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Organisational Factors of Rapid Growth of Slovenian Dynamic Enterprises

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The authors provide key findings on the internal and external environmental factors of growth that affect the rapid growth of dynamic enterprises in relation to individual key organisational factors or functions. The key organisational relationships in a growing enterprise are upgraded with previous research findings and identified key factors of rapid growth through qualitative and quantitative analysis based on the analysis of 4,511 dynamic Slovenian enterprises exhibiting growth potential. More than 250 descriptive attributes of a sample of firms from 2011 were also used for further qualitative analysis and verification of key growth factors. On the basis of the sample (the study was conducted with 131 Slovenian dynamic enterprises), the authors verify whether these factors are the same as the factors that were studied in previous researches. They also provide empirical findings on rapid growth factors in relation to individual organisational functions: administration – management – implementation (entrepreneur – manager – employees). Through factor analysis they look for the correlation strength between individual variables (attributes) that best describe each factor of rapid growth and that relate to the aforementioned organisational functions in dynamic enterprises. The research findings on rapid growth factors offer companies the opportunity to consider these factors during the planning and implementation phases of their business, to choose appropriate instruments for the transition from a small fast growing firm to a professionally managed growing company, to stimulate growth and to choose an appropriate growth strategy and organisational factors in order to remain, or become, dynamic enterprises that can further contribute to the preservation, growth and development of the Slovenian economy.

Keywords: organisational factors of rapid growth, dynamic enterprises, enterprise's internal environment, enterprise's external environment

1   Introduction

Every economy, including Slovenia's, has small, medium-sized and large enterprises that are growing and generating new jobs and garnering the largest share of economic growth. Such companies can even be found during times of crisis. Their growth is affected by individual internal and external factors of rapid growth that researchers recognised decades ago and that have only changed slightly over time. They include different organisational factors, as growth largely depends on the effects of key organisational relationships in a growing company, i.e. between administration, management and implementation. Andre (2008) states that individual relationships are characteristic of a specific organisation and can be described by using the specific characteristics or attributes by which they differ. In our case, these are individual descriptive attributes that best describe the seven recognised rapid growth key factors of dynamic enterprises that relate to the three key organisational functions.

In this article, the authors provide key findings on the already recognised factors of rapid growth of dynamic enterprises that were studied on the basis of different studies that were implemented both in Slovenia and abroad during different time periods (1990–1994, 1998–2002, 2006–2010). In a previous extensive study, the authors dealt with individual growth factors in detail and studied the effect of these factors that define the organisational characteristics of a growing company, especially a company transitioning from a small fast growing firm to a professionally managed growing (dynamic) company. The main goal of the research is to show the findings verifying the key growth factors of Slovenian dynamic enterprises in conjunction with some organisational factors that influence the (fast) growth, based on research findings from 2011, and compare them with the findings of dynamic enterprises and their key growth factors for the period of last twenty years (previous researches were made by Žižek and Liechtenstein, 1994; Mei-Pochtler, 1999; Pšeničny, 2002; Pšeničny et al., 2012). The research assumes that the key growth factors have not significantly changed in the last twenty years and that the factors depend on, or are related to, the effects of some key organisational relationships in a growing dynamic company (entrepreneur, manager, employees).

2   Purpose

The purpose of this article is to use the extensive study, which was conducted in 2011 and 2012, to provide findings for the posed main research question of whether rapid growth factors are still the same (congruent) as those studied by past researchers (Žižek and Liechtenstein, 1994; Mei-Pochtler, 1999; Pšeničny, 2002; Pšeničny et al., 2012), which attributes describe them the best and to what extent these factors depend on or are related to the effects of key organisational relationship in a growing dynamic company. In this respect, the authors focus on the key factors of rapid growth according to Žižek and Liechtenstein (1994). The research in 1994 was conducted with a sample of 150 dynamic Slovenian enterprises. The empirical data were obtained with the same survey, same number of descriptive attributes and questions. The enterprises were chosen from the database of all economic subjects in Slovenia in that time period with some excluding activities.

As mentioned in the Introduction, an extensive study was conducted in 2011 encompassing 4,511 dynamic Slovenian enterprises that were chosen from the AJPES database of Slovenian companies employing strict previously determined criteria for dynamic enterprises. A survey was sent to the companies in the form on an online survey and covered over 130 questions or more than 250 descriptive attributes of seven factors of rapid growth. The study was conducted on a sample of 131 dynamic Slovenian enterprises.

3   Theoretical background

The importance of organisational factors that influence growth was already studied by Gamble and Blackwell (2002) who determined three basic sets: 1. the individual, 2. the organisation, 3. the environment. Maier (2007) states that in terms of factors affecting success of management, 10 % relate to technology management, 20 % to the organisational processes and 70 % to human resources. Kreitner and Kinicki (2004), on the other hand, stress the importance of technology, which represents only 20 percent of knowledge management with the remaining 80 percent being people. Dimovski et al. (2005:34) similarly stresses that every company, small or large, dynamic or static (Tajnikar, 2006:84 86) usually creates the three mentioned basic functions or roles in the company (administration – management – implementation). In a broader sense, organisational culture, management, communication, information technology and human resources management could be emphasised as key organisational factors of knowledge management (similar findings also indicate by O'Gorman, 2001; Fischer and Reuber, 2003; Prajogo and McDermott, 2005; Rebelo, and Gomes, 2011).

In relation to dynamic enterprises and the importance of individual organisational factors, Rozman (2012:6 8) establishes that when a new company is set up, the entrepreneur starts by implementing all the activities himself (he is the owner of the company, administers it, freely uses it, plans, organises, controls and also implements the activity) – 1. administration (administrators). Chrusciel and Field (2006:505 506) understand administration as a function of owners. When an entrepreneur eventually wishes to remove himself from the numerous obligations and remain as only the owner (administrator) of the company, he hires a manager who assumes the remaining obligations. In doing so, the owner still manages and uses the company, i.e. determines its main directions and aims, its vision and success criteria. He also decides on the division of assets and the company's activities – 2. management (managers). Robbins (2001) believes that management is the main function of managers. Managers receive their tasks and authority to implement from administrators, i.e. owners. Their essence lies in harmonising technically dispersed work. With the company's growth, especially the growth of dynamic enterprises, the scope of work expands thus generating the need for additional employment. All gaps in production, development, marketing, finances and administration need to be filled with the best experts or other workers – 3. implementation (implementers). Rozman (2000:5 6) establishes that implementation is performed by implementers (specialists) who implement their part of the task (they cannot transfer it to others).

4   Dynamic enterprises

Through time, changes in ownership result in changes in organisational relationships in a company, especially in a dynamic enterprise. The entrepreneur is being replaced by the hired management, the number of implementers increases as well as the complexity of the information, decision-making and implementation process. Organisational changes, which are the result of rapid growth, are substantial and many companies are unable to transition from a small firm to a professionally managed growing company. This transition requires knowledge and competencies that are held educated, qualified and highly motivated individuals. Many researchers, including Kingstone (1987:225 232) and others call these dynamic entrepreneurs, dynamos.

Different researchers use the term dynamic enterprises for companies that grow swiftly or (develop) at an above-average rate (Širec and Rebernik, 2010:46), intensively employ labour and are always a step ahead of the competition (adapted from Birch, 1987; Žižek and Liechtenstein, 1994; Roure, 1999; Mei-Pochtler, 1999; Pšeničny, 2002; Acs and Mueller, 2008; Bavdaž et al., 2009; Littunen and Virtanen, 2009; Hölzl, 2009; Haisu and Zhongxiu, 2010; Mateev and Anastasov, 2010; Rebernik et al., 2012). The aim of such companies is not merely to survive but, above all, to succeed. Pšeničny (2002) states that dynamic enterprises, according to chosen criteria (e.g. growth of sales), in a time interval of at least five years record growth levels that place them among the top 5 or even 10 % of companies in the economy or sector. On the basis of these facts, the authors verified key (internal and external environmental) growth factors that affect the rapid growth of Slovenian dynamic enterprises and their congruence with the findings of Žižek and Liechtenstein (1994). In doing so, they were not only limited to the internal and external factors of establishing an organisation's structure, but were able to verify all relevant factors.

5 Organisational factors of rapid growth

In relation to organisational sciences, external factors include values, institutional conditions, the market and the development of science and technology and internal factors encompassing everything from the business strategy, technology and the production programme to the organisation's employees, size, location, management and tradition. Both sets of factors are somehow connected by the company's organisational culture. From the viewpoint of this study, special emphasis was placed on establishing the effect of the main factor – the entrepreneur and holder of the administrative/governance (ownership) and management function – and searching for eventual congruence/differences among these three main organisational functions from the viewpoint of a dynamic enterprise.

The main condition for the growth of each company is undoubtedly stemmed from the desire of the owner (the entrepreneur) to see his company to grow. In this respect, the entrepreneur, with all his characteristics, abilities, knowledge and motivation, is the fundamental and most important factor of rapid growth. Tajnikar (2006:78 80) establishes that there are also many other factors that affect growth intensity, such as an open economy, a developed financial system, connectivity between research and development of different institutes and entrepreneurs and the possibility of withdrawal, cashing in and collecting yields. In their operation, companies are also subject to different individual internal and external factors that affect their success and "speed" of growth. Different authors wrote about rapid growth factors (Penrose, 1959; Žižek and Liechtenstein, 1994; Charan and Tichy, 1998; Mei-Pochtler, 1999; Roure, 1999; Pšeničny; 2002; Pšeničny and Novak, 2012a).

The main internal and external factors that affect rapid growth and that are mentioned by the majority of these authors are: 1. the enterprise's external environment, 2. the entrepreneur or the entrepreneurial team, 3. the business strategy, 4. the management system, 5. employees, 6. innovations and implementation of changes, 7. growth financing. These factors of dynamic entrepreneurship can be described by a number of characteristics (attributes) that affect them from either the external or the internal environment of the enterprise. Each attribute describes a certain area of operation, or characteristics of the entrepreneur and the company, and is included in the form of a statement or question in the extensive survey. Mei-Pochtler (1999:97 104) calls them "facilitators and inhibitors of fast growth of enterprises". In a previous study, the authors verified the congruence of these attributes or variables and their connectivity in common sets (factors) that best describe an individual factor of rapid growth (Pšeničny and Novak, 2012a).

