Univerza v Mariboru
Ekonomsko-poslovna fakulteta

Letnik: 62 | Številka: 2 | 2016
Volume: | Number:

NG
OE

NAŠE GOSPODARSTVO
Revija za aktualna ekonomska in poslovna vprašanja

OUR ECONOMY
Journal of Contemporary Issues in Economics and Business

NAŠE GOSPODARSTVO

Revija za aktualna ekonomska in poslovna vprašanja

Letnik 62, št. 2, 2016

Izdajatelj:
Ekonomsko-poslovna fakulteta Maribor (EPF)

Glavna in odgovorna urednica:
Vesna Čančer

Pomočnica glavne in odgovorne urednice:
Romana Korez Vide

Naslov uredništva:
Maribor, Razlagova 14, Slovenija,
telefon: +386 2 22 90 112

Elektronska pošta:
nase.gospodarstvo@um.si

Spletna stran:
http://www.ng-epf.si

Revija je indeksirana v ABI/INFORM Global, EconLit in ProQuest ter vključena v EBSCO in Ulrich's Periodicals bazo.

OUR ECONOMY

Journal of Contemporary Issues in Economics and Business

Vol. 62, No. 2, 2016

Published by:
Faculty of Economics and Business, Maribor (FEB)

Editor-in-Chief:
Vesna Čančer

Co-editor:
Romana Korez Vide

Editorial and administrative office address:
Maribor, Razlagova 14, Slovenia,
phone: +386 2 22 90 112

E-mail:
our.economy@um.si

WWW homepage:
http://www.ng-epf.si

The review is indexed in ABI/INFORM Global, EconLit and ProQuest. It is included in EBSCO and Ulrich's Periodicals Directories.

Lektorji: mag. Darja Gabrovšek Homšak in ServiceScape Incorporated

Dtp: NEBIA, d. o. o.

Letno izidejo 4 (štiri) številke. Letna naročnina: za pravne osebe 46 €, za fizične osebe 29 € in za tujino 57,5 €.

ISSN 0547-3101

Revijo sofinancira Javna agencija za raziskovalno dejavnost Republike Slovenije.

Vsebina / Contents

ARTICLES

Does Grade Level Matter for the Assessment of Business Process Management Maturity?

Renata Gabryelczyk
University of Warsaw, Faculty of Economic Sciences, Poland
r.gabryelczyk@wne.uw.edu.pl

ORIGINAL SCIENTIFIC PAPER

RECEIVED: NOVEMBER 2015

REVISED: FEBRUARY 2016

ACCEPTED: MARCH 2016

DOI: 10.1515/ngoe-2016-0007

UDK: 005.5

JEL: M10, L20

Citation: Gabryelczyk, R. (2016). Does Grade Level Matter for the Assessment of Business Process Management Maturity?. Naše gospodarstvo/Our Economy, 62(2), 3–11. DOI: 10.1515/ngoe-2016-0007

Abstract

The purpose of this paper is to create and test the practical application of a business process management maturity assessment conducted at two different grade levels (management and professional level) in an organization. The conceptual framework for this research includes creating a business process maturity indicator (BPMI) for six process areas: strategy, documentation, optimization, implementation, execution, and controlling. The comparative analysis of the business process management maturity is performed using the BPMI on two cases: inside a single organization and the sector internally.

Keywords: business process management, maturity of business process management, maturity models, grade levels in the maturity assessment

1 Introduction

Maturity models are used for measuring the performance and maturity of individual functional areas or processes, as well as that of the whole organization (Rosemann & de Bruin, 2005; Hammer, 2007; Lockamy & McCormack, 2004; McCormack & Johnson, 2001; OMG, 2008; Rosemann, de Bruin, & Power, 2006; Zwicker, Fettke, & Loos, 2010). Business process maturity is the ability of an organization to control its processes efficiently—that is, to define, implement, and measure its processes as well as make continual improvement decisions based on performance measurements. The process of achieving maturity is associated with developing some features characteristic of the given maturity level (Rosemann & de Bruin, 2005; Hammer, 2007; Lockamy & McCormack, 2004; McCormack & Johnson, 2001; OMG, 2008; Rosemann et al., 2006; Zwicker et al., 2010) and improving the process management areas according to the business process lifecycle (Jost & Scheer, 2002), process management lifecycle (BOC, 2007), or business process management lifecycle (Macedo de Morais, Kazan, Inês Dallavalle de Pádua, & Lucirton Costa, 2014). Studies of business process management maturity in Polish literature encompass testing the degree of business process maturity of the selected companies (Dobrzyński, Dziekoński, & Jurczuk, 2012) or the diagnosis of process maturity in terms of project objectives (Jurczuk & Gabryelczyk, 2015). Literature studies have helped uncover a gap in the study of perception of maturity for different grade levels. Thus, the purpose of this paper is to create and test the practical application of the business process management maturity assessment conducted on two different grade levels in the organization: the management level and professional level. The research will be based on two case studies: (1) a large company representing the fuel sector and (2) a sample

NG
OE

NAŠE GOSPODARSTVO
OUR ECONOMY

Vol. 62 No. 2 2016

pp. 3 – 11

from the commercial banking sector. The survey covered six process areas distinguished in the process management life cycle (PMLC) model (i.e., strategy, documentation, optimization, implementation, execution, controlling) and was conducted on a group from the organization's employees representing the two different grade levels (i.e., management and professional). The research questions were formulated as follows:

RQ1: Is the employees' perception of the organization's process areas' maturity the same for both grade levels?

RQ2: Which of the process areas are most relevant in shaping the organization's business process management maturity in the opinion of employees representing different grade levels?

To express the perception of the analyzed areas' maturity in quantitative terms, a business process maturity indicator (BPMI) was designed. It enabled a *t*-test to be performed in order to answer RQ1 and to investigate the correlation between the general maturity of the organization and the maturity components according to the PMLC stages, thereby answering RQ2.

2 Literature Review

2.1 Maturity models in business process management (BPM)

While discussing processes, the notion of "maturity" is most typically defined as the capability of an organization and its processes to systematically deliver improved outcomes of its activity (Rosemann & de Bruin, 2005). The term *organizational maturity* was first defined by Philip Crosby (1979) as the organization's ability to professionally employ quality management methods and techniques. The Quality Management Maturity Grid (Crosby, 1979) is regarded as a precursor to the Capability Maturity Model Integration (CMMI) developed by Software Engineering Institute (Gibson, Goldenson, & Kost, 2006; SEI, 2006). The CMMI is currently one of the most popular organizational maturity assessment tools (Gibson et al., 2006; Humphrey, 1988). The key maturity models originating from this trend are the Business Process Management Maturity Model (Rosemann & de Bruin, 2005; Rosemann et al., 2006), Business Process Orientation Maturity Model (McCormack & Johnson, 2001), Process and Enterprise Maturity Model (Hammer, 2007), Business Process Maturity Model (OMG, 2008), and Process Maturity Ladder (Harmon, 2007). Röglinger, Poppelbuss, and Becker (2012) provided an overview of organizational and process maturity models.

The maturity of an organization is usually measured on a four- or five-degree scale and should address the factors determining the process repeatability, as well as the resources and capabilities that ensure such repeatability. According to Kohlbacher and Reijers (2013), the relevant aspects of maturity evaluation include process documentation, management commitment, process ownership, process measurement and monitoring, and continuous process improvement methods and techniques as well as organizational culture and structure. A higher level of maturity leads to a better control of the results, more accurate forecasting of goals, costs, and performance, greater effectiveness in reaching the defined goals, and the increased ability of an organization to plan and implement organizational changes (Lockamy & McCormack, 2004).

2.2 Process management lifecycle

As a rule, the business process management (BPM) lifecycle determines the management practice activities for several consecutive stages. According to Houy, Fettke, and Loos (2010), the number of steps and the terminology used when defining BPM lifecycles differ to a certain extent, but the concepts cover the same activities. Kohlbacher (2010) stressed that the BPM lifecycle not only encompasses business process analysis, design, development, and execution, but also addresses the interactions between these areas and an organization's control, optimization, and strategy. The process management lifecycle phases are most typically defined based on Deming's plan–do–check–act or plan–do–study–act cycle (Kalinowski, 2011) or using the approaches adapted by authors of process management architectures (BOC, 2007; Jost & Scheer, 2002). An overview of the literature on BPM lifecycle models, with common characteristics and peculiarities, is presented by Macedo de Morais et al. (2014), who described the seven BPM lifecycle models proposed by Van der Aalst (2004), Zur Muehlen and Ho (2006), Netjes, Reijers, and Van der Aalst (2006), Weske (2007), Hallerbach, Bauer, and Reichert (2008), Verma (2009), and Houy et al. (2010).

The PMLC (BOC, 2007) covers six basic dimensions of process management: process strategy, process documentation, process optimization, process implementation, process execution, and process controlling. These dimensions reflect the situation in the analyzed area or throughout the organization in terms of process maturity, while indicating opportunities for improvement and development toward the process management approach. PMLC is a model of procedures for process performance and

management. Conceptually, it contains all BPM lifecycle stages referred to in the literature.

3 Methodology

3.1 Research approach

The organization's process maturity evaluation exercise included a questionnaire-based survey conducted for two cases. Case 1 was a major company from the fuel sector and was listed on the Warsaw Stock Exchange. This case was selected based on the information in the management reports about the implementation of BPM in the organization and based on the practical criteria of data availability. Case 2 was a study of the banking sector, which—according to Polish authors—is the most advanced sector in process approach implementation (Nosowski, 2010). Employees in both organizations from case studies are divided into five main levels: paraprofessionals, professionals, middle and top management, executives, and board members. The professional and management groups in both case studies considered in the research were the most numerous and the most involved in the projects of business process management implementation. The study does not include paraprofessionals, executives, or board members due to the very small sample size and the inability to collect data. The professional grade level includes positions that require experience, skills, and theoretical and conceptual knowledge of the specialization in specific areas. The management grade level refers to employees focused on managing people and implementing policies and strategies to meet the organization's objectives. Employees of the organizations representing these grade levels were asked questions concerning the six process areas of the PMLC model. The questionnaire survey covered six basic dimensions distinguished in the PMLC model (BOC, 2007): process strategy, process documentation, process optimization, process implementation, process execution, and process controlling. In each area nine questions were asked.

For the process strategy, the questions of the survey revealed whether the organization's strategy is reflected in the process flows, especially those of strategic importance. The questions covered the following issues: the process objectives' definition in strategy; the interrelations between strategy and activities; the regularity of analyzing how processes contribute to the achievement of objectives; the process strategy communication; and the organization's process competence centers. The purpose of the questions concerning documentation was to find out if the processes of the organization have been identified, structured, and documented in the form of models. Understanding the organization's processes is a starting point for the development of a system for measuring and improving process performance and effectiveness. The questions explored such issues as the use of IT standards, methods and tools for process modeling, the contents of model description, the process of updating the model, and the assignment of the organization's resources to processes. In regard to process optimization, we asked if any organizational and technical barriers prevented the prompt and efficient execution of processes and if any potential process improvement opportunities were identified by the employees. Furthermore, the questionnaire covered process standardization, optimization of internal and inter-organizational processes, and process risk identification and reduction. The process implementation dimension specifies the extent to which the process approach has been implemented within the organization, resulting in the following issues being covered: employees' understanding of the new, process-based style of work; process-related training activities; the use of the organization's resources in the newly designed processes; and the limits of the organization's business units as potential barriers to the operation of processes. The process execution perspective shows the organization's maturity in aspects of the process control from the organizational and technical point of view. Here, the respondents assessed the quality of processes, the security and accessibility of the IT architecture and services, and the process risk management. Controlling enables managers to evaluate the achievement of process objectives on a regular basis by means of process monitoring and analysis tools. The questionnaire explored the issue of monitoring process performance indicators, internal process benchmarking, process planning, control and monitoring regardless of the business units' limitations, and the adjustment of the process objectives and indicators to the organization's fluctuating overall goals.

The responses were expressed on a 5-point Likert scale, ranging from 1 to 5. When answering the questions, the respondents expressed their subjective perception of the business model maturity, referring to each of the elements. The overall perception—the business process maturity indicator (BPMI)—was computed for the company as an arithmetic mean of the results obtained in the six process areas in the PMLC:

$$\text{BPMI} = \frac{1}{6}\sum_{i=1}^{6}\left(\frac{1}{k_i}\sum_{j=1}^{k_i} x_{ij}\right)$$

where x_{ij} is the value of the answer to the j^{th} question in the i^{th} process area, $i = 1, 2, \ldots, 6$, $j = 1, 2, \ldots, k_i$, and k_i is the number of questions for the i^{th} process area.

To answer RQ1, a *t*-test was conducted using BPMI, which allowed the evaluation of two groups, the management and professional grade levels, which are significantly different

from each other. Furthermore, BPMI enabled the examination of the correlations between the overall maturity of the organization and the maturity components as per PMLC.

3.2 Conceptual framework

The study was based on the conceptual framework shown in Figure 1, adapted from Roztocki and Weistroffer (2015). The literature overview focused mainly on the business process management maturity and PMLC studies. However, these studies have not covered the perception of maturity for different grade levels; therefore, the paper proposed research questions about differences of opinions expressed by the management and professional grade levels. The research approach proposes a formula for computing the BPMI for the six areas distinguished in PMLC. A comparative analysis for different grade levels was conducted. Case 1 covered an analysis inside an organization while Case 2 included an analysis inside the banking sector.

4 Results of the Study

4.1 Case 1

The business process maturity survey was conducted on a sample of 47 respondents in a large company representing the fuel sector in Poland. According to the job scale, the sample included 30 respondents classified as the management grade level (middle and top level management) and 17 respondents at the professional grade level. Descriptive statistics of the BPMI for both groups are summarized in Table 1.

In order to answer the RQ1, a *t*-test was conducted to investigate the significance of differences in the BPMI mean values in general and, with respect to the six process areas of PMLC, in both grade levels (Table 1). The BPMI results show strong, significant differences in means between the management and professional groups. Received significance is less than 0.05 for BPMI in general and for five of six process areas, which means that there are statistically significant differences between the employees' perception of the organization's

Figure 1. Conceptual framework

Table 1. Comparison of BPMI Elements between Management and Professional Grade Levels: Analysis within an organization

	Management grade level		Professional grade level		*t*-test
	Mean	Std. Dev.	Mean	Std. Dev.	*p* value
BPMI	3.788	0.715	3.219	0.632	0.0070**
BPMI Strategy	4.137	0.738	3.733	0.697	0.0681*
BPMI Documentation	3.852	0.746	3.320	0.919	0.0478**
BPMI Optimization	3.784	0.846	3.204	0.866	0.0310**
BPMI Implementation	3.922	0.543	3.200	0.816	0.0022**
BPMI Execution	3.529	0.945	2.986	0.839	0.0473**
BPMI Controlling	3.500	1.163	2.871	0.830	0.0365**

Notes: Mean, standard deviation, and results of two-tailed *t*-test assuming equal variances. *$p < 0.1$; ** $p < 0.05$
Anderson-Darling statistic was used to determine that data meet the assumption of normality or are very similar to a normal distribution.

process areas maturity. The outcomes can be used as inputs to RQ1 regarding the organization's process maturity perception by respondents representing different grade levels, showing higher BPMI scoring in the middle and top level management category. Strategy is the only area where differences in both groups' perception are not as apparent, which may indicate that process strategy is well communicated and perceived consistently by each of the two groups. An in-depth analysis of differences between the management and professional grade level groups' perceptions of both general and area-specific process maturity was conducted using a correlation matrix (Table 2). All process areas showed a positive correlation compatible with the PMLC model logic. According to the management grade level, execution, optimization, and controlling were the aspects most strongly correlated with the general maturity of the organization. These dimensions were strongly correlated throughout the process management cycle. Optimization uses data from controlling as inputs for the verification of process performance and effectiveness through the prism of objectives. Execution forms the organization's maturity in terms of process control from the organizational and technical point of view and collects data for controlling. As the process areas referred to thus far fall within the managers' scope of competence, they were perceived by this group as having the strongest impact on the BPMI level. Process documentation was of the least interest to the company's management.

According to the professionals, the BPMI level was most significantly affected by documentation and implementation. Professionals were interested in such areas as business process identification and modeling with the use of modeling notation as well as the practical implementation of these processes in the environment of those who perform them. Professionals perceived the area of controlling as showing the lowest degree of correlation with the overall maturity of a company.

Table 2. Pearson's Correlation Coefficients of BPMI Elements for Management and Professional Grade Levels: Analysis within an organization

	Management grade level	Professional grade level
	BPMI	BPMI
BPMI	1.0000	1.0000
BPMI Strategy	0.8660**	0.7181**
BPMI Documentation	0.6477**	0.8459**
BPMI Optimization	0.9314**	0.8110**
BPMI Implementation	0.8671**	0.8369**
BPMI Execution	0.9334**	0.8128**
BPMI Controlling	0.8873**	0.5415**

Notes: Significance level ** $p < 0.05$

4.2. Case 2

For the research of the business process maturity of the six process areas, the survey was conducted on a sample of 53 employees from commercial banks in Poland. This sample included 35 respondents classified as the management grade level (middle and top level management) and 18 respondents classified as the professional grade level. BPMI descriptive statistics for both groups are summarized in Table 3. The results of the general BPMI and for each of process area indicate differences in means between the management and professional groups. BPMI scoring is higher in the middle and top level management category.

As in Case 1, the strategy area shows less significant differences between the groups ($p < 0.1$). The fact that, in the perception of controlling, no significant differences exist between the management and professional groups seems to be peculiar to the banking sector. The financial sector is

Table 3. Comparison of BPMI Elements between Management and Professional Grade Levels: Analysis within the sector

	Management grade level		Professional grade level		*t*-test
	Mean	Std. Dev.	Mean	Std. Dev.	*p* value
BPMI	3.162	0.696	2.729	0.532	0.0148**
BPMI Strategy	3.296	0.862	2.902	0.651	0.0673*
BPMI Documentation	3.302	0.749	2.686	0.639	0.0028**
BPMI Optimization	3.056	0.596	2.641	0.565	0.0163**
BPMI Implementation	3.179	0.687	2.746	0.522	0.0134**
BPMI Execution	3.160	0.770	2.711	0.597	0.0228**
BPMI Controlling	2.975	0.866	2.686	0.640	0.1734

Notes: Mean, standard deviation, and results of two-tailed *t*-test assuming equal variances. *$p < 0.1$; **$p < 0.05$

Anderson-Darling statistic was used to determine that data meets the assumption of normality or are very similar to a normal distribution.

governed by the policies and rules imposed by international regulatory bodies (e.g., Sarbanes Oxley Act, Basel II) and national regulatory bodies (Polish Financial Regulatory Authority) and is therefore required to adopt formal internal regulations in various areas, including control effectiveness reporting. The process approach determines formal risk management and control regulations (Nosowski, 2010). Hence, the special nature of the banking sector may explain the fact that there are no statistically significant differences in the perception of controlling between the management and professional grade levels, as well as the strong, significant correlation between BPMI general and controlling for both groups. (Table 4).

The continual process of controlling provides information about the organization's strategy translated into activities and enables the organization to make the most of the complete business process management loop. Furthermore, the management grade level showed a strong correlation between BPMI for the execution and strategy process areas and lowest for process documentation. Also as in Case 1, the correlation between documentation and maturity was perceived to be stronger by professionals than by managers.

5 Discussion

The maturity model and the process management lifecycle models should be regarded as a formalized set of elements (features) describing fully efficient processes or requirements that, when satisfied, enable the achievement of maturity (Rosemann & de Bruin, 2005; Hammer, 2007; Lockamy & McCormack, 2004). It is a form of a roadmap and a standardized method of communication between participants of a project designed to build a process-oriented organization. Therefore, it is important for both managers and process operators to fully understand their roles and be aware of the organization's maturity when implementing process management (Hammer, 2007; Lockamy & McCormack, 2004). A thorough self-assessment performed using maturity models and lifecycle models enables the organization to identify sources of deficiencies as well as areas for improvement within the continual improvement cycle. Maturity models can be particularly useful for organizations initiating formalized process management, as they facilitate the identification of the current situation, thereby providing the motivation to act, while suggesting best practices that could be employed. The process management lifecycle method was chosen because the highlighted process areas in this model can be used for a comparative analysis of their perceptions by different grade levels.

Table 4. Pearson's Correlation Coefficients of BPMI Elements for Management and Professional Grade Levels: Analysis within the sector

	Management grade level	Professional grade level
	BPMI	BPMI
BPMI	1.0000	1.0000
BPMI Strategy	0.9525**	0.8826**
BPMI Documentation	0.8191**	0.8783**
BPMI Optimization	0.9021**	0.9011**
BPMI Implementation	0.9141**	0.8679**
BPMI Execution	0.9810**	0.8378**
BPMI Controlling	0.9479**	0.9238**

Notes: Significance level $**p < 0.05$

The findings show that the respondents from the management group perceived their organization more optimistically than the professionals, which can be explained by the impression management theory (Wayne & Linden, 1995), according to which managers may be trying to regulate and control information in their interaction with the personnel and the business environment in order to give them the best impression of the company, its objectives, and its management methods (RQ1). The highest scores given to process strategy confirmed the deep commitment of management at the strategy building stage and good strategy communication within the organization. The finding was supported by professionals' high perception of maturity and the fact that both grade levels differed least most notably in their perception of maturity. The *t*-test results confirmed that differences in the assessment of business process management maturity are significant between the professional and management groups (RQ1). The correlation matrix identified the process areas most relevant to shape the organization's business process management maturity in the opinion of employees (RQ2). The correlations show how individual process areas are interdependent with the organization's general BPM maturity in the perception of employees representing the management and professional grade levels. Each of the respondent groups in Case 1 favored its respective areas of involvement: optimization, execution, and controlling for the management grade level and documentation and implementation for the professional grade level. Management often participates in the business process management implementation projects in their preparation phases until the moment of the project launch (documentation, implementation), while showing no commitment later on. Professionals, who are actually involved in process tasks, have better insights into the operation aspects, which translate into the lower final maturity ranks. Out of all process areas, the controlling and execution dimensions were given lowest scores by both respondent categories,

but emphatically higher by the management group, which should come as no surprise as managers are specifically responsible for the regular evaluation of the achievement of process goals by means of process monitoring and analysis tools. In Case 2, the influence of the banking sector's nature on the process maturity perception was observed. The effect of external regulations on internal regulations is reflected in processes and seems particularly significant here. They are highly important to all employees of the banking area at various grade levels. The findings support that process maturity perception depends on the scope of responsibility of the personnel evaluating the organization as well as the communication of the business process management implementation results. Yet in both the internal analysis of a single organization (Case 1) and the analysis within a sector (Case 2), the maturity of all processes as well as the overall business process management maturity is given unequivocally higher marks by managers.

6 Conclusions and Limitations of the Study

The fact that the process approach has been implemented is not a sufficient condition for improving an organization's performance. The process maturity measurement provides a basis for making processes and process areas more efficient as well as for ensuring continual improvement. Maturity models and process management lifecycle management models may be used to (1) describe the current status of the organization; (2) ensure improvement, as the models include recommendations for the improvements required; and (3) provide comparative analyses, as they may be referred to as benchmarks for comparisons with historical data, illustrating process performance and organizational maturity, as well as for comparing maturity perception declared by employees representing different grade levels. It seems that the less diversified the maturity perception declared by personnel representing various levels in the organization, the more trustworthy the summarized evaluation of the analyzed organization's maturity. The process maturity measurement in a breakdown of six areas consistent with the PMLC reflects the process maturity of an area or of an organization as a whole while simultaneously showing opportunities for improvements and development of the organization toward process management. Limitations of this study are the small sample and cases from different fields. The presented research is only an initial study of the measuring instrument. The revision of this instrument should be done based on larger samples and through a comparative analysis of a company case in a particular branch against the same survey across the branch.

References

1. BOC. (2007). *Process management life cycle (PMLC), BOC information system GmbH*. Retrieved from http://www.bocpmmc.com/docs/BOC_PMLC_folder_web_de.pdf
2. Crosby, P. B. (1979). *Quality is free: The art of making quality certain*. New York: McGraw-Hill.
3. Dobrzyński, M., Dziekoński, K., & Jurczuk, A. (2012). A diagnosis of process maturity in a business cluster initiative. *Contemporary Management Quarterly, 3*, 41–50.
4. Gibson, D. L., Goldenson, D. R., & Kost, K. (2006). *Performance results of CMMI-based process improvement*. Technical Report CMU/SEI-2006-004 (pp. 5–6).
5. Hallerbach, A., Bauer, T., & Reichert, M. (2008). *Managing process variants in the process life cycle*. Paper presented at the Proceedings of the Tenth International Conference on Enterprise Information Systems (ICEIS), Barcelona (pp. 154–161).
6. Hammer, M. (2007). The process audit. *Harvard Business Review*, *85*(4), 111–123.
7. Harmon, P. (2007). *Business process change: A guide for business managers and BPM and Six Sigma professionals*. Burlington: Morgan Kaufmann. http://dx.doi.org/10.1016/b978-0-12-374152-3.50072-0
8. Houy, C., Fettke, P., & Loos, P. (2010). Empirical research in business process management—analysis of an emerging field of research. *Business Process Management Journal*, *16*(4), 619–661. http://dx.doi.org/10.1108/14637151011065946
9. Humphrey, W. S. (1988). Characterizing the software process: a maturity framework. *Software*, *5*(2), 73–79. http://dx.doi.org/10.1109/52.2014
10. Jost, W., & Scheer, A. W. (2002). Business process management: a core task for any company organization. In A. W. Scheer, M. Kirchmer & W. Jost (Eds.), *Business process excellence: Aris in practice* (pp. 33–43). Berlin, Heidelberg: Springer. http://dx.doi.org/10.1007/978-3-540-24705-0_3
11. Jurczuk, A., & Gabryelczyk, R. (2015). Cele doskonalenia przedsiębiorstw w kontekście dojrzałości procesowej. *Zeszyty Naukowe Politechniki Śląskiej, Organizacja i Zarządzanie*, *83*(1941), 245–254.
12. Kalinowski, T. B. (2011). Modele oceny dojrzałości procesów. *Acta Universitatis Lodziensis, Folia Oeconomica*, *258*, 173–187.
13. Kohlbacher, M. (2010). The effects of process orientation: a literature review. *Business Process Management Journal*, *16*(1), 135–152. http://dx.doi.org/10.1108/14637151011017985

14. Kohlbacher, M., & Reijers, H. A. (2013). The effects of process-oriented organizational design on firm performance. *Business Process Management Journal*, *19*(2), 245–262. http://dx.doi.org/10.1108/14637151311308303
15. Lockamy, A., & McCormack, K. (2004). Development of a chain management process maturity model. *Supply Chain Management: An International Journal*, *9*(4), 272–278. http://dx.doi.org/10.1108/13598540410550019
16. Macedo de Morais, R., Kazan, S., Inês Dallavalle de Pádua, S., & Lucirton Costa, A. (2014). An analysis of BPM lifecycles: from a literature review to a framework proposal. *Business Process Management Journal*, *20*(3), 412–432. http://dx.doi.org/10.1108/BPMJ-03-2013-0035
17. McCormack, K. P., & Johnson, W. C. (2001). *Business process orientation. Gaining the e-business competitive advantage*. New York: St. Lucie Press. http://dx.doi.org/10.1201/9781420025569
18. Netjes, M., Reijers, H., & Van der Aalst, W. P. (2006). *Supporting the BPM life-cycle with FileNet*. Paper presented at the Proceedings of the Workshop on Exploring Modeling Methods for Systems Analysis and Design (EMMSAD), Namur University, Namur (pp. 497–508).
19. Nosowski, A. (2010). *Zarządzanie procesami w instytucjach finansowych*. Warszawa: CH Beck.
20. OMG. (2008). *Business process maturity model (BPMM), version 1.0, object management group* (Document Number: formal/2008-06-01). Retrieved from http://www.omg.org
21. Rosemann, M., & de Bruin, T. (2005). *Towards a Business Process Management Maturity Model*. Proceedings *of the thirteenth European Conference on Information Systems* (ECIS), Regensburg, Paper 37.
22. Retrieved from http://aisel.aisnet.org/ecis2005/37
23. Rosemann, M., de Bruin, T., & Power, B. (2006). BPM maturity. In J. Jeston & J. Nelis (Eds.), *Business process management: Practical guidelines to successful implementations* (pp. 313–329). Burlington: Elsevier.
24. Roztocki, N., & Weistroffer, H. R. (2015). Information and communication technology in transition economies: An assessment of research trends. *Information Technology for Development*, *21*(3), 330–364. http://dx.doi.org/10.1080/02681102.2014.891498
25. Röglinger, M., Poppelbuss, J., & Becker, J. (2012). Maturity models in business process management. *Business Process Management Journal*, *18*(2), 328–346. http://dx.doi.org/10.1108/14637151211225225
26. SEI. (2006). *Appraisal requirements for CMMI, version 1.2 (ARC, V1.2)*. Technical Report CMU/SEI-2006-TR-011 ESC-TR-2006-011. Carnegie Mellon University, Software Engineering Institute.
27. Van der Aalst, W. M. (2004). Business process management: a personal view. *Business Process Management Journal*, *10*(2), 248–253. http://dx.doi.org/10.1108/bpmj.2004.15710baa.001
28. Verma, N. (2009). *Business process management: Profiting from process*. New Delhi: Global India.
29. Wayne, S. J., & Linden, R. C. (1995). Effects of impression management on performance ratings: A longitudinal study. *Academy of Management Journal*, *38*(1), 232–260. http://dx.doi.org/10.2307/256734
30. Weske, M. (2007). *Business process management: Concepts, languages, architectures*. Berlin, Heidelberg: Springer.
31. Zur Muehlen, M. & Ho, D. T. Y. (2006). Risk management in the BPM life cycle. In *Business process management workshops* (pp. 454–466). Berlin, Heidelberg: Springer. http://dx.doi.org/10.1007/11678564_42
32. Zwicker, J., Fettke, P., & Loos, P. (2010). Business process maturity in public administrations. In J. vom Brocke & M. Rosemann (Eds.), *Handbook on business process management 2* (pp. 369–396). Berlin, Heidelberg: Springer. http://dx.doi.org/10.1007/978-3-642-01982-1_18

Author

Renata Gabryelczyk, Ph.D., is an assistant professor at the Department of Information Systems and Economic Analysis, Faculty of Economic Sciences, and partner of Digital Economy Lab at the University of Warsaw. Her academic experience also includes studying at the Institute for Information Systems at Saarland University as well as research fellowships at scientific centers in Heidelberg, Constance, and Vienna. Her professional pursuits include business process management, performance management, business models, and entrepreneurship. She is also a member of the Polish Certificate of BPMN in Systems Research Institute of the Polish Academy of Science.

