior may be critical factors of enterprise success.

Employees’ performance is the basis for overall performance of the enterprise. If employees do not have a feedback, how their performance is assessed, how their employer is satisfied with their work, it is unlikely that they will change their behavior.
If enterprise management wants to manage employee performance, it must give them clearly know what is expected of them (set goals), create the conditions for the work and give feedback to employees how is satisfied with their current performance and what is seen as their further development potential (assessment). It is important to allow and ensure further development of employees for performance enhancement. Interesting results bought another study, which we carried out on a sample of 76 enterprises in Slovakia. 39% of them were large, 35% medium sized and 26% of small enterprises. Among other things, we focused on the feedback and information provided to employees in context of their performance assessment.

Figure 3 shows answers to question relating to employees performance assessment, if employees performance assessment is provided with regard to the implementation of the objectives achievement. Also, differences by size of enterprise can be found in this issue. Regular assessment of employees’ performance in a larger scale is used in large and medium-sized enterprises. Performance is assessed only irregularly in small enterprises.

Majority of respondents (58%) stated, that set objectives are in most cases derived from the strategic goals of the company and broken down to the lower levels in accordance to their enterprise performance management. Set objectives are broken down to particular departments resp. teams and so on to individuals in the form of specific goals or so called performance indicators (KPI - Key Performance Indicators).

Most of enterprise representatives are aware that success of the enterprise depends on several factors, among which are included in particular: the products uniqueness, their quality, flexible respond to changes, customer satisfaction as well as company and brand image. However, not in all enterprises they recognize, that people who work in it are the most important factor determining success. Employee satisfaction is measured in 43% of the survey participating enterprises. Subsequent use of measured indicators and their link to the strategic documents declared only 15% of the enterprises.

![Figure 3: Assessment of employees’ with regard to the objectives implementation data (own source)](image)

In general, there is an absence of specific and proven methods for management, which would consider corporate culture. Creation of corporate culture based on values, which promotes performance of individuals and the overall performance of the enterprise at the same time, is a challenge for management.

Performance assessment and evaluation of enterprise prosperity in a market economy is reasonable, in particular, for enterprise owners and potential investors. An important factor in ensuring the success of the enterprise is the ability of its management to decide right. A prerequisite for decision making are available information about the decision-making object, which can be obtained by monitoring all relevant, not just financial, performance indicators.

They must display the context of the strategic and operational objectives in the past, as well as the opportunity to set new goals for the future. Finding achieved objectives, as well as their determination shall be carried out by means of indicators obtained from data on enterprise performance. Indicators can be used as a source of information.
For the purpose of the analysis of performance data, it is important to "pull out" and to draw the consequences, because only in this way it is possible to properly assess performance and set goals for the next period. In addition to the registration and evaluation of performance data is an important part to set the range and scale of each set of indicators that can be used as a benchmark.

4. Discussion

Authors in their studies indicated that successful organizations have a clear identity, function and mission. Management and employees know why organization was established, what is accepted, what is important, which attitudes and behaviors are important and what resulting priorities for the enterprise proceedings are as a whole. It is often used in this context, the concept of "values". Identity, mission, function or values are communicated and thus known inside the enterprise and beyond, in successful organizations.

Closely associated with the clear identity is a strategy (target) orientation. Target orientation strictly goes through relevant organizational units and is enshrined in both, managers and employees inside the enterprise in successful organizations. In addition to the existence and communication of strategic vision is available as an indicator of the target orientation also uniform process of management by objectives (MBO) as well as its united and consistent application over the specific objectives at different levels throughout the enterprise.

Cultural norms and system of corporate values provides orientation to enterprise members when managing and controlling their behavior and during decision making with regard to corporate goals.

It is clear that the real guidance and unification is easier if it is preceded by the unification of the essentials. If the essential continuity is established, there are instructions, since it was understood what is important. Management by objectives works, therefore, on the basis of formulating target attributes,, because the contents of activities and values is known and mastered.

Formulated objectives are implemented via taking concrete action and achievement of these objectives is controlled through appropriate indicators. Isolated monitoring of indicators would not be meaningful; it is therefore appropriate reciprocal linking and hierarchical organization of causes, through the effects of financial success. From this can be deduced, how individual goals are linked through focus on employees, learning, customers orientation directly to the economic success and business performance.

Corporate culture is so provide fundamentals of enterprise economic success. Mutual interdependence and interconnection of corporate culture and the economic success describe model on figure 4.

Pyramidal decomposition of aggregated indicators (e.g. ROA – Return on Assets) to partial indicators of lower levels is usual part of financial analysis. This decomposition allows to analyze factors that have an impact on aggregate indicator. In non-financial indicators and their links to the financial indicators are not indicated any pyramidal decompositions in business practice and theory, yet.

Model of linking performance indicators in the context of corporate culture to the economic success of enterprise (market value of a enterprise) allows an analysis to show how non-financial factors influence development of market value of business. Change of any partial variable causes a change in the other partial indicators, as well as change of whole synthetic indicator.
Figure 4: Model of linking performance indicators in the context of corporate culture to the economic success (own source)

As a summary indicator – an indicator of business performance is actually often considered growth of market value of company, value for the owners. This growth is not possible without profit achievement, which may be regarded as an indicator of financial success (performance). The profit, as a performance indicator, it is necessary to take into account in the wider context, since it is "only account book category "which is often subject of "optimization". Profit ensures sales, which overpass production costs, resp. provided services.

Also, quality of production reveals as important in the questions of importance of individual factors of competition ability of enterprises. Achieved market price very often depends on production quality. Buying of product (service) is acceptance of the terms and conditions by customer and there (at market) shall be valorized whole endeavor. It is important that the customer will do not buy just once, but repeatedly returns. It depends, in particular, from his satisfaction, from the fair treatment, quality-price balance, contact personnel approach, etc. This can ensure staff of enterprise.
Studies show, that the most successful businesses consider commitment to employees to be the most valuable factor of competitiveness. Less successful enterprises often compete with price of their products. Enterprises management should, while respecting cultural differences, find ways to communicate with employees, but also with the public and Governments.

Corporate culture as a basis for all actions and decisions must be transformed into everyday business processes and operations.

Competitive enterprises "keep up" with the development and upgrade their products and services. Employees are involved into innovations and to improvement of processes by form of ideas management. Innovation and the number of improvement ideas growth lead to a stronger dimension of learning and development. The join support for employees and recognition of their ideas increase satisfaction and reduces the rate of fluctuation. Improvements will be reflected in customers’ satisfaction and leads to sustained profitability and high growth rate. This creates the potential for growth of the enterprise value and the value growth for owners.

Orientation on employees and mutually related orientation on teamwork, support of the work development of employees, mutual fairness and fair treatment, as well as ethical behavior of management have the biggest impact on engagement of employees.

Fluctuation is an important indicator in the current work market conditions (rising unemployment), however, also the existing, or the lack of willingness to recommend their employer, an assessment of overall quality of working environment respectively working place has also certain explanatory value. Employees are more likely to leave if the employer does not allow flexible work hours, does not provide any social benefits, if there is in general the lack of responsible behavior of management, the adaptation process is disregarded, if there is the lack of support for professional development, tolerance for errors is minimal and the joy of the work is very small. Casually then follows the low identification of employees with their employer. The opinion, that the job satisfaction is related to the performance, makes this concept interesting for enterprises respectively for management. Job satisfaction is a precondition for general life satisfaction and, ultimately, physical and mental health of employees.

Fluctuation of employees increases the costs for the enterprise. The amount of these costs also depends on the qualification of employees. Competencies ensuring the competitiveness of the enterprise are often bounded and associated with individuals. The enterprise is thus losing valuable knowledge (specific human capital) with departure of employees. In addition to the long time period and costs of finding and training of an appropriate employee, loss in production and the loss in know-how, fluctuation can be also reflected in a reduction in the performance of the remaining staff (rethinking their relationship with the company), as well as in the loss in confidence and "breaking down" relationships with business partners, who will get a new contact person in the company.

The phenomenon motivation plays an important role in enterprise performance, as well as in work psychology. We understand motivation as concept of to explain internal and external individual differences leading to the intensity and the level of performance. Employee motivation is considered to be a decisive factor in productivity of the enterprise. High work and performance motivation may be regarded as a necessary but not sufficient condition for sustainable success of enterprise. Important is how employees feel to be linked and bound with the enterprise, it is a prerequisite for individual performance and, in particular, to remain loyal to the enterprise. Commitment and satisfaction of employees in mutual interdependence, play an important role, decrease fluctuation and than can be expected higher work performance.

The satisfaction of employees and business climate are not parts of the corporate culture, but its results. These values mostly mean and provide information as to whether corporate culture is accepted and “accurate”. Favorable corporate climate is reflected in subjective feelings of managers and employees and has a positive impact on the corporate culture. Satisfied employees are more willing to identify with the company, its values and standards.

5. Conclusion

The role of strategic management is to ensure the long-term survival of the enterprise in the context of market conditions, its opportunities but also limitations. This means that the responsible manager must realize strategic activities to create by the greatest possible consistency between the enterprise, corporate culture and set strategic objectives. Although it has been described a lot about the link between organization, business strategy and success of
the enterprise, in recent years, knowledge remains theoretical, as confirmed outcomes of carried out studies and researches.