6 Methodology – verifying the congruence of factors of rapid growth of Slovenian dynamic enterprises

In their previous study, the authors established or verified which factors affect rapid growth of enterprises and whether these factors change through time. The obtained and arranged results of the implemented study were processed in the SPSS statistical program and were used to facilitate the verification and relevance of the posed question. The obtained data allowed the authors to establish the congruence of factors and individual descriptive attributes of rapid growth and thus compare them to the previous findings of researchers. They searched for a connection between individual descriptive attributes and the key organisational factor – the entrepreneur.

6.1 Sample

In 2011, Slovenian dynamic enterprises exhibiting growth potential during the time period of 2006 2010 were chosen from the database of all economic subjects (excluding activities such as banks, insurance companies, public institutions and similar) on the basis of criteria that were shaped pursuant to available findings on dynamic enterprises. From this list, all companies whose 2006 and 2010 data did not meet the criteria to be listed as dynamic enterprises were excluded. From the database covering the operation of 126,976 companies, a database of 4,511 companies (including 1,010 sole proprietors and 3,501 commercial companies) that cumulatively met all previously determined criteria was compiled. Among the 4,511 dynamic companies covered by the survey, the detailed structure of the companies was as follows (companies covered in the survey represent altogether 3,50 % of all commercial enterprises in Slovenia – excluding activities such as banks, insurance companies, public institutions and similar):

- 1,004 micro and small sole proprietors (1,41 % of all sole proprietors);
- 6 medium-sized sole proprietors (54,55 % of all medium-sized sole proprietors) and
- 3,501 commercial companies (6,28 % of all commercial companies).

An extensive survey with over 130 questions with more than 250 descriptive attributes of the seven factors of rapid growth was sent to all 4,511 companies. In its basic form, the survey was developed for researching European gazelles (Žižek and Liechtenstein, 1994). It was later completed and used to analyse the growth of dynamic enterprises in different studies (Pšeničny, 2002) and was subsequently updated for the study conducted in 2012 (Pšeničny et al., 2012).

6.2 Research question

With the aim of forming a new and fresh economic policy in Slovenia, an empirical study was designed in 2011 whose purpose was to analyse the growth of Slovenian companies in the last five years (2006 2010). The analysis focused on the fastest growing Slovenian companies – dynamic enterprises that generated growth in the last years. The authors used these guidelines to verify the success of dynamic enterprises in Slovenia on the basis of rapid growth factors, i.e. whether these factors are the same as the ones studied in the past by Žižek and Liechtenstein (1994) and which individual attributes describe them the best. Žižek and Liechtenstein (1994)

conducted their study employing a sample of 150 dynamic enterprises. The enterprises in the 1994 research were also chosen from the database of all economic subjects in Slovenia at that time. The empirical data were obtained with the same survey, same number of descriptive attributes and questions (excluding activities such as banks, insurance companies, public institutions and similar).

In this article, the authors paid special attention to searching for a connection between individual descriptive attributes that affect the key organisational factor – the entrepreneur -from the governance, management and implementation viewpoint.

6.3 Data Analysis

By employing factor analysis, which is used to cluster individual variables (attributes) and whose aim it is to determine a smaller number of linear combinations of the observed variables by using them to maximise the variance accounted for in the original data, 71 new factors were obtained explaining over 89 % of variance. We further named, described and verified all the newly obtained factors in terms of content. Using individual variables (attributes) that best describe and explain an individual factor and which were obtained via factor analysis we were able to, in the event that they would substantially differ from the ones we were verifying, form new nominal factors of rapid growth and compare them with the existing factors in terms of content. Based on the rotated matrix, we have examined all the strongest attributes (variables) for each new factor. To all 71 factors, we have added the corresponding strongest attribute (variable).

We further presented the interpreted and newly named factors (all seventy-one) that included only attributes with eigenvalues of over 0.5 or 0.4 if these were questions from the same set (based on key questions that describe the seven growth factors). In this manner, only the attributes with the highest eigenvalues remained or attributes that were the strongest for an individual factor. We later combined individual factors whose attributes describe similar fields (question sets) and obtained actual factors that best describe an individual field. It was on this basis that content-based factors of rapid growth were formed. After excluding the "weakest" attributes, we were left with 59 "new" factors comprised of attributes with the highest eigenvalues. Therefore, below are the results of combining similar factors that describe more or less the same or very similar fields.

7 Shaping and verifying congruence of factors of rapid growth

Congruence was verified for the seven main factors of rapid growth of dynamic enterprises that were primarily shaped according to Žižek and Liechtenstein (1994), summarised from Pšeničny (2002) and later verified and updated according to Pšeničny and Novak (2012a). The primary study has shown that the seven main factors of rapid growth are best described by 243 descriptive attributes. After verifying these factors and

their individual descriptive attributes, the authors established that all seven main factors of rapid growth remained the same but they managed to describe them with a smaller number of (the strongest) descriptive attributes, i.e. 150 recognised descriptive attributes. They established that in the last twenty years, rapid growth factors did not change substantially and there were also no fundamental changes in individual descriptive attributes of a specific rapid growth factor.

The main differences in the number of descriptive attributes were thus found in the first factor (the external environment), which they describe with 22 descriptive attributes compared to the primary study where 35 descriptive attributes were used to describe this factor. The second factor (the entrepreneur) was described with 16 attributes while in the primary study 39 descriptive attributes were used. The third factor (business strategy) is the most extensive factor that they described and interestingly enough used the same number of descriptive attributes, i.e. 68. The fourth factor (the management system) was initially described by 23 descriptive attributes; the authors described it with 7 descriptive attributes. The fifth rapid growth factor (the employees), which they later verified also from the organisational point of view, was described by 14 descriptive attributes, a difference from the initial 22. It was established that the sixth factor (innovations) is best described by 4 descriptive attributes; initially there were 11. For the last, seventh factor (financing), the authors established that it is best described by 19 descriptive attributes; initially there were 45.

Below are the descriptions and depictions of congruence/differences among individual descriptive attributes of rapid growth factors. A more detailed aspect is the link or connection between basic organisational factors of rapid growth, i.e. between the entrepreneur as the administrator (owner and manager in one person) of the company, the entrepreneur as the manager and the company's employees as implementers.

7.1 Descriptive fields and congruence between individual attributes

The study found that the external environment of a dynamic enterprise is the second most extensive factor of rapid growth. The key congruent attribute was the attribute describing the legislative field of dynamic entrepreneurship. This relates to the state's tax policy, which is very discouraging and which does not encourage companies to make new investments. For this reason, for companies to grow faster, extensive changes in their financial and business environment that would stimulate new investments are needed.

The second factor is the entrepreneur. The authors established that he is defined by the following strongest attributes that describe his field and level of education, previous years of work experience, years and diversity of work experience, company ownership, training abroad and managerial experience.

The business strategy factor was recognised as the most extensive factor. The business strategy of dynamic enterprises is usually directed towards professional management and attitude towards the employees and final buyers while first choosing the legal form. The employees and the management

are involved in the company's operation or strategy. In order to grow, companies need to choose sales markets where they generate the largest share of profit assuming that in terms of competitiveness they are among the top 3 % in their industry. Competitive advantage is generated or maintained through low purchase costs, low labour costs, good organisation, good knowledge of market trends and needs, the orientation of the company's employees towards increasing efficiency of the production process, etc.

The management system in dynamic enterprises is very employee-centred and employees are well remunerated and managed by highly qualified and equally well remunerated managers. Dynamic enterprises pay special attention to logistics and information support, technological development, the company's main advantages over its competition, choice of suppliers, etc. The entrepreneur performs the same tasks as in the past or in the previous job while has at the same improved his organisational skills.

Dynamic enterprises predominantly see their advantage in the qualifications of their employees who are also difficult to find for a specific narrow work segment. They first need to train and qualify the employees for the work themselves, and these employees are later involved in continual training and education. Their central growth strategies include a good human resources policy and increased employment of new employees with the company's good results in business.

The majority of dynamic enterprises are definitively innovative in different fields, as this is required for their fast growth and development. The strongest and congruent attributes relate to innovations and the quality of work (of services or products). Dynamic enterprises allocate substantial resources to investments in research and development. This is also their key strategy that they intend to follow in the future. In order to facilitate growth, companies also focus in the field of making products.

The factor of financing is undoubtedly one of the most important factors in the growth of a dynamic enterprise. Companies need to finance their growth prudently while at the same time generate sufficient profit to be able to finance their future growth (mostly with own sources, savings and borrowing). The generated surplus is invested in development and their investments are financed with loans. More venture capital and changes in the financial environment would substantially facilitate growth of dynamic enterprises.

7.2 Verifying relationships between individual content-based descriptive attributes and the main organisational functions (entrepreneur, management, employees)

The authors found that even after twenty years, there were no fundamental changes in basic factors of rapid growth in Slovenian dynamic enterprises. They also found that their content-based descriptive attributes also did not change substantially. On this basis, they further verified or searched for the main content-based differences and deviations in individual content-based attributes related to the organisational relationship between the entrepreneur, the manager and employees on

the basis of empirical findings from 1994 and 2011 (Pšeničny and Novak, 2012b).
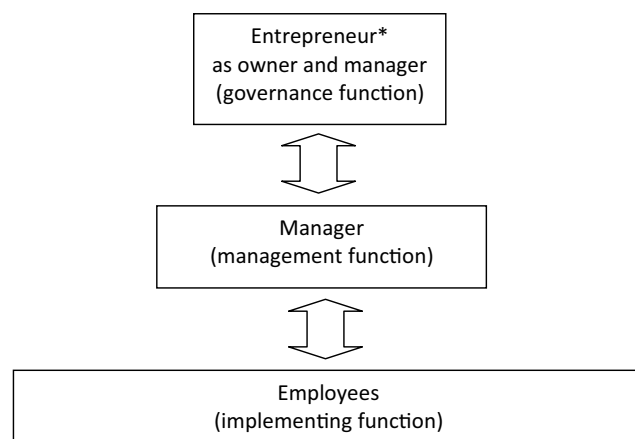
Figure 1: Basic organisational functions in a dynamic enterprise

Source: Own
* Entrepreneur (governance and administrative function in one person – from the beginning of the growth to the managing of the roles) – for the transition from a small fast growing firm to a professionally managed growing company

On the basis of empirical findings, the authors established that almost four fifths of dynamic enterprises are owned by the entrepreneur of the entrepreneurial management team. With respect to the 1994 findings, there were two thirds such companies. Over 90 % of all dynamic enterprises in both studies were set up by the entrepreneur. Another interesting aspect is that in the 1994 study, two thirds of entrepreneurs used to hold (in their previous job before setting up a dynamic enterprise) a management position, while in the 2011 study, such previous employment was found in "only" slightly less than two fourths. As the majority of dynamic enterprises were set up by the entrepreneur, the next in-depth question established that in 2011, slightly less than 40 % did so with the help of their family and friends. With respect to the 1994 findings, one third of companies were established in this manner.