Ali je delovno mesto pomembno za presojo zrelosti menedžmenta poslovnih procesov?

Izvleček

Namen tega prispevka je narediti in testirati praktično aplikacijo za presojanje zrelosti menedžmenta poslovnih procesov na dveh različnih ravneh (na menedžerski in strokovni ravni) v organizaciji. Konceptualni okvir za to raziskavo vključuje izdelavo indikatorja zrelosti poslovnih procesov za šest procesnih področij, tj. strateško, dokumentacijsko, optimizacijsko, implementacijsko, izvedbeno in nadzorno. Za primerjalno analizo zrelosti menedžmenta poslovnih procesov smo uporabili indikator zrelosti poslovnih procesov, in sicer v okviru posamezne organizacije in sektorja.

Ključne besede: menedžment poslovnih procesov, zrelost menedžmenta poslovnih procesov, modeli zrelosti, delovno mesto v presojanju zrelosti

ORIGINAL SCIENTIFIC PAPER

RECEIVED: JANUARY 2016

REVISED: APRIL 2016

ACCEPTED: MAY 2016

DOI: 10.1515/ngoe-2016-0008

UDK: 659.2:004

JEL: 033

Citation: Perko, I., & Ototsky, P. (2016). Big Data for Business Ecosystem Players. *Naše gospodarstvo/Our Economy, 62*(2), 12–24. DOI: 10.1515/ngoe-2016-0008

NG
OE

**NAŠE GOSPODARSTVO
OUR ECONOMY**

Vol. 62 | No. 2 | 2016

pp. 12–24

Big Data for Business Ecosystem Players

Igor Perko
University of Maribor, Faculty of Economics and Business, Slovenia
igor.perko@um.si

Peter Ototsky
Russian Academy of Sciences, Keldysh Institute of Applied Mathematics, Russia
peter@ototsky.com

Abstract

In the provided research, some of the Big Data most prospective usage domains connect with distinguished player groups found in the business ecosystem. Literature analysis is used to identify the state of the art of Big Data related research in the major domains of its use—namely, individual marketing, health treatment, work opportunities, financial services, and security enforcement. System theory was used to identify business ecosystem major player types disrupted by Big Data: individuals, small and mid-sized enterprises, large organizations, information providers, and regulators. Relationships between the domains and players were explained through new Big Data opportunities and threats and by players' responsive strategies. System dynamics was used to visualize relationships in the provided model.

Keywords: Business ecosystems; Big Data; information providers; system dynamics

1 Introduction

Big Data (BD)-related technologies—namely, data extraction and blending, predictive analytics, and user experience—provide a disruptive force by redefining the communication patterns and the insight levels on all players in business ecosystems and surrounding social and natural systems. BD positively influences the reactivity and provides a higher level of transparency (McAfee & Brynjolfsson, 2012).

Players in business ecosystems (BE) face new opportunities and challenges to survive and thrive (Evans, 2014). The BD effect on BE is twofold: On one hand it provides new means to execute internal and external processes faster and cheaper; on the other hand, the higher ecosystem security level enables the option to lower the barriers that protected companies in the previously hostile environment. Consequently, the roles of existing players shift and new players emerge on the field, such as system integrators, providing BD-supported networking services.

System thinking provides the theoretical basis for understanding complex systems on multiple levels (Lane, 2000). It also provides a rich toolset, such as system

dynamics, to help us understand the system members, their relationships, and the triggers that direct their behavior. BD technologies influence BE players through multiple domains, identifying opportunities and threats for the players. Players respond by using diverse strategies. In this paper, we provide an oversight of the influences BD will have on the BE players, using system thinking as a tool. We focus on a combination of the limited number of BD domains—namely, individual marketing, health treatment, work opportunities, financial services, and security enforcement—with a selected group of players: individuals, small and mid-sized enterprises (SMEs), large organizations, information providers, and regulators.

The paper is organized as follows. First, relevant backgrounds and the state of the art of BD, BE, and system thinking are elaborated. Next, BE players' objectives are elaborated and, according to the selected BD domains, opportunities and threats to players' responsive strategies are explained. Then the system dynamics overview is provided, visualizing the relationships between BD domains and BE players. The paper concludes with a discussion and future directions. The paper offers insights for BD architects regarding which services to design, business managers regarding what to expect from BD technologies, and researchers who plan to design BE to help them formulate a requisitely holistic set of requirements.

2 Background

2.1 Big Data

BD technologies of information processing (such as MapReduce) first appeared for searching and parsing Internet (Bryant, Katz, & Lazowska, 2008; Lämmel, 2008). The BD boom correlates with exponential growth of stored and sent information and will eventually lead to a metasystem transition of information technologies and shift in progress direction (Press, 2013). The digitalization of BE is part of that transition (Bryant et al., 2008; Cukier, 2014; Evans, 2014; McAfee & Brynjolfsson, 2012).

Historically, enterprise information systems (EIS), commonly known by its key subsystem enterprise resource planning (ERP) solutions, operate with internal data corresponding to a structure of the business. In fact, IT companies implement not only IT systems (ERP, etc.), but also enforce typical business models and structures. The standardization of business models logically follows the technical aspect: Data models and business logics are programmed in a database structure at a low level (Davenport, 1998; Wood, 2010). Subsequent the organization processes are limited by the EIS variety and can hardly cope with the internal complexity or the complexity of the BE (Waelchli, 1989).

One of the key BD technologies is MapReduce scalable distributed computing (Lämmel, 2008). The idea is that very simple processing is carried out in two stages: (1) map—one large computational task is divided to many similar small tasks and small tasks are then processed on distributed nodes; and (2) reduce—all results are combined into the one result. If the node is a human, not a computer, then the same MapReduce logic may be used for task distribution to performers (crowd sourcing). In this way, the "act" part can be also digitalized using the same BD methods as in the "sense" part.

Predictive analytics exploits the BD potentials not only to provide the whole picture, but also to predict future events (Waller & Fawcett, 2013). Combining BD and predictive analytics is an extremely powerful combination. It enables organizations to use collective memory in planning their actions, thereby provide management the sharable vision of the future and the capability to anticipate the unexpected.

2.2 Business ecosystems

Moore (1993, p. 2) defined business ecosystems as an economic community supported by a foundation of interacting organizations and individuals—the organisms of the business world. The economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organisms also include suppliers, lead producers, competitors, and other stakeholders. In a business ecosystem, companies coevolve capabilities around a new innovation: they work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations. Over time, they tend to align themselves with the directions set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community because it enables members to move toward shared visions to align their investments, and to find mutually supportive roles.

BE are not formalized; therefore, they provide a challenge for researchers to identify their structure, relationships, processes, and—above all—the reason for their existence. Gao, Zhang, Tian, Guan, and Li (2013) combined the evolutionary aspect of complex network theories to explain the e-BE development. Hellstrom, Tsvetkova, Gustafsson, and Wikstrom (2015) identified the cooperation mechanisms and their effect on closer collaboration, sustainability, and increased overall value creation. They pinpointed the

importance of identifying the factors driving the business models of the collaborating companies to facilitate changes. BE sizes range from closed supply chains, through local habitats, such as cities or national economies (Mavric, Tominc, & Bobek, 2014; McAfee & Brynjolfsson, 2012), to global markets (Korez-Vide, 2004; Umpleby & Lim, 2007).

BE consist of multiple players' roles. Basic entities in BE are individuals and organizations in the form of companies, information service providers, and regulators. Each player follows the goal of surviving and maximizing the bounty gained from the system. The strategies they use depend on the ecosystem resources, rules, and knowledge about how to exploit them.

Individuals follow their objectives or act as agents for the accomplishment of the organization's goals. Regardless of the role they play, the system is organized to utilize capacities and fulfill desires of every individual. The individual's personal engagement, and consequently the organizations' success, depends on the organizations' preparedness to represent their beliefs and support their needs and interests (Drucker, 2002; Waelchli, 1989). The behavior analysis and predictions found key individuals related to research issues (Ajzen, 1991; Nelson, 1970; Zhang, Chen, Mao, Hu, & Leung, 2014).

Companies ranging from micro enterprises to SMEs and large multinational organizations (Barney, 1991) use their knowledge and means to efficiently produce products and services from the available resources. They actively communicate with external players and employees (Frohlich & Westbrook, 2001; Tomlin, 2006). Dunkl, Jiménez, Zizek, Milfelner, and Kallus (2015), for instance, compared classical transformational leadership and health-oriented leadership, finding considerable differences in stress recovery processes.

The business software developers are providing significant support in developing and digitalizing BE. For example, SAP (Fauscette, 2014) develops high performance platforms for suppliers and procurement professionals to build collaborative relationships. IBM (Rometty, 2013) creates support for the development of smart organizations, while Salesforce connects companies and customers (Payne & Frow, 2005). Yet no matter how complex these tools are, they cannot reflect the complexity of the systems they should manage.

Software developers possess knowledge of business operations. Access to cloud-stored business data gives them an opportunity to evolve to a new meta-level. They can become business integrators, providing companies with services to instantly identify appropriate business partners and manage business partners' related processes effortlessly, significantly affecting the communication processes (Bregman, Peng, & Chin, 2015; Fauscette, 2014).

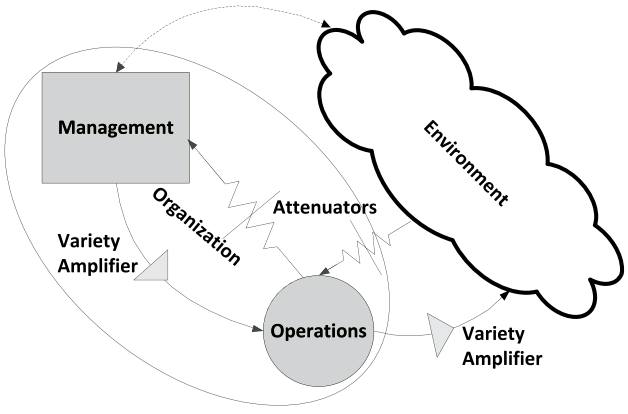
Regulators form and enforce rules under which the players execute their activities. Their role in the systemic sense is to support positive processes and omit the use of negative ones. Although players usually experience them through their repressing instruments (Beyer, Cohen, Lys, & Walther, 2010; King, Lenox, & Terlaak, 2005), they are responsible for the success of the whole ecosystem, its internal structure, and effects on other ecosystems. Cancer, Rebernik, and Knez-Riedl (2013) proposed methods for assessing the environmental reputation and the creation of new sets of values.

Attempts have been made to address the BE management issues requisitely holistically using diverse approaches. Razavi, Moschoyiannis, and Krause (2009) proposed a peer-to-peer network design that aims to support business activities conducted through a network of collaborations that generate value. We agree that some technologies can help optimize BE; nevertheless, to maximize the positive technological effect the BE, properties must undergo a systemic investigation.

2.3 System research

Systems and their viability have been defined by many researchers. The systemic view was provided by cybernetics, where Beer (1972) introduced the Viable System Model (VSM), based on biological and psychological observations and the Ashby's law of requisite variety.

Figure 1. The simplified organizational VSM



Adapted from (Beer, 1985)

Waelchli (1989) explained the relationships with the environment in VSM using a simplified version of the model (see Figure 1). The organizational components were reduced to management (in the rectangle) and Operations (in circle): Management regulates Operations, and Operations regulates

the environment. The viability of the system is supported by massive flows of information within the organization as well as between the organization and the environment. The main focus of the VSM is designing methods to transmit and manage very large amounts of information in real time. In Figure 1, the information communication channels, represented by arrows, interlock elements of the Organization (Management and Operations) and link the Organization to the Environment.

Researchers have proposed using systemic tools, such as system dynamics to help manage complex environments. Bianchi (2002) emphasized the need for a learning-oriented approach to planning and control as a prerequisite for SMEs' survival and growth. Oyebisi, Momodu, and Olabode (2013) compared models for managing a technological innovation system (TIS), defined drawbacks of conventional models, and proposed the use of system dynamic models as a valid solution. They all pointed out that potent modeling and simulation software and knowledge in multiple domains are required for successful modeling.

Limiting business information to financial or marketing information has been strongly challenged. Systemic thinking and requisite holism are a valid basis for innovation (Mulej & Potocan, 2007; Zenko & Mulej, 2011). It is insufficient to design processes by ignoring the information that cannot be attained by the current state of technology. We followed the advice to expand the observed data and use BD resources to get a step closer to a higher BE meta level.

3 Business Ecosystems Players

Rich BE provide an environment for multiple players with high diversity (Gao et al., 2013; Moore, 1993; Nachira, Dini, & Nicolai, 2013). In this section, we elaborate on the objectives and strategies of five BE players greatly affected by BD technologies: individuals, SMEs, large organizations, information providers, and regulators. The business players selection is based on Moore's (1993) definition of the business ecosystems and upgraded with information providers and regulators, which play an important role in the viable system perspective (Espejo, Bowling, & Hoverstadt, 1999).

For every player, a question arises: How can I exploit the available BE resources for individual growth and, more importantly, what do I need to invest into it to do it in the future? The answer depends on the individual strategies, which range from focusing on the short-term success to breaking down the ecosystem defense barriers and exploiting the system resources as well as taking a leadership role and generating sustainable resources needed for the other ecosystem members to survive. Independent of the decision about what role to play, the individual depends on information concerning other players.

Although BD affects players on multiple fields of attack (Cukier, 2014; McAfee & Brynjolfsson, 2012; Press, 2013; Zhang et al., 2014), we narrowed the field of identified topics identified to five influential topics that will identify opportunities and threats for BE players: individual marketing, health treatment, work opportunities, financial services, and security enforcement. The reduction criterion is based on a preliminary keyword analysis conducted in Google and Google Scholar. Selected topics related to "Big Data" achieved an average of 55,900 results in research-related contents and 48-900,000 in a general search.

To preserve the required level of standard deviation in model transparency, only the most important strategies are displayed. This results in hiding the direct feedback loops. Nevertheless, when observing from a distance, some of the most important system level loops ranging among multiple players can be identified. For instance, individuals receive protection from organizations and information providers by the regulators.

3.1 Individuals

Individuals are usually anonymized as customers or roles in organizations (Drucker, 2002; Dunkl et al., 2015). Nevertheless, if compared to the biological ecosystems, they play the role of cells with the special ability to stand alone or group with others to form an organization (Ajzen, 1991; Waelchli, 1989). Individuals actually run all the players in the ecosystem. Thus, every role—no matter how important—is designed to be executed by an individual. The question is, why do we not treat them as individuals? One of the obvious reasons is that it is exceedingly hard to follow the behavior of individuals and even harder to predict their actions while simultaneously not violating their personal integrity (Nelson, 1970; Zhang et al., 2014).

Individual objectives are highly volatile; they change over time and adapt to situations. Sometimes they are conflicting. For instance, they like autonomy in driving a car, but are averse to taking responsibility. The duality regarding BD technologies is that they like receiving customized services, but do not want to share uncensored personal data (Zhang et al., 2014).

Table 1 presents opportunities and threats to individuals for the selected BD domain. For opportunities, strategies on how to achieve them are represented; on the threat side, mitigation strategies are explained.

Table 1. BD Individual-related Opportunities and Threats and Strategies Used

BD domain		Opportunity	Threat
Individual marketing		Receive customized offers, potentials of choosing best-suited deals.	Becoming a target of marketing harassment, trading with individual data.
	Strategies	Sharing data on their properties, preferences, and activities.	Relying on the system protection. Sharing data with trusted players, limiting data content, protecting from undesired listening, rejecting unwanted messages.
Health treatment		Individual diagnosis and treatment propositions based on group knowledge.	Misuse of individual medical data.
	Strategies	Continually sharing medical data, using predictive models results.	Anonymization of shared data, audited data entry and data access.
Work opportunities		Finding perfect engagement.	Disclosure of job-seeking activities, deceiving job offers.
	Strategies	Searching for work opportunities that match my properties and offer desired rewards.	Active management of data privacy, checking the employee reputation.
Financial services		Access to investment and funding opportunities	Fraud and default risks.
	Strategies	Using tools for accessing inexpensive funding and profile-adjusted investments.	Using investment services with integrated fraud prediction.
Security enforcement		Using system security measures for a desired environment safety level.	Control misuse.
	Strategies	Using available system services and resources, sharing data when observed.	Using legislation to protect individual rights, using social communities to control security organizations.

Source: Author's own data

BD technologies focus not only on individuals, but also try to collect data on their activities. Generally, this can have great positive effects on the usability of the services offered to an individual in an instance; on the other hand, this information can be used to harm the individual and exploit his/her potential weaknesses. Individuals can support the positive effects by sharing information, but they need system-generated protection to prevent undesired behavior by other players.

3.2 SMEs

SMEs operate on limited resources; consequently, they use external resources and a narrow set of products and services for a limited market (Barney, 1991). Their viability depends on the capacity to adjust to properties of the BE (Beer, 1972). Because of their abundant numbers and the enthusiasm of the involved individuals, they are considered the most important innovation force (Zenko & Mulej, 2011) and a major BE producer (E._C._European_Commission, 2004). In their domain, SMEs actively research and develop new approaches that will provide them enough resources. In other domains. they use existing state-of-the-art services.

As depicted in Table 2, SMEs in all business domains use BD services to optimize the exploitation of their business environment and expand their influence. These services are used as a plug-and-play appliance to minimize the costs of new activities. SMEs typically face two kinds of threats: the active role of their competition and the disclosure of their behavior.

3.3 Large organizations

Large organizations have major influence in the local or global ecosystem (Beer, 1985; Davenport, 1998). In their domains (such as car manufacturing, energy providers, and pharmacy), they actively coordinate other players in the system. Large organizations include companies, public organizations such as hospitals, research organizations, educational organizations, and others. They possess the resources to lead big projects expecting long-term results (Moore, 1993); they systematically scan for promising solutions and adapt them to fit their needs. On the other hand, their adoption rate to changes in the ecosystem is rather slow.

Large organizations want to increase their influence and actively change their environment. To this end, they invest heavily in their domain-related research, and they go beyond using state-of-the-art toolsets and actively participate in their development until they fit their needs.

Large organizations use active participation in harnessing BD-related opportunities (see Table 3). They use BD technologies to gather more detailed data (for instance, using sensor data) or acquire data from their environment (such

as global medical data). They also actively participate in data analysis research to develop tailored BD-based tools (for instance, social media-based profiling in the employment-recruiting process).

Table 2. BD SMEs' Related Opportunities and Threats and Strategies Used

BD domain		Opportunity	Threat
Individual marketing		Reach existing and new customers, with high selling potential.	Losing customer trust or being replaced by the competition.
	Strategies	Combining classic marketing methods with outsourced services, offered by information providers.	Focusing on the customers, willing to accept marketing actions, providing them a real value added.
Health treatment		Using BD-based diagnosis and treatment selection services for their patients.	Potential of missuses by pharmaceutical companies.
	Strategies	Using existing predictive models based on medical BD on individual symptoms to determine diagnosis and treatment.	Using generally acknowledged information sources, involving organizations with high reputation.
Work opportunities		Acquiring employees fitting the position.	Dishonest applicant information.
	Strategies	Comparing the position requirements with the candidate properties.	Automatic profile assessment.
Financial services		Global direct investment and funding opportunities.	Fraud and default risks.
	Strategies	Using services for finding the most appropriate P2P funding, building low-level risk reputation.	Using investment services with integrated fraud prediction.
Security enforcement		Attaining a desired safety level.	Total control.
	Strategies	Using system information services to gain data on business partners' security risks.	Avoiding control or automatic reporting.

Source: Author's own data

Table 3. BD Large Organizations' Related Opportunities and Threats and Strategies Used

BD domain		Opportunity	Threat
Individual marketing		Retain existing customers, gain market shares, and access new markets more efficiently.	Not understanding the needs of customers, using wrong communication channels, sending wrong messages
	Strategies	In-house data analysis, accessing external data for data mining, actively cooperating with information providers.	Analyzing the content and volume of communication, used by the targeted groups of customers, and adapting to their patterns.
Health treatment		Design systems that use existing knowledge for diagnosis and treatment selection.	Forcing selling of selected products, resulting in suboptimal medical treatment.
	Strategies	Active cooperation in data design and knowledge extraction.	Building reputation, combining clinical results of healing substances produced by competing producers.
Work opportunities		Acquiring employees fit for the position.	Dishonest applicant information.
	Strategies	Designing support for comparative analysis of a candidate's potential and the tasks laid out for him.	Profiling applicant data.
Financial services		Managing investment portfolio and using inexpensive funding resources, financing customers.	Fraud and default risks
	Strategies	Using predictive analytics on investments, attracting low-risk investors.	Supporting the developments of fraud prediction models
Security enforcement		Designing a safe environment to conduct global operations.	Contra intelligence of players in external systems.
	Strategies	Algorithms for identifying localized threats based on behavior analysis and social contacts.	Data security measures, protecting the knowledge of behavioral analytics.

Source: Author's own data

3.4 Information providers

BD and cloud computing are responsible for the emergence of highly innovative new companies or the reorganization of companies with a long tradition of delivering information (rating agencies, registers, ERP providers, etc.). Information providers use their knowledge on how to access data, store data, blend data (publicly available, internal or restricted, social media, sensor-generated data, etc.), and analyze data to create services and products for other BE players. As they possess data from multiple sources and the knowledge to process it, they can actively use it to upgrade providing services to a new meta level, thereby becoming business integrators, financial intermediators, or service coordinators.

One of the common questions arising is whether the business partner will deliver. The most common strategy for predicting future behavior in a situation is using the knowledge of the masses. In the BD domains presented in Table 4, data on individual behavior are blended from multiple sources: In individual marketing, it is social media, sales, and localization data whereas in health treatment, data from diagnostic apparatuses are combined with medical records. BD projects are executed in cooperation with organizations or, as in the case of security enforcement, regulators.

Threats are often connected with the change of transparency in the system that information providers deliver. On one hand, all players would like a higher level of transparency of the system around them; on the other hand, they would like to conceal their potentially depraved behavior.

3.5 Regulators

Regulators' mission is to ensure that the desired processes in their regulation domain are executed efficiently and prevent undesired events. They do this by providing support, rules, and control mechanisms for the players' behavior. They consider players' viability, the level of activity in the system, and the system effects to the environment (Prosser, 1997; Warhurst, 2005). For instance, in the financial services domain, national and EU central banks provide rules and execute control in the form of constant reporting, but they regulate finance resources' prices and provide the required funds for the financial institutions to function (Beyer et al., 2010). For the regulators to act proactively, they need to measure activities and recognize the effects of desired and undesired behavior in the system (e.g., financial institutions are reporting to central banks for stress testing).

Table 4. BD Information Providers' Related Opportunities and Threats and Strategies Used

BD domain		Opportunity	Threat
Individual marketing		Offer data and services for identifying and sending customized offers to customers. Adapting a new role of market integrator.	Being accused of marketing harassment and trading with individual data.
	Strategies	Predicting future individual customer desires based on BD associative data mining. Designing new cooperative channels.	Following the system rules that enable sharing of personal data to referenced players, applying control mechanisms, respecting the individual integrity, preventing misuse by their customers.
Health treatment		Diagnosis and treatment proposition based on group knowledge	Sharing individual medical data
	Strategies	Designing predictive data-mining models for understanding patients based on knowledge stored in clinical BD.	Anonymization of shared data, audited data entry and data access.
Work opportunities		Connecting job seekers with potential employers.	Lack of discretion, dishonesty of job seekers and employees.
	Strategies	Design global and local comparative analysis of job offers and profile data algorithms.	Developing data security measures and reputation models.
Financial services		Connecting investors and loan receivers.	Fraud and default risks
	Strategies	Developing algorithms for finding the most appropriate peer-to-peer funding.	Developing fraud prediction algorithms and reputation analysis services.
Security enforcement		Providing methods of gathering, storing and analyzing BD.	Data leakage, data analysis methods' leakage.
	Strategies	Developing new communication channels, BD storages, multimedia analysis, threat detection models.	Data security measures, protecting the knowledge on BD methods.

Source: Author's own data

Table 5. BD Regulators' Related Opportunities and Threats and Strategies Used

BD domain		Opportunity	Threat
Individual marketing		Market optimization, reduced communication noise between the system players, better coordination between supply and demand.	Examples of marketing harassment, especially on players with low protection barriers
	Strategies	Designing protocols for individual marketing, redesigning rules and support mechanisms by involving all players on the market. Design methods for continuous rule redesign process.	Using BD exception identification technologies to redesign system level rules and control mechanisms.
Health treatment		Creating a global knowledge-based medical system.	Sharing individual medical data.
	Strategies	Designing protocols for safe medical data sharing, predictive data mining based on comparing the instance data with shared data pool.	Forming rules and creating control mechanisms on a system level for anonymization of shared data, audited data entry and data access. .
Work opportunities		Creating a transparent, secure environment for individuals and employees.	Indiscreet behavior, not fulfillment of obligations.
	Strategies	Registration and validation of activities in the job-seeking and evaluation system.	Developing tools to build and express reputation of individuals and organizations.
Financial services		Design and manage fluid financial markets.	Prevent liquidity shortage or overflow, manage and mitigate risks.
	Strategies	Co-design and manage new financing and investment models. Financial needs prediction model.	Design investment activities, demand and supply and projects' default rate of predictive analytics.
Security enforcement		Preventing undesired behavior of system and external players.	Misuse of security enforcement toolset.
	Strategies	Forming dynamic rules and control mechanisms for identifying and mitigating undesired behavior based on all available data, exception analytics and behavior predictions.	Developing control systems over protocol execution and delivering them to the system players.