The results of the researches have pointed to shortcomings in performance indicators setting. In spite of the constant interest of enterprises in its sustainable performance and its support through setting organizational performance goals and objectives, performance evaluation does not meet the all requirements that will lead to the performance enhancement.

Performance evaluation respectively prosperity of enterprise in a market economy has, in particular, an importance for the owners of the enterprise and potential investors. The ability of its management to decide right is an important factor in ensuring the success of the enterprise. A prerequisite for decision making are available information about the object, which can be obtained by monitoring all relevant, not just financial, performance indicators.

Performance monitoring is mostly demonstration of the strengths and weaknesses of the enterprise. Performance data should document the essential aspects of corporate activities. The important thing is to be understood. They have to display the context of the strategic and operational objectives in the past, as well as the opportunity to set new goals for the future. Finding of achieved targets, as well as their determination shall be carried out by means of indicators obtained from data on the performance of the enterprise. These indicators can be used as a source of information. For better description ability of these performance data, it is important to “pull out” and to draw the consequences, because only in this way it is possible to properly assess performance and set goals for the next period. In addition to the registration and evaluation of performance data is an important part to set of the range and scale of each indicators what can be used as a benchmark.

On the basis of theoretical work studies, obtaining a secondary research data from the past, in mainly foreign studies but also own researches we can note, that a sustainable performance indicators must be developed in the context of a corporate culture. In particular, the non-financial performance indicators should be tracked with regard to the orientation of the corporate culture. These indicators can be used as a complement to the corporate practice to generally recognized and used economic indicators.

It cannot be automatically assumed that mere creation of a corporate culture is responsible for the success of the enterprise and its development. It is necessary to modify and improve performance measurement systems in such a way, to promote objectives of the enterprises and meet their needs, to have a positive impact on the performance of employees. Such a systems should be transparent, to allow minimizing the subjective influences of evaluators, administratively unpretentious, and also a continuous.

There must become to mutual interaction and linking of corporate strategy - corporate culture - corporate structures – corporate communication.

There should be defined performance standards linked to the corporate Key Performance Indicators in each enterprise. Metrics of individual objectives consistent with the business strategy and business goals should corresponded to these standards. To build accurate and corporate culture in long term is possible with using clear system of performance management and evaluation of employees.

It is therefore necessary to establish clear performance indicators. These indicators should be both internal and external. Only with the right criteria can be measured and thus also managed how the performance of individual employees contributes to the enterprise performance and to ensure sustainability or growth of this performance.

Performance indicators should be selected so that they are understandable to all groups of employees and at all levels of management. It is important to aware employees with these indicators, inform employees and to analyze if there are not present barriers eliminating to increase the performance of employees. Workforce performance assessment systems have to be not only evaluating, but to developing, which will allow not only to evaluate, but also to manage the performance of employees. Effective performance management shall be supported by systematic process gathering information about work performance and behavior of employees.

This information should serve as a basis for their evaluation and proposal of requirements to improve the performance that need to be transferred into work and development goals aimed at sustainable improvement of performance of employees and whole teams.
Development and learning ability of the enterprise is based on the development of qualifications and competences of employees. This is possible to achieve with further education. It is necessary to establish an appropriate incentive system for employees, which will motivate employees to exploit their full potential. Targeted personnel development forms the basis for a competitive and innovative ability of the enterprise.

There is not possible any further development of enterprise without ability to learn. High potential to learn presume open and transparent communication, structure that enables collaboration, cooperative style of leadership and a convenient way for harmonization of interests and conflict solution.

Key is also consequent support of top management, convincing, and open communication and awareness of employees with the established systems. Only transparency, clarity and adequacy of the system of evaluation criteria will ensure acceptance of shared values and set objectives by employees and to positively influence their performance and the performance of whole enterprise.

References


Making Sense of the Intangibles - A Co-Word Analysis of the most Important Perspective of Analysis

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Abstract: Scholars have approached to managing intangible elements from several perspectives throughout the literature. This field of research is still young, with no more than two decades of more intensive empirical research, which has confirmed the relevance of intangible-based elements on achieving a competitive edge in virtually every industry. Taxonomy and classifications of intangible elements have been built from either deductive or inductive methods. And also practitioners are more concerned and convinced that intangible elements are a key in the today’s competition, more than ever before. However, a categorization of approaches followed by scholars is still missed. The categorization proposed in this article will allow a more in-depth understanding of how intangible elements may help to achieve a competitive advantage, either from a theoretical or an empirical perspective. In addition, it will provide further information on how the different intertwined approaches relate to each other and, hence, it will help scholars and practitioners to gain a further understanding of how to implement intangible-based strategies more successfully. With these goals in mind, a search on the main databases was conducted (namely, ISI-Web of Knowledge and Scopus). Up to 4,308 different articles dealing somehow with intangible assets were found. In this paper, the title and keywords are analyzed and the content is categorized in six different themes: Knowledge Management refers to IA and its consequences in the Knowledge cycle; Intellectual Capital refers to IAs as mainly the knowledge-based economic value, divided into Human Capital, Relational Capital and Structural Capital; Human Resource Development refers to IAs as organizational learning; Economics deals with the micro and macroeconomic consequences of IAs and with the market of IAs; by Social Policy we mean IAs investment considered as a commodity which have social benefits and which are managed by social operators; and finally the Management and Accountability, where the quite old fashioned view is addressed according to which IAs are strategic resources that must be accounted for and valued for money. We ended with the conclusion that KM and HRD are somehow linked, as are IC, Economics and Traditional Management and Accountancy. We believe this is a first interesting indication on how society looks at the phenomenon of Intangibles. We think that this finding could help scholars and practitioners understand that in fact there are three main ways of looking at intangibles, one related with money, the second with learning and the third with power and this fact should had important consequences in the management, teaching and research of Intangibles. The study is limited because we could have used an even higher number of words to analyze each face of the Cube.

Keywords: intangible assets, organizations, value, perspectives, intangible management

1. Introduction: The need for the Cube

The goal of this research is to investigate the relevance of diverse intangible dimensions for organizations, as well as how these dimensions have been dealt with throughout the literature on the management field. The convenient combination of such dimensions may allow firms build Intangible Assets (IAs) to finally achieve a knowledge-based competitive advantage. From a Penrosian approach, combinations of intangible-based elements are called to be a key for a further understanding of how enterprises, mainly small and medium-sized ones, can build competitive advantages over their different stages of growth. According to Penrose (1959), the ways of the firm’s growth may fall in two categories: internal and external growth. Most important to that classification is that internal growth can be based on tangible or on intangible elements. The natural limit imposed by the capacity of liability of small group of shareholders is an additional conclusion implied in one of the most influencing treaties on the growth of the firm. Accordingly, there is a time in the dynamics of an enterprise when internal growth cannot be undertaken anymore, leading these organizations to external forms of growth, namely merges and acquisitions or the entry of new shareholders. Nevertheless, she posited that growth requiring new tangible assets acquisition is a more risky situation than if the assets are intangible. Then it follows that under such circumstances, and in the current business cycle, a further understanding of how to manage intangible-based assets becomes a critical way not only for growing, but for the survival of firms.

Intangible Assets (IAs) have been studied addressing to basic questions: Q1) What is the value of the IA? Q2) What is its return? We call those questions the two faces of the Coin. The first one requires us to define what an IA is and how to count them. The second aims at defining the impact of IAs on individuals, organizations, and nations. We should
mention first and foremost that we consider those two perspectives important and needed nonetheless because they are rooted in the concepts of asset/stock/investment and return, which are basic for organizational management. But we also think that IAs analysis is and has been much more complex than that. Therefore we propose to find out under what approaches IAs have been assessed across literature. Six thematic areas were proposed (Tomé and González-Louriero 2012): Intellectual Capital (IC), Human Resource Development (HRD), Economics (Econ), Social Policy (SP) and Traditional Management and Accountability (TMA). And in this paper we aim at verifying the importance of those six perspectives in current IAs research. To do so, we conducted a search on two of the main databases (notably, ISI-Web of Knowledge and Scopus) and gathered up to 4,308 different articles dealing somehow with the key facts of IAs. Therefore, the remainder of the paper is organized as follows. First, we present the theoretical background of the Cube. Second, we introduce the data and the research and analytical methods we used. Third, we present our results, and after we discuss them. And finally, we expose our conclusions, framed with limitations, practical implications and suggestions for further research.