In 1994, entrepreneurs emphasised the owner's or the management team's organisational skills and the entrepreneur's/management team's experience as the main reason behind the success of a dynamic enterprise. An interesting aspect of the 2011 study is that entrepreneurs did not emphasise any specific reason for the company's success but have, on average, highlighted almost all four of the listed options. More than three fourths of entrepreneurs participating in the 2011 study manage their dynamic enterprises themselves or perform all the important activities themselves. In 1994, only one third of entrepreneurs managed their dynamic enterprise themselves, while slightly more than one fourth managed their company with a good team comprised of non-owners and owners. The established differences in the monthly salary of entrepreneurs, managers and employees show that in the 2011 study employees in over two fourths of cases earned an average monthly net salary between EUR 800.00 and EUR 1,000.00. The same was seen in the 1994 study. The average monthly earnings of the management team in 2011 amounted

to between EUR 1,000.00 and EUR 1,500.00 in slightly more than one third of cases. In the 1994 study, manager salaries were substantially higher standing between EUR 2,000.00 and EUR 2,500.00. The average net monthly salary of one half of the entrepreneurs in the 2011 study amounted to between EUR 1,000.00 and EUR 2,000.00. Twenty years ago, entrepreneurs had substantially higher salaries with one fifth remitting between EUR 3,500.00 and EUR 4,000.00 to their account. One third of those entrepreneurs emphasised that they were not paying themselves more due to tax reasons or in order to prepare the company for a new investment. In both studies, one third of entrepreneurs had already thought about including their employees in the company's ownership structure but had not yet done so; however they planned to do so in the future.

From the viewpoint of the entrepreneurial function, it was established that dynamic enterprises were on average set up by the entrepreneur or by the entrepreneurial management team. The average age of the entrepreneur at that point was between 40 and 49 years with at least 10 years of work experience. Twenty years ago, dynamic enterprises were also set up by the entrepreneur or the management team. It is interesting to note that the average age of the entrepreneur at that point was also between 40 and 49 years with at least 10 years of work experience. The entrepreneur's motivation for faster growth of the company is predominantly influenced by anticipated higher yield, risk premiums and social recognition or the recognition of the business environment. For entrepreneurs, this was their first and only established company and they did not own other companies. For fast growth, membership of the entrepreneur in one of the entrepreneurial organisations is important, as they exchange important information, make new acquaintances and conclude new business deals, socialise with other entrepreneurs and in general enjoy their time with other people. In order to facilitate growth, entrepreneurs also hire experienced consultants for specific fields. The emphasised fields for hiring a consultant were marketing, sales and purchase management. No substantial differences were found between individual descriptive attributes or their values.

From the viewpoint of the management function, dynamic enterprises, in order to record faster growth, should consider the importance of the most important fields in creating their competitive advantage. This predominantly relates to lower labour costs, company organisation and marketing strategy. The companies should also consider the importance of individual fields for company growth, i.e. the orientation of employees towards meeting customer demands. The importance of the main elements of human resources management in order to improve operations is also of exceptional importance and companies should pay special attention to this field, including the personnel policy or the right choice of employees, financial remuneration of employees and establishing of teams. This rapid growth factor also does not show any substantial differences in the content-based descriptive attributes with regard to the previous study.

The third and final organisational function is the implementing function, where the key factors are the employees of a dynamic enterprise. In order for the company to be successful, a high educational structure of employees is required, i.e. at least secondary school or higher education. Twenty years ago, secondary school was emphasised as the highest educational level, however the majority of employees were appropriately qualified to perform their jobs. They acquired the majority of

Table 1: Individual emphasised and related organisational factors with regard to the entrepreneur – manager – employees relationship

Field	1994 study (N = 150)	2011 study (N = 131)
Company ownership	Entrepreneur or entrepreneurial management team	
Founder of the dynamic enterprise	The entrepreneur	
Previous job	Management position	
"Help" in setting up the company	Alone + family and friends	
Main reason for the success of the dynamic enterprise	Organisational skills of the owner or the management team	
Company management (entrepreneur alone or with the help of qualified managers)	The entrepreneur performs all the important activities himself	
Net monthly salary of employees	Between EUR 800.00 and EUR 1,000.00	
Net monthly salary of managers	Between EUR 2,000.00 and EUR 2,500.00	Between EUR 1,000.00 and EUR 1,500.00
Net monthly salary of the entrepreneur	Between EUR 3,500.00 and EUR 4,000.00	Between EUR 1,000.00 and EUR 2,000.00
Employee ownership in the company	It might work, it is planned for the future	It might work but it will not be implemented

Source: Pšeničny et al., 2012

Table 2: Values of descriptive attributes for the organisational factor of entrepreneur

Content-based descriptive field	Values
Ownership source of the dynamic enterprise	Entrepreneur or management team
Age of the entrepreneur	Between 40 and 49 years (44 mean)
Level of education of the entrepreneur	Secondary school or higher
Years of work experience of the entrepreneur prior to setting up the now dynamic enterprise	More than 10 years
The entrepreneur's ownership share (main shareholder) in another company	None or one
Number of previously successful start-ups	One or none
Membership of the entrepreneur in an entrepreneurial organisation	Important
Socialising with people	Yes
Hiring consultants for specific fields	Marketing, sales and purchase management
Willingness to meet other dynamic entrepreneurs	Yes
The effect of main factors on the entrepreneur's motivation for faster growth of the dynamic enterprise	Anticipated higher yield, risk premiums and social recognition or the recognition of the business environment

Source: Pšeničny and Novak, 2012b

Table 3: Values of descriptive attributes for the organisational factor of management

Content-based descriptive field	Values
Main fields in generating competitive advantage	Low labour costs, company organisation, the marketing strategy
The most important areas for company growth	The orientation of employees towards meeting customer needs
Key elements of human resources management in order to improve operation	The personnel policy or the right choice of employees, financial remuneration of employees and establishing of teams

Source: Pšeničny and Novak, 2012b

knowledge and skills while working for the dynamic enterprise where they were employed at the time of the study. In their growth, dynamic enterprises consider the appropriate number of employees from the start. In the first year of operation, this number should be from 1 to 4. The same number is recommended also for the third and fifth year of operation. This, however, generally does not correspond to the actual situation in dynamic enterprises that require successful employees for their growth and their number continually increases through a longer period of time until the company reaches a satisfactory growth level. A similar stipulation also applies to the hiring of consultants for specific fields in the company with 1 to 4 being the recommended number. For this organisational factor there were also no substantial content-based differences in the descriptive attributes.

In the final part of the article, the authors provide their findings on verifying the relationships between individual content-based descriptive attributes (studies implemented in 2011 and in 1994) and the basic organisational functions (entrepreneur, management, employees).

8   Findings

8.1   Results

The comparative analysis of study results from the early nineties, late nineties and the beginning of this century has shown that with rapidly growing or dynamic enterprises we can easily point out seven key factors of rapid growth and 250 (Žižek and Liechtenstein, 1994) descriptive attributes that describe or determine these factors. The authors did not find any essential content-related differences but they did successfully reduce the number of the required attributes to define rapid growth factors from 250 to 150 key descriptive attributes, facilitating future recognition of rapidly growing dynamic enterprises in Slovenia.

The main organisational factors of rapid growth (entrepreneur, management – manager and employees) in rapidly growing dynamic enterprises in Slovenia also did not substantially change in the last twenty years, i.e. pursuant to the content-

Table 4: Values of descriptive attributes for the organisational factor of employees

Content-based descriptive field	Values
The number of employees in the first year of operation (n)	From 1 to 4
The number of employees in year (n + 1)	From 1 to 4
The number of employees in year (n + 5)	From 1 to 4
The number of employees in the year of the survey	From 1 to 4
The number of outsourced employees in year (n + 3)	From 1 to 4
The number of outsourced employees in year (n + 5)	From 1 to 4
The number of outsourced employees in the year of the survey	From 1 to 4
The educational structure of employees	Primary, apprentice, secondary
Appropriate qualifications of employees	The majority are appropriately qualified
The manner of acquiring qualifications of company employees for successful work	At seminars outside the school system, at previous jobs, while working for the current company

Source: Pšeničny and Novak, 2012b

based descriptive attributes that were obtained for these factors on the basis of a study conducted in 2011. The fact is that the most important aspect of a company's sustainable growth is the successful transition from a small firm managed by the entrepreneur – manager.

8.2 Managerial implications

The study has shown that the majority of small growing companies are managed by the entrepreneur himself and that this individuality even increased in fast growing companies with regard to the study conducted twenty years ago. In other words, today's entrepreners are more reluctant to work in an entrepreneurial management team than they were two decades ago. The same as two decades ago, dynamic enterprises are still not inclined towards including their employees in the ownership and management structure or in the participation of profit, which is one of the main characteristics of dynamic enterprises across the world (Pšeničny, 1999, 18 21). Only in the case of a company with over 50 employees, the entrepreneur is required to strengthen the company with professional managers, hire consultants and, to a greater extent, include employees in the decision-making and management processes. It is also interesting to note that three quarters of entrepreneurs are planning on adding 1 to 9 new jobs in the future, which will additionally facilitate the need to introduce new consultants and managers.

8.3 Discussion of results

The content analysis of differences in answers has thus shown that the main organisational relationships between the entrepreneur, the manager and the employees have not substantially changed. There are many signs that the rapidly growing companies, which were analysed, are not ready for the transition

from a small growing company to a professionally managed rapidly growing dynamic enterprise. Deliberation on and the search for reasons for stagnation or the lagging behind of the "entrepreneurial spirit" in rapidly growing companies should be the focus of further research, while on the other hand actual opportunities for the development of organisation in rapidly growing companies should be established in order to facilitate and enable faster progress, development and growth of these companies in future years.