Source: Author's own data

Regulators use BD technologies' potentials (Table 5) to optimize players' interactions and use of the resources, provide a higher level of transparency in the system, and predict future interactions. To address threats to the weakest players in the system in the form of marketing harassment or indiscreet behavior, regulators use BD technologies to design a more transparent environment and elaborate on the reputation qualities. In terms of security enforcement, they use similar strategies as do organizations to profile their partners, but they do it on a larger scheme. Regulators can only be successful by recognizing the power of all of the participants in the system.

4 BD System Impact

In this section, the five players' strategies are presented, addressing opportunities and threats. To create a system overview, the effects of players' strategies in relation to the other players' strategies are visualized. This will help us support the potential cooperation among players, eliminate threats, and achieve a win–win–win situation.

Figure 2 presents a highly simplified model of the effects BD have on the BE players, and their responses are provided. For every combination of five players and five BD domains, only one opportunity and one threat are represented. In addition, only one player's strategy is selected for every one of these. To preserve the minimal state of readability, the effects of a player's strategies with other players' strategies are not displayed. Positive (or supporting) flows are marked with "+" and negative (mitigation) ones are marked with "–".

Individuals are the main source of data. At the same time, end users—either of BD results or of products and services—tailor their resources to their desires with the help of BD. They are the most vulnerable group as they are threatened by marketing harassment, data trading, misuse, and disclosure. Interestingly, they are positioned at the opposite side of the information providers, assessing the relationships among these entities as relatively weak. Because the regulators' strategies are primarily focused on mitigating threats toward them, they are positioned in their vicinity.

A high level of overlap exists in opportunities and threats for SMEs and large organizations, ranging from reach existing

and new customers to total control of the system. Nevertheless, their strategies differ considerably. SMEs tend to use newly developed BD-based tools and services whereas large organizations co-develop these in their domains of interest. For instance, to reach better diagnosis and treatment selection, SMEs (e.g., practicing doctor offices) will use existing predictive models whereas large organizations (e.g., clinical centers and pharmaceutic companies) actively cooperate in data and algorithm design. They also share threats (losing trust, fraud, and default risks). Their strategies range from building up their reputation to the development and use of fraud prediction models.

Information providers' strategies are highly correlated with large organizations' strategies. They use organizations to blend data from multiple sources and deliver results to individuals—again through organizations (development of peer-to-peer algorithms to connect investors and loan receivers). Because of their knowledge of multiple domains, they tend to integrate multiple domains, such as marketing, sales, and finance, where they correlate with the regulators' objectives of coordinating the players.

The role of the information providers has significantly increased as they provide services to all players in the system and redesign domain processes. Thus, information providers' initiatives should be closely monitored by the regulators and above all by the public initiatives of individuals.

Regulators play a two-sided role: First, they rearrange the ecosystem processes to achieve a higher level of optimization; second, they provide system protection for the vulnerable players. The regulators' optimization efforts (market optimization, better coordination, fluid financial markets) provide guidelines for information providers. The protective side of the regulators is highly connected with the threats to individuals (marketing harassment, data trading, misuse, and disclosure) and organizations (losing trust, fraud, and default risks). To execute strategies to prevent threats (e.g., sharing rules and control mechanisms, building reputation, using predictive analytics), they include and co-design products and services offered by the information providers.

Monitoring individual actions and generating a smart reputation can create a major shift in cooperation. It may provide worldwide personal reputation transparency and provide a way for individuals to act socially responsibly. This will not only change business behavior, but will also affect all parts of the society.

On the negative side, BD will raise considerable privacy and security issues for individuals and organizations. It will redefine business secrets and fundamentally challenge individuals' privacy rights. Lowering organizational and personal independence will increase the possibility of rapid misinformation dispersion.

5 Discussion and Conclusion

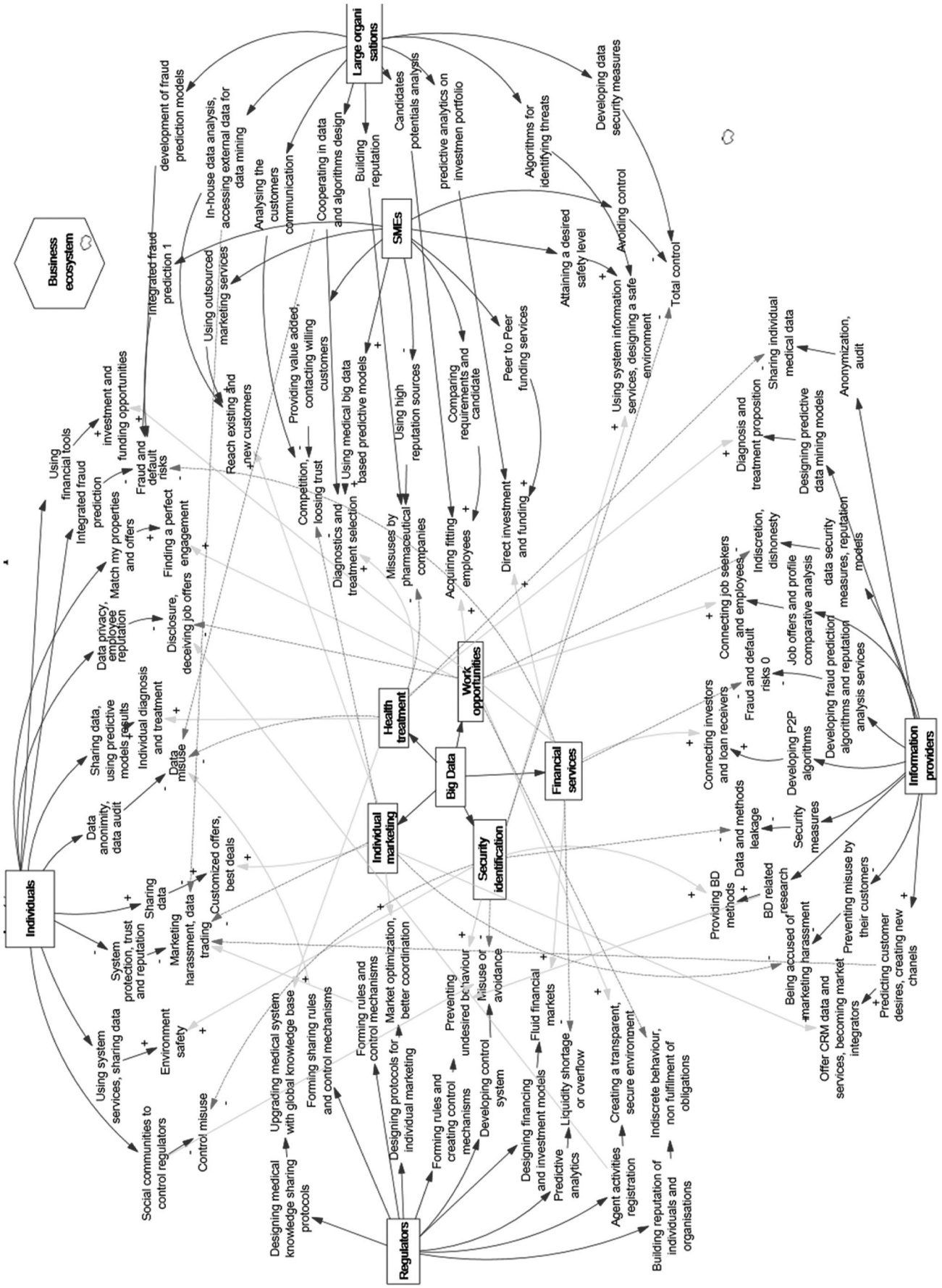
BD promises to be a disrupting technology, facilitating significant changes. In the BD R&D community, many efforts have been focused on storing and integrating large quantities of rapidly changing data with a high variety in form and content. Some focus has been put into supporting new ways of collaborations, predictions, and advanced user experiences. Although some researchers follow a requisitely holistic vision in the effort to create smart environments, most efforts focus on resolving partial issues.

It is hard to gain an appropriate perspective on the impact. An overly schematic view obscures all the important details and provides no value added or reference. A detailed view is too crowded and prohibits seeing the forest because of the trees. To provide a (somewhat) transparent view and still display important details, we used system analysis to achieve a visualization repository, displaying only the most important entities that occur in a selected viewpoint. We decided to include a limited number of players (5), BD domains (5), opportunities and threats (one of each for every BD domain and a player combination), and strategies to use the opportunities and mitigate threats (one for every opportunity and threat). The selection of the appropriate representatives is based on the literature reviewed.

The system of creating an overview is twofold. In step one, for every player in the system, its objectives, BD domains, related opportunities, threats, and strategies are scripted. This provides a brief profile of a player, his motivation, and resources he is capable or willing to engage when facing changes in his environment. In the second step, a system dynamic diagram is used to provide an overview of all the involved entities. The visualization of relationships among entities provides the desired overview effect and simultaneously gives information on particular strategies involved in reaching particular players' objectives.

This paper delivers important insights for multiple R&D communities. For BE designers and policymakers, it provides a tool to overview intersections of BE players and BD domains. It helps BD architects recognize the potentials their services offer to the players and threats they need to help preventing. It helps business managers direct organizations' development to fully exploit the BD potentials. Finally, it helps individuals actively influence the development of society and build their reputation.

Figure 2. The system dynamics diagram of BD opportunities, threats, objectives, and strategies



Source: Author's own data

This paper has provided a restricted view of the system. To generate a better BE–BD map, multiple limitations should be surmounted. It is hard to condense the system complexity: the players, their relationships, and strategies over time for entire populations at the instance level and the predictions based upon BD in a standard research paper, formatted for a static (even printed) version.

Thus, two paths should be followed. The first relates to the research scope. In terms of all the important relationships and strategies, we need to focus on the single instance—a single strategy that needs to be described in detail—to discover its complexity and its impact on the system entities and then connect them in a holistic map. The second involves a dynamic, highly visual communication channel for distributing the research results, capable of representing the research models' full complexity that goes well beyond current scientific journals' formats.

References

1. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211. http://dx.doi.org/10.1016/0749-5978(91)90020-T
2. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120. http://dx.doi.org/10.1177/014920639101700108
3. Beer, S. (1972). *Brain of the Firm*. London: The Penguin Press.
4. Beer, S. (1985). *Diagnosing the system for organisation*. Chrichester: John Wiley.
5. Beyer, A., Cohen, D. A., Lys, T. Z., & Walther, B. R. (2010). The financial reporting environment: Review of the recent literature. *Journal of Accounting & Economics, 50*(2-3), 296-343. http://dx.doi.org/10.1016/j.jacceco.2010.10.003
6. Bianchi, C. (2002). Introducing SD modelling into planning and control systems to manage SMEs' growth: a learning-oriented perspective. *System Dynamics Review, 18*(3), 315-338. http://dx.doi.org/10.1002/sdr.258
7. Bregman, R., Peng, D. X., & Chin, W. (2015). The effect of controversial global sourcing practices on the ethical judgments and intentions of US consumers. *Journal of Operations Management, 36*, 229-243. http://dx.doi.org/10.1016/j.jom.2015.01.001
8. Bryant, E. Randal, Katz, H. Randy, & Lazowska, D. Edward. (2008). Big-Data Computing: Creating revolutionary breakthroughs in commerce, science, and society. http://cra.org/ccc/wp-content/uploads/sites/2/2015/05/Big_Data.pdf
9. Cancer, Vesna, Rebernik, Miroslav, & Knez-Riedl, Jozica. (2013). The environmental creditworthiness assessment methodology/ Metodologija presojanja okoljske bonitete. *Nase Gospodarstvo : NG, 59*(1/2), 66-74.
10. Cukier, Kenneth (2014). Big Data and the Future of Business. In F. González (Ed.), Reinventing Company in the Digital Age: BBVA. Retrieved from https://www.bbvaopenmind.com/en/article/big-data-and-the-future-of-business/.
11. Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard Business Review, 76*(4), 121-131.
12. Drucker, F. Peter. (2002). They're not employees, they're people. *Harvard Business Review, 80*(2), 70-77.
13. Dunkl, Anita, Jiménez, Paul, Zizek, Simona Sarotar, Milfelner, Borut, & Kallus, Wolfgang K. (2015). Similarities and Differences of Health-promoting Leadership and Transformational Leadership. *Nase Gospodarstvo : NG, 61*(4), 3-13.
14. E._C._European_Commission. (2004). *Observatory of European SMEs: Internationalization of SMEs*. Brussels: EC.
15. Espejo, R., Bowling, D., & Hoverstadt, P. (1999). The viable system model and the Viplan software. *Kybernetes, 28*(6-7), 661-678. http://dx.doi.org/10.1108/03684929910282944
16. Evans, Philip. (2014). From Deconstruction to BigData: How technology is reshaping the corporation. In F. González (Ed.), Reinventing Company in the Digital Age BBVA. Retrieved from https://www.bbvaopenmind.com/en/article/from-deconstruction-to-big-data-how-technology-is-reshaping-the-corporation/.
17. Fauscette, Michael. (2014). Business Networks: The Next Wave of Innovation. https://go.sap.com/docs/download/2014/12/14c7ef1e-127c-0010-82c7-eda71af511fa.pdf
18. Frohlich, M. T., & Westbrook, R. (2001). Arcs of integration: an international study of supply chain strategies. *Journal of Operations Management, 19*(2), 185-200. http://dx.doi.org/10.1016/S0272-6963(00)00055-3
19. Gao, Ruize, Zhang, Zhenji, Tian, Zhihong, Guan, Xiaolan, & Li, Ang. (2013). Modelling the Emergence and Evolution of e-Business Ecosystems from a Network Perspective. *Studies in Informatics and Control, 22*(4), 339-348.
20. Hellstrom, Magnus, Tsvetkova, Anastasia, Gustafsson, Magnus, & Wikstrom, Kim. (2015). Collaboration mechanisms for business models in distributed energy ecosystems. *Journal of Cleaner Production, 102*, 226-236. http://dx.doi.org/10.1016/j.jclepro.2015.04.128
21. King, A. A., Lenox, M. J., & Terlaak, A. (2005). The strategic use of decentralized institutions: Exploring certification with the ISO 14001 management standard. *Academy of Management Journal, 48*(6), 1091-1106. http://dx.doi.org/10.5465/AMJ.2005.19573111
22. Lämmel, Ralf. (2008). Google's MapReduce programming model — Revisited. *Science of Computer Programming, 70*(1), 1-30. http://dx.doi.org/10.1016/j.scico.2007.07.001
23. Lane, D. C. (2000). Should system dynamics be described as a 'hard' or 'deterministic' systems approach? *Systems Research and Behavioral Science, 17*(1), 3-22. http://dx.doi.org/10.1002/(SICI)1099-1743(200001/02)17:1<3::AID-SRES344>3.0.CO;2-7

24. Mavric, Jasmina, Tominc, Polona, & Bobek, Vito. (2014). Qualitative indicators for measuring the performance development of selected cities/Kvalitativni indikatorji merjenja uspesnosti razvoja izbranih mest. *Nase Gospodarstvo : NG, 60*(3/4), 13-25.
25. McAfee, A., & Brynjolfsson, E. (2012). Strategy & competition Big Data: The Management Revolution. *Harvard Business Review, 90*(10), 60-68.
26. Moore, J. F. (1993). Predators and prey - a new ecology of competition. *Harvard Business Review, 71*(3), 75-86.
27. Mulej, M., & Potocan, V. (2007). Requisite holism - precondition of reliable business information. *Kybernetes, 36*(3-4), 319-332. http://dx.doi.org/10.1108/03684920710746986
28. Nachira, Francesco, Dini, Paolo, & Nicolai, Andrea. (2013). *Digital Business Ecosystems* Retrieved from http://www.digital-ecosystems.org/book/DBE-2007.pdf
29. Nelson, P. (1970). INFORMATION AND CONSUMER BEHAVIOR. *Journal of Political Economy, 78*(2), 311-329. http://dx.doi.org/10.1086/259630
30. Oyebisi, Timothy O., Momodu, Abiodun S., & Olabode, Segun O. (2013). System thinking in managing technological innovation systems in manufacturing companies/Sistemsko razmisljanje pri upravljanju tehnoloskega informacijskega sistema v proizvodnih podjetjih. *Nase Gospodarstvo : NG, 59*(3/4), 50-57.
31. Payne, A., & Frow, P. (2005). A strategic framework for customer relationship management. *Journal of Marketing, 69*(4), 167-176. http://dx.doi.org/10.1509/jmkg.2005.69.4.167
32. Press, Gil. (2013). A Very Short History Of Big Data. *Forbes/tech*. http://www.forbes.com/sites/gilpress/2013/05/09/a-very-short-history-of-big-data/
33. Prosser, Tony. (1997). *Law and the regulators*. Oxford: Oxford unvierity press.
34. Razavi, A., Moschoyiannis, S., & Krause, P. (2009). An open digital environment to support business ecosystems. *Peer-to-Peer Networking and Applications, 2*(4), 367-397. http://dx.doi.org/10.1007/s12083-009-0039-5
35. Korez-Vide, Romana. (2004). Uncertainties of Measuring Globalisation. *Nase Gospodarstvo : NG, 50*(1,2), 46-51.
36. Rometty, Ginni. (2013). A New Era of Smart. https://www.youtube.com/watch?t=19&v=iNZj38sD81w
37. Tomlin, B. (2006). On the value of mitigation and contingency strategies for managing supply chain disruption risks. *Management Science, 52*(5), 639-657. doi: 10.1287/mnsc.11060.0515
38. Umpleby, Stuart, & Lim, Lucy. (2007). The spread of management ideas and methods around the world/Razsirjenost menedzerskih idej in metod po svetu. *Nase Gospodarstvo : NG, 53*(3/4), 124-135.
39. Waelchli, Fred (1989). the VSM and Ashby's law as illuminants of historical management thought. In R. Espejo (Ed.), *The Viable system model : interpretations and applications of Stafford Beer's VSM*: Willey.
40. Waller, M. A., & Fawcett, S. E. (2013). Data Science, Predictive Analytics, and Big Data: A Revolution That Will Transform Supply Chain Design and Management. *Journal of Business Logistics, 34*(2), 77-84. http://dx.doi.org/10.1111/jbl.12010
41. Warhurst, A. (2005). Future roles of business in society: the expanding boundaries of corporate responsibility and a compelling case for partnership. *Futures, 37*(2-3), 151-168. http://dx.doi.org/10.1016/j.futures.2004.03.033
42. Wood, David. (2010). *Linking Enterprise Data* (D. Wood Ed.): Springer science+Business Media. http://dx.doi.org/10.1007/978-1-4419-7665-9
43. Zenko, Zdenka, & Mulej, Matjaz. (2011). Innovating measurement of economic success for more accurate information/Inoviranje merjenja ekonomskega uspeha za bolj ustrezne informacije. *Nase Gospodarstvo : NG, 57*(5/6), 11-19.
44. Zhang, Yin, Chen, Min, Mao, Shiwen, Hu, Long, & Leung, Victor C. M. (2014). CAP: Community Activity Prediction Based on Big Data Analysis. *Ieee Network, 28*(4), 52-57. http://dx.doi.org/10.1109/MNET.2014.6863132

Authors

Igor Perko is an assistant professor at the University of Maribor, Faculty of Economics and Business, Slovenia. His PhD thesis was "Intelligent agents in management information systems." His research interests include business intelligence systems and Big Data, focusing on cooperation support in business ecosystems. He is connecting the use of knowledge management structures, business data sharing, Big Data, cloud technologies, and predictive analytics to provide intelligence support of trans-business processes. He is the author of professional and scientific papers, actively involved in business ICT development, and a member of WOSC.

Peter Ototsky graduated as applied mathematics and physics master in 2005 in Moscow Institute of Physics and Technology (Moscow). From 2003 to 2005 he worked in information technologies domain supporting SAP R/3 in JSC Gasprom Export. In 2008 he received PhD for a complex systems modelling at synergetic science school in the Keldysh Institute of Applied Mathematics, Russian Academy of Science. Since 2009 works as a commercial director in a wholesale company. From 2010 to 2012 was teaching a course of systems modelling and management cybernetics. At 2010 co-found a Moscow Management Cybernetics club. Since 2008 he leads a Cognitive Centers team at the Keldysh Institute of Applied Mathematics performing

research and several projects for regional administration and private companies. His research interests are modelling, cybernetics, complexity management and innovation management.

Veliki podatki za soudeležence poslovnih ekosistemov

Izvleček

V predstavljeni raziskavi povezujemo nekaj najbolj perspektivnih področij uporabe velikih podatkov z reprezentativnimi predstavniki skupin poslovnih ekosistemov. Z analizo literature identificiramo trenutno stanje razvoja velikih podatkov na pomembnejših področjih njihove uporabe: pri osebnem trženju, zdravstvenih storitvah, priložnostih za delo, finančnih storitvah in zagotavljanju varnosti. Teorije sistema smo uporabili za identifikacijo predstavnikov skupin, na katere vplivajo veliki podatki: posamezniki, mala in srednja podjetja, velike organizacije, ponudniki informacij in regulatorji. Razmerja med področji uporabe velikih podatkov in deležniki pojasnjujemo z analizo priložnosti in tveganj ter strategij, s katerimi se ti deležniki odzivajo. Za vizualizacijo relacij smo oblikovali model z orodji sistemske dinamike.

Ključne besede: poslovni ekosistemi, veliki podatki, ponudniki informacij, sistemska dinamika

Nonprofit Organizations from the Perspective of Organizational Development and Their Influence on Professionalization

Katalin Dobrai
University of Pecs, Faculty of Business and Management,
Department of Leadership and Organizational Sciences, Hungary
dobrai@ktk.pte.hu

Ferenc Farkas
University of Pecs, Faculty of Business and Management,
Department of Leadership and Organizational Sciences, Hungary
farkas@ktk.pte.hu

ORIGINAL SCIENTIFIC PAPER

RECEIVED: NOVEMBER 2015

REVISED: FEBRUARY 2016

ACCEPTED: APRIL 2016

DOI: 10.1515/ngoe-2016-0009

UDK: 334.72

JEL: L30, O15

Citation: Dobrai, K., & Farkas, F. (2016). Nonprofit Organizations from the Perspective of Organizational Development and Their Influence on Professionalization. *Naše gospodarstvo/ Our Economy, 62*(2), 25 – 32. DOI: 10.1515/ngoe-2016-0009

Abstract

The aim of this paper is to give an overview of the phenomenon of professionalization that is observable in organizations from the nonprofit sector. Empirical research was conducted among Hungarian nonprofit organizations, and the data were collected within the framework of a country-wide survey. Through the analysis of the research results, the paper provides deeper insights into knowledge about professionalization trends in the nonprofit sector. It proves that organizational development positively impacts nonprofit organizations' improvement of their professionalization level and the members of these organizations.

Keywords: organizational development, nonprofit organizations, professionalization, learning, knowledge

1 Introduction

The purpose of this paper is to provide an overview of special issues related to the growing professionalization of nonprofit organizations from both theoretical and practical perspectives. In recent years, new dilemmas have arisen for those involved in the nonprofit sector. These dilemmas regard knowledge processes such as learning and development of individuals working for nonprofit organizations (NPOs) as well as organizational development (OD) and the importance of professionalization for individuals and organizations.

Taking these circumstances into consideration, this article focuses on the relationship between the development of skills and the growing professionalization of their activities. With the participation of Hungarian nonprofit organizations, a large sample survey of Hungarian nonprofit organizations provided the basis for the empirical evidence. A general decline in the number of organizations during the last four years (Statisztikai Tükör, 2014) has drawn the authors' attention to the fact that sustainable existence of the organizations of the nonprofit sector to a large extent depends on their development.

NG
OE

NAŠE GOSPODARSTVO
OUR ECONOMY

Vol. 62 No. 2 2016

pp. 25 – 32

The paper consists of two parts. The first part includes desk research in which we utilized papers discussing the professionalization of NPOs that were published mainly in the last decade. The second part contains a detailed research methodology along with analysis and discussion of the empirical research. The paper concludes with lessons learned from the research, limitations of the research, and suggestions for further research ideas.

2 Theoretical Framework

In this chapter, we briefly clarify the basic terms and phenomena relevant for the empirical research.

2.1 Nonprofit organizations and challenges

Different terms are used worldwide for organizations in the nonprofit sector (non-governmental, voluntary, etc.), and the terms themselves are used in various meanings. For this reason, it is necessary to explain our understanding of this term. We accept Salamon and Anheier's (1992) definition according to which nonprofit organizations are entities that:

- are institutionalized and have regularity in their activities;
- are private and independent from the government, even if they receive support from the government;
- do not distribute profits to their owners or leaders, but reinvest their surplus earnings into the objectives of the organizations;
- are not controlled by other entities from outside the organization; and
- provide voluntary membership or participation in the activities.

However, these principles are often are compromised in practice in many countries.

The changing environment makes daily operations for nonprofit entities increasingly difficult. Some challenges include the emergence of the so-called knowledge-intensive business services (Dobrai & Farkas, 2008), competition from other sectors and from organizations in the nonprofit sector, and more rigorous regulations. Meeting these challenges involves making changes in nonprofit organization, structure, leadership and organizational processes (Epstein & McFarlen, 2011). Performance is more essential than ever; thus, fulfilling commitments is challenging for the NPOs. NPOs must learn constantly so that they acquire knowledge from business sector companies (Chen & Graddy, 2010; Kreutzer, 2009). By precisely defining their goals, they increase the likelihood of success in the accomplishment of their mission (Bradach, Tierney, & Stone, 2008). Acquiring new and specialized knowledge in other fields also enables them to use models and solutions to implement methods of the business sector for long-term existence, better performance, and sustainable success (Al-Tabbaa, Leach, & March, 2014). These changes found their way into the nonprofit sector from the business sector through the public sector, where methods of new public management were introduced. This led to the adoption of management practices of for-profit organizations (Lewis, 2001; Roberts, Jones, & Fröhling, 2005).

2.2 Professionalization in nonprofit organizations

2.2.1 The term "professionalization"

The terms *professionalization* and *professionalism* have been the topic of continuous discussions. In numerous publications, Evetts has provided a very detailed and critical analysis of the sociological aspects of professionalism as well as its changes during the last decade to the present (Evetts, 2011; Maister, 2003).

Professionalization in NPOs can be understood as the implementation of business strategies and the use of methods and tools to help entities become market oriented (Mannsky & Siebart, 2010). This process is characterized by the usage of tools and methods transferred into the nonprofit from the for-profit sector (Alfirević, Pavičić, & Najev Čačija, 2014). This requires implementing strategic thinking into these organizations (Clark, 2012) and enabling them to perform well in special areas not focused on earlier, such as marketing (Chad, Kyriazis, & Motion, 2014) or organizational performance (Alfirević et al., 2014). Publications reveal different concepts of professionalization, including organizational, occupational, and managerial factors (Evetts, 2011; Salamon, 2012).

Professionalization from the perspective of organizational sciences has become a current topic with respect to nonprofit organizations both in countries where NPOs have long existed and in the post-socialist countries where the sector's professionalization level is generally low (Rakar & Kolarič, 2010). However, efforts have already addressed a large variety of country-specific questions (Alfirević et al. 2014; Čada & Ptačková, 2014; Dill, 2014; Dill, Zrinščak, & Coury, 2012; Korolczuck, 2014; Strečansky & Stoláriková, 2012; Rakar et al., 2011).

Practice-oriented publications, such as those by Callanan, Gardner, Mendonca, and Scott (2014), suggest professional solutions for eliminating deficiencies in most leadership fields and activities. In addition, cultivating and staffing talent is

attracting more attention now as a way to professionalize performance (Green & Hauser, 2012; Neff & Randal, 2011).

Based on the different concepts of professionalization and professionalism discussed and approaching them from the perspective of organizational sciences, we formulated our own definition that we found to be applicable for our empirical research. Hence, we understand professionalization as the process of becoming professional (i.e., developing a high level of professionalism). This involves not being an amateur anymore, showing expertise, skillfully executing organizational tasks, and providing superior services both internally and externally.