2. Theoretical background

In this section we explain each of the six parts of the cube and link them with our search strategy. The six parts are presented in the following order: a) KM; b) IC; c) HRD; d) Economics; e) Social Policy; f) Traditional Management and Accountability.

a) Knowledge Management
KM is both a science and a field of activity. As an activity KM comprises the dynamic practices developed to extract value from the knowledge resource. Every time a knowledge transfer or conversion is done the business value grows (Sveiby 2001). Those activities have been defined as a Knowledge Cycle (Nonaka and Takeuchi 1995). Therefore, KM can be described fully with only that term in a search strategy, since an author will include it among the article’s keywords.

b) Intellectual Capital
A second dimension is the analysis of IC. It was generated from the need of understanding the difference between the market and the book value of companies. Therefore, IC analysis extended the traditional accounting by exposing the importance of intangibles. IC is sometimes defined “[…] as knowledge that can be converted into value […]” (Edvinsson and Sullivan 1996: 358). The IC is usually disaggregated into three components: human, structural and a third component often called customer capital (narrow conceptualization, (cf. in Marr and Adams 2004) or relational capital (wide conceptualization following European Commission, 2006 and Viedma Marti 2001). Nevertheless, IC is also fully described by the term in itself, likewise KM is.

c) Human Resource Development and Learning
Some of the most important analyses regarding IAs have been made in the field of Human Resource Development and Learning (HRDL). The IAs investments in this specific field offer the possibility of having an impact on the participants, their learning, their competences, their behaviour, or in other company outcomes, as stated by Kirkpatrick long ago (1959). This matrix of thought generated both the HRD and the Organizational Learning (OL) fields. HRD is a strategic and a business approach to training and development of human resources in an organization for performance and organizational improvement (Garavan 1995; Harrison 2000). Becker and Gerhart (1996) suggested that the most fundamental implication is that the choice of HR systems can have an economically significant effect on firm’s performance. According to Abdullah (2009) there are four interrelated functions in HRD: Organization Development; Career development; Training and Development; and Performance Improvement.

d) Economics
The basic economic analysis of IAs may have two starting points: as an investment or as a market. As an investment, the operation should generate future benefits that would out-weight the costs. The investment may be made by the individuals, the organizations, or by the State. Rates of returns and added values can be attributed to each investment. The analysis may be made in either a microeconomic and in a macroeconomic way. The former perspective implies that the returns generated by IA investments are measured in terms of: wages or employment for individuals; productivity, sales, market share, work ambiance or product quality for companies; income or exports for countries (Briggs 1987; Whalen 2009). In macroeconomic terms the investment in IAs produces the transformation from a low poor, less qualified, less competent and technically incipient society into a rich, qualified, competent and technological developed one. In the first type of society a vicious cycle exist regarding IAs (low investment and low
return) and in the second type of society a virtuous cycle exists (high investment and high returns). The focus is put on the human resource at macroeconomic level because this economics “[...]address such difficult issues as efficiency, equity, stabilization and growth [...]”, i.e. economic progress (Brigss 1987: 1207). As a market, the economic analysis usually lacks the basic elements defining a market when it comes to intangibles (i.e. supply, demand, quantity, price), as for instance the intellectual property rights in the open innovation paradigm (Chesbrough 2003). Finally, the market is constituted by private operators but also by public ones, and the economic analysis gives valuable insights into the correctness of the public operations in the IAs market. Therefore the main descriptors are economics and markets.

e) Social Policy
Social Policy (SP) is an academic discipline which analyses the way societies develop policies to deal with the basic social needs (Titmuss 1950; 1958). A vast majority of operations (programs) that result in the investment in IAs are made by the public sector or at least are made to satisfy some social or public goal. This form of looking at IAs is linked with the notion of Welfare State (WS) (Esping-Andersen 1990). A WS is a social construct which tries to solve the social needs in a planned way. A WS is opposed to a Welfare Society, in which no such an organized way of solving the social problems exists. Therefore in a Welfare Society, individuals and groups have to basically take care of themselves, perhaps with some support from the outside world (national or international organizations and NGOs). Any WS is characterized by a Welfare Mix (WM). A WM is a composite of public, private and third sector actions, in order to build a WS (Esping-Andersen 1990; Deacon and Mann 1999; Ferrera et al. 2000).

f) Traditional Management and Accountability
Virtually all the literature on intangible highlights that dealing with intangible resources and assets is a relevant problem of traditional management and accountancy (TMA). Particular characteristics of intangibles, such as non-consumption for use, total availability and so forth as described by Molloy et al. (2011), makes them difficult to be understood by TMA. Just as Spender (1989, 2011) keeps on reminding us, the issue is whether the value is created by adding tangible and intangible capital (TC+IC), or whether it is a question of a moderator effect (TC*IC) in the process of value creation. In addition, Furrer et al. (2008) showed how the strategy field is consistently about performance. Then it follows that intangible, from a strategic accountancy approach, must be about how to increase performance and overcome competitors thanks to intangible-based assets.

3. Methods

a) Sample and data collection
Databases selected were ISI-Web of Science (Social Sciences Citation Index-SSCI) and Scopus. They abstract and index the main scientific journals in the field of Social Sciences. Because of the fact that several journals are included in both, the results were integrated into a single file and duplicate registers were deleted.

The information was gathered between December-2102 and January-2013. A timespan of all the years available in each database to December 2012 was defined for the search.

An initial search strategy included a list of basic key words by each of the six facets (see table 1). A manual filter enabled deleting some articles included in the big box of Social Sciences, which clearly were not related with this investigation. They were articles dealing with fields such as ecology, immunology, psychiatry, occupational health, and the like. After the first results were obtained, Wordstat software was used to extract a list of keywords describing each facet: nouns, verbs and compound forms were extracted from both the title and articles’ keywords. After that, a new search was conducted by including in the search strategy the most frequent keywords obtained in the latter step. This iterative search yielded a total of 4,308 different articles. In a last step, again Wordstat software extracted the final list of keywords. A manual filter of this list was conducted in order to eliminate meaningless words. Up to 82 different keywords were retained as main descriptors of research in the field of IAs to date.
Table 1: Search strategy

<table>
<thead>
<tr>
<th>Facet</th>
<th>Words included in the search</th>
<th>Number of different articles (total=4,308)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Management</td>
<td>Knowledge Management; KM</td>
<td>3,227</td>
</tr>
<tr>
<td>Intellectual Capital</td>
<td>Intellectual Capital</td>
<td>450</td>
</tr>
<tr>
<td>Human Resource Development (HRD)</td>
<td>Human Resource Development; HRD; Organization Development; Intangible* AND [Career Development OR Training and Development OR Performance Improv* OR Learning]</td>
<td>120</td>
</tr>
<tr>
<td>Economics (Econ)</td>
<td>Intangible* AND [Econom* OR Market*]</td>
<td>469</td>
</tr>
<tr>
<td>Social Policy (SP)</td>
<td>Intangible* AND [Welfare state OR social policy OR welfare mix OR social capital]</td>
<td>92</td>
</tr>
<tr>
<td>Traditional Management and Accountability (TMA)</td>
<td>Intangible* AND [strategic management OR strateg* OR performance OR accounta*]</td>
<td>315</td>
</tr>
</tbody>
</table>

(*) A wildcard “*” was used in some cases since different forms of the same lexeme may appear.

(a) Total number of different articles is different to the addition of partial results because an article may be found in more than one of the searches conducted.

Source: own draft from ISI-WoK and Scopus databases (data updated on January 20th, 2013)

It must be highlighted that this search strategy does not ensure that pairwise intersections were empty sets. This is why the addition of partial results is not equal to the total numbers of different articles found.

It is worthy to mention that KM is predominant field of research when it comes to IAs. Conversely, SP is the less investigated area in the research of IAs, where only 92 different articles were found.

b) Statistical procedure

Mapping the intellectual structure of a research field requires a mixed method approach, combining both qualitative and quantitative methods. Several methods have been used in related fields such as strategy (e.g. Ronda-Pupo and Guerras-Martin 2012), strategic management (Furrer et al. 2008) or expatriates in international business (e.g. Dabic et al. 2013). Among them, it is worthy to mention the co-citation analysis, which is useful to detect influential works (who) and content analysis, designed to provide a quantitative result of what has been investigated. The latter approach was selected in order to shed some light on the content of research in the IAs across literature.

The method used was similar to that used by Furrer et al. (2008). Accordingly, the methodology described by Hoffman and De Leeuw (1992) was followed and a multiple correspondence analysis (MCA) was conducted. First, a matrix of articles (cases) and keywords (variables) was constructed. When a keyword appeared in an article then a “1” was computed and “0” otherwise. So a matrix of 4,302 articles and 82 keywords was obtained. The HOMALS procedure (homogeneity analysis of variance by mean of least squares) was performed in SPSS (v20) to compute the MCA.

In this case, the HOMALS computes the co-occurrence of a keyword among the set of articles. Frequency and two coordinates are the results of this procedure. Keywords are also depicted in a two-dimensional map. Therefore, the MCA yields a kind of distance between pairs of keywords. The more frequent a pair of keywords appears jointly in the set of articles, the more proximal they will appear in the map, and the more distant otherwise. Thus the resulting map will actually show the shared substance among the set of keywords. Labels to the poles of the axes depend on the meaning of the keywords more proximal to each pole.

4. Results

In the first graphic result of the HOMALS procedure, the cloud of keywords showed that there might be implicit two orthogonal axes. Therefore, the initial solution was rotated 45° counter-clockwise, what yielded more easily interpretable axes (figure 1).
In terms of most frequent keywords (see appendix), the field of research is clearly governed by Knowledge Management issues. The impact of IAs on organizational performance has been the main consequence investigated. A strategic viewpoint of resources and capabilities has pervaded this field, with descriptors such as strategy or competitive, or intangible-based issues such as innovation. At a glance, Social Policy issues have seemed to attract little attention of scholars in the field of IAs: youth, unemployment, cohesion, migration, solidarity or inequality are among the less frequent descriptors.

A better interpretation of the map can be reached if poles are labelled. To do so, more proximal keywords to each pole must be considered. On the left side, keywords with the highest values are youth, migration, welfare, membership, unemployment, inequality and participation. Social Policy (SP) is an academic discipline which analyses the way societies develop policies to deal with the basic social needs (Titmuss 1950; 1958). A great deal of operations (programs) that result in the investment in social IAs are made by the public sector or at least are made to satisfy some social or public goal. Therefore, this pole can be labeled as “Social Policy”.