8.4 Conclusions

It could also be emphasised that there are certain obstacles that hinder and hold entrepreneurs back, keeping them at a minimal growth level and impeding extensive organisational interventions, i.e. professionalisation of management and operation. These obstacles mainly relate to individual obstacles in the financial and business environment (poor possibilities of taking on long-term loans, high interest rates, poor economic possibilities, high tax burdens, limiting governmental decrees, etc). In all this, the continuation of the currently running business is still affected by the entrepreneur's motivation to set up a dynamic enterprise, i.e. to realise his idea and vision. This corresponds to the key growth strategy for the future, which is undoubtedly developing and offering existing and new products and services to new markets.

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Organizacijski dejavniki hitre rasti slovenskih dinamičnih podjetij

Avtorja v članku podajata ugotovitve preverjanja posameznih notranje in zunanje okoljskih dejavnikov hitre rasti, ki vplivajo na hitro rast dinamičnih podjetij v povezavi z nekaterimi ključnimi organizacijskimi dejavniki oziroma funkcijami. Temeljna organizacijska razmerja v rastočem podjetju nadgrajujeta s spoznanji dosedanjih raziskovanj in prepoznanih odločilnih dejavnikov hitre rasti, in sicer s kvalitativno in kvantitativno analizo na osnovi analize 4.511 slovenskih dinamičnih podjetij s potencialom rasti ter vzorca teh podjetij iz leta 2011, ki je služil za nadaljnjo kvalitativno analizo in preverjanje ključnih dejavnikov rasti z 250 opisnimi atributi. Na osnovi obravnavanega vzorca preverjata (vzorec je 131 slovenskih dinamičnih podjetij), ali so ti dejavniki enaki, kot so jih ugotavljali raziskovalci v preteklosti. Prav tako podajata empirične ugotovitve o dejavnikih hitre rasti v povezavi s posameznimi organizacijskimi funkcijami: upravljanje – poslovodenje – izvajanje (podjetnik – menedžer – zaposleni). S pomočjo faktorske analize sta iskala moč povezanosti posameznih spremenljivk (atributov), ki najbolje opisujejo posamezni dejavnik hitre rasti in se navezujejo na omenjene organizacijske funkcije v dinamičnih podjetjih. Izsledki preveritve ključnih dejavnikov hitre rasti nudijo podjetjem možnost upoštevanja teh dejavnikov pri načrtovanju in izvajanju poslovanja in s tem izbor primernih instrumentov za prehod iz malega rastočega podjetja v profesionalno vodeno rastoče podjetje, za stimulacijo rasti, izbor primerne strategije rasti ter organizacijskih dejavnikov, vse z namenom, da ostanejo ali postanejo dinamična podjetja in tako dodatno prispevajo k ohranitvi in rasti ter razvoju slovenskega gospodarstva.

Ključne besede: organizacijski dejavniki hitre rasti, dinamična podjetja, notranje okolje podjetja, zunanje okolje podjetja

Analysis of Increased Information Technology Outsourcing Factors

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The study explores the field of IT outsourcing. The narrow field of research is to build a model of IT outsourcing based on influential factors. The purpose of this research is to determine the influential factors on IT outsourcing expansion. A survey was conducted with 141 large-sized Slovenian companies. Data were statistically analyzed using binary logistic regression. The final model contains five factors: (1) management's support; (2) knowledge on IT outsourcing; (3) improvement of efficiency and effectiveness; (4) quality improvement of IT services; and (5) innovation improvement of IT. Managers immediately can use the results of this research in their decision-making. Increased performance of each individual organization is to the benefit of the entire society. The examination of IT outsourcing with the methods used is the first such research in Slovenia.

Keywords: Informatics, Outsourcing, Information Technology Outsourcing, ITO, Model, Business Process Management

1 Introduction

Organizations are faced every day with a more and more difficult market situation. Management should use all potential means for advancement. Business process management contains large reserves for this. One possibility by which an organization can improve performance is business process outsourcing (BPO) and information technology outsourcing (ITO or IT outsourcing). Business process outsourcing means that a business process or part of a process is transferred to an external supplier or multiple suppliers for implementation. Outsourcing means obtaining products or services from an external source. Often, the term provider or vendor is used instead of supplier, but in general this is our business partner. The model defines the presentation of reality that is too complex to be studied such as it is. The model must represent reality as closely as possible. The subject of this research study is outsourcing of informatics as an organizational unit or service, i.e. IT outsourcing; as a socio-technical system that contains technical and human components. Expressions IT and informatics are used interchangeably. The survey was conducted with large-sized Slovenian businesses.

IT outsourcing is defined as a general research area and the design of the IT outsourcing model as a specific research question based on the level of outsourcing of IT activities. Arguments, for or against outsourcing, are of great importance in decision-making. Past experience is also important. A positive attitude increases the level of outsourcing and a negative view decreases the level of outsourcing. The purpose and goal of this research study is to produce a model of outsourcing information technology.

2 Theoretical background and literature review

2.1 IT outsourcing

We are familiar with many different types of IT outsourcing. The level of outsourcing can be measured by the number of activities outsourced according to all activities or by the amount of costs according to total costs for informatics. An extreme example is full IT outsourcing by an organization.

In most organizations informatics represents a significant part of business, but the importance varies in different organizations. Depending on this, we must make decisions on the future of informatics. IT leadership challenges are (Hoving, 2007, p. 147): (1) harnessing technology; (2) providing business value; (3) managing resources; and (4) executing work. Findings by Dibbern, Chin and Heinzl (2012, p. 488)' confirm, "that a sourcing arrangement chosen by an organization is a result of the consideration of multiple types of rational choice reasoning, including efficiency and effectiveness criteria as well as social and environmental influences".

IT outsourcing must be treated as a process composed of two phases (Fink, 2010, p. 130): (1) decision phase – needed and available IT resources; and (2) implementation phase – outsourced IT resources. It has to provide four types of ability

(Sia, Koh, and Tan, 2008, p. 408): (1) robustness; (2) modifiability; (3) new capability; and (4) ease of exit. Cullen and Willcocks (2003, p. 3) stress's that ITO is (1) a strategy for managing the delivery of IT services, and (2) a transition path toward that vision, and defines eight stages of life-cycle: (1) discard myths; (2) prepare strategies; (3) choose target services; (4) design future; (5) select suppliers; (6) make transition; (7) manage the ITO; and (8) reconsider options.

2.2 Arguments for IT outsourcing

The goals that an organization wants to achieve with IT outsourcing must be clearly defined in its business strategy. Objectives must be known to all employees, and in-return, they must agree with them. If we want success, employees must identify themselves with the objectives.

The motives for deployment are different in different organizations; deployment is conditioned by many determinants. The five reasons why outsourcing has strategic meaning for CEOs are (Willcocks, 2010, pp. 63–65): (1) outsourcing impact on market value; (2) outsourcing is pervasive and growing – spending alone needs attention; (3) outsourcing can damage corporate health; (4) outsourcing can play a positive, strategic role; and (5) CEOs alone possess the crucial bargaining power.

Lacity, Willcocks and Feeny (2004, p. 139) stress: (1) better employee management; (2) redesigned processes; (3) customer-centric servicing; (4) enabling technology; and (5) new facilities. Gonzalez, Gasco and Llopis (2009, pp. 184–186; 2010, pp. 290–295) quote ten arguments for deployment: (1) focus on strategic issues; (2) increased IS department flexibility; (3) improved IS quality; (4) elimination of troublesome, everyday problems; (5) increased access to technology; (6) decrease obsolescence risk; (7) staff cost savings; (8) providing alternatives to in-house IS; (9) technology cost savings; and (10) following the fashion. Similar reasons are stated by McLellan, Marcolin and Beamish (1995, pp. 312–317): (1) changing organizational boundaries; (2) restructuring the organization; (3) mitigating technological risk and uncertainty; (4) accessing new technology; (5) improving management of IS operations; and (6) link between IT and business strategy.

There are many reasons for the deployment of IT outsourcing, but cost reduction is only one (Khan, Niazi, and Ahmad, 2011, p. 690). Organizations lose opportunities with other reasons if they are focused only on cost reduction, where cost reduction is the most important motivation (Fisher, Hirschheim, and Jacobs, 2008, p. 177; Lewin and Peeters, 2006, p. 22). Other organizations choose other strategic goals, such as (Quinn, 1999, p. 9; 2000, pp. 13–14): (1) improvement of the efficiency and effectiveness of informatics; and (2) improving the company's capacities to stay competitive. Johnston, Abader, Brey and Stander (2009, p. 37) conclude that cost is the most influential factor when deciding whether to outsource on not, irrespective of an organization's size and type. Organizations often decide for other reasons and not solely due to cost reduction, taking into account short and long-term consequences that are difficult to predict (Baldwin, Irani and Love, 2001, p. 23).

2.3 IT outsourcing expectations

We have to define determinants that are necessary for the success of outsourcing and that could be compared with outsourcing expectations. The success is valued in two ways: (1) the project implementation efficiency and effectiveness; and (2) improvement of the efficiency and effectiveness of informatics. It is valued more widely by: (1) efficiency and effectiveness of the organization; (2) efficiency and effectiveness of informatics; (3) the relationship of efficiency and effectiveness between the vendor and the buyer; and (4) the efficiency and effectiveness of the outsourcing project implementation. The cost of informatics is a relatively small part of the total organization's costs; as such, if we implement total IT outsourcing, the influence on business, in many cases, is not significant. It is difficult to distinguish IT outsourcing savings from other causes, e.g. the global economic situation. Gorla and Lau (2010, p. 91) evaluate, that satisfaction with IS outsourcing is only 33% and that 78% of projects are discontinued either by switching vendors or by back-sourcing. In-house IT capabilities are associated with IT outsourcing success (Aubert, Houde, Patry, and Rivard, 2012, p. 20; Dutta, Gwebu, and Wang, 2011, p. 240).

The seven characteristics of IT offshore outsourcing projects that differentiates success and failure (Rottman and Lacity, 2008, pp. 266–271) are: (1) projects that engage one large offshore supplier are rated higher than projects that engage one small offshore supplier or multiple suppliers; (2) projects with some offshore suppliers employed onsite are rated higher than projects with all suppliers employed offshore; (3) projects with greater-value contracts are rated higher than projects with lesser-value; (4) long-term projects are rated higher than short-term; (5) some organizational units' projects are rated differently than other organizational units; (6) development and maintenance/support projects are rated equally; and (7) recent projects are rated higher than older ones.