2.2.2 Professionalization practices in the sector

It is increasingly characteristic of the sector that, along with the traditional nonprofit organizations (associations and foundations), new legal and hybrid forms are emerging. Hybrid organizations possess characteristics of more than one sector (Billis, 2010; Davie, 2011; Strečansky & Stoláriková, 2012) and systematically integrate the civil society and markets (Jäger & Schröer, 2014). They use governance and operational methods, employ techniques of different organizational types, and are characterized by an improved business mindset. Their emergence is a sign of the dynamism and resilience of the sector's organizations (Salamon, 2012) that offer new solutions and opportunities, such as accessing social networks and other formalized structures, while bringing professionalized knowledge into the organizations. Dynamism and resilience are phenomena that accompany the implementation of different governance methods and techniques (Wellens & Jegers, 2013). In addition, various intra-and inter-sector cooperative efforts contribute to improved organizational learning in the nonprofit sector as well as its becoming more effective (Al-Tabbaa et al., 2014; Chen & Graddy, 2010; Cousins, Goh, Elliott, Aubry, & Gilbert, 2014).

2.2.3 Organizational development (OD)

By narrowing the tools of professionalization, we now concentrate our attention on OD as a relevant component of our empirical research. Although a variety of definitions of OD are accepted and used by organizations, some common elements can be identified, as can be seen in the following brief overview.

Raia (1972, p. 13) sees the contribution of OD in its features in that it "focuses on innovation and planned change in organizations." Its outcome is an increased body of knowledge. According to one popular definition, organizational development is "the system-wide application and transfer of behavioral science knowledge to the planned development, improvement and reinforcement of the strategies, structures and processes that lead to organizational effectiveness" (Cummings & Worley, 2008, p. 752). Jackson (2006, p. 33) also stressed that OD is a collaborative process to improve organizational effectiveness.

OD is also viewed as a means of professionalization and capacity building. OD is a process that focuses on the organization and not the individual, although it provides the individual with an opportunity to learn, acquire, and develop new knowledge. In the nonprofit sector, the choice of how to develop different capacities depends on stakeholders' interests as they have different preferences and different reasons to support organizational development initiatives (Millesen, Carman, & Bies, 2010). OD practitioners play a central role in the OD process. They are consultants who work as facilitators together with nonprofits in fields where OD is necessary—namely, in various areas of interventions in the nonprofit organizations such as people carrying out the projects, staff and organization leaders, or even donors (Tschirhart & Bielefeld, 2012).

OD practitioners provide knowledge-intensive services (Dobrai & Farkas, 2008) that lead to a joint learning process and the co-production of new knowledge. Wirtenberg and her colleagues (2007) found that OD experts can and should contribute to the development of nonprofit organizations in areas of urgency by working together with the leaders of nonprofits, transferring knowledge to them, and presenting a high level of flexibility.

For our empirical research, we built upon the previously mentioned features of OD. We view this management tool as a top-down effort that involves the whole organization and aims to increase the efficiency and lifecycle of an organization by taking structured actions. Thus, in conclusion to this brief overview, we can say that the implementation and usage of management tools and techniques, the introduction of new and better solutions, networking, cooperation and special processes such as OD are critical to improving the professionalization level of an organization.

3 Empirical Research

The following sections of the paper provide a brief summary and analysis of the empirical research.

3.1 Hypotheses

This article summarizes the findings that answer the following hypotheses:

H1. A significant difference can be observed in the level of professionalism between the organizations that have already participated in OD programs and those organizations that have not taken part in such programs.

H2. Organizational development programs help the professionalization of nonprofit organizations.

H3. There is a connection between the perceived professionalization level of the respondent and that of his/her perception of the organizational level of professionalization.

H4. The differences perceived in the personal and organizational professionalism show a close correlation.

3.2 Methodology

In order to determine whether organizational development a suitable tool for promoting and enhancing the professionalization of nonprofit organizations, we used various methods during the different phases of the research (Table 1).

The empirical research started in 2011–2012 with a pilot project that included two counties in Hungary (there are 19 regional units called counties in Hungary). An online questionnaire was sent to 58 participants of an organizational development program at the House of Civil Communities in Pécs and was returned by 33 organizations. In the next phase, semi-structured interviews were conducted with representatives of 38 organizations, most of whom participated in the online survey. In the third phase (i.e., 2013), a large sample survey took place that used the experiences of the first two phases and the database of the Central Statistical Bureau of Hungary. We also conducted 41 additional interviews in the last research phase with organizations from different regions of the country.

For the country-wide survey, 18,000 questionnaires were sent to organizations via e-mail; 841 questionnaires were returned, representing each of the official activities listed by the Hungarian Statistical Office. The returned questionnaires met the requirements of representativeness regarding the location of the organizations and showed the approximate relationship between the two basic legal forms (associations and foundations).

4 Results and Discussion

4.1 Findings

We can make the following general statements about the participating organizations and the people who filled out the questionnaire for those organizations:

There is a medium-strength positive relationship between the age of the organization and the number of full-time employees, which implies that older organizations have a higher number of full-time employees (Pearson correlation: 0.250**, significant at the 0.01 level, 2-tailed).

- There is a positive relationship between the age of the organizations and the number of members, suggesting long-term development and the opportunity for performance improvement (Pearson correlation: 0.297**, significant at the 0.01 level, 2-tailed).
- Both findings have very important implications for the performance of the organizations in the sector. It is well known that many organizations do not have any paid employees for obvious reasons.
- The analysis of the relationship between personal and organizational professionalization (Table 2) shows that:

Table 1. Phases of the Research and Methods Applied

Research Phases	Methods Used	Number of Organizations Involved	Location of Organizations Involved
Phase 1	questionnaire	33	2 counties
Phase 2	interviews	38	2 counties
Phase 3	questionnaire	841	country-wide
Phase 4	interviews	41	country-wide

Source: Authors' own data

Table 2. Participation in an OD Program, and the Perceived Level of Professionalization (7-Point Scale, Mean)

Participation in OD Program	Evaluation of Professionalization (7-point scale)	
	Individual	Organization
Participated	4.78	4.62
Did not participate	3.60	3.41

Source: Authors' own data

- Respondents who previously participated in OD programs gave their own professionalization level an average score of 4.78 on a 7-point scale and placed the professionalization level of their organization somewhat lower, with an average score of 4.62; and
- Respondents who had never participated in an OD program perceived the two professionalization levels as being much lower: 3.60 for the individual and 3.41 for the organization. (H1)

This result was also supported by a correlation analysis that pointed out a positive connection between participation in an OD program and the perceived professionalization level (H2)—namely:

- A medium-strength positive connection between participation in an OD program and the perceived level of personal professionalization (Cramer's V: 0.355; p = 0.000, Pearson correlation: 0.493. Correlation is significant at the 0.01 level, 2-tailed); and
- A medium-strength positive connection between participation in an OD program and the perceived level of organizational professionalization (Pearson correlation: 0.575. Correlation is significant at the 0.01 level, 2-tailed).

The hypothesis was also accepted (Table 3) regarding the impact on satisfaction with the program by the program provider's origin. According to the research findings, how efficient participants find an OD program depends on the provider of the OD program. Although no significant difference exists between the averages of the three categories, those who had participated in an EU-supported OD program found that they had reached a high level of professionalism. Those least satisfied were the participants of domestic programs (H3).

If we look at the whole sample, we can say that, regarding the personal and organizational professionalization level (Table 4), for their own personalization level, respondents gave on average a score of 3.93 and scored their organization's professionalization level 3.75 on average. Skewing and kurtosis showed normal distribution in both cases. This difference implies that opportunities exist for further professionalization of the organizations if they utilize members' knowledge.

If we want to analyze the relationship between perceived level of personal professionalization and the field of activity of the represented organization by using the test of homogeneity of variances and ANOVA, we can state that, at the 5% significance level, a connection exists between the two variables (p = 0.017). By using the same methods, we also find a relationship between the perceived level of organizational professionalism and the field of activity of the represented organization (p = 0.000).

The data from our research also show that the higher the perceived level of the personal professionalization, the higher the perceived level of organization professionalization (Pearson correlation: 0.753**, Sig. (2-tailed) 0.000, strong and positive relationship. [H4]).

Table 3. Provider of the OD program and the Perceived Level of Professionalization (7-Point Scale, Mean)

Origin of the Organization Providing the OD program	Level of Personal Professionalism	Level of Organizational Professionalism
Hungary	4.67	4.50
EU	5.03	4.81
Foreign	4.87	4.87

Source: Authors' own data

Table 4. Comparison of Perceived Level of Personal and Organizational Professionalization

Characteristics	Personal	Organizational
	Professionalism	
N	776	774
Mean	3.93	3.75
Std. deviation	1.584	1.598
Mode	5	3
Skewness	-.158	-.699
Std. Error of Skewness	0.88	0.88
Kurtosis	-.632	-.763
Std. Error of Kurtosis	.175	.176

Source: Authors' own data

Observing the connection between the professionalization level of the organization and the age of the organization, we can conclude that those organizations that achieved the highest professionalization level (4.10) had been operating for 9 to 15 years whereas the lowest level was characteristic of organizations that had existed for 1 to 3 years (2.88). The difference between these values also supports our assumptions regarding the connection among age, development, and professionalism at both the individual and organizational levels.

4.2 Limitations of present study and opportunities for future research

As the survey results demonstrated, the OD programs helped people and organizations learn and improve their skills and knowledge and become more professional in their service. Hence, it is a good tendency not only to look at the targeted community that these organizations serve, but also take care of the organization. The finding that the OD programs and OD providers influence the subjective professionalization level of the individual can facilitate a better choice of OD program.

The research limitations are twofold. In some cases, although it was clear that there was a difference between the different categories, some tests to prove it with a more sophisticated method could not be carried out because the sample did not satisfy certain criteria of that method. The comparability of the results with research in other countries is limited as most papers address a diversity of topics related to country-specific problems of professionalization as mentioned in the theoretical part of the paper (Dill, 2014; Korolczuck, 2014; Strečansky & Stoláriková, 2012). However, this also suggests the possibilities for further research to be expanded internationally based on the existing experiences and to be deepened and broadened.

5 Conclusion

Through an analysis of writings and examples from actual practice, this article has provided evidence of the fact that nonprofit organizations feel the importance of organizational development from the perspective of their sustainable existence. As the survey results demonstrated, OD programs help nonprofit organizations learn and improve their skills and knowledge and become more professional in their services.

The findings support our hypotheses that OD programs and OD providers influence the subjective professionalization level of the individual and of the organization and that a strong positive relationship exists between personal and organizational professionalism. The hypotheses were verified, and the answer to the research question is that organizational development is a suitable tool to promote and enhance the professionalization of nonprofit organizations.

However, our research should also be compared with research in other countries. Future research could be expanded internationally and Phase 4 interviews deeply analyzed.

This paper contributes to the knowledge of the professionalization in the nonprofit sector not only in Hungary, but also in other post-socialist countries. As a result, Western counterparts can also see the development of the sector in this region.

References

1. Alfirević, N., Pavičić, J., Najev Čačija, L. (2014). Performance of non-profit organizations: Empirical contrasts between privately and publicly funded Croatian humanitarian organizations. *Economic Annals*, *LIX*(8), 115–129. http://dx.doi.org/10.2298/EKA1400115A
2. Al-Tabbaa, O., Leach, D., & March, J. (2014). Collaboration between nonprofit and business sectors: A framework to guide strategy development for nonprofit organizations. *Voluntas, 25*(3), 657–678. http://dx.doi.org/10.1007/s11266-013-9357-6
3. Billis, D. (2010). From welfare bureaucracies to welfare hybrids. In D. Billis (Ed.), *Hybrid organizations and the third sector: Challenges for practice, theory and policy* (pp. 3–24). London: Palgrave Macmillan.
4. Bradach, J. L., Tierney, T. J., & Stone, N. (2008). Delivering on the promise of nonprofits. *Harvard Business Review*, *December*, 88–97.
5. Čada, K., & Ptačková, K. (2014). Between clients and bureaucrats: An ambivalent position of NGOs in the social inclusion agenda in Czech statutory cities. *Policy and Society*, 129–139. http://dx.doi.org/10.1016/j.polsoc.2014.05.003
6. Callanan, L., Gardner, N., Mendonca, L., & Scott, D. (2014). What social-sector leaders need to succeed. *Insights and Publications*, *November*, 1–10. Retrieved from http://www.mckinsey.com/insights/social_sector/what_social_sector_leaders_need_to_succeed
7. Chad, P., Kyriazis, E., & Motion, J. (2014). Bringing marketing into non-profit organisations: A managerial nightmare! *Australasian Marketing Journal*, *22*, 342–349. http://dx.doi.org/10.1016/j.ausmj.2014.09.003
8. Chen, B., & Graddy, E. A. (2010). The effectiveness of nonprofit lead-organization networks for social service delivery. *Nonprofit Management and Leadership*, *20*(4), 405–422. http://dx.doi.org/10.1002/nml.20002
9. Clark, W. (2012). Introducing strategic thinking into a non-profit organization to develop alternative income streams. *Journal of Practical Consulting, 4*(1), 32–42.
10. Cousins, J. B., Goh, S. C., Elliott, C., Aubry, T., & Gilbert, N. (2014). Government and voluntary sector differences in organizational capacity to do and use evaluation. *Evaluation and Program Planning, 44*(June), 1–13. http://dx.doi.org/10.1016/j.evalprogplan.2013.12.001

11. Cummings, T. G., & Worley, C. G. (2008). *Organization development & change*. Mason, GA: South-Western Cengage Learning.
12. Davie, G. (2011). Social entrepreneurship. A call for collective action. *OD Practitioner*, *43*(1), 17–23.
13. Dill, A. P. (2014). Health care and disability NGOs in Croatia: State relations, privatization, and professionalism in an emerging field. *Voluntas*, *25*(5), 1192–1213. http://dx.doi.org/10.1007/s11266-014-9440-7
14. Dill, A. P., Zrinščak, S., & Coury, J. M. (2012). Nonprofit leadership development in the post-socialist context: The case of Croatia. *Administration in Social Work*, *36*(3), 314–341. http://dx.doi.org/10.1080/03643107.2011.602470
15. Dobrai, K., & Farkas, F. (2008). Knowledge-based organizations: Examining knowledge processes in public-serving nonprofit organizations. *International Journal of Knowledge, Culture and Change Management*, *8*(2), 9–22.
16. Epstein, M. J., & McFarlan, F. W. (2011). Nonprofit vs. for-profit boards. Critical differences. *Strategic Finance*, *March*, 28–35.
17. Evetts, J. (2011). A new professionalism? Challenges and opportunities. *Current Sociology*, *59*(4), 406–422. http://dx.doi.org/10.1177/0011392111402585
18. Green, A., & Hauser, J. (2012). *Managing to change the world. The nonprofit manager's guide to getting results.* San Francisco: Jossey-Bass.
19. Jackson, J. C. (2006). *Organization development. The human and social dynamics of organizational change*. Lanham: University Press of America, Inc.
20. Jäger, U. P., & Schröer, A. (2014). Integrated organizational identity: A definition of hybrid organizations and a research agenda. *Voluntas*, *25*(5), 1281–1306. http://dx.doi.org/10.1007/s11266-013-9386-1
21. Korolczuk, E. (2014). Promoting civil society in contemporary Poland: Gendered results of institutional changes. *Voluntas*, *25*(4), 949–967. http://dx.doi.org/10.1007/s11266-013-9388-z
22. Kreutzer, K. (2009). Nonprofit governance during organizational transition in voluntary associations. *Nonprofit Management and Leadership, 20*(1), 117–133. http://dx.doi.org/10.1002/nml.244
23. Lewis, D. (2001): *The management of non-governmental development organizations*. New York: Routledge. http://dx.doi.org/10.4324/9780203002162
24. Maister, D. (2003). *Managing the professional service firm*. London: Simon Schuster UK Ltd.
25. Mannsky, A., & Siebart, P. (2010). *Trends der Professionalisierung in Nonprofit-Organisationen*. Frankfurt am Main: PWC. Retrieved from https://www.pwc.de/de_DE/de/offentliche-unternehmen/assets/Trends_der_Professionalisierung_in_Nonprofit-Organisationen.pdf
26. Millesen, J. L., Carman, J. G., & Bies, A. L. (2010). Why engage? Understanding the incentive to build nonprofit capacity. *Nonprofit Management and Leadership, 21*(1), 5–20. http://dx.doi.org/10.1002/nml.20009
27. Neff, D. J., & Randal, C. (2011). *The future of nonprofits. Innovate and thrive in the digital age*. Hoboken, NJ: John Wiley & Sons, Inc. http://dx.doi.org/10.1002/9781118386781
28. Raia, A. P. (1972). Organizational development—Some issues and challenges. *California Management Review*, *14*(4), 13–20. http://dx.doi.org/10.2307/41164378
29. Rakar, T., & Kolarič, Z. (2010). A szlovén non-profit szektor sajátos hely(zete) a posztszocialista országok között (Special position of the Slovenian non-profit sector among the post-socialist countries). *Civil Szemle (Civil Review)*, *2*, 75–87.
30. Rakar, T., Vrbica, S. Š., Deželan, T., Kolarič, Z., Črnak-Meglič, A., Nagode, M., & Matoz Ravnik, A. (2011). *CIVICUS Civil Society Index analytical country report for Slovenia, 2010. Towards maturity: challenges for Slovenian civil society.* Ljubljana: Social Protection Institute of the Republic of Slovenia Retrieved from http://civicus.org/downloads/CSI/Slovenia.pdf
31. Roberts, S. M., Jones, J. P. III, & Fröhling, O. (2005). NGOs and the globalization of managerialism: A research framework. *World Development*, *33*(11), 1845–1864. http://dx.doi.org/10.1016/j.worlddev.2005.07.004
32. Salamon, L. M. (Ed.) (2012). *The state of nonprofit America*. Washington, DC: Brookings Institution Press.
33. Salamon, L. M., & Anheier, H. K. (1992). *In search of the nonprofit sector II: The problem of classification.* Baltimore: The Johns Hopkins University Institute for Policy Studies.
34. Statisztikai Tükör (Statistical Mirror) (2014). A nonprofit szektor legfontosabb jellemzői, 2013 (The most important characteristics of the nonprofit sector, 2013). *Statisztikai Tükör (Statistical Mirror), 142*, 19.
35. Strečansky, B., & Stoláriková, K. (2012). Social economy and social enterprises in Slovakia. *Civil Szemle (Civil Review)*, *9*(4), 87–100.
36. Tschirhart, M., & Bielefeld, W. (2012). *Managing nonprofit organizations*. Hoboken, NJ: John Wiley & Sons, Inc.
37. Wellens, L., & Jegers, M. (2013). Effective governance in nonprofit organizations. A literature based multiple stakeholder approach. *European Management Journal*, 1–21.
38. Wirtenberg, J., Backer, T. E., Chang, W., Lannan, T., Applegate, B., Conway, M., … & Slepian, J. (2007). The future of organization development in the nonprofit sector. *Organization Development Journal*, *25*(4), 179–195.

Acknowledgments: The authors are grateful to the Hungarian Scientific Research Fund project No. 101886 for supporting the research "Knowledge-based services—Professionalization of nonprofit organizations," analyzed in the paper. This paper is dedicated to the 650th anniversary of the establishment of the University of Pécs, Hungary.

Authors

Katalin Dobrai, Ph.D., is an associate professor at the Department of Leadership and Organizational Sciences of the Faculty of Business and Economics of the University of Pécs. Her teaching areas include leadership and organization, knowledge management, and human resource management. Her research focuses on knowledge management and organizational learning in knowledge-intensive businesses and nonprofit organizations. Postal address: 7622 Pecs, Rakoczi str. 80, Hungary; Phone: (36) 72/ 501599 ext. 23132, e-mail: dobrai@ktk.pte.hu

Ferenc Farkas, Ph.D., is a full professor at the Department of Leadership and Organizational Sciences of the Faculty of Business and Economics of the University of Pécs. His teaching areas include change management, organizational behavior, and leadership. His research interest focuses on nonprofit management and leadership as well as HRM. He has been the team leader of Hungarian and international projects, financed by the EU and the Hungarian government. Postal address: 7622 Pecs, Rakoczi str. 80, Hungary; Phone: (36) 72/ 501599 ext. 23130, e-mail: farkas@ktk.pte.hu

Neprofitne organizacije z vidika organizacijskega razvoja in njegovega vpliva na profesionalizacijo

Izvleček

Cilj tega članka je predstaviti fenomen, ki se imenuje profesionalizacija in ki ga je mogoče opaziti v organizacijah neprofitnega sektorja. Empirična analiza je bila izvedena v madžarskih neprofitnih organizacijah, podatki pa so bili pridobljeni v okviru deželne raziskave. Z analizo raziskovalnih izsledkov omogoča članek globlji vpogled v znanje o profesionalizacijskih trendih v neprofitnem sektorju. V članku dokazujemo, da organizacijski razvoj pozitivno vpliva na izboljšanje ravni profesionalizacije v neprofitnih organizacijah in pri njihovih članih.

Ključne besede: organizacijski razvoj, neprofitne organizacije, profesionalizacija, učenje, znanje

The Analysis of Barriers in Succession Processes of Family Business with the Use of Grey Incidence Analysis (Polish Perspective)

Ewa Więcek-Janka
Poznan University of Technology, Poznan, Poland
ewa.wiecek-janka@put.poznan.pl

Rafał Mierzwiak
Poznan University of Technology, Poznan, Poland
rafal.mierzwiak@put.poznan.pl

Joanna Kijewska
Poznan University of Technology, Poznan, Poland
joanna.kijewska@put.poznan.pl

ORIGINAL SCIENTIFIC PAPER

RECEIVED: FEBRUARY 2016

REVISED: APRIL 2016

ACCEPTED: MAY 2016

DOI: 10.1515/ngoe-2016-0010

UDK: 334.722.24

JEL: D64, L26, M12

Citation: Więcek-Janka, E., Mierzwiak, R., & Kijewska, J. (2016). The Analysis of Barriers in Succession Processes of Family Business with the Use of Grey Incidence Analysis (Polish Perspective). *Naše gospodarstvo/Our Economy, 62*(2), 33–41. DOI: 10.1515/ngoe-2016-0010

Abstract

The article presents results of research on the identification and evaluation of barriers faced by successors in family businesses during the first process of succession. The analysis of empirical material used grey systems theory, which was considered as an equivalent for the analysis of small samples and qualitative research. While conducting the literature review and empirical study, the authors concentrated on (a) the identification of barriers in the development of family firms and (b) eliciting the perspective of the new generation of owners in family firms entering the succession process through an empirical analysis of the assessed level of risk in relationships with family and business.

Keywords: Family business, grey incidence analysis, grey system theory

1 Introduction

Succession in a family firm can be discussed in various contexts—namely, as an act finalizing the period of management of one generation, without which it is difficult to define a company as a family business (Barach & Ganitsky, 1995; Ganitsky, Carson, & Doochin, 1988; Litz, 1995; Sharma, 2002; Ward, 1987); as a process that accompanies the owners and successors during the generation change (Astrachan & Kolenko, 1994; Astrachan & Shanker, 2003; Blake & Saleh, 1995; Budge & Janoff, 1991; Cadieux, Lorrain, & Hugron, 2002; Danco, 1975; Davis, 1982; Klein 2000; Duh, 2003; Duh, Belak, & Milferner, 2010; Dyer, 2006; Dyer, 2003; Letonja & Duh, 2015); and as a systemic challenge that changes the view on the components of a family firms, redefines the norms and values, and influences business and family relations (Więcek-Janka, 2013). While discussing succession, one ought to look at a family firm as a system. The main challenge for explicitly defining the notions of family enterprise or family firm is the difficulty in the proper conceptualization of the level of component dependency,

NG
OE

NAŠE GOSPODARSTVO
OUR ECONOMY

Vol. 62 No. 2 2016

pp. 33 – 41

which is its immanent feature. Kepner (1991) considered that the strands of the family and business system are so tightly intertwined that it is impossible to disentangle them without seriously damaging one of them. Budge and Janoff (1991) conducted research to explain how business families draw from two discourses—the family and the business—to communicate and to understand themselves and the world. Similar research was conducted by Swagger (1991) who, studying the succession process in family firms, was analyzing the pattern of relationships among all the members of the generation of successors—namely, sons and daughters, including their spouses. He was interested in the influence of the relationships among the members of the next generation and their personal needs. In these approaches, the functioning spheres of the individuals, family, and business are combined within the framework of the concept of multigenerationality. The aforementioned fields (strands and discourses) are governed by different rules, needs, and values. Part of them function in co-existence, and some of them generate the effect of positive synergy; yet some have a negative influence. Maintaining a relative balance between fields defined in this manner forces the owners to engage in constant activity in order to merge the interests of these fields and redefine the values and order governing them. For the needs of this article, the authors adopted a definition that takes this division into account. Thus, a family enterprise is defined as:

> a market organism trigonal in its structure, encompassing family, business and individuals, which functions according to various, but mutually adapted objectives, and which devotes its energy to accomplishing them in multigenerational perspective by management and the control over its functioning and ownership (Więcek-Janka, 2013, p. 35).

Many researchers and practitioners in the circle of family entrepreneurship have expressed the opinion that the responsibility for ensuring succession rests chiefly on the founders and owners of these firms (Danco, 1975). The remaining ones relate to the success of the succession process with the traits, competencies, and experiences of the subsequent generations (Barnes, 1988; Aldrich & Cliff, 2003; Handler & Kram, 1989; Dunk, Jimenez, Sarotar Zizek, Milfelner & Kallus, 2015). The scientific papers also include a view that succession depends on family values and upbringing models employed by the parents (Arnoff, McClure, & Ward, 2012; Davis, 1982; Handler & Kram, 1989; Kedmenec, Sebjan, & Tomic, 2015). Lansberg (1988) treated the succession process as "a change which influences the functioning the whole system of family and business, including the family members, and the environment meant as the suppliers, customers and local economy" (p. 120). The authors of the article acknowledge a similar approach to succession and treat succession as a planned change (Letonja & Duh, 2015; Więcek-Janka, 2013). A planned change can help impede conflicts and secure the relationships within the family, especially considering that succession process usually involves resistance—first at the planning level and later in the realization itself—which concerns the founders themselves (the seniors), the successor, the remaining members of the family, and finally non-family employees. Family enterprises frequently postpone the decision about entering the succession process in order to avoid problems and conflicts that can be related to it.

In the context of multigenerationality, one ought to strive for the recognition of succession as a systematic change, accomplished at the pre-assumed period of time, such as every 25 years (with the assumption of a family firm's proper course of development). Hence, what can the planned and systematic successional change be linked with, apart from the time frames? It can consist in a deliberate and organized search for and shaping of the opportunities to accomplish the objectives concerning upbringing and education, oriented toward preparing first the successor, second the senior to assume a new social role, and third the environment to accept the new (Duh et al., 2010; Więcek-Janka, 2011).

The aim of this article is to identify and analyze the barriers that may emerge in the succession process, especially barriers concerning the successors themselves. While conducting the literature review and empirical study, the authors concentrated on (a) the identification of barriers in the development of family firms and (b) the elicitation of the perspective of the new generation of owners in family firms entering the succession process, through an empirical analysis of the assessed level of risk of encountering the identified barriers in their personal succession-related experiences.

Due to the complex characteristics of barriers' identification in the functioning of family firms, especially succession, the accomplished studies ought to be treated not as responses to detailed questions, but as a complementary situational study, drawing from the experiences of the experts, including the founders of the companies, as well as the successors from the next generation.

2 Description of the Collected Empirical Material

The study was conducted in two stages, employing two research methods: an in-depth group interview and a survey. The objective of the first stage was the identification of the barriers in the succession process, based on the opinion of the successors in Polish family firms according to their responses during in-depth group interviews. The results of

the conducted survey allowed for the classification of the barriers in the succession process into two groups: internal and external ones. Internal barriers are related to personal traits comprising knowledge, competencies, and personality, while the external ones encompass market conditions, culture along with family and business values, and finally interpersonal relationships. The model of successors' barriers in the succession process, taking their source into account, is presented in Table 1.

The study of Polish successors was conducted using an elaborate methodology whose chief objective was to elicit the subjectively identified barriers in the succession process. The statements had open characteristics and were obtained during two in-depth group interviews with successors entering the succession process (n = 25). In a survey led by a moderator, the interviewees presented their experiences related to the process of succession and the emotions associated with it. In one of the stages of the interview, the respondents were asked to name several (between 3 and 5) barriers that, in their opinion, impede the succession process. The obtained list of barriers is presented in Table 2.