At one second pole, keywords with highest values are brand, marketing, diversification, subsidies, customer, intangible, stock and acquisitions. According to Furrer et al. (2008), diversification and acquisitions are corporate-level strategies. Some additional keywords proximal to this pole are competitive and industry. Therefore, it can be said that this pole is about strategies involving intangible-based elements at either corporate or competitive levels, hence the strategic dimension of IAs.

Keywords with the highest loads on the upper side are community, science, sharing, participation, tacit, learning, system, culture, communication, training, membership and knowledge. They relate with key issues in the field of knowledge management and knowledge systems (González-Loureiro and Figueroa-Dorrego 2012). This comprises the identification, acquisition, development, distribution, use and retention of knowledge flows throughout the organization (Probst and Büchel 1997; Davenport and Prusak 1998). Some issues relate with Human Resource Development such as training and the development of groups (membership). Therefore this pole agglutinates two intertwined faces of the cube, KM and HRD, both of them dealing with the human dimension of intangible assets: knowledge.

Finally at one third pole, keywords dropped in the map are equity, brand, stock, intangible, accounting, diversification, assets, investment, costs, marketing, youth and financial. They relate with the quantification of the intangible value in
economic terms. The measurement of intangibles is a key input to facilitate an efficient management of IAs (González-Loureiro and Figueroa-Dorrego 2012). The overlapping between Traditional Management Accountancy and Intellectual Capital seem to be at the very extreme of this pole, while Economics is also present at about halfway from the origin to this pole.

At the very center of the map, keywords are extremely intertwined among the different facets under which IAs has been investigated to date. Key issues relate essentially with strategy, taking the form of performance, development, resources, capabilities or industry.

Accordingly, KM has been overrepresented in the research on IAs. Two dominant poles relate with the human dimension of IAs, i.e. KM and HRD, and with the measurement of economic inputs, processes and outcomes, i.e. IC, TMA and Economics. However, Social Policy has attracted little attention from scholars on IAs. And yet Social Policy can be seen as a relevant input, a process or an output strongly based on intangibles. For instance, the country’s or region’s welfare and its social stability in institutional terms are seen as key determinants for new entries of international firms, in the case of international business research (Dabic et al. 2014). Therefore there is room for enlarging the empirical research on IAs toward Social Policy issues. For instance, this question is particularly relevant in the case of emerging economies where market imperfections call for the intervention of the state. While foreign actors do not always want more interferences in free market rules and call for speeding up their transition to less regulated markets.

Yet whether Social Policy is an input, a process or an output of IAs management is still a black box that deserves further attention from scholars.

5. Discussion: A step forward in the road to the Intangible Cube

Our main with the research project we have in mind and in which this paper is included is to make sense of the Intangible analysis, by specifying several different ways of analysis. In a first paper we defined the theoretical differences between the six approaches (Tomé and Loureiro, 2012).

In a following study we hope to perform an empirical study on companies in which we will define what is the importance practitioners give to each facet of the cube. If we then dimension each face of the cube according to that dimension we will end up with an hexahedron which will represent the real situation of the cube in the economy and the society.

In this context this paper is complementary of that future work. Firstly, this paper dealt with scientific work, not with managers opinions. Secondly in this paper we found that there are three main ways of grouping the six faces. And frankly, the grouping we found makes perfect sense. In first place, we know almost intuitively that the problematic of power and social policy has been absent of many intangible studies. This occurs even the prosperity of the western world is built over an immense set of social policies devoted to enlarge and consolidate the various aspects of intangibles, namely education, training, brands, routines and experience. The fact that so many people use it and so few people study it is in our opinion related to funding mechanisms. IC, and KM sciences won importance when companies began to worry about market value and knowledge as an asset. In each case, technology helped the promotion and importance of the analysis. Crucially companies funded the studies on KM and IC because they were worried with the consequences of IC and KM for their own situation. But regarding SP, basically only governments make and made those studies because they are meant to analyze policies, from whichever form of Welfare State (Esping Andersen, 1990). Therefore, Social Policy has been a distant cousin in the analysis of intangibles.

In what concerns HRD and KM, the analysis have been much related because the people who need to know about the competence of the individual or organization also want to know about his or her knowledge. In fact there is some overlap, which is deeply increased if we speak about learning. Given that we acquire knowledge when we learn, and that we should get more competent when we learn, KM and HRD are so intertwined that sometimes it is difficult to disentangle them.

A similar situation occurs in relation to IC, Economics and Traditional analysis. IC analysis is much more money related than KM and HRD analysis, so it should be definitely put in a second axis. And, if IC is related with money, it becomes essentially a problem of value for money, as in traditional accountancy. So, the link between IC and TAC becomes
intuitively clear. But, if we are talking about money, Economics is THE natural field, because in a way we may think the “economics is the study of money”. Therefore the rationality for the third axis becomes also quite obvious.

One question that remains unanswered is, which one of the axis, on power, money or learning is more viewed by companies and organizations. We would guess that if we address the questions accurately, it may happen that SP will be included in the second axis and that we will have one axis related with money and the other with other aspects of the company. Also we may arrive at a situation in which power, money and learning will be seen as equally important because if we need learning to generate money and we need money to invest in learning, in the end of the day we need power structures to promote learning and to relate money with learning.

Another question that these results raise is the consequences in the management, teaching and research of activities on Intangibles of finding that there are two, or three main ideas, namely power, money and learning.

In what concerns management, the message of this paper is that power, learning and money should be considered as key factors in any policy of organizational development, anchored in SP, KM and HRD, and IC, Economics and Accounting theory respectively.

For teaching, this paper suggests that one should be very aware of the importance of the six perspectives when lecturing intangible analysis. This means that each perspective and its main theories should be included in the syllabus of the education and training of the Intangibles specialist. This fact has the consequence that if Intangibles are the main asset in the 21st globalized economy, the education of the specialist in intangibles should also be global, in the sense that he should master a vast quantity of theories from the six facets we mentioned.

For the research community point of view, scholars should take note of the detected importance of power, learning and money. Furthermore, the community should address the relation between those three ideas in the perspective of maximizing the use and benefit of intangible in societies and organizations. In the context of scarce resources, this idea is much interesting and ultimately would have impacts in the management of organizations and societies. The community of scholars should also be aware of the vast number of possible insights, at least six, over any problem, and of the need to be heteroclite and not only strictly focused in a given and very limited field, that is only one facet, to understand intangibles.

Finally we must understand that the present study is limited because we could have used an even higher number of words to analyze each face of the Cube. This issue ought to be dealt with in a revision of the study in the future, and it would relate essentially to the SP facet.

Summing up, intangible are a plural phenomenon, decisive in a global age, and that requires a global understanding of the various facets to be reasonably known.

6. Conclusions: The six facets of intangible assets

The aim of this article was to investigate how the main dimensions of IAs have been dealt with throughout the literature on the management field. As a multifaceted phenomenon, we initially provided six different facets to begin with this investigation. A co-word analysis of up to 4,308 different articles dealing somehow with IAs has allowed us to explore how these six facets relate and intertwine each other.

In analyzing this set of articles, we found that the descriptors of some facets are also included in some other dominant facets. As a result, two axes were built to map this wide field of research. A first axis is explained mainly by the fields of KM, IC and Economics. A second axis is explained largely by HRD and IC fields. It must be highlighted that KM is predominant in terms of the number of papers. Meanwhile SP has not been explored extensively from this approach of IAs.

These results may help to gain an in-depth understanding of the IAs phenomenon from the side of scholars. Further research is still needed to confront these results with the practitioners’ side in order to evaluate how the real business world assess these six facets of the IAs in order to achieve an intangible-based competitive advantage. Such a competitive advantage is easier to be maintained apart from competitors because of the imperfections of the IAs’ market. In addition, in the current context it may ease the survival of firms, particularly SMEs, since this advantage requires a less risky combination of resources, capabilities and assets.
Finally we would like to add some final comments on applicability. First, we think the cube is a metric on how scientists and managers look at intangibles. In this regard, a visual future outcome of this research would be two transparent cubes—representing scholars’ and managers’ perceptions—in which the dimension of each face would represent its relative importance for each group of individuals. Second, according to the main posits of the theory of the firm’s growth (Penrose 1959; Foss 1999), internal-based growth is naturally constrained by the limited capacity of the current owners, namely the Penrosian managerial services. Therefore, further research may be conducted to shed some light on the survival and success of firms from this intangible-based approach, including elements of each of the six facets disclosed over this article. Third, this research demonstrates the importance of the resource-based approach to the strategic management process of intangibles, even in a context of rapid changing environment. This emphasizes the view of strategy as fit and the key role of knowledge and dynamic capabilities on the ongoing review of strategic decisions. It would be very interesting to check whether managers and practitioners would share similar ideas in this regard, since managing intangibles is governed by right opposed principles to managing tangibles (the latter is deprecated by its use while the former is enriched). In short, a more clear taxonomy and mapping of concepts related with intangibles will help scholars to find research avenues while practitioners will gained a better understanding on how intangibles should be managed strategically to compete successfully in the ever changing competitive landscape.