Some authors indicate a positive, others a negative, and thirdly a neutral impact of outsourcing on the IT efficiency and effectiveness in organizations. Hirschheim and Lacity (2000, p. 105) note in their study that half of the organizations achieve cost savings, whereas half do not. Similar conclusions are found by Bengtsson and Dabhilkar (2009, pp. 252–254) who conclude that some authors show significant positive effects, while others do not and that investments into technology and organization contribute more towards efficiency and effectiveness than business process outsourcing. Gilley and Rasheed (2000, p. 788) conclude that there is no connection between business process outsourcing and an organization's performances. Downing, Field and Ritzman (2003, p. 88) have a positive opinion about IT outsourcing and they conclude that outsourcing information systems can create lower overall process costs and may lead to superior overall process performance. In sharp contrast to common belief, Broedner, Kinkel and Lay (2009, p. 127) state that outsourcing has a strong negative impact on an organization's labor productivity.

Aron and Singh (2005, p. 135) summarize in their study three reasons for the success or failure of business process outsourcing (n.b.: half of the attempts do not reach financial

expectations): (1) choosing the right processes; (2) control both the operational and structural risks; and (3) match organizational forms to needs. Shi (2007) lists client-side problems, which are: (1) cost-saving mirage; (2) lack of process model maturity; and (3) lack of understanding or consensus of target business model. On the other side, we have vendor-side problems, which are: (1) competence gap; (2) heavy turnover of key personnel; and (3) weak security practices or requirements. And finally, reasons for failures or difficulties are often inside client-vendor relationships, which are: (1) lack of precise and detailed project specification; (2) language and culture misalignment; (3) knowledge transfer difficulties; (4) process calibration difficulties; (5) incompatible pace of technology change; (6) incompatible architectural style; and (7) loss of continuity due to employee shuffles. (p. 29)

2.4　IT outsourcing models

The model is a simplified description of the real situation; it is important, that the model is most similar as possible to reality. Yang, Kim, Nam and Min (2007, p. 3771) define a business process outsourcing decision model based on three determinants: (1) expectation – cost savings, focus on core competence, and flexibility; (2) risk – information security, loss of management control, and morale problems; and (3) the environment – vendor's service quality, market maturity, and other firms' outsourcing decisions.

The outsourcing model from a client's perspective is composed of three factors (Khan and Fitzgerald, 2004, p. 44): (1) organizational factors – decision makers/initiators, SWOT issues, implementations, and re-engineering potential; (2) technological factors – internal organizational capabilities, key requirements and usage, and support and maintenance; (3) process factors – in depth specifications/capture full requirements, project management – by meeting strict deadlines, contract, trust & security, communication, and standard quality; and (4) geographical/environmental factors – domestic/overseas, resource/expertise, standard quality, infrastructure capability – ability to network, trade law, political stability, culture adaptability, and market entry advantage.

Barthélemy and Geyer (2005, p. 535) highlight important internal determinants for decision making on IT outsourcing as: (1) IT activity specificity; (2) IT department size; and (3) IT internal organization (profit center); and as external determinants, which are: (4) institutional environment; and (5) sector IT intensity. Configuration can be described using seven parameters (Cullen, Seddon, and Willcocks, 2005, p. 362): (1) scope grouping; (2) supplier grouping; (3) financial scale; (4) pricing framework; (5) contract duration; (6) resource ownership; and (7) commercial relationship. Han, Lee and Seo (2008, p. 32) propose a relationship based model: (1) relationship effecting resources – technical and managerial IT capability, organizational relationship capability, and vendor management capability; (2) relationship formation processes – information sharing, communication quality, and collaborative participation; (3) relationship outcome – trust and commitment; and (4) performance – outsourcing success.

Different authors have used different models for studying IT outsourcing. Alvarez-Suescun (2007, p. 767) used three

variables for model design: (1) IS technical skills; (2) IS implementation capability; and (3) strategic contribution of IS. Lee (2001, p. 326) has tested the effectiveness of outsourcing based on: (1) organizational capability; (2) knowledge sharing; and (3) partnership quality. Gonzalez, Gasco and Llopis (2010, pp. 291–296) have created a model based on: (1) outsourcing reasons; and (2) outsourcing risks. Gorla and Lau (2010, p. 96) have made a model based on: (1) risks; and (2) past negative experiences.

3　Methodology

3.1　Data collection and analysis

The questionnaire was created based on relevant literature. The validity of the questionnaire was checked at two levels: (1) the questionnaire was reviewed and evaluated by two experts from the field of management of information systems; and (2) after receiving 80 questionnaires, a pilot survey was conducted, with which the validity and intelligibility of the questions were determined.

The questionnaire was sent to 484 organizations by standard postal mail and was addressed to the head of IT. The envelope contained the questionnaire, a cover letter, and a pre-paid self-addressed envelope. The cover letter emphasized that the questionnaire was anonymous to the respondent and the organization. The final questionnaire results also were offered to the respondents. At the first stage, 92 responses were received. To obtain a higher response rate, another cover letter with the questionnaire was resent to all the organizations that did not respond. After the second call, a total of 141 questionnaires or a 29% response rate was achieved and served as the sample for this research study.

The population was organizations that had more than 150 employees. Large-size companies were chosen using the criteria of the average number of employees in the financial year, the amount of net turnover, and asset values.

Statistical data analysis was conducted with binary logistic regression. Statistical significance is usually defined at 0.05 i.e. at 5%, and in certain circumstances at 0.01 (1%) or 0.001 (0.1%) and denoted by p, p means a two-tailed test i.e. p (2-tailed).

3.2　Measuring instrument

The first question examined whether the organization would expand IT outsourcing or keep it at the same level in the future. This question is used as a dependent variable in logistics regression analysis. This is a binary variable (0 – same level, 1 – increased level). The second question was with regard management's support for IT outsourcing. Respondents responded with a binary response: 0 (low support) and 1 (high support). The third question was used to determine the level of employees' knowledge on IT outsourcing in their organization. Two responses were possible: 0 – insufficient and 1 – sufficient (binary response). In addition, respondents were asked five questions regarding the experience of deploy-

ment of IT outsourcing: (1) performance – improvement of efficiency and effectiveness; (2) costs – IT cost reduction; (3) delay – shortening time of IT services; (4) quality – quality improvement of IT services; and (5) innovation – innovation improvement of IT. All variables are binary variables, where 0 means low and 1 is equal to high. All seven variables were used in binary logistic regression as independent variables, i.e. predictors.

The demographic data of respondents is summarized in Table 1.

Table 1: Demographic Data of Respondents

Question	Response	
Function	**Head of IT**	58.6%
	Other function or position	16.4%
	Head of department in IT	12.1%
	Director of business function	10.7%
	CEO	2.1%
Education	**II. Bologna Cycle**	49.6%
	I. Bologna Cycle	25.2%
	III. Bologna Cycle	14.4%
	Secondary Education	10.8%
Gender	**Male**	85.6%
	Female	14.4%
Age (average)		41.8 years
Seniority (average)		18.2 years

4   Results and discussion

Descriptive statistics was used to determine the correlation among independent variables. Nonparametric Spearman's correlation coefficient (r_s) was determined to be adequate as there were only binary variables. As can be seen in Table 2 all correlations were positive; most correlations have approximately a medium effect (+0.3). Stronger correlations were among Quality, Performance, and Delay. Perfect collinearity did not exist among predictors. Variance inflation factor (VIF) is less than 2.38 for all variables. This test confirms that multicollinearity is not problematic among variables.

IT function can be executed in an organization, can be partially executed by the supplier, can be fully executed by the supplier, or the organization has no such activities. For the purposes of this research study, it is important to examine whether IT outsourcing level will be increased or not. This is the dependent variable.

The first factor represents top managers' support of IT outsourcing, which is crucial to success. The second factor represents level of knowledge on outsourcing. This is not important only among managers, but also among all employees. The third factor describes how outsourcing increase overall performance (i.e. effectiveness and efficiency through deployment). To achieve this goal, we must utilize all available resources. The fourth factor includes the importance of cost-cutting. Many organizations estimate that costs are too high for informatics and that they need to be lowered to maintain competitiveness. The fifth factor is delay. Many organizations expect that delay of services decrease with more competent suppliers' staff. The sixth factor represent quality of IT services and should increase with supplier cooperation. The last factor represents the innovation improvement of IT. IT staff can be more focused on their core business.

Table 3 shows only five factors that have a statistically significant impact on the model. These are: (1) management's support; (2) knowledge on IT outsourcing; (3) improvement of efficiency and effectiveness; (4) quality improvement of IT services; and (5) innovation improvement of IT. The remaining two factors: (1) IT cost reduction; and (2) shortening time of IT services, have a lesser impact and were not statistically significant; as such are not shown in Table 3. However, being aware on the significance of these two factors is also very important. Quality improvement of IT services is most important for the decision that the organization will increase IT outsourcing (odds ratio i.e. exp(B) = 19.10). The basic model is improved by adding five independent variables i.e. five predictors, value of –2LL is reduced from 115.64 to 70.90. The

Table 2: Spearman's Correlation Coefficients Among Independent Variables

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
(1) Management						
(2) Knowledge	0.32**					
(3) Performance	0.29**	0.34**				
(4) Costs	0.20*	0.16	0.44**			
(5) Delay	0.40**	0.30**	0.59**	0.54**		
(6) Quality	0.26**	0.35**	0.67**	0.39**	0.65**	
(7) Innovation	0.22**	0.22**	0.46**	0.37**	0.43**	0.48**

Notes: * $p < 0.05$ (2-tailed); ** $p < 0.01$ (2-tailed)

Table 3: Regression Model

	B (SE)	**95% CI for Odds Ratio**		
		Lower	**Odds Ratio**	**Upper**
Constant	–3.41 (0.62)***			
Management	2.17 (0.71)**	2.19	8.73	34.76
Knowledge	1.34 (0.65)*	1.12	4.03	14.45
Performance	2.43 (0.86)**	2.12	11.34	60.53
Quality	2.95 (0.92)**	3.18	19.10	114.82
Innovation	2.41 (0.84)**	2.17	11.13	57.20

*Notes: R^2 = 0.57 (Cox and Snell), 0.76 (Nagelkerke); Model $\chi^2(5)$ = 111.87, $p < 0.001$; *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$*

total percentage of correct predictions of the model is 87.3%. Nagelkerke R^2 = 0.76 imitates the coefficient of determination R^2 multiple regression and can be interpreted as the percentage of explained variance.