In the surveyed sample, fear was identified as a significant barrier. During the interview, the analysis of this category was deepened. As it turned out, fear in the succession process can be interpreted differently and can have different backgrounds. Hence, fear was divided into several different categories: fear of responsibility, fear of criticism, fear of competition, and fear of being unsuccessful.

In the second stage of the study, the successors themselves assessed the impact that the identified successors' barriers have. The test group consisted of successors of Polish family firms in the course of the succession process (n = 25). The identified barriers (X_1–X_{19}) were included in the questionnaire and submitted for assessment in a five-point scale, where the influence of the identified barriers on the successor was rated as 1 (has no influence), 2 (has little influence), 3 (has a moderate influence), 4 (has a rather large influence), or 5 (has considerable influence). The following symbols were used: X_1 = lack of professional training; X_2 = lack of experience; X_3 = bad relations with parents; X_4 = other plans; X_5 = successor is too young; X_6 = large number of successors; X_7 = lack of perspectives for development of the

Table 1. Barriers to Successors, Identified by Experts from Foreign Academic Centers

Successors' internal barriers	External barriers
Personality-related: • Inability to accept change • Limited resistance to stress • Inclination to impose one's own will instead of listening to others • Inexorability • Lack of sensitivity to other people's needs • Lack of openness	Market conditions: • Competition from larger companies • Not realizing the requirements of globalization
Level of knowledge: • Experience • Professionalism • Lack of commitment	Culture and values: • The senior's approach and employees' attitude • Maladjustment to work requirements after the freedom successors had when growing up • Lack of knowledge about organizational culture • Questionable attitude to honesty
Competencies: • Problems with communication • Lack of ability to work in a group • Lack of creativity and innovativeness	Interpersonal relations: • Large number of successors • Distorted family relationships

Source: Authors' own data

Table 2. Classification of Identified Barriers in Succession Process from Successors' Perspective (n = 25)

Internal barriers	External barriers
Fears (encompassing several indications)	Bad relations with parents
Lack of professional training	The number of successors
Lack of experience	Uncertainty
Lack of practical experience	Unfamiliarity with the trade
Other points of interest	Lack of perspectives for development of the firm
Other plans (including reluctance to run a business)	Lack of capital
Too young age	Bureaucracy
	Young age of the present owner

Source: Authors' own data

firm; X_8 = fear of responsibility; X_9 = fear of being unsuccessful; X_{10} = fear of criticism; X_{11} = reluctance to run a business; X_{12} = lack of capital; X_{13} = large competition in the market; X_{14} = uncertainty; X_{15} = bureaucracy; X_{16} = young age of the present owner; X_{17} = lack of practical experience; X_{18} = other points of interest; and X_{19} = unfamiliarity with the trade. The questionnaire also included questions about the completed succession process (X_0) and whether the company possessed a business model (X_{21}). The responses to these questions were coded in a 0–1 scale, where 0 meant "no" and 1 meant "yes." Moreover, the respondents were asked how they assessed the strategies implemented in their firm (X_{20}). They answered this question using a five-point Likert scale. The collation of results obtained in the conducted study is presented in Table 3.

The largest barrier, often paralyzing the successor in the succession process, is the fear of responsibility. Both the weighted means and the dispersion of results indicated that this barrier was the most challenging according to successors. The next two barriers, also related to successors' personality traits, were fear of criticism from parents, seniors, and firm employees and fear of competition, understood as the competition within the family and competition on the market. The obtained data allowed us to elaborate on the visualization of the profile of the successors' largest barriers in the succession process of Polish family firms, as illustrated in Figure 1.

3 Research Methodology Using a Grey Incidence Analysis

Due to the small sample, composed of the representatives of 25 family enterprises, the analysis of the results was conducted using a grey incidence analysis (Liu & Yi, 2006; Mierzwiak & Więcek-Janka, 2015). The main objective of

Table 3. *Results of Empirical Study*

No.	X_0	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	X_{20}	X_{21}
1	0	5	4	3	3	3	3	4	3	3	3	3	4	4	5	4	4	3	4	3	0
2	0	4	4	4	4	4	5	4	4	4	3	5	4	4	5	4	4	3	4	1	0
3	1	5	5	3	3	3	3	3	3	3	2	4	4	2	1	3	2	2	1	3	1
4	0	4	3	3	3	4	4	5	3	3	5	4	4	4	3	3	4	3	2	2	0
5	0	2	5	4	4	5	4	1	2	5	4	4	3	4	3	4	3	4	5	1	0
6	1	3	2	2	2	2	3	2	2	2	3	3	3	3	3	4	3	1	3	3	1
7	0	4	3	3	3	3	3	3	3	4	3	3	4	4	2	3	4	4	2	3	1
8	0	5	5	3	3	4	4	3	3	3	3	3	4	4	4	3	4	3	2	3	0
9	0	3	3	4	3	4	3	4	4	4	3	4	3	3	4	3	3	4	3	2	0
10	1	2	3	3	3	1	1	3	3	2	2	1	3	3	3	3	4	3	1	3	1
11	1	4	3	2	3	2	1	1	1	1	1	3	3	3	3	3	2	2	3	3	1
12	0	5	4	5	3	3	5	5	5	5	5	3	3	3	5	3	5	5	3	1	0
13	1	4	4	4	1	2	3	4	3	1	1	3	3	2	4	2	3	2	4	3	1
14	0	5	4	5	3	3	3	3	4	3	3	3	5	5	5	4	4	3	3	1	0
15	0	3	3	2	2	5	5	3	3	3	3	4	2	2	4	4	4	4	4	2	1
16	0	3	3	3	3	3	3	3	3	3	4	4	4	3	5	4	4	4	3	2	1
17	0	3	4	5	3	3	4	3	4	5	5	5	4	3	2	3	3	3	3	2	0
18	1	2	3	3	4	3	2	3	3	4	3	3	3	3	3	3	3	1	1	3	1
19	0	5	5	5	5	4	5	5	5	5	5	5	4	4	3	4	4	4	4	1	0
20	0	5	4	4	4	4	4	3	3	3	3	4	4	5	3	4	4	4	3	1	0
21	0	5	4	2	3	3	4	4	3	5	5	5	4	4	3	4	4	4	3	1	0
22	0	4	3	3	3	3	4	4	3	3	3	3	4	3	3	3	4	2	3	2	1
23	1	3	2	2	2	3	4	4	4	3	3	3	2	3	3	2	4	2	1	3	1
24	1	3	3	3	3	3	3	3	4	4	4	4	3	3	3	3	3	3	2	3	1
25	0	4	4	4	4	4	3	3	3	3	3	4	4	3	4	4	4	3	3	1	0

Source: Authors' own data.

Figure 1. Profile of barriers in succession process from the successor's point of view (*n* = 25).

Results are expressed as the weighted means.
Source: Author's own data

employing this method was to discover the relationships between the identified barriers and undergoing the succession process by a firm, possessing the company's own business models and undergoing the succession process by a firm, as well as the assessment of strategy realisation and undergoing the succession process by a firm. (Więcek-Janka & Mierzwiak, 2015, p 310).

In order to determine the influence of particular barriers on the succession process, the absolute degree of grey incidence process was applied in order to measure the correlation between the sequences (Liu & Yi, 2006).

Assuming that X_0 is a description of the surveyed enterprise system and that the relevant factors are X_1–X_{19}, the calculation is as follows (Liu & Yi, 2006):

1. Computing zero starting point images of X_0 and X_i

$$X_i D = (x_i(1)d, x_i(2)d, ..., x_i(n)d), k = 1,2,...,25$$
$$x_i(k)d = x_i(k) - x_i(1) \quad (1)$$

X'_0 (0,0,1,0,0,1,0,0,0,1,1,0,1,0,0,0,0,1,0,0,0,0,1,1,0)
X'_1 (0,0,2,0,1,0,0,0,0,-1,2,2,1,2,-2,0,0,0,1,1,0,1,0,0,2)
X'_2 (0,-1,0,-1,-3,-2,-1,0,-2,-3,-1,0,-1,0,-2,-2,-2,-3,0,0,0,-1,-2,-2,-1)
X'_3 (0,0,1,-1,1,-2,-1,1,-1,-1,-1,0,0,0,-1,-1,0,-1,1,0,0,-1,-2,-1,0)
X'_4 (0,1,0,0,1,-1,0,0,1,0,-1,2,1,2,-1,0,2,0,2,1,-1,0,-1,0,1)
X'_5 (0,1,0,0,1,-1,0,0,0,0,0,0,-2,0,-1,0,0,1,2,1,0,0,-1,0,1)
X'_6 (0,1,0,1,2,-1,0,1,1,-2,-1,0,-1,0,2,0,0,0,1,1,0,0,0,0,1)
X'_7 (0,2,0,1,1,0,0,1,0,-2,-2,2,0,0,2,0,1,-1,2,1,1,1,1,0,0)
X'_8 (0,0,-1,1,-3,-2,-1,-1,0,-1,-3,1,0,-1,-1,-1,-1,-1,1,-1,0,0,0,-1,-1)
X'_9 (0,1,0,0,-1,-1,0,0,1,0,-2,2,0,1,0,0,1,0,2,0,0,0,1,1,0)
X'_{10} (0,1,0,0,2,-1,1,0,1,-1,-2,2,-2,0,0,0,2,1,2,0,2,0,0,1,0)
X'_{11} (0,0,-1,2,1,0,0,0,0,-1,-2,2,-2,0,0,1,2,0,2,0,2,0,0,1,0)
X'_{12} (0,2,1,1,1,0,0,0,1,-2,0,0,0,0,1,1,2,0,2,1,2,0,0,1,1)
X'_{13} (0,0,0,0,-1,-1,0,0,-1,-1,-1,-1,-1,1,-2,0,0,-1,0,0,0,0,-2,-1,0)
X'_{14} (0,0,-2,0,0,-1,0,0,-1,-1,-1,-1,-2,1,-2,-1,-1,-1,0,1,0,-1,-1,-1,-1)
X'_{15} (0,0,-4,-2,-2,-2,-3,-1,-1,-2,-2,0,-1,0,-1,0,-3,-2,-2,-2,-2,-2,-2,-1)
X'_{16} (0,0,-1,-1,0,0,-1,-1,-1,-1,-1,-1,-2,0,0,0,-1,-1,0,0,0,-1,-2,-1,0)
X'_{17} (0,0,-2,0,-1,-1,0,0,-1,0,-2,1,-1,0,0,0,-1,-1,0,0,0,0,0,-1,0)
X'_{18} (0,0,-1,0,1,-2,1,0,1,0,-1,2,-1,0,1,1,0,-2,1,1,1,-1,-1,0,0)
X'_{19} (0,0,-3,-2,1,-1,-2,-2,-1,-3,-1,-1,0,-1,0,-1,-1,-3,0,-1,-1,-1,-3,-2,-1)

2. Calculating

$$|s_0|, |s_1|, |s_2|, ..., |s_{19}|, |s_1 - s_0|, |s_2 - s_0|, |s_3 - s_0|, ..., |s_{19} - s_0|.$$

$$|s_i| = \left|\sum_{k=2}^{n-1} x_i^0(k) + \frac{1}{2}x_i^0(n)\right|,$$
$$|s_j| = \left|\sum_{k=2}^{n-1} x_j^0(k) + \frac{1}{2}x_j^0(n)\right|, \quad (2)$$
$$|s_i - s_j| = \left|\sum_{k=2}^{n-1}[x_i^0(k) - x_j^0(k)] + \frac{1}{2}[x_i^0(n) - x_j^0(n)]\right|.$$

$|s_0| = 8, |s_1| = 11, |s_2| = 29{,}5, |s_3| = 10, |s_4| = 8{,}5, |s_5| = 1{,}5, |s_6| = 5{,}5, |s_7| = 11,$
$|s_8| = 16{,}5, |s_9| = 6, |s_{10}| = 9, |s_{11}| = 7, |s_{12}| = 14{,}5, |s_{13}| = 12, |s_{14}| = 15{,}5,$
$|s_{15}| = 38{,}5, |s_{16}| = 16, |s_{17}| = 10, |s_{18}| = 1, |s_{19}| = 29{,}5.$

$|s_1 - s_0| = 3, |s_2 - s_0| = 37{,}5, |s_3 - s_0| = 18, |s_4 - s_0| = 0{,}5,$
$|s_5 - s_0| = 6{,}5, |s_6 - s_0| = 2{,}5, |s_7 - s_0| = 3, |s_8 - s_0| = 24{,}5,$
$|s_9 - s_0| = 2, |s_{10} - s_0| = 1, |s_{11} - s_0| = 1, |s_{12} - s_0| = 6{,}5,$
$|s_{13} - s_0| = 20, |s_{14} - s_0| = 23{,}5, |s_{15} - s_0| = 46{,}5, |s_{16} - s_0| = 24,$
$|s_{17} - s_0| = 18, |s_{18} - s_0| = 7, |s_{19} - s_0| = 37{,}5.$

3. Computing the absolute degree of grey incidence

$$\varepsilon_{ij} = \frac{1 + |s_i| + |s_j|}{1 + |s_i| + |s_j| + |s_j - s_i|} \quad (3)$$

$\varepsilon_{01} = 0{,}87; \varepsilon_{02} = 0{,}507; \varepsilon_{03} = 0{,}514; \varepsilon_{04} = 0{,}972; \varepsilon_{05} = 0{,}618; \varepsilon_{06} = 0{,}853;$
$\varepsilon_{07} = 0{,}87; \varepsilon_{08} = 0{,}51\ \varepsilon_{09} = 0{,}882; \varepsilon_{0,10} = 0{,}947; \varepsilon_{0,11} = 0{,}941; \varepsilon_{0,12} = 0{,}783;$
$\varepsilon_{0,13} = 0{,}512; \varepsilon_{0,14} = 0{,}51; \varepsilon_{0,15} = 0{,}505; \varepsilon_{0,16} = 0{,}51\ \varepsilon_{0,17} = 0{,}514;$
$\varepsilon_{0,18} = 0{,}588; \varepsilon_{0,19} = 0{,}507$

Based on the absolute degree of grey incidence coefficient, we identified the following arrangement of the influence of the barriers on succession process: X_4 (other plans) > X_{10} (fear of criticism) > X_{11} (reluctance to run a business) > X_9 (fear of being unsuccessful) > X_1 (lack of professional training) > X_7 (lack of perspectives for development of the firm) > X_6 (large number of successors) > X_{12} (lack of capital) > X_5 (successor is too young) > X_{18} (other points of interest) > X_3 (bad relationships with parents) > X_{17} (lack of practical experience) > X_{13} (large competition on the market) > X_{14} (uncertainty) > X_{16} (young age of the present owner) > X_8 (fear of responsibility) > X_2 (lack of experience) > X_{19} (unfamiliarity with the trade) > X_{15} (bureaucracy).

In order to determine the relationship among the company's business models (X_{21}), the assessment of strategy realization (X_{20}), and the company's succession process, the absolute degree of grey incidence method was employed again, resulting in the following calculations:

1. Computing zero starting point images of X_0, X_{20}, and X_{21} based on formula (1)

X_0 (0,0,1,0,0,1,1,0,0,1,1,0,1,0,1,1,0,1,0,0,0,1,1,1,0)

X_{20} (0,-2,0,-1,-2,0,0,0,-1,0,0,-2,0,-2,-1,-1,-1,0,-2,-2,-2,-1,0,0,-2)

X_{21} (0,0,1,0,0,1,0,0,0,1,1,0,1,0,0,0,0,1,0,0,0,0,1,1,0)

2. Calculating $|s_0|, |s_{20}|, |s_{21}|, |s_{20} - s_0|, |s_{21} - s_0|$ based on formula (2)

$|s_0| = 8, |s_{20}| = 21, |s_{21}| = 12.$

$|s_{20} - s_0| = 29, |s_{21} - s_0| = 4.$

3. Computing the absolute degree of grey incidence based on formula (3)

$\varepsilon_{0,20} = 0{,}508; \varepsilon_{0,21} = 0{,}84 \Rightarrow$
X_{21} (there is a business model) > X_{20} (strategic planning)

The absolute degree of grey incidence indicated the relationship between the system's factors (X_{21}, X_{22}) and characteristics (X_0). The relationship was assessed using the geometric similarities of its sequences. The higher the value of the absolute degree of grey incidence, where the lowest value of the relative relational degree is 0.5 (Xie & Liu, 2009), the higher the similarity between the system's factors and characteristics is. Therefore, having a company's own business model (X_{21}) is related more to the ongoing succession when compared to the strategy realization (X_{20}).

4 Conclusions

The obtained material allowed the researchers to verify the elaborated provisional model, which has been considerably changed as a result of the conducted analysis. The results of the study indicated a distinct arrangement of the barriers influencing the succession process in the opinion of the successors in Polish family firms. Barrier X_4 (other plans) ought to be considered the most significant barrier after the verification of the model, as the value of absolute degree of grey incidence equaled 0.972. The obtained result is close to the result obtained for the succession process. Enterprises in which this barrier received the highest rating have not undergone the succession process thus far.

The next significant barrier was X_{10} (fear of criticism) with a value of 0.947. Successors assessed this barrier similarly to X_4, and the explanation of such behavior of variables can be the thesis that this barrier is primordial to the previously discussed one. It might be shaped in the process of upbringing and socialization, even it successors' early years. Fear of criticism might be built into the individual value system, and the idiosyncratic defense mechanism of a particular personality reacted with transference (Valliant, 2005). Due to such a mechanism, a more objective barrier emerged—namely, the socially accepted other plans. Another barrier might be shaped on the basis of the same mechanism and is related to the declared reluctance to run a business (X_{11}), with an equally high absolute degree of grey incidence amounting to 0.941. Other barriers distinguished and highly correlated to undergoing the succession process belong to the group

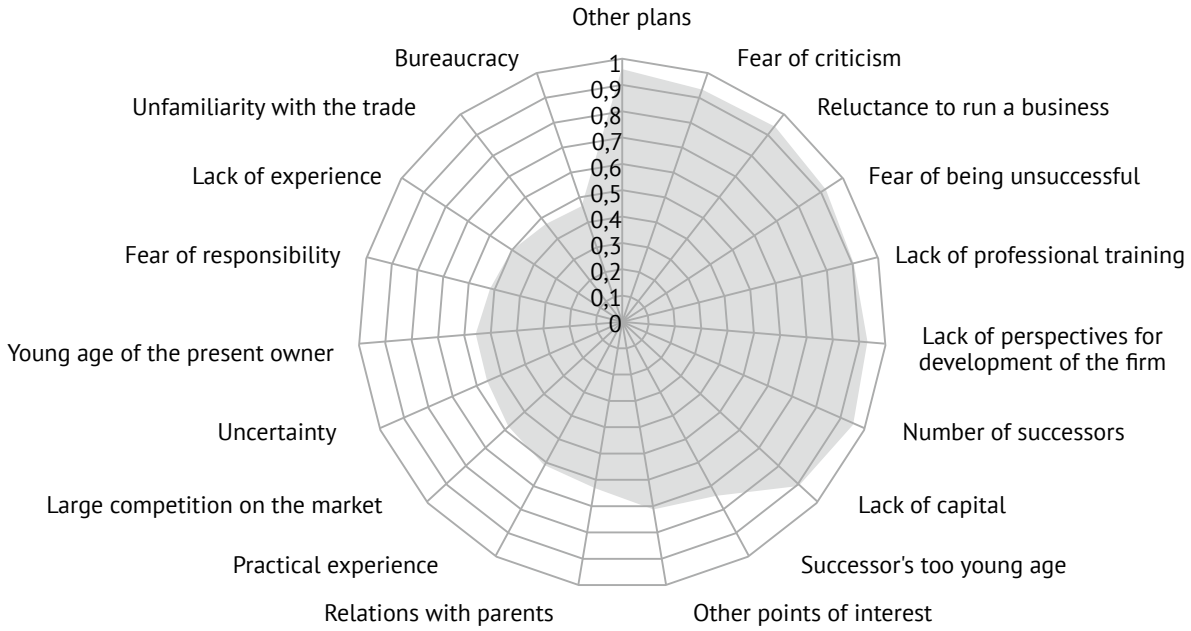
of primordial barriers shaped over the years of socialization and formation (or rather their absence) of social and entrepreneurial competencies. They encompass X_9 (fear of being unsuccessful) with the result of 0.882, X_1 (perceived lack of professional training) with the result of 0.870, and X_7 (lack of perspectives for development of the firm) with exactly the same result.

The barriers indicated and verified according to the presented methodology also suggested the capability to assess one's own competencies as a successor[1] and knowledge of market conditions of family business functioning. The number of successors (X_6) with the result amounting to 0.870 has an equally large influence on the positive course of succession. The remaining identified barriers in the succession process did not receive such considerable results from the absolute degree of grey incidence analysis, indicating that their relation to the course of succession process is not as close.

The original view obtained on the classification of barriers in the Polish succession process did not considerably diverge from the psychodynamic approach, which explains that people have a natural tendency to maintain an equilibrium of the mind and actions and make their decisions rationally. Moreover, the human psyche strives to drift away from the imbalanced state, leaving negative and often chaotic scenarios and thoughts, and attempts to reach a more stable condition leading to self-complacency. The respondents' assessments of the barriers in the succession process might have been drawn from their so-called pre-understanding, which is created from previous experiences and often shaped in early childhood (Anderson & Goolishian, 1992).

The employed methodology of the absolute degree of grey incidence enabled us to develop a final version of the model of successors' barriers in the course of the succession process in Polish family firms (see Figure 2).

Figure 2. Profile of barriers in succession process from successor's point of view (*n* = 25)



Source: Author's own data

The conducted study identified, for the first time in Poland, considerable deficiencies in the research carried out thus far. The obtained profile of statistical successors' barriers corroborated that the barriers to the succession of Polish successors can result from the inappropriate preparation of the younger generation to taking over the business. Hence, one can put forward a hypothesis, to be corroborated in further research, that the upbringing process lacks the ideas for shaping entrepreneurial competencies, which might be helpful in overcoming the fears that the successors have to face when taking over family firms.

[1] As presented in other studies by the research team.

References

1. Aldrich, H., & Cliff J. (2003). The pervasive effects of family on entrepreneurship, toward a family embeddedness perspective. *Journal of Business Venturing, 12,* 573–596. http://dx.doi.org/10.1016/S0883-9026(03)00011-9
2. Anderson, H., & Goolishian, H. (1992). The client is the expert: A not-knowing approach to therapy. In S. McNamee & K. Gergen (Eds.), *Social construction and the therapeutic process*. Newbury Park, CA: Sage.
3. Arnoff, C. E., McClure, S. L., & Ward, J. L. (2012). *Succession in family businesses* (*Sukcesja w firmach rodzinnyc*h). Kraków: MiP Publishing House.
4. Astrachan, J. H., & Kolenko, T. A. (1994). A neglected factor explaining family business success: Human resource practices. *Family Business Review*, *7*(3), 251–262. http://dx.doi.org/10.1111/j.1741-6248.1994.00251.x
5. Astrachan, J. H., & Shanker, M. C. (2003). Family businesses' contribution to the U.S. economy: A closer look. *Family Business Review*, *16*(3), 211–219.
6. Barach, J. A., & Ganitsky, J. B. (1995). Successful succession in family business. *Family Business Review*, *8*(2), 131–155. http://dx.doi.org/10.1111/j.1741-6248.1995.00131.x
7. Barnes, L. B. (1988). Incongruent hierarchies: Daughters and younger sons as company CEOs. *Family Business Review, 1*, 9–21. http://dx.doi.org/10.1111/j.1741-6248.1988.00009.x
8. Blake, C. G., & Saleh, D. D. (1995). A model of family owned small business performance. *Family Business Annual, 1*, 22–30.
9. Budge, G. S., & Janoff, R. F. (1991). Succession in women-owned family businesses: A case study. *Family Business Review*, *4*(4), 367–381. http://dx.doi.org/10.1111/j.1741-6248.1991.00367.x
10. Cadieux, L., Lorrain, J., & Hugron, P. (2002). Succession in women owned family businesses: A case study. *Family Business Review*, *15*, 17–30. http://dx.doi.org/10.1111/j.1741-6248.2002.00017.x
11. Danco, L. (1975). *Beyond survival—A business owner's guide for success*. Cleveland, OH: University Press.
12. Davis, J. A. (1982). *The influence of life stage on father–son relationships in the family firm* (Doctoral dissertation). Harvard Business School.
13. Duh, M. (2003). *Family business. Development in strategy management family business (Druzinsko podjetje. Razvoj in razvojni management druzinskego podjetia)*. MER Evrocenter, Maribor: Publishing House MER.
14. Duh, M., Belak, J., & Milfelner, B. (2010). Core values, culture and ethical climate as constitutional elements of ethical behaviour: Exploring differences between family and non-family enterprises. *Journal of Business Ethics, 97*, 473–489. http://dx.doi.org/10.1007/s10551-010-0519-9
15. Dunk, A., Jimenez, P., Sarotar Zizek, S., Milfelner B., & Kallus, W. K. (2015). Similarities and differences of health-promoting leadership and transformational leadership. *Our Economy*, *61*(4), 3–13.
16. Dyer, G. W. (2006). Examining the "family effect" on firm performance. *Family Business Review*, *19*(4), 253–273. http://dx.doi.org/10.1111/j.1741-6248.2006.00074.x
17. Dyer, W. G. (2003). The family, the missing variable in organizational research. *Entrepreneurship. Theory and Practice*, *27*(4), 401–416. http://dx.doi.org/10.1111/1540-8520.00018
18. Ganitsky, J. A., Carson, J. B., & Doochin, B. A. (1988). Entry of the next generation: Strategic challenge for family business. *Journal of Small Business Management*, *26*, 49–56.
19. Handler, W. C., & Kram, K. E. (1989). Succession in family firms: The problem of resistance. *Family Business Review, 1*, 361–381. http://dx.doi.org/10.1111/j.1741-6248.1988.00361.x
20. Kedmenec, I., Sebjan, U., & Tomic, P. (2015). Effect of rurality and human capital resources in the entrepreneurial opportunity identification process. *Our Economy*, *61*(2), 35–44.
21. Kepner, E. (1991). The family and the firm: A coevolutionary perspective. *Family Business Review, 4*, 445–461. http://dx.doi.org/10.1111/j.1741-6248.1991.00445.x
22. Klien, S. B. (2000). Family businesses in Germany, Significance and structure. *Family Business Review*, *6*, 769–784. http://dx.doi.org/10.1111/j.1741-6248.2000.00157.x
23. Lansberg, I. (1988). The succession conspiracy. *Family Business Review*, *1*, 119–143. http://dx.doi.org/10.1111/j.1741-6248.1988.00119.x
24. Letonja, M., & Duh, M. (2015). Knowledge transfer in family businesses and its effects on the innovativeness of the next family generation. *Knowledge Management Research & Practice, December*, 1–12. http://dx.doi.org/10.1057/kmrp.2015.25
25. Litz, R. A. (1995). The family business: Toward definitional clarity. *Proceedings of the Academy of Management*, 100–104. http://dx.doi.org/10.5465/AMBPP.1995.17536337
26. Liu, S., & Yi, L. (2006). *Grey information: theory and practical applications.* New York: Springer Science & Business Media.
27. Mierzwiak, R., & Więcek-Janka, E. (2015). The analysis of successors' competencies in family enterprises with the use of grey system theory. *Grey Systems: Theory and Application, 5*(3), 302–312. http://dx.doi.org/10.1108/GS-03-2015-0007
28. Sharma, P. (2002, August). *Stakeholder mapping technique: Toward the development of a family firm typology*. Paper presented at the 62nd meeting of the Academy of Management, Denver, CO.
29. Swagger, G. (1991). Assessing the successor generation in family businesses. *Family Business Review*, *4*, 397–411. http://dx.doi.org/10.1111/j.1741-6248.1991.00397.x

30. Ward, J. L. (1987). *Keeping the family business healthy*, San Francisco: Jossey-Bass.
31. Więcek-Janka, E. (2011). *Games and decisions.* Poznan: University of Technology Publishing House.
32. Więcek-Janka, E. (2013). *The guiding value in the management of family businesses* (*Wiodące wartości w zarządzaniu przedsiębiorstwami rodzinnymi).* Poznan: University of Technology Publishing House.
33. Więcek-Janka, E., Mierzwiak, R. (2015). The analisis of successors' competencies in family enterprises with the use of grey system theory. *Grey Systems: Theory and Application,* 5 (3), 302-312.
34. Vaillant G.E., (2005), *Ego Mechanisms of Defense: A Guide for Clinicans and Researchers*, American Psychiatic Press, Inc. Washington.
35. Xie, N., & Liu, S. (2009). Research on evaluations of several grey relational models adapt to grey relational axioms. *Journal of Systems Engineering and Electronics, 20*(2), 304–309.