References


Eduardo Tomé and Miguel Gonzalez-Loureiro


## Appendix: List of keywords describing the field of intangible assets research

<table>
<thead>
<tr>
<th>Keywords</th>
<th>dim1 (rot.45º)</th>
<th>dim2 (rot.45º)</th>
<th>Frequency</th>
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<td>INFORMATION</td>
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<tr>
<td>POLICY</td>
<td>-3.96</td>
<td>-1.05</td>
<td>211</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>-3.49</td>
<td>-1.28</td>
<td>205</td>
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<tr>
<td>TRANSFER</td>
<td>0.14</td>
<td>0.92</td>
<td>194</td>
</tr>
<tr>
<td>HUMAN</td>
<td>-1.12</td>
<td>-1.45</td>
<td>191</td>
</tr>
<tr>
<td>ASSETS</td>
<td>1.30</td>
<td>-5.59</td>
<td>185</td>
</tr>
</tbody>
</table>
Impact of Intellectual Capital and its Components on Firm Performance Before and After Crisis

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Abstract: The recent economic crisis has caused a significant discontinuity in the world of business. Companies and researchers are constantly trying to understand the key drivers that caused significant impact on companies’ performance and how to challenge them in the future. One still insufficiently covered research issue is the role that intellectual capital and its different components have played in the performance of small and medium-sized enterprises, and how this role has changed after the crisis. Intellectual capital has become a key value creation driver in the new economy. Its positive influence on firm performance has been proved by numerous empirical studies worldwide. Several of them also investigated how the economic crisis affected this paradigm. However, the body of knowledge supported by sound empirical findings in this field is still rather scarce. Therefore, the purpose of our study is to examine the relationship between intellectual capital (IC) and its different components, and firm performance before the recent economic crisis and in the period of recovery, among SMEs in different industries in Slovakia. To measure the level of IC and its respective components we applied the Value added intellectual coefficient (VAIC™) indicator developed by Pulic. This measure, however being criticized by some authors, is the most frequent metric used to evaluate IC and its components using financial data. We selected ROA as our performance measure. Our analysis also accounted for firm size and financial leverage while investigating the effect of IC on SME performance. We based our analysis on panel data comprising of 2008 and 2011 financial statements of 1947 Slovak SMEs operating in 10 industries (sections according to SK NACE rev. 2 classifications). These data were obtained from business information portal Universal Register Plus operated by CRIF - Slovak Credit Bureau. To compare the influence of IC on firm performance we constructed pre-crisis (2008) and post-crisis (2011) regression models and analyzed the observed differences from two different perspectives. Our findings suggest a rather consistent pattern across almost all investigated industry sections showing that the role of intellectual capital performance in predicting firm’s financial performance has increased in the past-crisis period compared to the pre-crisis situation. For the industries where the relationship between IC and firm performance had been strengthened from both employed perspectives we have studied the differences in the effect of particular IC components. Our results suggest that while different IC components generally play a significant and from the time-perspective a consistent role in predicting firm financial performance, there are considerable differences across the industries. However, these different modes of interplay between IC components seem to lead to a similar pattern when the firm’s financial performance is combined with its overall intellectual performance.

Keywords: intellectual capital, intellectual capital components, firm performance, VAIC™, HCE, SCE, CEE, SMEs, economic crisis

1. Introduction

Intellectual capital is seen as one of the key value drivers in the modern economy wherein knowledge-based firms are crucial for economic development. A core strategy for gaining a competitive advantage by a firm is the use of knowledge as a resource base. As such, value is thereby created for shareholders and stakeholders. Authors such as Sveiby (1997), Edvinsson (1997) and Lynn (1998) consider intellectual capital as a main source of value creation in the new economy. It is clear that formulation of an adequate strategy is a very important component in the value creation process. Equally important is value management process in which relevant intellectual capital management is a serious challenge. Part of this challenge is also measurement of the contribution of intellectual capital to the economy. OECD (2008), in its report, stresses the importance of this issue as follows: „The current bias towards tangible assets in measuring investment may lead to inefficient policymaking, misallocation of resources by managers and increased cost of capital for investors. However, any shift toward consideration of intellectual assets as investments, rather than as expenses, must overcome a range of measurement and valuation problems”.

On the micro level impact of intellectual capital on a firm’s financial performance can be measured from both short term and long term perspectives. From a short term perspective the impact of intellectual capital can be measured with selected financial performance ratios such as ROA, ROE or sales to total assets. These may be considered proxies for total value creation measurement. The long term perspective can be measured by value creation. The issues addressed above are complex and create a challenge for all types of companies but especially for small and medium size companies (SMEs). In many economies, similar to Slovakia, SMEs play a critical role in their development. In Slovakia SMEs include 99.9% of the companies, with 72.2% of total employment and 23.0% of GDP. They have their specific characteristics and managerial issues, however they must also use knowledge as source of competitive
advantage particularly in turbulent times. Thus in our paper we have investigated whether the role of intellectual
capital and its components in financial performance of Slovak SMEs, operating in different industries, has changed
before and after the peak of the recent financial crisis.

In Section 2 we discuss the context of intellectual capital, the recent economic crisis and financial performance. In
Section 3 we present the data and methods used in our research. Section 4 presents the results of our analysis and
Section 5 discusses the findings as well as their implication.

2. Intellectual capital, economic crisis and financial performance

The most frequently quoted definition of intellectual capital is: any knowledge convertible into value (Edvinsson
1997). The essence of intellectual capital is the value creation that can be understood as a complex of intangible
property, knowledge, skills, processes, applied experience and technologies used in organizations to ensure a
competitive advantage on the market (Papula and Volna 2011). According to literature (Edvinsson 1997, Sveiby 1997,
human capital, organizational capital and relational capital. As can be seen in Figure 1 (Papula and Volna 2011) human
and organizational capital both contain knowledge oriented towards something inside the organization, in contrast to
relational capital which contains knowledge items oriented outside the company.

![Components of intellectual capital](image)

**Figure 1:** Components of intellectual capital

For several decades and during the last one a considerable amount of research on intellectual capital and its relation
to financial performance of the company has been published. Whereas some of the results are ambiguous (Javornik et
al. 2012, Iazzolino and Laise 2013), considerable amount of research confirmed positive relationship of intellectual
capital and firm performance (Chen et al. 2005, Clarke et al. 2011, Alipour 2012, Mondal and Ghosh 2012, etc.). The
influence of intellectual capital on firm performance both through financial and non-financial results is very well
illustrated within the ARCS model for Intellectual Capital Reporting (Koch et al. 2000), that is presented in Figure 2.

![Process of influence of intellectual capital components on firm performance](image)

**Figure 2:** Process of influence of intellectual capital components on firm performance

Intellectual capital is a complex phenomenon. Due to that, a lot of questions regarding measurement of its impact on
company performance remain unanswered. To a great extent it really depends on the perspective or the purpose of
particular measurement. As a result, researchers have developed a number of different methods in an attempt to
overcome the limitations and irrelevance of traditional measures.

In 2005, Karl Eric Sveiby presented a comprehensive analysis of 42 identified measurement methods (Sveiby 2005).
According to his classification measurement methods for intellectual capital can be grouped into four main categories:
direct intellectual capital evaluation methods (DIC), scorecard (SC) methods, market capitalization methods (MCM) and return on assets (ROA) methods. DIC and SC methods identify intellectual capital components and instead of them create some index. MCM and ROA are based on decomposition of certain parameters. The value added intellectual coefficient (VAIC™), a method developed by Ante Pulic (Pulic 1998, 2000, 2004, 2008), is the only one that doesn’t quite fit any of the four listed categories. Its closest fit is the ROA measurement methods (Sveiby 2005). Each of these methods has its own pros and cons. In our opinion the best way how to compare the results of the intellectual capital impact on value creation (e.g. as a part of strategy formulation process) is through methods based upon available financial information. We consider these methods the most pragmatic for this purpose.

The most frequently used methods that are based on available financial information are the Q-Tobin coefficient (Tobin 1969), EVA, MVA and FGV developed by Stern Stewart&Co., and VAIC™ (Pulic 1998, 2000, 2004, 2008). Despite the fact that introduction of EVA, MVA and FGV has been innovative in firm performance measurement, and shareholder valuation, in the knowledge economy, “these basic indicators of industrial economy do not really show whether and how much value has been created” (Pulic 2000).

Pulic proposed the use of the value added as an indicator for measuring performances in a knowledge economy context. His VAIC™ concept has been criticized both for his assumptions (e.g. Zeghal and Maaloul 2010, Andriessen 2004) as well as for poor results in case of relationship between VAIC™ and firm performance in some industries and emerging markets (e.g. Chan 2009, Puntilla, 2009). According to Iazzolino and Laise (2013) part of this criticism is due to misunderstandings because of the different meanings that Pulic gives to the terms of human capital (HC) and structural capital (SC) in comparison to Scandia Navigator. They believe that “the bridge that Pulic created between the notions of value added and that of value creation in a knowledge economy context constitutes the strength of his proposal”. On the other hand they think that the main weakness is the attempt to qualify VAIC™ as a performance measurement criterion alternative (or rival) to the existing ones like EVA etc. Their opinion is that VAIC™ complements existing measurement of the multidimensional concept of firm performance as an innovative indicator of intellectual capital efficiency (ICE).