Only five factors in the final model were retained. This model can explain 76% of variance. Organizations often decide for deployment or expansion of outsourcing based on factors beyond IT outsourcing. This is especially present in times of economic crisis. Management, for example, decides on outsourcing to reduce the number of employees. In this case, the arguments for and against outsourcing lose their importance. Other management may decide otherwise in exactly the same situation. Due to the crisis in which we want to preserve as many jobs as possible, we decided for job transfer from an external supplier back to the organization, thus reducing the volume of outsourcing. IT outsourcing is sometimes politically motivated and is not based on real needs. The points of view of business executives and IT executives are often different and sometimes detrimental for outsourcing activity (Chakrabarty and Whitten, 2011, p. 812).

Interestingly, respondents did not select cost-reduction as the most important factor. Many authors say that sole cost reduction (cheaper informatics) is not sufficient, but it is necessary through innovation (better informatics) to achieve higher added value for customers, better performance of informatics and the organization (Weeks and Feeny, 2008, pp. 132–135). Also Linder (2004, p. 52) stresses that the organization needs to use IT outsourcing to achieve strategic goals and not for cost reduction only, which is only one benefit. This conclusion also is confirmed in this research study.

The outsourcing of information technology must be efficient and effective that can be evaluated through costs, delay, quality, human resources and environment. We expect that it will reduce informatics costs, will increase IT responsiveness, will improve the quality of IT services, will increase employee satisfaction, and that employees will have better working conditions. Many authors draw attention to the phenomenon of failed ITO deployment (Espino-Rodríguez and Padrón-Robaina, 2006, p. 64). This means, that there are many opportunities for improvement.

5   Conclusions

The level of IT outsourcing will increase in Slovenia in the future. Five factors were confirmed in this study that significantly influence future decisions: (1) IT outsourcing management's support; (2) employees' knowledge about IT outsourcing; (3) improvement of efficiency and effectiveness as a result of IT outsourcing; (4) quality improvement of IT services caused by IT outsourcing; and (5) innovation improvement of IT because of IT outsourcing. An interesting finding from this study was that (1) IT cost reduction and (2) shortening time of IT services, were not significant factors. Organizations decide on outsourcing based on several reasons and the most important is not cost reduction in informatics.

The Slovenian economy is lagging behind the rest of the European Union by over 10 years, maybe even 20 years. In the developed world the outsourcing of information technology has reached a maximum and it is to be expected that this trend of expansion would be reversed. In Slovenia, research concerning this area is still relevant namely because of this delay. The volume of outsourcing will continue to increase. This study is the first such to be carried out in the Slovenian territory and represents a contribution to science in this area. Managers can immediately use the results of this research study in their work. The contribution of this study to society is also important. From the national-economic point of view it is important that all or most organizations that choose IT outsourcing are successful.

In the model proposed, we included the importance of arguments for and against outsourcing, positive and negative past experiences, and other factors. These are some suggestions for further research.

The limitations of the study are that the study was limited to the Slovenian area, only large-sized organizations were included in the sample, and only companies were included.

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Analiza faktorjev povečanja zunanjega izvajanja informatike

Študija raziskuje področje zunanjega izvajanja informatike. Kot ožje raziskovalno področje definiramo izgradnjo modela na osnovi vplivnih faktorjev. Namen raziskave je ugotoviti, kateri faktorji vplivajo na razmah zunanjega izvajanja informatike. Naredili smo anketo med 141 največjimi slovenskimi organizacijami. Podatke smo statistično obdelali z binarno logistično regresijo. Končni model vsebuje pet faktorjev: (1) podpora najvišjega managementa; (2) znanje o zunanjem izvajanju informatike; (3) povečanje uspešnosti in učinkovitosti; (4) povečanje kakovosti storitev informatike in (5) povečanje inovativnosti informatike. Izsledke raziskave bo menedžment v organizacijah lahko takoj uporabil pri svojih odločitvah. Večja uspešnost vsake posamezne organizacije pomeni pridobitev za celotno družbo. Ta raziskava zunanjega izvajanja informatike je z uporabljenimi metodami prva tovrstna študija v slovenskem prostoru.

Ključne besede: informatika, zunanje izvajanje, zunanje izvajanje informatike, ITO, model zunanjega izvajanja informatike, menedžment poslovnih procesov

Financial Distress Prediction of Iranian Companies Using Data Mining Techniques

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Decision-making problems in the area of financial status evaluation are considered very important. Making incorrect decisions in firms is very likely to cause financial crises and distress. Predicting financial distress of factories and manufacturing companies is the desire of managers and investors, auditors, financial analysts, governmental officials, employees. Therefore, the current study aims to predict financial distress of Iranian Companies. The current study applies support vector data description (SVDD) to the financial distress prediction problem in an attempt to suggest a new model with better explanatory power and stability. To serve this purpose, we use a grid-search technique using 3-fold cross-validation to find out the optimal parameter values of kernel function of SVDD. To evaluate the prediction accuracy of SVDD, we compare its performance with fuzzy c-means (FCM).The experiment results show that SVDD outperforms the other method in years before financial distress occurrence. The data used in this research were obtained from Iran Stock Market and Accounting Research Database. According to the data between 2000 and 2009, 70 pairs of companies listed in Tehran Stock Exchange are selected as initial data set.

Keywords: financial distress prediction; Support vector data description; Fuzzy c-mean.

1   Introduction

The empirical literature of financial distress prediction has gained considerable attention in the post 2007-2009 global financial crises. Policymakers (Dodd-Frank Act of 2010) and regulators (SEC, Basel III) emphasize about failure of many banks in the aftermath of the global financial crisis and are seeking the best way to predict business failures. Prior studies have addressed two major research trends in financial distress prediction. One is investigating the situation of failure to find the symptoms (Dambolena & Khoury, 1980; Gombola & Ketz, 1983; Jo & Han, 1997; Scott, 1981). The other is comparing the prediction accuracy of the diverse classification methods (Tam & Kiang, 1992; Jo & Han, 1997). This study belongs to the second group of research. The primary purpose of this study is to apply support vector data description (SVDD) to the financial distress prediction problem in an attempt to suggest a new model with better explanatory power and stability. We use a grid-search technique using 3-fold cross-validation to examine the optimal parameter values of kernel function of SVDD. In addition, to evaluate the prediction accuracy of SVDD, we compare its performance with fuzzy c-means

(FCM).Using the data from Iran Stock Market and Accounting Research Database for 70 couples of companies listed in Tehran Stock Exchange during 2000 and 2009; we find that SVDD outperforms the other method.

2   Literature review

The empirical literature of financial distress prediction has recently gained further momentum and attention from financial institutions. Academicians and practitioners realize that the problem of asymmetric information between banks and firms lies at the heart of important market crashes such as credit rationing and that improvement in monitoring techniques represents a valuable alternative to any incomplete contractual arrangement aimed at reducing the borrowers' moral hazard (Becchetti & Sierra, 2003; Stiglitz & Weiss, 1981; Xu, 2000). Among financial distress forecasting methods, discriminant analysis was the dominant method for predicting corporate failure from 1966 until the early part of the 1980s (Altman, 1968, 1983; Back et al., 1996b). It gained wide popularity due to its ease of use and interpretation. However,

both linear and quadratic discriminant analyses are sensitive to deviation from multivariate normality (Karels & Prakash, 1987; Laitinen & Laitinen, 2000). During the 1980s, the probit (Zmijewski, 1984) and, especially, the logit methods (logistic regression model) (Back et al., 1996b; Ohlson, 1980) used the discriminant method.

These two models do give a crisp relationship between explanatory and response variables of the given data from a statistical viewpoint and do not assume multivariate normality, but the probit model assumed that the cumulative probability distribution must be standardized normal distribution, while the logit model assumed that the cumulative probability distribution must be logistic distribution. Since the 1990s, neural networks have been the most widely used techniques in developing quantitative financial distress prediction (Back et al., 1996b; Tam & Kiang, 1992; Wilson & Sharda, 1994), in particular, the approximation or classification powers of the MLP trained by the backpropagation algorithm (Hassoun, 1995; Hertz, Krogh, & Palmer, 1991). Many studies compared the neural networks backpropagation algorithm with the statistical methods and found neural networks backpropagation outperforms the other statistic methods, such as multivariate discriminant analysis (MDA), probit and logit methods (Back et al., 1996a; Shin, Lee & Kim, 2005; Wilson & Sharda, 1994). Neural networks have recently been employed to extract rules for solving fuzzy classification problems (Kim et al., 2003). A number of fields use the radial basis function network (i.e., RBFN), for classification problems (Jang, Sun, & Mizutani, 1997; Surendra & Krishnamurthy, 1997), function approximations (Chuang, Jeng, & Lin, 2004; Hertz et al., 1991; Jang, 1993; Jang et al., 1997; Nam & Thanh, 2003) and management sciences (Stam, Sun, & Haines, 1996; Vythoulkas & Koutsopoulos, 2003).

The approximation or classification powers of the MLP trained by the back propagation algorithm (Hassoun, 1995; Hertz et al., 1991) and RBFN are determined by the number of hidden nodes. In fact, the number of hidden layers influences the performance of back propagation MLP. Additionally, an RBFN is functionally equivalent to a zero-order Sugeno fuzzy inference system under some conditions (Jang et al., 1997). In addition, it was proven that the zero-order Sugeno fuzzy inference system could approximate any nonlinear function on a compact set to an arbitrary degree of accuracy under certain conditions (Jang, 1993). However, if a phenomenon under consideration does not have stochastic variability but is also uncertain in some sense, it is more natural to seek a fuzzy functional relationship for the given data, which may be either fuzzy or crisp.