Authors

Ewa Więcek-Janka, Doctor of economics, MA in psychology, engineer of management, works at the Faculty of Engineering Management Poznan University of Technology, Marketing and Economic Engineering Department. She is a member of the Family Business Initiative, Association of Polish Engineers and Mechanics. She is the author of 98 publications, including books on applied management tools. She has participated in conferences abroad (Denmark, Sweden, Slovenia, USA, Italy) and has conducted in internship research and teaching in Finland, Mexico, Bulgaria, Romania, Hungary, Serbia, Slovenia, and Slovakia.

Joanna Kijewska, Ph.D. candidate in the Marketing and Economic Engineering Department at Poznan University of Technology, is completing her Ph.D. thesis on quality management of the integrated marketing communication. Her research interests center on the science of the quality, principles of marketing, and marketing management, especially the environmental scanning and quality of the marketing information system.

Rafał Mierzwiak, Ph.D., focuses on research into applications of grey systems theory in management. In this area, his most important efforts are his publications in scientific magazines, such as *Journal of Cleaner Production*, *Lecture Notes of Computer Science,* and *Grey Systems: Theory and Application*. He received prizes for the best paper at the international conferences in Cracow and Leicester.

Analiza ovir v procesih nasledstva družinskih podjetjih z uporabo sive incidenčne analize (poljska perspektiva)

Izvleček

v prispevku predstavljamo izide raziskave o zaznavanju in ocenjevanju ovir, s katerimi se srečujejo nasledniki v družinskih podjetjih v prvem procesu nasledstva. V empirični analizi smo uporabili sivo sistemsko teorijo, ki smo jo ocenili kot enakovredno za analizo majhnih vzorcev in kvalitativno raziskavo. Pri pregledu literature in v empirični raziskavi smo se osredotočili na: a) identifikacijo ovir pri razvoju družinskih podjetij ter b) opredeljevanje perspektive nove generacije lastnikov v družinskih podjetjih, ki vstopajo v proces nasledstva, z empirično analizo ocenjene ravni tveganja v povezavi z družino in poslom.

Ključne besede: družinsko podjetje, siva incidenčna analiza, siva sistemska teorija

ORIGINAL SCIENTIFIC PAPER

RECEIVED: DECEMBER 2015

REVISED: MARCH 2016

ACCEPTED: MARCH 2016

DOI: 10.1515/ngoe-2016-0011

UDK: 303.725.35

JEL: E43, G12, C52

Citation: Lorenčič, E. (2016). Testing the Performance of Cubic Splines and Nelson-Siegel Model for Estimating the Zero-coupon Yield Curve. *Naše gospodarstvo/Our Economy, 62*(2), 42–50. DOI: 10.1515/ngoe-2016-0011

Testing the Performance of Cubic Splines and Nelson-Siegel Model for Estimating the Zero-coupon Yield Curve

Eva Lorenčič
Ranca 35, 2211 Pesnica pri Mariboru, Slovenia
eva.loren@gmail.com

Abstract

Understanding the relationship between interest rates and term to maturity of securities is a prerequisite for developing financial theory and evaluating whether it holds up in the real world; therefore, such an understanding lies at the heart of monetary and financial economics. Accurately fitting the term structure of interest rates is the backbone of a smoothly functioning financial market, which is why the testing of various models for estimating and predicting the term structure of interest rates is an important topic in finance that has received considerable attention for many decades. In this paper, we empirically contrast the performance of cubic splines and the Nelson-Siegel model by estimating the zero-coupon yields of Austrian government bonds. The main conclusion that can be drawn from the results of the calculations is that the Nelson-Siegel model outperforms cubic splines at the short end of the yield curve (up to 2 years), whereas for medium-term maturities (2 to 10 years) the fitting performance of both models is comparable.

Keywords: Cubic splines; Nelson-Siegel; yield curve; zero-coupon bonds; term structure of interest rates

1 Introduction

The purpose of this paper is to construct a zero-coupon yield curve based on the data for coupon yields, price, and maturity of Austrian government bonds. The models used are the Nelson-Siegel and cubic splines. Forecasting the term structure of interest rates is a prerequisite for managing investment portfolios, pricing financial assets and their derivatives, calculating risk measures, valuing capital goods, managing pension funds, formulating economic policy, making household finance decisions, and managing fixed-income wealth. Prices of fixed-income securities such as swaps, bonds, and mortgage-backed securities depend on the yield curve. The yields on default-free government bonds that have different maturities, when examined together, reveal information about forward rates, which can predict real economic activity and are, hence, of interest for policymakers, market participants, and economists. For instance, forward rates are often inputs to pricing models and may indicate market expectations of the movement of inflation rates and currency appreciation/depreciation rates in the future. Understanding the relationship between interest rates and the term to maturity of securities is a prerequisite for developing and testing financial theory and, therefore, lies at the heart

NG
OE

**NAŠE GOSPODARSTVO
OUR ECONOMY**

Vol. 62 No. 2 2016

pp. 42–50

of monetary and financial economics. Accurately fitting the term structure of interest rates is the backbone of a smoothly functioning financial market, which is why refining yield curve modeling and forecasting methods is an important topic in finance that has received considerable attention for many decades (De Rezende & Ferreira, 2013; Diebold, Li, & Yue, 2008; Exterkate, van Dijk, Heij, & Groenen, 2013; Ioannides, 2003; Jordan & Mansi, 2003; Linton, Mammen, Nielsen, & Tanggaard, 2001; Rugengamanzi, 2013).

The yield curve is a graphical representation of the term structure of interest rates (i.e., a one-to-one relationship between yields and corresponding maturities of default-free zero-coupon securities issued by sovereign lenders). The term structure of interest rates contains information about the yields of zero-coupon bonds[1] of various maturities at a certain date. Constructing the term structure of interest rates is not a straightforward task due to the scarcity of zero-coupon bonds on the market, which represent the essential part of the term structure of interest rates. The majority of bonds traded in the market bear coupons. The yields to maturity on coupon-bearing bonds, whose maturities or coupons differ, are not immediately comparable. As a result, a uniform way of measuring the term structure of interest rates is needed: The spot interest rates[2] (i.e., the yields earned on bonds that pay no coupon) must be estimated from coupon bond prices of bonds with different maturities by using interpolation methods, such as polynomial splines (e.g., cubic splines) and parsimonious functions (e.g., Nelson-Siegel). This is how the yield curve of zero-coupon bonds is constructed (Christensen, Diebold, & Rudebusch, 2011; Christofi, 1998; Gauthier & Simonato, 2012; Luo, Han, & Zhang, 2012; Teichmann & Wüthrich, 2013; Yu & Zivot, 2011).

The most widely used models for estimating the zero-coupon yield curve are Nelson-Siegel and cubic splines. For instance, the central banks of Belgium, Finland, France, Germany, Italy, Norway, Spain, and Switzerland use the Nelson-Sigel model or some type of its enhanced extension to fit and forecast yield curves (BIS, 2005). The European Central Bank uses the Sonderlind-Svensson model, an extension of the Nelson-Siegel model, to estimate yield curves in the Eurozone (Coroneo, Nyholm & Vidova-Koleva, 2011).

The remainder of the paper is organized as follows. Section 2 gives an overview of the existing literature and relevant research studies. Section 3 presents the data; Section 4 lays out the methodology and the results. Section 5 concludes the paper.

[1] Another name for "zero-coupon bond" is discount bond.

[2] The terms "yield to maturity on a zero-coupon bond," "zero-coupon interest rate," "spot interest rate" and "zero-coupon yield" are synonyms; they all describe the same aspect of reality.

2 Literature Review

The yield curve estimation methods originated in McCulloch's (1975) cubic splines and in Nelson and Siegel's (1987) parsimonious function. Most of the research studies on the term structure of interest rates build on these two methods and propose improvements and extensions. McCulloch (1975) modeled the discount curve with a spline. The fitted discount curve gives a poor fit of the yield curves, most notably at longer maturities. Nelson-Siegel's parsimonious function allows for various shapes of the yield curve. The forward rates are a solution to a second-order differential equation. The forward rate curve under McCulloch's method is not smooth, whereas the forward rate curve under Nelson-Siegel's method is smooth, but still unable to accurately price instruments at the longest end of the yield curve (Rugengamanzi, 2013).

The Nelson-Siegel type of models are relatively efficient in capturing the general shapes of the yield curve, which is why they are extensively used by central banks and market practitioners. Nevertheless, the Nelson-Siegel type of models are still inferior to the dynamic term structure models, like the quadratic or affine term structure models or the forward rate-based arbitrage-free model introduced by Heath, Jarrow, and Morton (1992). Jordan and Mansi (2003) used five distinct yield curve-smoothing methods to derive spot rates from on-the-run treasuries. All methods used the bootstrapping[3] technique either in discrete time or in continuous time. Yield curve-smoothing methods based on continuous-time bootstrapping deliver a superior approximation of the term structure of interest rates to those methods that employ the discrete-time bootstrapping technique. Of the five yield curve-smoothing methods, the linear spline interpolation produces the worst results; the second-worst method is cubic splines; and the two best methods are Mansi-Phillips and Nelson-Siegel.

Diebold and Li (2006) developed a dynamic version of the Nelson-Siegel model. They showed that the three factors present in the Nelson-Siegel model can be interpreted as the level, slope, and curvature of the yield curve. They also corroborated that the dynamic model improves the forecasting accuracy. Diebold, Rudebusch, and Aruoba (2006) combined the Diebold-Li model with macroeconomic variables to analyze the relationship between the yield curve and the economy. Diebold et al. (2008) extended the dynamic Diebold-Li model to a global context. A large set of country yield curves was modeled in a setting that allows for both country-specific and global factors. The researchers found that the global yield level and slope factors exist and can

[3] "Bootstrapping" refers to calculating spot rates from bond yields in an iterative manner (Jordan et al., 2003).

explain a substantial proportion of variation in country bond yields. Christensen, Diebold, and Rudebusch (2009) proposed a generalized arbitrage-free Nelson-Siegel model using five factors. Christensen et al. (2011) added the arbitrage-free restriction to the Diebold-Li model, thereby creating an affine arbitrage-free Nelson-Siegel model (AFNS). The results show an improvement in the model's predictive performance. Yu and Zivot (2011) empirically tested Diebold and Li's dynamic Nelson-Siegel three factor model and found that the dynamic Diebold-Li factor AR(1) model is superior to other models on the out-of-sample forecast accuracy. Luo et al. (2012) compared the forecasting ability of the Diebold-Li, dynamic Svennson, and dynamic Björk and Christensen models for the term structure of Chinese treasury yields. The results showed that all three models fit the data very well and that more flexible models produced superior in-sample fitting performance.

Gauthier and Simonato (2012) developed linearized algorithms for estimating spot interest rate term structures. These algorithms converge much faster while retaining the important characteristics of the original approaches. These algorithms are superior in that they enable the inclusion of prior information about some of the parameters, thereby enhancing the precision of the estimated spot rate curves. Using the Brazilian yield curve data, De Rezende and Ferreira (2013) compared the in-sample adjustment and the out-of-sample forecasting performance of four different Nelson-Siegel type models: Nelson-Siegel, Bliss, Svensson, and a new five-factor model that is an extension of the Svensson model and could improve the fitting flexibility. The introduction of the fifth factor into the model produced the best in-sample fitting, but poor out-of-sample forecasting. Exterkate et al. (2013) investigated whether the inclusion of additional macroeconomic information into the Nelson-Siegel model results in improved yield curve forecasts. In general, the forecasts could not be improved in stable times (e.g., 1994–1998): When the yields are not volatile, the dynamic Nelson-Siegel model produces good yield curve forecasts. The inclusion of additional macroeconomic variables can substantially improve the yield curve forecast accuracy when the yields are volatile (e.g., 2008–2009).

3 Data

We empirically tested the fitting performance of the Nelson-Siegel model and cubic splines on the data for Austrian government bonds. The data were retrieved from Bloomberg[4] on October 8, 2013(see Table 1). All prices are in euros.

[4] We do not have access to more recent data, as Bloomberg terminal subscription costs around $20,000 per user per annum, which is why the license is mostly bought by and available in major institutions only.

Table 1. Data on Austrian Government Bonds (retrieved from Bloomberg on October 8, 2013).

AT - Benchmark	Maturity	Coupon (%)	Bid (EUR)	Ask (EUR)
1Y BUND	20.10.2014	3,40	103,32	103,35
2Y BUND	15.07.2015	3,50	105,72	105,77
3Y BUND	15.09.2016	4,00	110,14	110,18
4Y BUND	15.09.2017	4,30	113,39	113,46
5Y BUND	15.01.2018	4,65	115,53	115,58
6Y BUND	15.03.2019	4,35	116,25	116,29
7Y BUND	15.07.2020	3,90	114,85	114,91
8Y BUND	15.09.2021	3,50	112,44	112,50
9Y BUND	20.04.2022	3,65	113,35	113,42
10Y BUND	20.10.2023	1,75	95,98	96,02
13Y BUND	15.03.2026	4,85	125,63	125,81

Source: Bloomberg.

The raw data given in Table 1 was used to calculate the accrued interest and the dirty price (i.e., the market value, the present value). The dirty price is a sum of the clean price (i.e., the average of the "bid quote" and the "ask quote") and the accrued interest. The accrued interest is the interest that a bond holder would have obtained in theory between the last coupon date of each bond and the current date (which we assumed to be October 8, 2013—the day the data were extracted).

The Nelson-Siegel model and cubic splines were applied to the data in Table 1 to estimate the zero-coupon bond yield curve.

4 Methodology and Results

The two main categories of methods for estimating a yield curve are the spline methods and the parsimonious methods. The spline methods use a piecewise polynomial function (usually a cubic one) to approximate the yield curve. Cubic splines were first introduced by McCulloch (1975) and subsequently improved by Fisher, Nychka, and Zervos (1995), Waggoner (1997), and Anderson and Sleath (1999). The parsimonious methods (such as Nelson-Siegel model [1987]; Nelson-Siegel-Svensson model [Sevensson, 1995], and models described by Wiseman [1994] and Bjork and Christensen [1997]) approximate the yield curve by estimating the parameters in a single parametric function. With spline methods, it is possible to capture almost any shape of the yield curve, whereas parsimonious methods can capture only yield curves obeying certain financial constraints. Both groups of methods have specific advantages and disadvantages, but none of them seems to be able to consistently

outperform the other (Manousopoulos & Michalopoulos, 2009). In this paper, we employed the most representative type of each method (cubic splines and Nelson-Siegel) with the goal of estimating the zero-coupon yield curve.

4.1 Cubic splines model

The cubic splines method, developed by McCulloch (1971) and McCulloch (1975), divides the zero-coupon yield curve into distinct intervals. In each of these intervals, a cubic spline acts as vertebra in the vertebrate spinal column. If the yield curve is divided into *k–1* knots, then we need *k* parameters to describe the entire zero-coupon yield curve. The optimal parameters are obtained by constructing the matrix *A*, defined in the continuation of the paper. The optimal parameters and the optimal zero-coupon yield curve minimize the discrepancy (the error) between the model price and the market price of government bonds (McCulloch, 1975; Jankowitsch & Pichler, 2003; Rugengamanzi, 2013).

To fit the observed market data for government bond yield curve, McCulloch (1971) used the discount function presented in (1):

$$D(t) = 1 + \sum_{j=1}^{k} f_j(t) \cdot a_j, \tag{1}$$

where a_j are the parameters that need to be estimated. For $j < k$, $f_j(t)$ is a cubic polynomial defined as follows:

I. When $t < d_{j-1}$:

$$f_j(t) = 0 \tag{2}$$

II. When $d_{j-1} \le t < d_j$:

$$f_j(t) = \frac{(t - d_{j-1})^3}{6 \cdot (d_j - d_{j-1})}. \tag{3}$$

III. When $d_j \le t < d_{j+1}$:

$$f_j(t) = \frac{c^2}{6} + \frac{c \cdot e}{2} + \frac{e^2}{2} - \frac{e^3}{6 \cdot (d_{j+1} - d_j)}, \tag{4}$$

where $c = d_j - d_{j-1}$ and $e = t - d_j$.

IV. When $d_{j+1} \le t$:

$$f_j(t) = \left(d_{j+1} - d_{j-1}\right) \cdot \left[\frac{2 \cdot d_{j+1} - d_j - d_{j-1}}{6} + \frac{t - d_{j+1}}{2}\right]. \tag{5}$$

Two additional conditions have to be met:

a. When j = 1:

$$d_j = d_{j-1} = 0 \tag{6}$$

b. When j = k:

$$f_j(t) = t \tag{7}$$

In $f_j(t)$, t stands for time and j is a knot number (j = 1, …, *k–1*). Because the number of knots is equal to *k–1*, we need *k* parameters. The knots are denoted as d_j. We used four parameters (k = 4) and three knots ($k–1$ = 3). We set the first knot equal to zero ($d_1 = 0$), the second knot equal to five ($d_2 = 5$), and the third knot equal to 13 ($d_3 = 13$), which corresponds to the maturity of the last bond (McCulloch, 1975; Jankowitsch & Pichler, 2003; Rugengamanzi, 2013).

The zero-coupon yields are calculated from the discount function defined by (1) as follows:

$$r(t) = \left(\frac{1}{D(t)}\right)^{\frac{1}{t}} - 1. \tag{8}$$

In order to calculate the parameters a_j (which are needed in (1) and (8)), we first need to construct matrix *A*:

$$A = (X \cdot X^T)^{-1} \cdot X^T \cdot Y, \tag{9}$$

where X is a matrix and Y is a matrix. X^T and Y^T are the transposed matrices of matrices X and Y. The matrix A has j rows and one column. The element a_{j1} of matrix A (where j = 1, …, k) is an optimal parameter a_j, needed to calculate the discount function, as defined by (1).

The matrix X is given as follows:

$$x_{ij} = \sum_{h=1}^{R_i} Z_i(h) \cdot f_j\left(w_i(h)\right) \tag{10}$$

for every i=1,…,n and for every j=1,…,k,

where R_i = the number of future cash flows of bond i,
$Z_i(h)$ = a future cash flow h of bond i,
$w_i(h)$ = the time to maturity of a next cash flow h of bond i in years, and
$f_j(t)$ = a function of time t, defined by equations (2) to (5).

The matrix Y is given as follows:

$$y_i = P_i - \sum_{h=1}^{R_i} Z_i(h) \text{ for every } i = 1,\ldots,n, \tag{11}$$

where P_i = the dirty price (the present value, the market value) of bond *i*.

The dirty price (the present value, the market value) P_i of bond is defined as follows:

P_i=*clean price from Bloomberg+accrued interest.* (12)

The accrued interest is defined as follows:

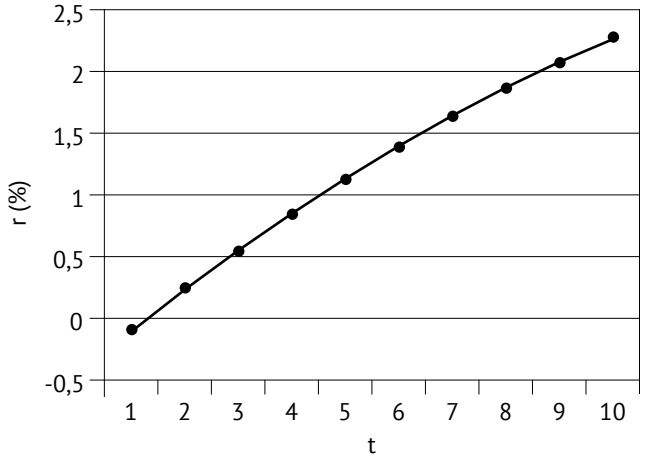
$$\text{accrued interest} = \text{the next cash flow (coupon amount)} \times \frac{\text{time that has passed between the last coupon payment and today}}{\text{time between two consecutive coupon payments}} \quad (13)$$

Table 2. Estimated Discount Factors (D(t)) and Zero-coupon Yields for t = 1, 2, ..., 10.

t	D(t)	r(t)	r(t) in %
1	1,00056	-0,00056	-0,05606
2	0,99443	0,00279	0,27943
3	0,98238	0,00594	0,59424
4	0,96517	0,00890	0,89031
5	0,94355	0,01169	1,16896
6	0,91830	0,01431	1,43070
7	0,89024	0,01675	1,67481
8	0,86020	0,01900	1,90021
9	0,82901	0,02105	2,10539
10	0,79751	0,02288	2,28837

The final results obtained by empirically testing the cubic splines model (equations (1) to (13)) on data given in Table 1 (Austrian government bonds) are summarized in Table 2.

Figure 1. The zero-coupon yield curve, estimated with the cubic splines model.



The estimated zero-coupon yield curve is displayed in Figure 1.

4.2 Nelson-Siegel model

Nelson and Siegel (1987) developed a parsimonious function to model forward rates. The zero-coupon yield (the spot rate) can be derived as follows:

$$r(t) = \beta_1 + \beta_2 \cdot \frac{1 - e^{-\frac{t}{\tau_1}}}{\frac{t}{\tau_1}} + \beta_3 \cdot \left(\frac{1 - e^{-\frac{t}{\tau_1}}}{\frac{t}{\tau_1}} - e^{-\frac{t}{\tau_1}} \right) =$$

$$= \beta_1 + (\beta_2 + \beta_3) \cdot \frac{1 - e^{-\frac{t}{\tau_1}}}{\frac{t}{\tau_1}} - \beta_3 \cdot e^{-\frac{t}{\tau_1}}, \quad (14)$$

where t = time to maturity of a bond (in years),
β_1 = parameter beta 1 (the level factor),
β_2 = parameter beta 2 (the slope factor),
β_3 = parameter beta 3 (the curvature factor),
τ_1 = parameter tau 1 (the rate of exponential decay), and
e = exponential function.

The parameters β_1, β_2, β_3, and τ_1 can be calculated with the Excel add-in "Solver" by minimizing the sum of squared residuals between the dirty price (market value, present value) of the bonds and the model price of the bonds. (The dirty price is a sum of the clean price, retrieved from Bloomberg, and accrued interest.) The price of zero-coupon securities for time *t* is calculated as follows:

$$P(t) = e^{\frac{-r(t) \cdot t}{100}}. \quad (15)$$

The market value (MV) of a bond *i* according to the Nelson-Siegel model is calculated as follows:

$$MV\ Nelson\ Siegel\ (bond_i) = \sum_{h=1}^{R_i} Z_i(h) \cdot P(w_i(h)), \quad (16)$$

where R_i = the number of future cash flows of bond *i*,
$Z_i(h)$ = a future cash flow *h* of bond *i*,
$w_i(h)$ = the time to maturity of a future cash flow *h* of bond *i* in years, and
$P(t)$ = the present value of a zero-coupon security with nominal value 1 and maturity in time *t*.

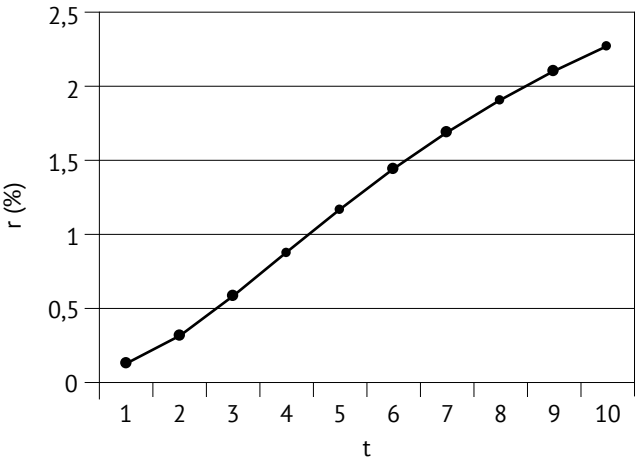
The error of the Nelson-Siegel model for bond *i* is defined as follows:

The error of the model for bond i =
$= (dirty\ price\ of\ bond_i - MV\ Nelson\ Siegel\ of\ bond_i)^2$ (17)

Table 3. Estimated Zero-coupon Yields for t = 1, 2, …, 10.

t	r(t) in %
1	0.11
2	0.30
3	0.57
4	0.86
5	1.15
6	1.42
7	1.67
8	1.89
9	2.09
10	2.26

Figure 2. The zero-coupon yield curve, estimated with the Nelson-Siegel model.



The final results obtained by empirically testing the cubic splines model (equations (14) to (17)) on data given in Table 1 (Austrian government bonds) are summarized in Table 3.

The estimated zero-coupon yield curve is displayed in Figure 2.

4.3 Comparison of the two models

Our coupon bond price estimation results (Tables 4 and 5) are comparable with the in-sample coupon bond price estimation results of Jordan and Mansi (2003; see Table 2). Jordan and Mansi's (2003) results show that, at the short end of the yield curve (0 to 5 years), the Nelson-Siegel model outperforms cubic splines; the same is true for the intermediate range (5 to 10 years). Our findings are similar to Jordan and Mansi's (2003) findings in that the Nelson-Siegel model performed better than cubic splines at the short end of the yield curve (up to 5 years) and in the intermediate range (5–10 years); however, the supremacy of the Nelson-Siegel model over cubic splines was more pronounced for short-term maturities than for medium-term maturities.

The cubic splines and Nelson-Siegel estimates of zero-coupon yields are summarized and compared in Table 6. The Nelson-Siegel model outperformed cubic splines at the short end of the yield curve (up to 2 years), whereas for medium-term maturities (2 to 10 years), the fitting performance of both models was comparable.

Table 4. Comparison of Cubic Splines and Nelson-Siegel Estimates of Bond Prices.

Maturity of the bond	Actual bond price	Cubic splines bond price estimation	Nelson-Siegel bond price estimation	Cubic splines squared price error*	Nelson-Siegel squared price error**
1 year	106.62	106.85	106.68	0.05061	0.00308
2 years	106.56	106.63	106.55	0.00532	0.00006
3 years	110.41	110.24	110.31	0.02882	0.01081
4 years	113.70	113.60	113.69	0.00949	0.00001
5 years	118.94	118.89	118.97	0.00301	0.00082
6 years	118.74	118.76	118.77	0.00058	0.00134
7 years	115.79	115.90	115.84	0.01271	0.00242
8 years	112.69	112.67	112.60	0.00038	0.00797
9 years	115.10	115.26	115.21	0.02767	0.01350
10 years	97.69	97.47	97.52	0.04878	0.02825
13 years	128.47	128.52	128.54	0.00213	0.00422
				Sum: 0.18951	**Sum:** 0.07246

Notes. *Cubic splines squared price error is equal to the squared difference between the actual bond price and the cubic splines bond price estimation.

**Nelson-Siegel squared price error is equal to the squared difference between the actual bond price and the Nelson-Siegel bond price estimation.

Table 5. Comparison of Cubic Splines and Nelson-Siegel Squared Price Errors for Short-term and Medium-term Maturities.

Maturity	Sum of squared price errors, cubic splines	Sum of squared price errors, Nelson-Siegel
Up to 5 years	0.0972*	0.01477*
> 5–10 years	0.09012**	0.05348**

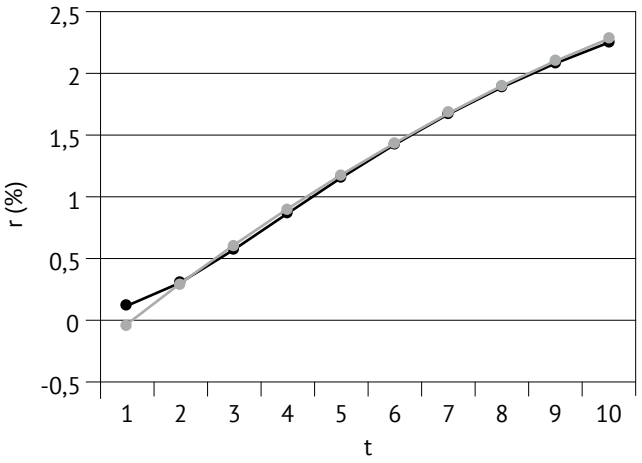
Notes. *Sum of squared price errors for maturities from 1 to 5 years. **Sum of squared price errors for maturities from 6 to 10 years.