The issue of intellectual capital measurement on a micro level is relevant not only for the overall intellectual capital concept, but also for its different components. When we hold to the Pulic’s VAIC™ model, the value of intellectual capital performance is a result of the efficiency of human and structural capital and asset value efficiency (Pulic 1998, 2000, 2004, 2008). As an integral part of VAIC™ model, this structure as well as the definition and operationalization of its respective components, face a similar criticism as the entire model, mostly based on a shift in meaning commonly assigned to the respective components (Iazzolino and Laise 2013). Again, similar to the overall VAIC™, Pulic’s components of intellectual capital have been frequently utilized in empirical research as potential predictors of firm performance (e.g. Javornik et al. 2012, Joshi et al. 2013, Phusavat et al. 2011).

Economic crisis and recession periods have always required new business strategies formulation and implementation. These periods are usually accompanied by shortage of financial resources. Therefore one of the options for companies today is to put more effort on improvement of intellectual capital usage. The qualitative research study by Lennox (2012) confirmed that, due to financial constraints of the recent recession, companies have to utilize their relational capital to sustain their operations and negotiate with suppliers, customers and financiers. Theoretical grounding suggests that the role of intellectual capital in SMEs value creation should have increased as a result of economic recession. Unfortunately we haven’t found any empirical evidence based on quantitative analysis that would explain a pattern of change in usage of intellectual capital in financial performance improvement as a proxy to increase value of SMEs.

3. Research methods and data

The aim of our study was to examine the relationship between intellectual capital and its different components and firm performance before the recent economic crisis and in the beginning of the recovery period, in order to discover how the crisis influenced the importance of intellectual capital in determining firm performance among SMEs in different industries.

3.1 Sample

Our analysis is based on panel data comprising financial statements of 1947 Slovak SMEs operating in 10 different industrial sections for years 2008 and 2011. While 2008 financial statements depict the situation before the recent economic crisis, the 2011 financial statements of the same firms reflect the influence of the crisis and the beginning of
recovery period. To obtain the research sample we have used a commercial database of business information portal Universal Register Plus operated by CRIF - Slovak Credit Bureau. The vendor collected the data from the official Company register collection of documents and official Business bulletin. The original dataset contained 2370 companies with financial statements available for both 2008 and 2011. To obtain our final sample we have employed several criteria. First, we have selected only small and medium-sized enterprises adhering to the EU definition (EC 2005), applying the financial thresholds (due to missing information on staff headcount and autonomy of the enterprise these criteria were omitted). Second, we filtered out all companies with zero turnover, zero staff costs or negative equity in any of the examined years (2008 and 2011). Third, we have selected industries that contain at least 50 companies, while making sure that this selection will reasonably cover the scope of existing industries. To classify the companies into different industries we have applied SK NACE Rev. 2 statistical classification using the most aggregated level of industry sections (EC 2008). This filtering procedure resulted into the final sample of 1947 SMEs from 10 different industries. Despite the limited representativeness of this sample (due to the character of the original data) resulting from convenience sampling, its considerable scale and panel character enables us to generalize the findings to certain extent. The industry distribution of our research sample is provided in Table 1.

Table 1: Industry distribution of research sample

<table>
<thead>
<tr>
<th>SK NACE</th>
<th>Industry section</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Agriculture, forestry and fishing</td>
<td>242</td>
</tr>
<tr>
<td>C</td>
<td>Manufacturing</td>
<td>566</td>
</tr>
<tr>
<td>D</td>
<td>Electricity, gas, steam and air conditioning supply</td>
<td>63</td>
</tr>
<tr>
<td>F</td>
<td>Construction</td>
<td>157</td>
</tr>
<tr>
<td>G</td>
<td>Wholesale and retail trade, repair of motor vehicles and motorcycles</td>
<td>522</td>
</tr>
<tr>
<td>H</td>
<td>Transportation and storage</td>
<td>103</td>
</tr>
<tr>
<td>J</td>
<td>Information and communication</td>
<td>61</td>
</tr>
<tr>
<td>L</td>
<td>Real estate activities</td>
<td>86</td>
</tr>
<tr>
<td>M</td>
<td>Professional, scientific and technical activities</td>
<td>92</td>
</tr>
<tr>
<td>N</td>
<td>Administrative and support service activities</td>
<td>55</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1947</td>
</tr>
</tbody>
</table>

3.2 Variables

As a dependent variable measuring firm performance we used the gross ROA financial indicator. This indicator is one of the most common firm performance financial indicators in intellectual capital as well as entrepreneurship and strategy research (Javornik et al. 2012, Carton and Hoffer 2006). Gross return on assets was calculated as a ratio of gross profit and book value of the company’s total assets. It shows profitability of a company relative to its total assets.

To measure the level of intellectual capital in the firm we applied the VAIC™ indicator developed by Pulic (1998, 2000, 2004, 2008). According to Pulic (2004) this composite coefficient is calculated as a sum of intellectual capital efficiency coefficient (ICE) and capital employed coefficient (CEE). The first coefficient (ICE) comprises an indicator of human capital efficiency (HCE) and indicator of structural capital efficiency (SCE). HCE shows how much value added (VA, a difference between the total output and total input representing the new wealth created) is created by the human capital (HC, total labor costs representing the investment in knowledge workers). The calculation is: HCE=VA/HC. SCE measures the share of structural capital (here human capital and structural capital are inversely proportional, SC=VA-HC) in the creation of value added. The calculation is: SCE=SC/VA. The value of ICE is therefore given by summing up. The latter coefficient (CEE) acts as an indicator of asset value efficiency, and it represents the value (VA) created by one unit of physical and financial capital of a company (CE). The calculation formula looks as follows: CEE=VA/CE. We present the visualization of entire VAIC™ formula in Figure 3.

Our financial data is comprised of a time series (panel data). Therefore the question of deflation and its appropriateness comes to the place. Since both the dependent and independent variables are financial ratios, it is not necessary for them to be adjusted for inflation or deflation.
To control for the potential impact of other variables that may explain the observed relationship with firm performance, we have included two control variables in our analysis: firm leverage and firm size. Firm leverage was calculated as a ratio of total debt and book value of the company’s total assets. The natural logarithm of the book value of total assets was used as the measure of firm size.

3.3 Methods

In order to examine the relationship between intellectual capital and its components (as measured by the VAIC\textsuperscript{TM} model) and firm performance both before and after the recent economic crisis, we created two sets of regression models using forward stepwise regression analysis. This method allows for adding predictor variables into the model at each step in the regression until the best regression model is achieved (Munkova et al. 2012). The final model enables us to estimate the contribution that each of the predictive variables makes toward explaining the variability in ROA, the dependent variable. We examined the change in the relationship between the IC and ROA by creating two sets of models. The first, pre-crisis set comprised of 10 models (each for a specific industry section), depicts the strength and significance of the relationship between the VAIC\textsuperscript{TM}, control variables and ROA in 2008. Accordingly, the second, post-crisis set of 10 models describes the observed relationship using the same sample of SMEs in year 2011.

To analyze how the relationship between intellectual capital and firm performance has been changed by the economic crisis we compared the pre-crisis and post-crisis models in particular industries and looked for differences and common patterns among these differences. We have identified the industries that showed change in the examined relationship. Further, we have also looked at these industries and focused on the particular intellectual capital components - human capital efficiency, structural capital efficiency and capital employed efficiency. We have used the respective indicators (HCE, SCE and CEE) to estimate their contribution to the variability of ROA before and after crisis. We have computed two sets of models (for years 2008 and 2011) for each industry and analyzed the differences observed between pre-crisis and post-crisis patterns.

The assumptions we made in our study regarding statistical methods were also tested for appropriateness. A plot of standardized residuals and independent variables to test the linear relationship between dependent variable and independent variables and heteroscedasticity were also constructed. This test proved the appropriateness of our models. A normal plot of residuals was also constructed. To confirm the independence of residuals the Durbin-Watson test for independence and serial correlation were applied. In a majority of cases the serial correlation value was close to 0 and values of Durbin-Watson statistics were close to 2. This indicates that residuals were independent. Outliers in our data were eliminated by setting extreme values to 5\textsuperscript{th} percentile or 95\textsuperscript{th} percentile respectively. Therefore in our case the model input data contained no outliers. Finally, to test for multicolinearity we used correlation analysis. The results of above mentioned test methods confirmed the appropriateness of the statistical method used.

4. Results

The results of the first stage of our analysis, i.e. pre-crisis and post-crisis regression models for 10 industry sections analyzed are displayed in Table 2, Table 3 and Table 4 below. For each model the overall model parameters (adjusted coefficient of determination, F value and Durbin-Watson statistics) as well as different predictor variables, their significance and explanatory power are presented.

Table 2: Overview of regression - modeling gross ROA in 2008 and 2011, industry sections A to F
The results presented in Tables 2 to 4 clearly show that VAIC\textsuperscript{TM} is a significant predictor variable for ROA (the dependent variable). This is the case for both the pre-crisis and post-crisis models for all 10 industries. In each of the 20 presented models, VAIC\textsuperscript{TM} was the predictor variable with the highest explanatory power. This indicates that none of the control variables (leverage and firm size) had higher impact on ROA than intellectual capital measured by VAIC\textsuperscript{TM}. In most cases, the model parameters (Durbin-Watson statistics and F value) were acceptable. The adjusted coefficient of determination explained 19.1% of ROA variance for the pre-crisis models, and 26.2% of the post-crisis models. This is a significant increase. In a few cases, especially in the pre-crisis models, the percentage of explained variance was low (e.g. sections D, G or L). However, in most of these cases, the adjusted coefficients of determination did increase considerably in the post-crisis period.