Sun and Li (2008) use weighted majority voting combination of multiple classifiers for FDP, Chen and Du (2009) introduced an integration strategy with subject weight based on neural network for financial distress prediction. They all generated diverse classifiers by applying different learning algorithms (with heterogeneous model representations) to a single data set, and concluded that, to some degree, FDP based on combination of multiple classifiers was superior to single classifiers according to accuracy rate or stability. The most used machine learning technique is the neural network model (Haykin, 1999), trained by the back-propagation learning algorithm (Wong et al., 1997; Wong and Selvi, 1998) whose prediction accuracy outperforms statistical models including logistic regression (LR), linear discriminant analysis (LDA), multiple discriminant analysis (MDA) and other machine learning models, such as k-nearest neighbor (k-NN) and decision trees. In addition, the back-propagation neural network (BPN) model can be used as the benchmark for financial decision support models. Chen and Du (2009) found that prediction performance for the clustering approach is more aggressively influenced than the BPN model and the BPN approach obtains better prediction accuracy than the data mining (DM) clustering approach in developing a financial distress prediction model. classifiers which were diversified by using neural networks on different data sets for financial distress prediction, and their experimental results showed that multiple neural network classifiers did not outperform a single best neural network classifier, based on which they considered that the proposed multiple classifiers system may be not suitable for the binary classification problem as financial distress prediction. Song et al, (2010) presented genetic algorithm (GA) based approach and statistical filter approaches are applied to identify the best features for the support vector machine (SVM). The proposed GA-based approach is carefully designed in order to have the capability of simultaneously optimizing the features and parameters of the SVM. Experimental results on the data from Chinese companies showed that the GA-based approach could extract fewer features with a higher accuracy compared with statistical filter approaches.

Recent studies in Artificial Intelligence (AI) approach, such as ANN (Ravisankar & Ravi 2010), SVM (Lin et al. 2011; Min & Lee 2005; Bao et al., 2012) have also been successfully applied to financial distress prediction.

The purpose of this paper is to apply fuzzy clustering means and support vector data description (SVDD) in financial distress prediction model. Fuzzy c-means (FCM) clustering is one of well-known unsupervised clustering techniques, which allows one piece of data were two or more clusters. SVDD is known as the algorithm that finds a special kind of linear model with the maximum margin hyperplane. The maximum margin hyperplane gives the maximum separation between decision classes. The training examples that are closest to the maximum margin hyperplane are called support vectors. The SVDD classifier will be trained by different kernel functions in order to compare it with the benchmark of the neural network model. In SVDD, Using different kernel functions and the determination of optimal values of the parameters to train SVMs will lead to different results.

Therefore, the current study aims to compare the accuracy of these two forecasting techniques in predicting financial distress of companies. The original classification accuracy indicates that SVDD outperforms the FCM model.

3 Technical background

3.1 Support vector data description

SVDD, inspired by the idea of support vector machine by Vapnik (1995), is a method of one-class classification, for

which not the optimal separating hyperplane but the sphere with minimal volume containing all or most objects has to be found; its sketch in two-dimensional spaces is shown in Figure 1. It is often used as a method of novelty detection.

Novelty detection based on boundary essentially is to find a sphere with minimum volume containing all (or most of) the normal data objects. For a data set containing N normal data objects, when one or a few very remote objects are in it, a very large sphere is obtained, which will not represent the data very well. Therefore, some data points outside the sphere are allowed with introducing slack variable ξi , then, the sphere can be described by centre a and radius R as follows

$$\min L(R) = R^2 + C\sum_{t=1}^{N} \xi t$$
$$s.t. (x_t - a)^T (x_t - a) \le R^2 + \xi t \qquad (1)$$
$$\xi t \ge 0 \qquad (i = 1, 2, \dots N)$$

Where the variable C gives the trade-off between simplicity (or volume of the sphere) and the number of errors (number of target objects rejected). We construct the Lagrange

$$L(R, a, \alpha t, \xi t)$$
$$= R^2 + C\sum_t \xi t - \sum_t \alpha_t [R^2 + \xi^2 - (x_t^2 - 2ax_t + a^2$$
$$- \sum_t \gamma_t \xi t \qquad (\alpha_t \ge 0, \gamma \ge 0) \qquad (2)$$

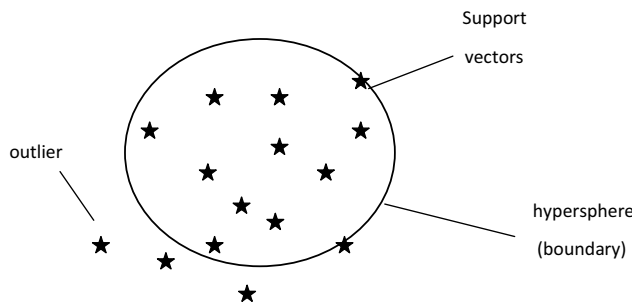*Figure.1 The sketch of SVDD in two-dimensional space*

Setting the partial derivatives to 0, new constraints are obtained

$$\sum_t \alpha t = 1, \qquad a = \frac{\sum_t \alpha_t x_t}{\sum_t \alpha_t} = \sum_t \alpha_t x_t \qquad (3)$$
$$c - \alpha t - \gamma t = 0 \quad \forall i$$

Then, new optimal equation can be obtained

$$\max L = \sum_{t=1}^{N} \alpha_t (x_t, x_t) - \sum_{t=1}^{N}\sum_{f=1}^{N} \alpha_t \alpha_f (x_t, x_f) \qquad (4)$$
$$s.t. \ 0 \le \alpha_t \le C_t \qquad \sum_{t=1}^{N} \alpha t = 1$$

From the above process, it is observed that the centre of the sphere is a linear combination of data objects with weight factors α_i. Only for a small set of objects the equality of the second equation in equation (1) is satisfied, which are the objects on the boundary of the sphere. This means that SVDD holds sparseness, which determines its excellent computation.

The above method computes a sphere around the data in the original input space. Normally, data are not spherically distributed, and we cannot expect to obtain a very tight description. Therefore, kernel function $K(x_i, x_j)$ is introduced to replace inner products $(x_i \cdot x_j)$, which implicitly maps the objects xi into some feature space. A better, tighter description can be obtained when a suitable feature space is chosen. Different kernel functions result in different description boundaries in the original input space. Gaussian kernel is the most commonly used function, its expression is as follows:

$$k_G(x_t, x_f) = \exp\frac{-(x_t - x_f)^2}{\sigma^2} \qquad (5)$$

where σ is the width parameter, also called extension constant. This function can suppress the growing distances for large feature spaces.

3.2 Fuzzy c-means

FCM theory is the most perfect one among many fuzzy clustering analysis methods that are effective for pattern recognition; details can be seen in reference. Considering a sample set $X = \{x_1, x_2, \dots, x_N \}$, xi, Rs, which is required to be divided into C categories; the aim of FCM is to obtain each category's clustering centre $vc = \{vc_1, vc_2, \dots, vc_S\}$ $(1 \_ c \_ C)$ by minimizing the weighed square sum of inner-cluster error.

Therefore its objective function is as follows

$$J_m(U, V) = \sum_{c=1}^{C}\sum_{n=1}^{N} (\mu_{cn})^m (d_{cn})^2, \quad m \in [1, \infty) \qquad (6)$$

With constraints

$$s.t. \begin{cases} 0 \le \mu_{cn} \le 1, & 1 \le c \le C, 1 \le n \le N \\ 0 \langle \sum_{n=1}^{N} \mu_{cn} \langle N, & 1 \le c \le C, \\ \sum_{c=1}^{C} \mu_{cn} = 1, & 1 \le n \le N \end{cases} \qquad (7)$$

where m is the smoothing parameter, which makes it effective from hard c-means to FCM. This parameter controls the sharing degree among each fuzzy categories, bigger m will result in more fuzzy division, or results in more definitive division. Its experimental range is [1.1, 5]; μcn is subjection of xn to the cth category; dcn represents the distance between xn and vc, which often is measured in Euclidean space

$$(d_{cn})^2 = \|x_n - v_c\| = (x_n - v_c)^T (x_n - v_c) \qquad (8)$$

U and **V** can be optimized by performing a number of iterative computations using following equations (9) to (11), whose astringency has been proved

$$\mu_{ln} = \begin{cases} \dfrac{1}{\sum_{c=1}^{C} (d_{ln}/d_{cn})^{2/(m-1)}} & I_n = \Phi \\ 0, & \forall c \in \overline{I_n} \\ 1, & \forall c \in In \ne \Phi \end{cases} \qquad (9)$$

where

$$I_n = \{c \mid 1 \le c \le C, d_{cn} = 0\} \quad (10)$$
$$\overline{I_n} = \{1,2,...,C\} - I_n$$

$$v_c = \frac{1}{\sum_{n=1}^{N}(\mu_{cn})^m} \sum_{n=1}^{N}(\mu_{cn})^{m_{x_n}} \quad (11)$$

4 Research method

4.1 Data collection and preprocessing

The data used in this study obtained from Tehran Stock Exchange. Based on the background of Iranian listed companies, the criteria whether the listed company is specially treated (ST) by the Teheran Stock Exchange categorizes companies into two classes based on their financial condition: normal or distressed. Distressed companies are referred to ST (specially treated) companies and are classified as such if their accumulated losses are more than 50% of stockholder equity (Iran Business Law Article 141). Companies were chosen so that the Ln total assets are almost equal distressed companies. In this analysis, we use financial data from two years before a company is classified as ST and denote it as year (t-2).

The data used in this study is obtained from the Iran Stock Market during 2000 and 2009 and Accounting Research Database and includes 70 pairs of companies listed on the Teheran Stock Exchange. Firms with missing financial ratios or ratios that are more than 3 Standard Deviations from the mean are excluded. After eliminating companies with missing and outlier data, the final number of sample companies is 120.

4.2 Feature Selection

This study uses more variables than other authors, which usually do not use more than 20. The ratios initially selected allow for a very comprehensive financial analysis of the firms including financial strength, liquidity, solvability, productivity of labour and capital, various kinds of margins and profitability and returns. Although, in the context of linear models, some of these variables have small discriminatory capabilities for default prediction, the non-linear approaches used here can extract relevant information contained in these ratios to improve the classification accuracy without compromising generalization. Feature selection is an important issue in financial distress prediction, as in other problems where a large set of attributes is available, since elimination of useless features may enhance the accuracy of detection while reducing the amount of time for processing the data. Due to the lack of an analytical model, the relative importance of the input variables can only be estimated through empirical methods. A complete analysis would require examination of all possibilities, for example, taking two variables at a time to analyze their dependence or correlation, then taking three at a time, etc. This, however, is both infeasible and not error free since the available data may be of poor quality in sampling the full input space. 24 financial ratios covering profitability, activity ability, debt ability and growth ability are selected as the initial features (see Table1).