Table 6. *Comparison of Cubic Splines and Nelson-Siegel Estimates of Zero-coupon Yields.*

t	Cubic splines estimates of zero-coupon yields in %	Nelson-Siegel estimates of zero-coupon yield in %	Absolute difference between the two model estimates in basis points
1	-0.06	0.11	17
2	0.28	0.30	2
3	0.59	0.57	2
4	0.89	0.86	3
5	1.17	1.15	2
6	1.43	1.42	1
7	1.67	1.67	0
8	1.90	1.89	1
9	2.11	2.09	2
10	2.29	2.26	3
Sum of absolute differences in basis points:			33

The term structure of interest rates, as estimated by the two models, is displayed in Figure 3.

Figure 3. The term structure of interest rates, as estimated with cubic splines (grey line) and Nelson-Siegel (black line).



5 Conclusion

In this paper, we empirically contrasted the performance of cubic splines and the Nelson-Siegel model by estimating the zero-coupon yields of Austrian government bonds. The main conclusion drawn from the results of the calculations was that the Nelson-Siegel model outperformed cubic splines at the short end of the yield curve (up to 2 years), whereas for medium-term maturities (2 to 10 years) the fitting performance of both models was comparable. In estimating the term structure of interest rates, we employed the simplest versions of the two models without any further extensions. In reality, Nelson-Siegel is one of the most widely used models for deriving the zero-coupon yield curve; however, the central banks and more sophisticated commercial banks use its enhanced versions.

Our study is limited in that we test the fitting performance of the models on the data of government bonds from only one country (Austria). In order to further substantiate our findings, the fitting performance of the models could be tested on a wider set of data, such as government bond data from various countries.

As shown in the theoretical part of this paper, the researchers recently derived the dynamic and no-arbitrage improved versions of the Nelson-Siegel model, which are characterized by a greater estimate precision and forecast accuracy. Further research studies are warranted to evaluate and analyze the performance of the more recent versions of the model.

References

1. Anderson, N., & Sleath, J. (1999). New estimates of the UK real and nominal yield curves. *Bank of England Quarterly Bulletin*, *November*, 384–392.
2. BIS. (2005). *Zero-coupon yield curves: Technical documentation.* Basle: Bank for International Settlements.
3. Bjork, T., & Christensen, B. (1997). Interest rate dynamics and consistent forward rate curves. *University of Aarhus Working Paper*, 1–38.
4. Christensen, J. H., Diebold, F. X., & Rudebusch, G. (2009). An arbitrage-free generalized Nelson-Siegel term structure model. *The Econometrics Journal*, *12*(3), 33–64. http://dx.doi.org/10.1111/j.1368-423X.2008.00267.x
5. Christensen, J. H. E., Diebold, F. X., & Rudebusch, G. D. (2011). The affine arbitrage-free class of Nelson-Siegel term structure models. *Journal of Econometrics*, *164*(1), 4–20. http://dx.doi.org/10.1016/j.jeconom.2011.02.011

6. Christofi, A. C. (1998). Estimation of the Nelson-Siegel parsimonious modeling of yield curves using an exponential GARCH process. *Managerial Finance*, *24*(9/10), 1–19. http://dx.doi.org/10.1108/03074359810765813
7. Coroneo, L., Nyholm, K., & Vidova-Koleva, R. (2011). How arbitrage-free is the Nelson-Siegel model? *Journal of Empirical Finance*, 18(3), 393–407. http://dx.doi.org/10.1016/j.jempfin.2011.03.002
8. De Rezende, R. B., & Ferreira, M. S. (2013). Modeling and forecasting the yield curve by an extended Nelson-Siegel class of models: A quantile autoregression approach. *Journal of Forecasting, 32*(2), 111–123. http://dx.doi.org/10.1002/for.1256
9. Diebold, F. X., & Li, C. (2006). Forecasting the term structure of government bond yields. *Journal of Econometrics*, *130*(2), 337–364. http://dx.doi.org/10.1016/j.jeconom.2005.03.005
10. Diebold, F. X., Li, C., & Yue, V. Z. (2008). Global yield curve dynamics and interactions: A dynamic Nelson-Siegel approach. *Journal of Econometrics*, *146*(2), 351–363. http://dx.doi.org/10.1016/j.jeconom.2008.08.017
11. Diebold, F. X., Rudebusch, G. D., & Aruoba, B. (2006). The macroeconomy and the yield curve: a dynamic latent factor approach. *Journal of Econometrics*, *131*(1–2), 309–338. http://dx.doi.org/10.1016/j.jeconom.2005.01.011
12. Exterkate, P., van Dijk, D., Heij, C., & Groenen, P. J. F. (2013). Forecasting the yield curve in a data-rich environment using the factor-augmented Nelson-Siegel model. *Journal of Forecasting*, *32*(3), 193–214. http://dx.doi.org/10.1002/for.1258
13. Fisher, M., Nychka, D., & Zervos, D. (1995). Fitting the term structure of interest rates with smoothing splines. *Working Paper 95-1, Finance and Economics Discussion Series, Federal Reserve Board*.
14. Gauthier, G., & Simonato, J-G. (2012). Linearized Nelson-Siegel and Svensson models for the estimation of spot interest rates. *European Journal of Operational Research*, *219*(2), 442–451. http://dx.doi.org/10.1016/j.ejor.2012.01.004
15. Heath, D., Jarrow, R., & Morton, A. (1992). Bond pricing and the term structure of interest rates: a new methodology for contingent claims valuation. *Econometrica*, *60*(1), 77–105. http://dx.doi.org/10.2307/2951677
16. Ioannides, M. (2003). A comparison of yield curve estimation techniques using UK data. *Journal of Banking & Finance*, *27*(1), 1–26. http://dx.doi.org/10.1016/S0378-4266(01)00217-5
17. Jankowitsch, R., & Pichler, S. (2003). Estimating zero-coupon yield curves for EMU government bonds. *Work based on a research project funded by the Austrian National Bank (OeNB–Jubiläumsfondprojekt Nr. 8808)*. Vienna University of Economics and Business Administration, December 2003.
18. Jordan, J. V., & Mansi, S. A. (2003). Term structure estimation from on-the-run Treasuries. *Journal of Banking & Finance*, *27*(8), 1487–1509. http://dx.doi.org/10.1016/S0378-4266(02)00273-X
19. Linton, O., Mammen, E., Nielsen, J. P., & Tanggaard, C. (2001). Yield curve estimation by kernel smoothing methods. *Journal of Econometrics*, 105(1), 185–223. http://dx.doi.org/10.1016/S0304-4076(01)00075-6
20. Luo, X., Han, H., & Zhang, J. E. (2012). Forecasting the term structure of Chinese Treasury yields. *Pacific-Basin Finance Journal*, *20*(5), 639–659. http://dx.doi.org/10.1016/j.pacfin.2012.02.002
21. Manousopoulos, P., & Michalopoulos, M. (2009). Comparison of non-linear optimization algorithms for yield curve estimation. *European Journal of Operational Research*, *192*(2), 594–602. http://dx.doi.org/10.1016/j.ejor.2007.09.017
22. McCulloch, J. H. (1971). Measuring the term structure of interest rates. *The Journal of Business*, *44*, 19–31.
23. McCulloch, J. (1975). The tax-adjusted yield curve. *Journal of Finance*, *30*, 811–830. http://dx.doi.org/10.1111/j.1540-6261.1975.tb01852.x
24. Nelson, C., & Siegel, A. (1987). Parsimonious modeling of the yield curve. *Journal of Business, 60*(4), 473–489.
25. Rugengamanzi, M. N. (2013). *Term structure estimation based on a generalized optimization framework* (Doctoral dissertation, No. 1539). Sweden, Linköping University, Department of Mathematics.
26. Svensson, L. (1995). Estimating forward interest rates with the extended Nelson and Siegel method. *Sveriges Riksbank Quarterly Review*, *3*.
27. Teichmann, J., & Wüthrich, M. V. (2013). *Consistent long-term yield curve prediction*. (Under review). Retrieved from https://people.math.ethz.ch/~wueth/Papers/2013_Yield_Curve_Prediction.pdf
28. Waggoner, D. F. (1997). Spline methods for extracting interest rate curves from coupon bond prices. *Federal Reserve Bank of Atlanta, Working Paper 97-10*.
29. Wiseman, J. (1994). The exponential yield curve model. *JPMorgan European Fixed Income Research*.
30. Yu, W.-C., & Zivot, E. (2011). Forecasting the term structures of Treasury and corporate yields using dynamic Nelson-Siegel models. *International Journal of Forecasting*, *27*(2), 579–591. http://dx.doi.org/10.1016/j.ijforecast.2010.04.002

Author

Eva Lorenčič holds a Master's Degree in Economics, awarded by the University of Maribor, Faculty of Economics and Business, and is currently a trainee at the European Central Bank in Frankfurt. She has authored and co-authored several original scientific papers, review papers, and professional papers. She interned with Erste Group Bank AG (in Vienna), Sberbank Europe AG (in Vienna), and Nova KBM (in Maribor). Her professional interests include corporate finance, banking regulation and supervision, monetary and fiscal policy, macroeconomics and international economics.

Testiranje učinkovitosti modela kubičnih zlepkov in Nelson-Sieglovega modela pri ocenjevanju krivulje donosa brezkuponskih vrednostnih papirjev

Izvleček

Razumevanje razmerja med obrestnimi merami in časom do dospelosti vrednostnih papirjev je osnovni pogoj za razvoj in ovrednotenje pravilnosti finančne teorije. Ta tematika je zato v osrčju monetarne in finančne ekonomije. Natančno prilagajanje terminske strukture obrestnih mer je hrbtenica tekoče delujočega finančnega trga. To je razlog, da je testiranje različnih modelov, ki ocenjujejo in napovedujejo terminsko strukturo obrestnih mer, na področju financ pomembna vsebina, ki je že nekaj desetletij deležna precejšnje pozornosti. V tem članku empirično primerjamo učinkovitost modela kubičnih zlepkov in Nelson-Sieglovega modela, tako da ocenimo donosnost brezkuponskih avstrijskih državnih vrednostnih papirjev. Ključni sklep, ki ga lahko izpostavimo na podlagi dobljenih rezultatov, je, da Nelson-Sieglov model bolje aproksimira brezkuponsko krivuljo donosa na kratkem koncu (do dveh let), na srednjem delu krivulje donosa (od dveh do desetih let) pa med rezultati obeh modelov ni bistvenih razlik.

Ključne besede: kubični zlepki, Nelson-Sieglov model, krivulja donosa, brezkuponske obveznice, terminska struktura obrestnih mer

The Relationship between Spiritual Intelligence and Work Satisfaction among Leaders and Employees

Maja Koražija
PhD Student at the University of Maribor, Faculty of Economics and Business, Slovenia
maja.korazija@gmail.com

Simona Šarotar Žižek
University of Maribor, Faculty of Economics and Business, Slovenia
simona.sarotar-zizek@um.si

Damijan Mumel
University of Maribor, Faculty of Economics and Business, Slovenia
damijan.mumel@um.si

ORIGINAL SCIENTIFIC PAPER

RECEIVED: JUNE 2015

REVISED: JANUARY 2016

ACCEPTED: JANUARY 2016

DOI: 10.1515/ngoe-2016-0012

UDK: 005.32:331.101.32

JEL: M54

Citation: Koražija, M., Šarotar Žižek, S., & Mumel, D. (2016). The Relationship between Spiritual Intelligence and Work Satisfaction among Leaders and Employees. *Naše gospodarstvo/Our Economy, 62*(2), 51–60. DOI: 10.1515/ngoe-2016-0012

Abstract

This study aims to investigate the relationship between spiritual intelligence and work satisfaction among both leaders and employees. Most studies in this area have focused on researching the relationship between employees' spiritual intelligence and work satisfaction, so we also researched the relationship between leaders' spiritual intelligence and work satisfaction. Our leading thesis was that leaders and employees with a higher level of spiritual intelligence have a higher level of work satisfaction. In our study, we found no significant relationship between spiritual intelligence and work satisfaction for leaders, but we found a significant positive relationship between spiritual intelligence and workplace satisfaction for employees.

Keywords: spiritual intelligence, work satisfaction, leaders, employees

1 Introduction

The majority of the developed world is in a post-materialistic period, in which not only people's basic needs but also their needs in the workplace are changing. Because jobs have largely transformed from routine to more creative positions in which the main components are the abilities and competence of the human mind, higher-order needs have emerged. To satisfy these needs, leadership must be based not on profits, but on values (Fry, 2003). Such a leader has not only a high level of cognitive intelligence, but also a high degree of emotional and spiritual intelligence. Cognitive and emotional intelligence constructs are fairly well known; meanwhile, the theory of spiritual intelligence is in the early stages of development. In one of the earliest definitions, Zohar and Marshal (2000) defined spiritual intelligence as

> what we use to develop our longing and capacity for meaning, vision, and value. It allows us to dream and to strive. It underlies the things we believe in and the role our beliefs and values play in the actions that we take and the way we shape our lives. (p. 3)

NG
OE

**NAŠE GOSPODARSTVO
OUR ECONOMY**

Vol. 62 No. 2 2016

pp. 51–60

To create a complete picture of human intelligence, we need to understand all of the various types of intelligence. In his theory of multiple intelligences, Gardner (1999) included nine different types of intelligence (natural, musical, logical, existential, interpersonal, physical, linguistic, emotional, and spatial). Spiritual intelligence is integrated into the model of multiple intelligences as a concept of existential intelligence, which is concerned with the "ultimate issues" of life (Gardner, 1999). Halama and Strizenec (2004) subsequently concluded that the existential and spiritual intelligences are "related and overlapping constructs with some common as well as unrelated aspects" (p. 15).

Working without purpose and meaning leaves people unsatisfied and causes organizations to struggle to create an identity in the market and contribute to the communities they serve (Covey, 1990; Deming, 1981). The results of a study among teachers in master's (MA) and bachelor's (BA) programs conducted by Yahyazadeh-Jeloudar and Lotli-Goodarzi (2012) showed a significant relationship between work satisfaction and spiritual intelligence.

Both leaders and employees are equally important group entities for a successful organization. Several research papers have examined the relationship between employees' spiritual intelligence and work satisfaction (Nodehi & Nehardani, 2013; Sadeghi, Zamani, & Mamasani, 2015; Yahyazadeh-Jeloudar & Lotli-Goodarzi, 2012), but due to a lack of studies among leaders, the main objective of the present study is to investigate the relationship between spiritual intelligence and the work satisfaction of both leaders and employees. The conceptual framework presented in this paper will help provide a modest contribution to the literature on this phenomenon, especially on the empirical fronts.

2 Definitions of Key Concepts

2.1 Spiritual intelligence

It is important to realize how we perceive the environment, how we understand the background and meaning of events, and that we have the ability to imagine new steps and open up new possibilities. "Intelligence is the strongest predictor of our cognitive achievements, as well as our school and academic performance" (Musek & Maravič, 2004, p. 5).

Gardner (1999) first introduced the theory of multiple intelligences, which posits that intelligence is more than a single property of the human mind. He did not include the concept of spiritual intelligence in his theory; instead, he used the concept of existential intelligence as viable. Emmons (2000) took it a step further in presenting the evidence that spirituality meets the criteria for intelligence. He identified five components of spiritual intelligence: the capacity for transcendence; the ability to enter into heightened spiritual states of consciousness; the ability to invest everyday activities, events, and relationships with a sense of the sacred; the ability to utilize spiritual resources to solve problems in living; and the capacity to engage in virtuous behavior (to show forgiveness, to express gratitude, to be humble, and to display compassion).

With a high level of spiritual intelligence, we can use our spirituality to bring meaning, importance, and general enrichment to our lives. This helps us achieve personal integrity, determine the purpose of our lives, and stay on the right path (Zohar & Marshall, 2000). Because of spiritual intelligence, we are integrated—rationally, emotionally, and spiritually—creatures/individuals (Zohar & Marshall, 2000). Ideally, these three (cognitive, emotional, and spiritual) basic human intelligences work together and support each other, but each can operate independently in a certain area.

Emotional intelligence enables us to assess the situation we are in and how we can properly find ourselves in it. On the other hand, spiritual intelligence allows us to ask ourselves whether we want to be in this particular situation or whether we would prefer to change the situation and create another, more appropriate one. This means changing and moving our limitations, which allows us to self-direct our position. Spiritual intelligence links all of our intelligences by allowing us to recognize what is truly important (Schwartz, 1995; Vaughan, 2002).

Wolman (2001) defined spiritual intelligence as "the human capacity to ask ultimate questions about the meaning of life and to experience simultaneously the seamless connection between each of us and the world in which we live" (p. 83). Wolman (2001) identified seven factors that make up human spiritual experience and behavior: divinity, mindfulness, intellectuality, community, extrasensory perception, childhood spirituality, and trauma. A clear and widely accepted definition suggested by Vaughan (2002) describes spiritual intelligence as "a capacity for a deep understanding of existential questions and insight into multiple levels of consciousness" (p. 19). King (2008) proposed four core components to comprise spiritual intelligence: critical existential thinking, personal meaning production, transcendental awareness, and conscious state expansion. Ronel (2008) continued the idea, asserting that spiritual intelligence is a key capability that connects us to something bigger than ourselves and is reflected not only in the values, but also in the motivation, intentions, emotions,

and personality structure of an individual. He described spiritual intelligence as the ability to understand, emote, evaluate, create, and administrate. He understood spiritual intelligence to be an ability that goes beyond the desires and motives of individuals; it is not present to serve their selfish interests, but to lead them toward spiritual meaning.

Wigglesworth (2012) defined spiritual intelligence as "the ability to behave with wisdom and compassion, while maintaining inner and outer peace, regardless of the situation" (p. 7). She asserted that we can develop the ability to hear the voice of our higher self and our ego and then be guided by deep wisdom and compassion.

2.1.1 Spiritually intelligent leaders

Spiritually intelligent leaders represent more than just a new kind of ideal leadership; they represent a shift in the paradigm of leadership. This shift affects employees and managers as they transform their standards of success. No matter what kind of work we perform, it can always be done with heart and soul (Fairholm, 2000). The new paradigm of spiritual leadership focuses on vision, empowerment, risk, creativity, harmony, trust, honesty, and compassion. The terms that accompany this new paradigm are spiritual leadership (Wolf, 2004), moral conduct (Thompson, 2004), authentic leadership (Beagrie, 2005), and ethical conduct (Marques, 2006).

Leaders need to feel responsible in all situations and be respected by others (i.e., employees). Decision-making must take place through the prism of empathy (Šarotar Žižek, 2008). Leaders who exhibit grace and values such as joy, beauty, optimism, and confidence are more likely to inspire their employees. Kouzes and Posner (as cited in Amram, 2009) stressed the importance of self-orientation—which refers to being circumspect, possessing clarifying values, being honest, and living in conjunction with these principles—and setting criteria for employees. These are some of the essential qualities of spiritually intelligent leadership, which every good leader should possess and learn to emphasize.

2.1.2 Spiritually intelligent employees

Spiritually intelligent leaders are not the only ones who are important to the overall organizational structure; equally important are employees. Spiritual intelligence and profitability are not mutually exclusive; in fact, integrating ethics and spiritual values into the workplace can lead to higher productivity and profitability, happier employees, and more honest relationships with customers and can help build the organization's reputation (Marques, 2006). Spiritually intelligent employees are more consistent with themselves, happier, and more deeply integrated and harmonious (George, 2006).

Despite the fact that spiritually intelligent employees are of great value for organization, George (2006) stressed that no universal prescription exists for how to seek and find spiritual intelligence. Each individual has to find it for him-/herself, and only he/she knows how to obtain it. There is also a universal question of how to find an external power and vitality and give it meaning and significance for all external events. Such challenges are much more present for employees during difficult times, when values are not the priority for their leaders and employees are seen only as tools for gaining profits.

2.1.3 Spiritually intelligent organization

Fry (2003) argued that "organizational environments in the 21st century are chaotic and require rapid response from highly committed, productive, intrinsically motivated learning organizations" (p. 717). In order for organizations to meet the great challenges they face successfully, they have to make a radical shift and transformation to a new business model—a spirituality-based organization.

Spiritual intelligence provides employees a sense of interconnectedness and community. Workplaces are places where people spend most of their lives, develop friendships, create value, and make their most meaningful contributions to society (Fairholm, 2000). Furthermore, companies that engage not just the minds, but also the hearts and emotions of their employees will be more profitable. In other words, an organization that earnestly treats its employees and leaders as part of its community and emotionally engages them in the organization's purposes, which makes all the difference in the world and will attract a higher level of leaders and employees' motivation and loyalty, ultimately leading to higher organizational performance (Brown, 1999).

2.2 Work satisfaction

The term "work satisfaction" is used in several different sciences, including (organizational) psychology, sociology, and management. A number of experts believe that the trends of work satisfaction influence the functioning of the labor market and labor productivity, work effort, work absenteeism, and staff resignations (European Foundation for the Improvement of Living and Working Conditions, 2007).

Organizations have a major impact on the people who work in them. One of these effects is reflected in individuals' relationship with (Brayfield & Rothe, 1951) and about their workplace (Spector, 1997, as cited in European Foundation for the Improvement of Living and Working Conditions, 2007). Evans's (1997) definition connects work satisfaction to the needs associated with the workplace and an individual's perception of the degree of satisfaction.

An alternative to the traditional view of work satisfaction was offered by Sousa-Paz and Sousa-Poza (2000) based on the assumption that there are basic and universal human needs. If an individual's needs are met in their current situation, that person can be considered happy. Due to the fact that people spend a major part of their life in the workplace, it is important that they are "happy in the workplace" (Nguyen, Taylor, & Bradley, 2003, p. 133). "More satisfied employees are more efficient and effective at their work. For this reason an organization can be truly effective and successful only if inside of that organization work a majority of satisfied individuals" (Regent, 2013).

3 Research Question and Hypothesis Development

Personal characteristics that can be developed through a higher level of spiritual intelligence and those needed for higher work satisfaction are very similar and, at some point, even overlap (Tischler, Biberman, & McKeage, 2002; Zembylas & Papanastasious, 2004). It is important to realize that a person who is happy in the workplace will consequently experience the world outside the work environment as less stressful. Generally speaking, such a person has a greater sense of well-being (Marques, 2006). Spiritual intelligence can be considered a method for improving the well-being of management executives as well as organizational well-being (Subramaniam & Panchanatham, 2014).

People with a higher level of spirituality are happier and more satisfied with life than people with a lower level of spirituality (Cohen, 2002; Perrone, Webb, Wright, Jackson, & Ksiazak, 2006). Spirituality can have a tremendous impact on an individual's life, such as by creating a better balance of work, family, and life satisfaction (Perrone et al., 2006).

Some studies have demonstrated a significant positive relationship between employees' spiritual intelligence and work satisfaction (Nodehi & Nehardani, 2013; Sadeghi et al., 2015; Yahyazadeh-Jeloudar & Lotli-Goodarzi, 2012). In contrast, Rastgar, Davoudi, Oraji, and Abbasian (2012) investigated the relationship between employees' spiritual intelligence and work satisfaction, but found no significance.

Given the contradictory results we found in the investigation of the relationship between employees' spiritual intelligence and work satisfaction, and because it makes sense to investigate the same relationship in leaders, we decided to conduct a study to answer the following research question: Is the spiritual intelligence of leaders and employees positively correlated with their level of work satisfaction? Based on the reviewed literature and our research question, we designed the thesis of this research: Leaders and employees with a higher level of spiritual intelligence also have a higher level of work satisfaction. Thus, we formulated the following two hypotheses:

H1*: Leaders with a higher level of spiritual intelligence have a higher level of work satisfaction.*

H2*: Employees with a higher level of spiritual intelligence have a higher level of work satisfaction.*

4 Method

4.1. Instruments

To measure spiritual intelligence we used the Integrated Spiritual Intelligence Scale (ISIS) (Amram & Dryer, 2007). The reliability of the ISIS was high (i.e., Cronbach's alpha = 0.97). This self-reporting instrument provides an overall measure of spiritual intelligence as well as scores for five dimensions of spiritual intelligence: consciousness, grace, meaning, transcendence, and truth (Amram & Dryer, 2007). The instrument comprises 45 items and uses a 5-point summative response scale. Positively worded items are scored from 1 to 5 while negatively worded items are scored conversely. Overall scores for an individual can range from a minimum of 45 to a maximum of 225. A low score indicates a lower level of spiritual intelligence whereas a high score indicates a higher level of spiritual intelligence. Overall, spiritual intelligence measured based on the sum of the ISIS dimensions scores was previously used by Shabani, Hassan, Ahmad, and Baba (2010) and Yahyazadeh-Jeloudar and Lotfi-Goodarzi (2012).

To measure the work satisfaction, we used the Job Descriptive Index (JDI) (Smith, Kendall, & Hulin, 1969), which is one of the most widely used measures of work satisfaction (Landy, Shankster, & Kohler, 1994). We used a version that was already translated into the Slovenian language and validated in Slovenia (Sabadin, 1978). There are five dimensions of JDI: work, coworkers, supervision, pay, and promotion

(Smith et al., 1969). The version we used is composed of 106 items and uses a 3-point summative response scale. Positively worded items are scored with 3, 1, and 0 points whereas negatively worded items are scored conversely. Overall, scores for an individual can range from a minimum of 0 to a maximum of 318; a low score indicates a lower level of work satisfaction whereas a high score indicates a higher level of work satisfaction. Overall, work satisfaction measured using the sum of the JDI dimensions scores was previously used by Crossman and Abou-Zaki (2003) and Shaikh, Bhutto and Maitlo (2012).

When analyzing the reliability of the instruments used in our study, we calculated Cronbach's alpha coefficients. The Cronbach's alpha for ISIS was 0.810 and for JDI was 0.946, which indicates a high level of reliability according to George and Mallery (2003).

4.2 Data collection procedure and sample profile

Data were collected in one of the largest metal manufacturing companies in Slovenia, which employs 1,150 people. Surveys were sent to a random sample of 100 leaders and 100 employees (a total of 200 questionnaires). We used a drop-off/pick-up method with printed copies of the questionnaire. The response rates were 37% (37 respondents) for leaders and 75% (75 respondents) for employees, resulting in a total of 112 respondents. The overall response rate was 56%. Table 1 summarizes the sample profile.

5 Results

5.1 Spiritual intelligence and work satisfaction of leaders and employees

The means (M) and standard deviations (SD) of leaders' and employees' work satisfaction and spiritual intelligence are presented in Table 2.

We tested normality using the Shapiro-Wilk test. Given that $W = 0.957$ and $p = 0.167$ for the leaders' spiritual intelligence, $W = 0.976$ and $p = 0.160$ for employees' spiritual intelligence, $W = 0.971$ and $p = 0.424$ for leaders' work satisfaction, and $W = 0.974$ and $p = 0.130$ for employees' work satisfaction ($p > 0.05$), we concluded that both variables for both independent samples were normally distributed. Therefore, the assumption of normality was met. In addition, our data satisfied the assumption of homoscedasticity of variances via Levene's F test: F (110) = 2, p = 0, 160.

An independent-samples *t*-test was conducted to compare the differences between the means of leaders' and employees' spiritual intelligence and between the means of leaders' and employees' work satisfaction. Leaders (M = 154.5, SD = 12.04) showed significantly higher scores than employees (M = 147.0, SD = 14.56) on the spiritual intelligence scale ($p < 0.05$), but no significant difference existed between leaders (M = 184.5, SD = 49.65) and employees (M = 168.5, SD = 47.40) in terms of work satisfaction (Table 2).