Table 5 summarizes the pre-crisis and post-crisis models evidence on relationship between intellectual capital and firm performance. Changes in both the explanatory power of the VAIC\textsuperscript{TM} and its value as a predictor variable are presented.

<table>
<thead>
<tr>
<th>Dependent:</th>
<th>Section: A</th>
<th>Section: C</th>
<th>Section: D</th>
<th>Section: F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictors:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAIC (BETA)</td>
<td>0.656***</td>
<td>0.592***</td>
<td>0.499***</td>
<td>0.414***</td>
</tr>
<tr>
<td>Leverage (BETA)</td>
<td>-0.148**</td>
<td>-0.119*</td>
<td>-0.131**</td>
<td>-0.081*</td>
</tr>
<tr>
<td>Size (BETA)</td>
<td>-0.123</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F (ANOVA)</td>
<td>85,435</td>
<td>44,205</td>
<td>109,633</td>
<td>59,816</td>
</tr>
<tr>
<td>Adj. R-sq</td>
<td>0.412</td>
<td>0.350</td>
<td>0.278</td>
<td>0.173</td>
</tr>
<tr>
<td>Durbin-Watson st.</td>
<td>2,238</td>
<td>1,827</td>
<td>1,965</td>
<td>2,310</td>
</tr>
</tbody>
</table>

Table 3: Overview of regression - modeling gross ROA in 2008 and 2011, industry sections G to L

<table>
<thead>
<tr>
<th>Dependent:</th>
<th>Section: G</th>
<th>Section: H</th>
<th>Section: J</th>
<th>Section: L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictors:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAIC (BETA)</td>
<td>0.436***</td>
<td>0.123*</td>
<td>0.483***</td>
<td>0.375***</td>
</tr>
<tr>
<td>Leverage (BETA)</td>
<td>-0.131**</td>
<td>-0.328*</td>
<td>-0.317**</td>
<td>-0.216*</td>
</tr>
<tr>
<td>Size (BETA)</td>
<td>-0.108*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F (ANOVA)</td>
<td>54,270</td>
<td>8,016</td>
<td>30,743</td>
<td>16,576</td>
</tr>
<tr>
<td>Adj. R-sq</td>
<td>0.235</td>
<td>0.013</td>
<td>0.226</td>
<td>0.132</td>
</tr>
<tr>
<td>Durbin-Watson st.</td>
<td>1,917</td>
<td>2,032</td>
<td>1,82</td>
<td>1,956</td>
</tr>
</tbody>
</table>

Table 4: Overview of regression - modeling gross ROA in 2008 and 2011, industry sections M to N

<table>
<thead>
<tr>
<th>Dependent:</th>
<th>Section: M</th>
<th>Section: N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictors:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAIC (BETA)</td>
<td>0,544**</td>
<td>0,361**</td>
</tr>
<tr>
<td>Leverage (BETA)</td>
<td>-0,266*</td>
<td>-0,315*</td>
</tr>
<tr>
<td>Size (BETA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F (ANOVA)</td>
<td>37,784</td>
<td>13,521</td>
</tr>
<tr>
<td>Adj. R-sq</td>
<td>0,288</td>
<td>0,121</td>
</tr>
<tr>
<td>Durbin-Watson st.</td>
<td>1,914</td>
<td>1,564</td>
</tr>
</tbody>
</table>
Table 5: Summary of comparisons between 2008 and 2011 regression models

<table>
<thead>
<tr>
<th>Section (SK NACE)</th>
<th>Model Adjusted R-sq increased</th>
<th>VAIC (BETA) increased</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>C</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>D</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>F</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>G</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>H</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>J</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>L</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>M</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

The comparison between pre-crisis and post-crisis models indicates a relatively consistent pattern of change across almost all industries examined. In nine out of ten industrial sections (except of section N - Administrative and support service activities) the explanatory power of VAIC\textsuperscript{TM} predictor variable has increased. In addition, the adjusted coefficient of determination model increased in eight industries (except ions are sections F - Construction and N - Administrative and support service activities). With respect to both the direction of change and its absolute value, the adjusted coefficient of determination increase exceeded 50\% in five industries. Our results indicate that, overall, in eight of ten industries, the relationship between ROA and VAIC\textsuperscript{TM} has been strengthened from both analyzed perspectives. In these eight industrial sections, the median increase in the overall adjusted coefficient of determination was 66\%, whereas the explanatory power of VAIC\textsuperscript{TM} showed a median increase of 25\%. Thus, these results show that, in these industries, the impact of intellectual capital on firm performance has increased from the pre-crisis to the post-crisis periods.

The results of the second step of our analysis, i.e. pre-crisis and post-crisis regression models examining relationship between IC components (HCE, SCE, CEE) and ROA in those industry sections with increase in the impact of IC on firm performance, are presented in tables 6 and 7 below. For each model its overall parameters are presented (adjusted coefficient of determination, F value and Durbin-Watson statistics) together with the examined predictor variables' significance and explanatory power.

Table 6: Overview of regression - modelling gross ROA in 2008 and 2011, industry sections A, C, D, G

<table>
<thead>
<tr>
<th>Dependent:</th>
<th>Section: A</th>
<th>Section: C</th>
<th>Section: D</th>
<th>Section: G</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCE (BETA)</td>
<td>0.570***</td>
<td>0.158*</td>
<td>0.478***</td>
<td></td>
</tr>
<tr>
<td>SCE (BETA)</td>
<td>0.381***</td>
<td>0.534***</td>
<td>0.413***</td>
<td>0.432***</td>
</tr>
<tr>
<td>CEE (BETA)</td>
<td>0.438***</td>
<td>0.460***</td>
<td>0.299**</td>
<td>0.487***</td>
</tr>
<tr>
<td>Leverage (BETA)</td>
<td>-0.119*</td>
<td>-0.125**</td>
<td>-0.071*</td>
<td></td>
</tr>
<tr>
<td>Size (BETA)</td>
<td>0.100*</td>
<td>0.070*</td>
<td>0.232*</td>
<td>0.229*</td>
</tr>
<tr>
<td>F (ANOVA)</td>
<td>67,936**</td>
<td>99,972**</td>
<td>136,397**</td>
<td>155,351**</td>
</tr>
<tr>
<td>Adj. R-sq</td>
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<td>0.552</td>
<td>0.489</td>
<td>0.471</td>
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<tr>
<td>Durbin-Watson st.</td>
<td>2.022</td>
<td>2.164</td>
<td>2.111</td>
<td>1.771</td>
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Table 7: Overview of regression - modelling gross ROA in 2008 and 2011, industry sections H, J, L, M

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<td>ROA</td>
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<td>HCE (BETA)</td>
<td>0.514***</td>
<td>0.427***</td>
<td>0.844***</td>
<td>0.878***</td>
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<tr>
<td>SCE (BETA)</td>
<td>0.712***</td>
<td>0.783***</td>
<td>-0.646**</td>
<td>-0.662**</td>
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<tr>
<td>CEE (BETA)</td>
<td>0.299**</td>
<td>0.341**</td>
<td>0.286**</td>
<td>0.467***</td>
</tr>
<tr>
<td>Leverage (BETA)</td>
<td>-0.170*</td>
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<tr>
<td>Size (BETA)</td>
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<td>37,616</td>
<td>53,381</td>
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As can be seen from the results presented in tables 6 and 7, in the case of all industry sections investigated at least two out of three intellectual capital performance components were significant predictors of the dependent variable ROA. In none of the models the control variables employed (firm leverage and firm size) showed a higher impact on ROA than any of the intellectual capital components measured using the VAIC™ model-based indicators. While the intra-industry compositions of predictors have been rather stable over the time analyzed (comparing their significance as ROA predictors in pre-crisis and post-crisis models), the intra-industry changes in predictors’ explanatory power and inter-industry comparisons of predictors’ composition show no consistent pattern among the industrial sections investigated. This indicates the respective role of different intellectual capital components is rather industry specific.

The human capital efficiency (HCE) was a significant predictor of the dependent variable ROA in sections A (Agriculture), G (Wholesale and retail) and L (Real estate activities). In the first two sections its explanatory power has increased in the post-crisis period, while in section L (Real estate activities) there has been a slight decrease. The structural capital efficiency (SCE) was identified as a significant predictor in 6 out of 8 industries, with three of these showing a post-crisis increase in SCE explanatory power. Interestingly, in case of industrial section L (Real estate activities) the effect of SCE on ROA has been proved to be negative in both pre- and post-crisis models. Finally, the capital employed efficiency (CEE) was a significant predictor in all models but one (post-crisis model for industry L - Real estate activities). In most of these cases (except of two models), its explanatory power has increased in the post-crisis period compared to pre-crisis time. When compared to the pre-crisis period the Slovak SMEs in almost all industrial sections still exert considerable effort mainly to increase efficiency of financial and physical capital. On the other hand, it seems they underestimate the importance of key intellectual capital components (HCE and SCE) resulting in competitive advantages for improving firms’ financial performance.