Table 1. Sample Profile

Frequency		Leaders		Employees		Total	
		Proportion	Frequency	Proportion	Frequency	Proportion	
Gender	Female	16	0.43	33	0.44	49	0.44
	Male	21	0.57	42	0.56	63	0.56
Age	Below 30	3	0.8	18	0.24	21	0.19
	31–40	18	0.49	23	0.31	41	0.37
	41–50	12	0.32	23	0.31	35	0.30
	Above 50	4	0.11	11	0.14	15	0.14
Education	Short-cycle tertiary education	5	0.14	42	0.56	47	0.42
	Bachelor or equivalent	9	0.24	11	0.15	20	0.18
	Master or equivalent	17	0.46	21	0.28	38	0.34
	Doctorate or equivalent	6	0.16	1	0.10	7	0.60
Years of work experience	Below 10	6	0.16	24	0.32	30	0.27
	11–20	18	0.49	26	0.35	44	0.39
	21–30	10	0.27	16	0.21	26	0.23
	Above 30	3	0.8	9	0.12	12	0.11

Table 2. Means, Standard Deviations, and t-tests of Variables Used in the Study for Leaders and Employees

	Leaders			Employees			Total			*t*-test		
Scale	N	M	SD	N	M	SD	N	M	SD	*t*	df	*p*
Overall spiritual intelligence	37	154.5	12.04	75	147.0	14.56	112	149.5	14.17	2.69	110	**.008**
Overall work satisfaction	37	184.5	49.65	75	168.5	47.40	112	173.8	48.53	2.87	110	.101

5.2 Hypothesis testing

Hypothesis H1 predicts that leaders with a higher level of spiritual intelligence will have a higher level of work satisfaction. A Pearson's correlation was applied to determine the relationship between two variables. No statistically significant correlation existed between spiritual intelligence and work satisfaction for leaders ($p > 0.05$; see Table 3). Therefore, leaders' spiritual intelligence and work satisfaction were not found to be significantly correlated, and hypothesis H1 was not accepted.

Table 3. Correlation between Spiritual Intelligence and Work Satisfaction of Leaders and Employees

	Leaders	Employees
Pearson Correlation	0.090	0.289
Sig. (2-tailed)	0.596	**0.012**
N	37	75

Hypothesis H2 predicts that employees with a higher level of spiritual intelligence will have a higher level of work satisfaction, so we examined the relationship between spiritual intelligence and work satisfaction among employees. The correlation between employees' work satisfaction and spiritual intelligence showed that they are significantly positively correlated ($p < 0.05$), so hypothesis H2 was accepted.

6 Discussion and Implications

Few studies have been conducted on spirituality as spiritual intelligence has only been recently recognized. Spiritual intelligence is currently expanding as a researched phenomenon, although research is still in its early stages. In Slovenia, only a few studies by Musek (2008) and Šarotar Žižek (2008, 2012) have explored the field of spiritual intelligence.

Most researchers initially focused only on the exploration of the separate constructs: leaders' spiritual intelligence and employees' work satisfaction. They subsequently investigated the relationship, but only of employees' spiritual intelligence and work satisfaction. They missed the relationship between leaders' spiritual intelligence and work satisfaction. For this reason, we expanded the scope of our research to explore the relationship between leaders' spiritual intelligence and work satisfaction.

6.1 Conclusions

The results of our research showed a significant positive relationship between employees' spiritual intelligence and work satisfaction, which is inconsistent with some of the previous literature that found employees' spiritual intelligence and work satisfaction are not significantly correlated (Rastgar et al., 2012). The differences between Rastgar et al.'s (2012) findings and our findings can be explained by the different methodological approaches applied. Rastgar et al. used other measurement instruments and statistical methods. To measure spiritual intelligence, they used the Psycho Matrix Spirituality Inventory, whereas we used ISIS. To measure work satisfaction, they used the Index of Work Satisfaction whereas we used JDI. They tested their hypothesis using structural equation modeling (SEM); we used with Pearson's correlation coefficient. However, our results are consistent with the findings of Yahyazadeh-Jeloudar and Lotli-Goodarzi (2012), Nodehi and Nehardani (2013), and Sadeghi et al. (2015), who also found a significant relationship between employees' spiritual intelligence and work satisfaction.

For leaders, we found no significant relationship between spiritual intelligence and work satisfaction. We could not compare this result with other studies as we found no previous relevant research. Comparing the spiritual intelligence of leaders and employees, we found that the level of leaders' self-reported spiritual intelligence is significantly higher than that of employees. Although leaders' self-reported level of work satisfaction was higher than that of employees, no significant difference emerged.

6.2 Managerial implications

Zohar and Marshall (2004) argued that spiritual intelligence should be grown and developed with training. This

is consistent with Wigglesworth's (2012) study, which found that mature leadership requires spiritual intelligence development. The development of employees' spiritual intelligence level will enhance their abilities and increase their level of work satisfaction.

The findings of our study suggest that human resource managers should formulate strategies for developing and increasing employees' spiritual intelligence, because we found a significant positive relationship between employees' spiritual intelligence and work satisfaction. These strategies could help increase employees' work satisfaction, which can result in higher productivity, organizational commitment, and organizational efficiency as well as loyalty, presentism, and less absenteeism and fluctuation. Therefore, the concepts of spiritual intelligence and work satisfaction need to be understood in greater detail by human resource managers and leaders.

Human resource managers should assess the spiritual intelligence of their job applicants in order to recruit the best candidates. They should do the same throughout employees' careers so they can adjust training and education to their spiritual needs. The development of spiritual intelligence could be a valuable part of an organization's development strategy as a way to create similar objectives and goals among employees in relation to the objectives and goals of the entire organization.

7 Limitations and Further Research

Our research has some limitations. We gathered information in only one organization, so we cannot generalize the results of our research to other organizations. Our study only represents the situation in that particular organization. In addition, self-reporting can vary in terms of reliability and validity, although it is generally considered a useful technique to measure work satisfaction and spiritual intelligence. Future research should use multiple assessments of leaders' and employees' spiritual intelligence. In addition to self-assessments, leaders can assess employees' spiritual intelligence and vice versa.

The spiritual intelligence construct is far from achieving consensus across the scientific community. New definitions and findings on spiritual intelligence (Mahajan, 2015) have appeared in different segments and in general, which opens new dimensions for understanding spiritual intelligence.

We only used an overall measure of work satisfaction for the purposes of this article. In terms of practice, by measuring all five dimensions of work satisfaction, organizations and their managers can obtain a complete view of employees' specific work satisfaction with work itself, pay, opportunity for promotion, supervision, and coworkers.

We found a significant relationship between employees' spiritual intelligence and workplace, but not with leaders. Future studies are needed to extend these findings using more diverse predictors and criteria.

Spiritual intelligence is a good predictor of general well-being (Musek, 2008), subjective well-being (Šarotar Žižek, Treven, & Mulej, 2011), and health (Perrone et al. 2006; Sousa-Poza & Sousa-Poza, 2000). Because all these studies were conducted separately for each pair of constructs, it could be beneficial if more concepts were analyzed in one comprehensive study.

References

1. Amram, Y. (2009). *The contribution of emotional and spiritual intelligences to effective business leadership*. Palo Alto, CA: Institute of Transpersonal Psychology.
2. Amram, Yosi & Dryer, Christopher. (2007). *The Development and Preliminary Validation of the Integrated Spiritual Intelligence Scale (ISIS)*. Palo Alto, CA: Institute of Transpersonal Psychology Working Paper. Available on http://www.geocities.com/isisfindings/
3. Beagrie, R. (1999). Why the future belongs to value added companies. *The Journal for Quality & Participation*, *22*(1), 884–895. Retrieved from http://dx.doi.org/10.1108/02621710610692089
4. Brayfield, A. H., & Rothe, H. F. (1951). An index of job satisfaction. *Journal of Applied Psychology, 35*(5), 307–311. Retrieved from http://psycnet.apa.org/doi/10.1037/h0055617
5. Brown, E. (1999). America's most admired companies. *Fortune*, *1*(3), 68–73.
6. Cohen, A. B. (2002). The importance of spirituality in well-being for Jews and Christians. *Journal of Happiness Studies*, *3*, 287–310. Retrieved from http://dx.doi.org/10.1023/A:1020656823365
7. Covey, S. R. (1990). *Principle-centered leadership*. New York: Fireside.
8. Crossman, A., & Abou-Zaki, B. (2003). Job satisfaction and employee performance of Lebanese banking staff. *Journal of Managerial Psychology*, *18*(4), 368–376. Retrieved from http://dx.doi.org/10.1108/02683940310473118

9. Deming, W. E. (1981). Improvement of quality and productivity through action by management. *National Productivity Review*, *1*(1), 12–22. Retrieved from http://dx.doi.org/10.1002/npr.4040010105
10. Emmons, R. A. (2000). Is spirituality an intelligence? *The International Journal for the Psychology of Religion*, *10*, 27–34. Retrieved from http://dx.doi.org/10.1207/S15327582IJPR1001_2
11. European Foundation for the Improvement of Living and Working Conditions. (2007). *Measuring job satisfaction in surveys-comparative analytical report*. Retrieved from http://www.eurofound.europa.eu/sites/default/files/ef_files/ewco/reports/TN0608TR01/TN0608TR01.pdf
12. Evans, L. (1997). Understanding teacher morale and job satisfaction. *Teaching and Teacher Education*, *13*(8), 831–245. Retrieved from http://dx.doi.org/10.1016/S0742-051X(97)00027-9
13. Fairholm, G. W. (2000). *Capturing the heart of leadership (spirituality and community in the new American workplace)*. Westpoint, CT, London: Praeger.
14. Fry, L. W. (2003). Toward a theory of spiritual leadership. *The Leadership Quarterly, 14*(6), 693–727. Retrieved from http://dx.doi.org/10.1016/j.leaqua.2003.09.001
15. Gardner, H. (1999). *Intelligence reframed: Multiple intelligences for the 21st century*. New York: Basic Books.
16. George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference*. Boston: Allyn & Bacon.
17. George, M. (2006). Practical application of spiritual intelligence in the workplace. *Emerald Group Publishing Limited*, 3–5. Retrieved from http://dx.doi.org/10.1108/09670730610678181
18. Halama, P., & Strizenec, M. (2004). Spiritual, existential or both? Theoretical considerations on the nature of higher intelligences. *Studia Psychologica, 43*, 239–253. Retrieved from http://katpsych.truni.sk/osobne/halama/Halama,%20Str%C3%AD%C5%BEenec,%202004.pdf
19. King, D. B. (2008). *Rethinking claims of spiritual intelligence: A definition, model, & measure* (Unpublished master's thesis). Trent University, Peterborough.
20. Landy, F. J., Shankster, L. J., & Kohler, S. S. (1994). Personnel selection and placement. *Annual Review of Psychology*, *45*, 261–296. Retrieved from http://org/doi/10.1037/0021-9010.83.1.3
21. Mahajan, R. (2015). *Study of the relationship of research contribution and professional exposure of Indian agricultural scientists with their self-destructive intelligence syndrome and spiritual intelligence*: *Degree*. India: Kumaun University.
22. Marques, J. F. (2006). The spiritual worker: An examination of the ripple effect that enhances quality of life in- and outside the work environment. *Emerald Group Publishing Limited*, 884–895. Retrieved from http://dx.doi.org/10.1108/02621710610692089
23. Mihalič, R. (2008). *Povečajmo zadovoljstvo in pripadnost zaposlenih: praktični nasveti, metodologija, interni akt in model usposabljanja za upravljanje in merjenje zadovoljstva in pripadnosti zaposlenih, z ukrepi za večje zadovoljstvo pri delu in pripadnost organizaciji*: *priročnik*. Škofja Loka: Mihalič in partner.
24. Musek, J. (2008). Duhovna inteligentnost: struktura in povezave. *Anthropos*, *3–4*, 259–106. Retrieved from http://www.anthropos.si/anthropos/2008/3_4/13_musek.pdf
25. Musek, J., & Maravič, K. (2004). *Vrednote in duhovna inteligentnost*. Retrieved from http://www.dlib.si/stream/URN:NBN:SI:DOC-AV2T-FKY5/a24f0214-d9d6-48dd-8d2f-acafa118c411/PDF
26. Nguyen, A. N., Taylor, Y., & Bradley, S. (2003). *Job autonomy and job satisfaction: Some new evidence* (Working paper 045). Department of Economics: Lancaster University Management School. Retrieved from http://www.lancaster.ac.uk/staff/ecasb/papers/job%20autonomy%20%20job%20satisfaction%2030july03.pdf
27. Nodehi, H., & Nehardani, H. (2013). Relation between spiritual intelligence and job satisfaction. *Journal of Social Issues & Humanities*, *1*(5), 67–72. Retrieved from http://www.journalsih.com/Research%20Articles/Issue%205/Relation%20between%20Spiritual%20Intelligence%20and%20Job%20Satisfaction.pdf
28. Perrone, K. M., Webb, K. L., Wright. S. L., Jackson, V. Z., & Ksiazak, Z. M. (2006). Relationship of spirituality to work and family roles and life satisfaction among gifted adults. *Journal of Mental Health Counseling*, *28*(3), 253–268. Retrieved from http://dx.doi.org/10.17744/mehc.28.3.81a1dlhwelblce0v
29. Rastgar, A. A., Davoudi, S. M. M., Oraji, S., & Abbasian, M. (2012). A study of the relationship between employees' spiritual intelligence and job satisfaction: A survey in Iran's banking industry. *A Journal of Multidisciplinary Research*, *1*(2), 57–74. Retrieved from http://prj.co.in/setup/socialscience/paper9.pdf
30. Regent, P. (2013). *Obremenjenost in zadovoljstvo pri delu v odnosu do izgorelosti učiteljev* (doktorska disertacija). Ljubljana: Filozofska fakulteta Univerze v Ljubljani.
31. Ronel, N. (2008). The experience of spiritual intelligence. *The Journal of Transpersonal Psychology, 40(1),* 100–120. Retrieved from http://www.atpweb.org/jtparchive/trps-40-08-01-100.pdf
32. Sabadin, A. (1978). *Kvantitativni vidik analize strukture dela* (doktorska disertacija). Ljubljana: Filozofska fakulteta Univerze v Ljubljani.
33. Sadeghi, H., Zamani, A., & Mamasani, A. N. (2015). Study the relationship between spiritual intelligence and emotion intelligence with the quality of work life Izeh principals. *Journal of Scientific Research and Development*, *2*(1), 187–190. Retrieved from http://jsrad.org/wp-content/2015/Issue%201,%202015/33%202015-2-1-187-190.pdf
34. Schwartz, T. (1995). *What really matters: Searching for wisdom in America*. New York: Bantam.
35. Shabani, J., Hassan, S. A., Ahmad, A., & Baba, M. (2010). Age as moderated influence on the link of spiritual and emotional intelligence with mental health in high school students. *Journal of American Science*, *6*(11), 394–400. Retrieved from https://www.researchgate.

net/profile/Aminah_Ahmad2/publication/265550153_Age_as_Moderated_Influence_on_the_Link_of_Spiritual_and_Emotional_Intelligence_with_Mental_Health_in_High_School_Students/links/5411a7970cf264cee28b4b9d.pdf

36. Shaikh, M. A., Bhutto, N. A., & Maitlo, Q. (2012). Facets of job satisfaction and its association with performance. *International Journal of Business and Social Science, 3*(7), 322–326. Retrieved from http://ijbssnet.com/journals/Vol_3_No_7_April_2012/36.pdf
37. Smith, P. C., Kendall, L., & Hulin, C. L. (1969). *The measurement of satisfaction in work and retirement: A strategy for the study of attitudes*. Chicago: Rand McNally.
38. Sousa-Poza, A. & Sousa-Poza, A. A. 2000. Well-being at work: a cross-national analysis of the levelsand determinants of job satisfaction. *Journal of Socio-Economics 29*, 517–538 http://dx.doi.org/10.1016/S1053-5357(00)00085-8
39. Subramaniam, M., & Panchanatham, N. (2014). Relationship between emotional intelligence, spiritual intelligence and wellbeing of management executives. *Global Research Analysis*, *3*(3), 92–94
40. Šarotar Žižek, S. (2008). Pomen osebnega in osebnostnega razvoja človeških virov v (slovenskem) turizmu. *Academica Turistica: Fakulteta za turistične študije*, *3–4*, 42–48. Retrieved from http://www.turistica.si/downloads/revija/AcademicaTuristica-Nr3-4-December2008.pdf
41. Šarotar Žižek, S. (2012). *Vpliv psihičnega dobrega počutja na temelju zadostne in potrebne osebne celovitosti zaposlenega na uspešnost organizacije* (doktorska disertacija). Maribor: Ekonomsko poslovna fakulteta Univerze v Mariboru.
42. Šarotar Žižek, S., Treven, S., & Mulej, M. (2011). *Povezava med psihičnim dobrim počutjem zaposlenih in duhovno inteligentnostjo kot dejavniki primerno celovitega menedžmenta*. Moderna organizacija. Maribor: Fakulteta za organizacijske vede.
43. Thompson, L. (2004). Moral leadership in a postmodern world. *Journal of Leadership and Organizational Studies*, *11*(1), 27–37. http://dx.doi.org/10.1177/107179190401100105
44. Tischler, L., Biberman, J., & McKeage, R. (2002). Linking emotional intelligence, spirituality and workplace performance: Definitions, models and ideas for research. *Journal of Managerial Psychology*, *17*(3), 203–218. Retrieved from http://dx.doi.org/10.1108/02683940210423114
45. Vaughan, F. (2002). What is spiritual intelligence? *Journal of Humanistic Psychology*, *42*(2), 16–33. http://dx.doi.org/10.1177/0022167802422003
46. Wigglesworth, C. (2012). *SQ21: The 21 skills of spiritual intelligence*. New York: Selected Books.
47. Wolf, E. (2004). Spiritual leadership: a new model. *Healthcare Executive*, *19*(2), 22–25. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15017832
48. Wolman, R. N. (2001). *Thinking with your soul: Spiritual intelligence and why it matters*. New York: Harmony Books.
49. Yahyazadeh-Jeloudar, S., & Lotli-Goodarzi, F. (2012). What is the relationship between spiritual intelligence and job satisfaction among MA and BA teachers? *International Journal of Business and Social Science*, *3*(8), 299–303. Retrieved from http://ijbssnet.com/journals/Vol_3_No_8_Special_Issue_April_2012/35.pdf
50. Zembylas, M., & Papanastasiou, E. (2004). Job satisfaction among school teachers in Cyprus. *Journal of Educational Administration*, *42*(3), 357–374. Retrieved from http://dx.doi.org/10.1108/09578230410534676
51. Zohar, D., & Marshall, I. (2000). *SQ—Spiritual intelligence, the ultimate intelligence*. London: UL copy.

Authors

Maja Koražija is currently a Ph.D. student at the Faculty of Economics and Business at the University of Maribor. She earned her master's degree in human resource management, in which her main focus of study and research also lies. She actively participated in an international conference in India and presented her doctoral theme at Cambridge University. During most of her academic years, she has worked in the economic sector for Elektro Maribor and Steklarna Rogaška, where she worked on European funding projects.

Dr. Simona Šarotar Žižek is an assistant professor at the University of Maribor's Faculty of Economic and Business. She is the author and/or co-author of several articles published in various international and Slovenian journals and/or presented at scientific and expert conferences. She has prepared several scientific monographs and chapters in scientific and expert monographs. On several occasions she has been invited to present her papers at scientific and expert conferences. She is also active in preparing and implementing projects.

Dr. Damijan Mumel works as a professor of marketing at the University of Maribor, Faculty of Economics and Business. He is the head of the Marketing Institute and vice dean for research. His main areas of interest and lecturing are consumer behavior, research methodology, qualitative research, and communication. He has presented his work at international scientific conferences and published original scientific papers in domestic and foreign scientific journals. He is a member of the Slovenian Marketing Association and the Slovenian Psychologists' Association as well as the European Marketing Academy (EMAC).

Povezanost med duhovno inteligentnostjo in delovnim zadovoljstvom pri vodjih in zaposlenih

Izvleček

Namen študije je raziskati odnos med duhovno inteligentnostjo in delovnim zadovoljstvom tako pri vodjih kot tudi pri zaposlenih. Raziskave v preteklosti so se osredotočale le na raziskovanje povezanosti med duhovno inteligentnostjo in delovnim zadovoljstvom pri zaposlenih, zato smo v našo raziskavo vključili tudi ugotavljanje povezanosti med duhovno inteligentnostjo in delovnim zadovoljstvom pri vodjih. Naša vodilna teza je bila, da vodje in zaposleni z višjo stopnjo duhovne inteligentnosti občutijo tudi več delovnega zadovoljstva. V študiji smo ugotovili, da pri vodjih ni bilo statistično pomembne povezave med duhovno inteligentnostjo in delovnim zadovoljstvom, hkrati pa je bila ugotovljena statistično pomembna pozitivna povezava med duhovno inteligentnostjo in delovnim zadovoljstvom pri zaposlenih.

Ključne besede: duhovna inteligentnost, delovno zadovoljstvo, vodje, zaposleni

NAVODILA AVTORJEM

Revija **Naše gospodarstvo / Our Economy** objavlja znanstvene članke iz vseh področij ekonomije in poslovnih ved. Avtorje vabimo, da v uredništvo revije pošljejo originalne prispevke, ki še niso bili objavljeni oziroma poslani v objavo drugi reviji. Avtorji podeljujejo lastniku revije ekskluzivno pravico za komercialno uporabo članka, ki stopi v veljavo na osnovi sprejetja članka v objavo. Avtorji v celoti odgovarjajo za vsebino prispevka. Objavljamo samo članke, ki dobijo pozitivno oceno naših recenzentov.

Prispevki naj bodo napisani v angleškem jeziku. Na posebni strani navedite ime avtorja, njegov polni habilitacijski in znanstveni naziv ter ustanovo, kjer je zaposlen. Prva stran naj vsebuje naslov, izvleček (maksimalno 650 znakov) in ključne besede, vse troje v slovenskem in angleškem jeziku. Dodajte tudi trimestno kodo JEL klasifikacije, ki jo najdete na https://www.aeaweb.org/econlit/jelCodes.php?view=jel.

Za besedilo članka uporabljajte praviloma pisave Times, Times New Roman CE, SL Dutch in podobne v velikosti od 10 do 12 pik (points). V tabelah in slikah obvezno uporabljajte pisavo brez serifov (Helvetico, Arial, Arial CE, SL Swiss ali podobno). Za poudarke v besedilu uporabljajte poševni tisk, ne krepkega ali podčrtanega tiska.

Morebitne tabele in slike naj bodo oštevilčene ter naslovljene nad, opombe in viri pa pod tabelo oziroma sliko. V tabelah uporabljajte enojne okvirje, debeline pol pike (1/2 point). Sprotne opombe naj bodo oštevilčene in navedene pod tekstom pripadajoče strani. Oštevilčite tudi morebitne enačbe.

Vire v tekstu in v seznamu virov je potrebno urediti skladno z APA standardom – navodila na http://www.apastyle.org/learn/tutorials/basics-tutorial.aspx.

Nekaj osnovnih napotkov:

Navedbe virov v tekstu

Primer 1a: Another graphic way of determining the stationarity of time series is correlogram of autocorrelation function (Gujarati, 1995).

Primer 1b: Another graphic way of determining the stationarity of time series is correlogram of autocorrelation function (Gujarati, 1995, p. 36).

Primer 2a: Engle and Granger (1987) present critical values also for other cointegration tests.

Primer 2b: Engle and Granger (1987, p. 89) present critical values also for other cointegration tests.

Navedbe virov v seznamu virov

Primer 1 – Knjiga: Gujarati, D. N. (1995). *Basic Econometrics*. New York: McGraw-Hill.

Primer 2 – Članek v reviji: Engle, R. F., & Granger, C. W. J. (1987). Co-integration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 55(2), 251-276.

Primer 3 – Poglavje v knjigi, prispevek v zborniku: MacKinnon, J. (1991). Critical Values for Cointegration Tests. In R. F. Engle & C.W. J. Granger, (Eds.), *Long-Run Economic Relationships: Readings in Cointegration* (pp. 191-215). Oxford: University Press.

Primer 4 – Elektronski vir: Esteves, J., Pastor, J. A., & Casanovas, J. (2002). Using the Partial Least Square (PLS): *Method to Establish Critical Success Factors Interdependence in ERP Implementation Projects*. Retrieved from http://erp.ittoolbox.com/doc.asp?i=2321

Prispevek naj ne bo daljši od avtorske pole (30.000 znakov). Stran naj bo velikosti A4, s tricentimetrskimi robovi in oštevilčenimi stranmi. Izpis naj bo enokolonski z 1,5 razmika med vrsticami. Elektronsko verzijo prispevka pošljite v MS Word obliki na e-naslov our.economy@um.si ali nase.gospodarstvo@um.si.

S prispevkom pošljite za avtorja in vse soavtorje še celotni naslov, elektronski naslov in telefonsko številko, preko katere je dosegljiv uredništvu. Dodajte tudi kratek CV (obsega od 500 do 550 znakov, upoštevajoč presledke).

Revija avtorjem ne zaračunava stroškov objave.

INSTRUCTIONS FOR AUTHORS

The journal **Naše gospodarstvo / Our Economy** publishes original scientific articles covering all areas of economics and business. Authors are invited to send original unpublished articles which have not been submitted for publication elsewhere. Authors are completely responsible for the contents of their articles. Only articles receiving a favorable review are published. The authors grant the Journal Owner the exclusive license for commercial use of the article throughout the world, in any form, in any language, for the full term of copyright, effective upon acceptance for publication.

Please write your text in English (American or British usage is accepted, but not a mixture of these). The cover page should include the author's name, academic title or profession, and affiliation. The first page must contain the title, an abstract of no more than 650 characters, and key words, all in English. Add also three-character codes of JEL classification (https://www.aeaweb.org/econlit/jelCodes.php?view=jel).

Manuscripts should be prepared on a word processor in a font such as Times, Times New Roman CE, or SL Dutch in size 10 to 12 points. Tables and figures are to be presented in fonts without serifs (Helvetica, Arial, Arial CE, SL Swiss or similar). Emphasized parts of the text should be in italics, not bold or underlined.

Figures and tables should be numbered with a title above and notes and sources below. Figures should be in ½ point single-line frames. Footnotes should be numbered consecutively and placed at the bottom of the relevant page. Equations should also be numbered.

References in the text and in the list of references should be arranged according to APA style – see http://www.apastyle.org/learn/tutorials/basics-tutorial.aspx.

Some elementary directions:

References in the text

Example 1a: Another graphic way of determining the stationarity of time series is correlogram of autocorrelation function (Gujarati, 1995).

Example 1b: Another graphic way of determining the stationarity of time series is correlogram of autocorrelation function (Gujarati, 1995, p. 36).

Example 2a: Engle and Granger (1987) present critical values also for other cointegration tests.

Example 2b: Engle and Granger (1987, p. 89) present critical values also for other cointegration tests.

References in the list of references

Example 1 – Book: Gujarati, D. N. (1995). *Basic Econometrics*. New York: McGraw-Hill.

Example 2 – Journal article: Engle, R. F., & Granger, C. W. J. (1987). Co-integration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 55(2), 251-276.

Example 3 – Book chapter or article from conference proceedings: MacKinnon, J. (1991). Critical Values for Cointegration Tests. In R. F. Engle & C.W. J. Granger, (Eds.), *Long-Run Economic Relationships: Readings in Cointegration* (pp. 191-215). Oxford: University Press.

Example 4 – Web source: Esteves, J., Pastor, J. A., & Casanovas, J. (2002). Using the Partial Least Square (PLS): *Method to Establish Critical Success Factors Interdependence in ERP Implementation Projects*. Retrieved from http://erp.ittoolbox.com/doc.asp?i=2321

The size of the article should not exceed 30,000 characters and should be prepared on A4 paper with 3 cm margins and numbered pages. The text should be in single column layout, with 1.5 line spacing. Send the electronic version of article in MS Word to the following address: our.economy@um.si or nase.gospodarstvo@um.si.
For the author and co-authors please add their postal address, e-mail address, telephone number as well as their CV (which range from 500 to 550 characters including spaces) in one paragraph.

The journal does not have article processing charges (APCs) nor article submission charges.

NG
OE

LETNIK
VOLUME 62