From an industry perspective, industry section L (Real estate activities) appears to have the greatest diversion from the rest of the industries. It is the only industrial section where an IC component has been proved to have negative influence on firm performance measured by ROA.

5. Discussion and conclusion

The findings from the first stage of our analysis indicate a somewhat consistent pattern across almost all industry sections investigated. This shows that when compared to the pre-crisis (year 2008), the role of overall intellectual capital performance in predicting firm’s financial performance has increased in post-crisis period (i.e. year 2011). On the other hand, a closer observation of the internal structure of intellectual capital performance phenomenon in the second stage, when examining its particular components, clearly indicates that the above mentioned relation is industry specific in its internal structure. Therefore, different modes of interplay between IC components across different industries appear to lead to a similar relationship pattern between IC performance and firm overall performance, and its change after the recent economic crisis. Below we discuss our findings with respect to the recent economic recession, overall firm performance, and specific industry characteristics. In addition, we present the contrast from our findings with those of previous research and theory relative to IC, firm performance and their industry-specific nature.

At the intellectual capital level, across all industries, we observe an increasing role with respect to firm financial performance. Because contribution of the identified changes exclusively to the economic crisis would require a deeper inquiry, a more detailed investigation into these findings is required under significant changes in economic conditions. The arguments supporting this have appeal in the discussions on how the recent crisis changed the world of business in SMEs. One possible reason for the increased role of intellectual capital performance in predicting financial performance as a proxy for value creation may lie in the fact that financial constraints forced SMEs to look for internal sources to increase efficiency. It means that increased IC performance resulting from the interplay between human capital and structural capital efficiency together with the efficiency of capital employed (physical and financial assets) has become a stronger determinant of financial performance and value creation. The importance of utilizing intellectual capital appears to have increased, and it has become the source of competitive advantage in terms of value creation from a short term perspective. In simple words, good intellectual capital performers became good financial performers. The recent crisis may have forced SMEs, in terms of managerial practice and techniques, to deal with intellectual capital efficiency. Those SMEs that were successful in increasing their intellectual capital performance also became very good financial performers. Those who did not increase their intellectual capital performance experienced a decline in financial performance. Since the differences are clear while on the other hand considerable but still not dramatic in size, this can be considered a suggestion that needs further examination. Further research is
required to determine more precisely the impact of IC in the industries that don’t show the full fit with the suggested pattern, with particular focus on specifics of business in these industries. The industry sections such as N (Administrative and support service activities) can be generally considered as knowledge intensive. Therefore the intellectual capital performance has probably been important value creation driver already before the crisis. In section F (Construction), even though the model and predictor parameters were slightly lower, there was still a considerable proportion of variance in ROA explained by VAIC™ in the post-crisis period. It might indicate that this business’ recovery will last longer, and that year 2011 wasn’t still the post-crisis period for section F (Construction).

A break-down of the intellectual capital components reveals the considerable divergence of our findings. Whereas, in each industry a significant portion of variance was explained, differences existed among particular intellectual capital components. The differences were likely due to specific industry characteristics. Examining these differences for particular industries was beyond the scope of our study because of the restrictions of sample size and period of time covered. A more comprehensive study may be able to explain these differences. With full respect to this limitation, however, we propose set of arguments related to different industries that aim to illustrate possible reasons behind specific role of different intellectual capital components in particular industry. We propose these arguments to be challenged by further research.

Industrial sections A (Agriculture) and G (Wholesale and retail) showed the similar post-crisis pattern, where human capital and capital employed efficiency (with small effect of control variables) together explained significant portion of variance in ROA. Despite these industries may appear rather different at the first glance, there are several similarities. Most of all, both of them are characterized by rather low-paid labor and high requirements on operational efficiency, which may partially explain this pattern. Industrial section L (Real estate activities) showed quite contradictory pattern with high positive effect of HCE and at the same time high negative effect of SCE on firm financial performance. This pattern was same in pre- as well as post-crisis model. Looking at calculation of these components in VAIC™ model, this finding seems to be quite contradictory. In our opinion this fact may be determined by the effect of firm size in terms of annual turnover, i.e. firms with high volumes of turnover (e.g. real estate developers) may report higher profitability than firms with small scale of business (e.g. small real estate agencies). Our computation doesn’t control for the effect of firm size in terms of turnover (firm size as control variable is constructed from total assets instead). Industrial sections C (Manufacturing), D (Utilities), H (Transportation), J (Information and communication) and M (Professional, scientific and technical activities) showed similar pattern in post-crisis models. In their case, both SCE and CEE were identified as significant predictors with positive influence on firms’ ROA. In first two cases (sections C and D) the effect of CEE dominated in size, while in remaining three industries (sections H, J and M) effect of SCE as predictor of ROA was higher than effect of CEE. Looking for potential reason for non-significant role of HCE, two arguments may appear. First, one could argue that human capital costs and their efficiency are embedded also in SCE component. Second, the efficiency of human capital in these industries may have already reached the level where differences are not that considerably spread among and businesses that it could cause significant differences in financial performance. In our opinion, in this case value added (which has greater influence in SCE indicator than in HCE indicator) probably better reflects the logic how certain businesses over-perform others in terms of profitability.

Whatever may be the interaction that exists among the different components of intellectual capital performance (HCE, SCE, CEE) across different industries, our findings reveal that the relationship between overall IC performance and firm performance significantly explained the variance in ROA, across most industries, during the recent financial crisis.

As we already mentioned, one stream of interpretation of relationship between ROA (or other performance measures such as EVA) and Pulic’s VAIC™-based perspective on firm intellectual capital performance argues that these two indicators reflect different dimensions of firm performance and therefore should be perceived as co-existing indicators representing two views on performance, according to perspective employed to describe this contextual concept (Iazzolino and Laise 2013). This interpretation is against finding how intellectual capital or its components (in terms of VAIC™) imply financial performance, including performance expressed with ROA. Even though our approach violates the fundamentals of this perspective, our findings may contribute to its debate. If we consider profitability-based and intellectual capital-based expressions of performance as two different perspectives of the multidimensional concept of firm performance, our results suggest that these two dimensions have been subjects of mutual convergence, when comparing pre-crisis and post-crisis situation. Therefore, we are able to argue that financial and intellectual capital dimensions of performance have come closer to reflect the similar intra-firm performance drivers.
There is still a substantial amount of research that considers intellectual capital and its components measured by VAIC™ model as the potential predictor of overall firm performance. Researchers have investigated the relationship among VAIC™-based measures and overall performance measures, such as ROA, ROE etc. with inconsistent results (Javornik et al. 2012, Iazzolino and Laise 2013). This requires additional research to resolve it. The lack of unambiguous results does not advocate for rejecting this research stream, but rather reflects the real life complexity and specifics of different industries. Our findings from the two steps of the analysis contribute to this research stream and at the same time they perfectly support our argument on industry specific nature of relation between intellectual capital or its components and firm performance. In both of these steps we took into consideration industry specifics by analyzing different industries separately. Studying the overall intellectual capital performance measured by VAIC™, our findings indicate that it represents a significant determinant of overall value creation (in terms of its proxy - a financial performance measured by ROA). The explanatory power of this predictor was considerable for most of the 10 industrial sections we studied, and especially for the post-crisis period. These findings have supported the findings by Pilkova et al. (2013). Whereas, studying the three main intellectual capital components (according to VAIC™ model), according to our opinion findings highlighted the different nature of the analyzed industries. The significance and explanatory power (and in one case also its direction) varied across industries and over time despite the fact they showed similar pattern in overall intellectual capital performance impact on firm performance. This finding definitely advocates that while intellectual capital performance may be commonly important overall firm performance driver across industrial sections, industry specifics play significant role in the internal structure of the intellectual capital performance. In addition, our results indicate that the period of recent economic crisis had positive effect on role of intellectual capital in predicting firm performance. However, in certain industries it has also changed the mode of the interplay between different intellectual capital components that have impacted overall performance. This encourages further effort within this stream of research. So far, only a minor attention has been paid to investigation how the role of intellectual capital or its components in determining firm performance has been changed during the recent economic crisis (e.g. Javornik et al. 2012).

As far as implications of our results are concerned, to confirm increasing role of intellectual capital across industries, with industry-specific intrinsic nature of this relationship, we suggest that examination of relationship between performance of intellectual capital or its components and firm financial performance before and after the recent economic crisis should be repeated in other contexts. As a part of this research stream, we suggest to pay attention to investigation how mean values of intellectual capital performance measurement constructs (VAIC™ and its components HCE, SCE and CEE) in different industries have changed during the recent economic crisis. Regarding the implications for SME management practice, we recommend SMEs managers or owner-managers to focus more on increasing their company intellectual capital performance, with specific focus on intellectual capital component that is a key driver of value creation in their industry. The relationship between intellectual capital, its components and firm financial performance leading to value creation appears to have gained on importance after the recent economic crisis. Therefore, we argue that intellectual capital has become more and more important driver of SME value creation.

Acknowledgements

This study was realized as a part of the research project Vega 1/0920/11 “Intellectual Capital Management as Part of Strategic Management of Company Value”.

Authors would like to thank to CRIF - Slovak Credit Bureau for providing access to Universal Register Plus (now branded as Cribis Universal Register) data used in our study.

References


### Appendix 1

**Statistics summaries for VAIC™, 2011**

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