5 Results and analysis

To investigate the effectiveness of the SVDD approach trained by small data set size in the context of the corporate financial distress classification problem, we utilize a grid-search tech-

Table 1. Definition of predictor variables

Variable	Financial ratios Description	Variable	Financial ratios Description
X1	Funds provided by operations to Stockholders' equity	X13	Accumulated earnings to total assets
X2	Funds provided by operations to total liabilities	X14	Current ratio
X3	Net working capital to total assets	X15	Interest expenses to total expenses
X4	Total assets turnover	X16	Debt ratio
X5	Monetary asset to current assets	X17	Inventory stock turnover
X6	Monetary asset to current liabilities	X18	Gross income to sales
X7	Earnings before interest and taxes to Interest expenses	X19	Net income to Stockholders' equity
X8	Net interest expenses to total liabilities	X20	Net income to sales
X9	Funds provided by operations to Net working capital	X21	Net working capital to sales
X10	Earnings before interest and taxes to total assets	X22	Interest expenses to sales
X11	Natural logarithm total assets	X23	Interest expenses to Net working capital
X12	Inventory stock to current assets	X24	Market value stockholders' equity to total assets

nique using 3-fold cross-validation in order to choose optimal values of the upper bound C and the kernel parameter g that are most important in SVDD model selection. Since the aim is to find the most discriminative features, classification accuracy is the key criterion to evaluate the fitness function. For median-sized problems, cross-validation might be the most reliable way to choose the model parameters. Hence, the fitness is defined as the 3-fold cross-validation accuracy on the training set. In 3-fold cross-validation, the training set is divided into 3 subsets of equal size. Sequentially, each subset is tested by the classifier trained on the remaining 3– 1 subsets (i.e. validation sets). Thus, the cross-validation accuracy is the average accuracy across 3-fold subsets. Note that the cross-validation method can prevent the over-fitting problem. We conducted the experiment with respect to various kernel parameters and the upper bound C, and compared the prediction performance of SVDD with various parameters as the training set size got smaller. We set an appropriate range of parameters as follows: a range for kernel parameter is between 1 and 100 and a range for C is between 0 and 1.

5.1 Findings from planning the support vector data description model:

Results from algorithm test based on support vector data description by using data in the financial distress occurrence year (t year) are in Table 2.

Table 2. Results from algorithm based on support vector data description in the financial distress occurrence year - educational sample

sample	Classifying type	year	Correct classifying percent	incorrect classifying percent	sum
educa-tional	financial distress	t	97.10	2.9	100

As in seen in the Table No. 2, the model recognize in t-year, 97.10 percent of financial distress firm in educational sample correctly. On the other hand, classification error is 2.90 percent.

Table 3. Results from algorithm test based on support vector doctor data description in the financial distress year- experimental sample

sample	Classifying type	year	Correct classifying percent	incorrect classifying percent	sum
experi-mental	financial distress	t	91.90	8.10	100

Table 3 shows, the model in t-year, 91.90 percent of financial distress in experimental sample correctly (classification error is 8.1 percent). Further, results from model testing show that general accuracy for this model in classifying educational sample and experimental sample in financial distress year is 97.10% and 91.90% respectively. Noticeable point about this

model is non-falling (lack of falling) of predicting accuracy in experimental sample relative to educational sample, which could represent relevant general ability of the model. Results from testing basic on support vector data description in each one of t-l year (one year before financial distress) and t-2 year (two years before financial distress) based on entire samples are presented in Table 4.

Table 4. Results from testing support vector data description algorithm in one and two year before financial distress occurrence

sample	Classifying type	year	Correct classifying percent	incorrect classifying percent	sum
Total data	financial distress	t-1	85	15	100
Total data	financial distress	t-2	78	22	100

As it is seen in Table No. 4 the model classifies financial distress firms in accuracy 85 and 78 percent respectively in t-1 and t-2 year. Noticeable point about this model is intense non-falling in predicting accuracy financial distress which could represent relevant general ability of this model.

5.2 Findings from designing fuzzy c-means model:

Designing fuzzy c-means algorithm was performed so that in the first step it divides the data into two selected clusters based and their features. Summary results from testing fuzzy c-means algorithm by using data in the financial distress occurrence year (t year) are presented in Table 5.

Table 5. Clustering data in the financial distress occurrence year

Number of feature(K)	Selected features	Degree of Unconformity
24	All features	0.8966

Table 6 shows that if we use all features in designing a fuzzy c-means algorithm, then the model is able to separate two clusters with an accuracy of 89.66%. In our application, so we document unconformity of these two clusters with an accuracy of close to 100%. In other words, our results imply that the clusters have been separated better and there is maximum asymmetry between these two clusters. In the second step, another test is performed to determine degree of symmetry for each data (firms) with Iran Business law Article 141 (criteria for classifying two classes). In this step, percentage of symmetry between two generated clusters by fuzzy c-means with two clusters which have been classified under Article 141 to going concern. With this advantage that it could be determined data percentage to every class. By analyzing the finding is became clear that in going concern cluster based FCM, there was 100% of financial distress data (classified with criteria for Article 141 in Iran Business Law) but data which was classi-

fied in financial distress cluster under FCM 96.67% at them are the same data which were attributed to financial distress class under Article 141 in Iran Business law (implying that 3.33% error and all errors is related to financial distress class).

Summary results of the study are presented in Table 6.

Table 6. Degree of conformity FCM clusters with clusters of Iran Business law 141 Article in the financial distress occurrence year

Selected feature	α_1	α_2	β_1	β_2
All features	.96670	1	1	0.

Where:

α_1: number of data financial distress is correct clustering to total number of data financial distress.

α_2: number of data going concern is correct clustering to total number of data going concern.

β_1: number of data financial distress is incorrect clustering to total number of data incorrect clustering.

β_2: number of data going concern is incorrect clustering to total number of data incorrect clustering.

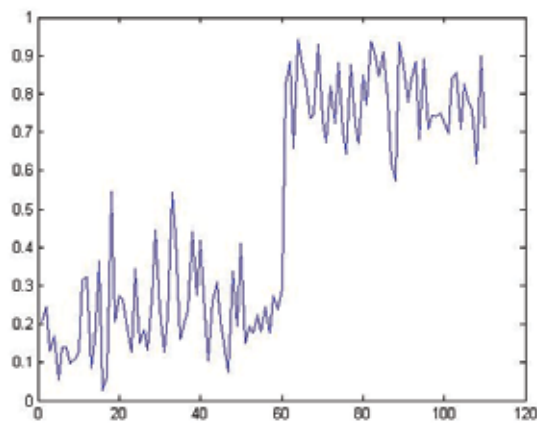Figure 2 shows the amount of data to its class.

Figure 2. Data in financial distress occurrence year

Horizontal axis show the number of firms and vertical axis show the percent of belong for data to its class. Financial distress data are in the right side and going concern data are in the left side in this axis. The closer the data in its class to top horizontal axis (financial distress) or down (going concern) are, their percent belong to its class is greater. Results from testing fuzzy c-means algorithm by using data in one year before financial distress (t-1 year are provided in Table 7.

Table 7. Clustering data in year before financial distress

Number of feature(K)	Selected features	Degree of Unconformity
24	All features	0.8519

Another test was performed to determine the amount conformity between clusters based FCM and Iran Business law 141 Article. Summary results of this research have been provided in Table 8 based on selected feature.

Table 8. Degree of conformity FCM clusters with clusters of Iran Business law 141 Article in one year before the financial distress occurrence

Selected features	α_1	α_2	β_1	β_2
All features	0.83440	1	1	0

Figure 3 shows the amount of belong for data to its class
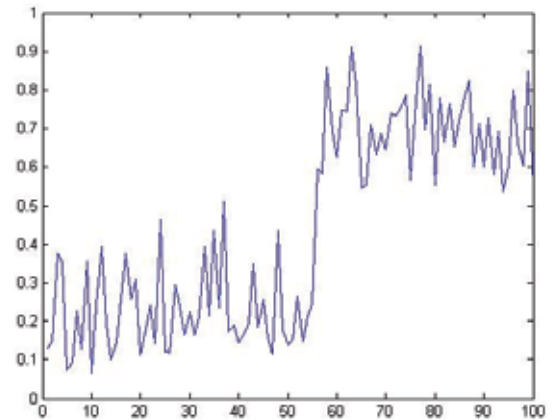
Figure 3. Data in one year before financial distress occurrence

Results from testing fuzzy c-means algorithm by using data in two year before financial distress (t-2 year) are provided in Table 9.

Table 9. Clustering data in two years before financial distress

Number of feature(K)	Selected features	Degree of Unconformity
24	Features	.7538

Another test was performed to determine the amount conformity between clusters based FCM and Iran Business law 141 Article. Summary results of this research have been provided in Table 10 based on selected feature.

Table 10. Degree of conformity FCM clusters with clusters of Iran Business law 141 Article in two year before the financial distress occurrence

Selected features	α_1	α_2	β_1	β_2
All features	0.7734	0.9832	0.96	0.04

Figure 4 shows the amount of data to its class in two year before the financial distress.

As we showed, in two years before financial distress belong percent for going concern data to their class have become lower. On the other hand, behavior at going concern firms in further years have had not so many stability (constant) and some they have had tendency toward financial distress. Generally, results from testing fuzzy c-means algorithm show that the model cluster financial distress firms in accuracy 96.67, 83.44 and 77.34 percent respectively by using data in financial distress year, one and two years before financial distress, thus in classifying going concern firms it could cluster in accuracy 100, 100 & 98.32 percent respectively by using
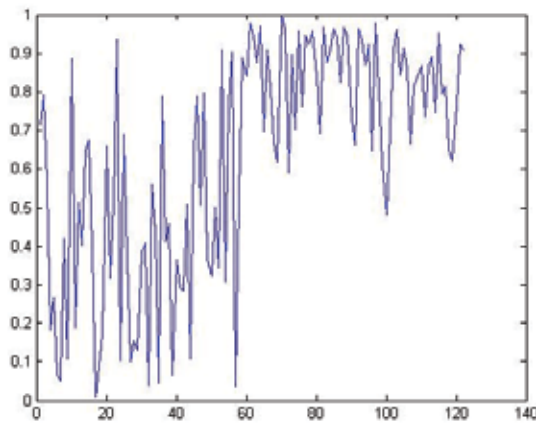
Figure 4. Percent data in two years before financial distress occurrence

data for financial distress occurrence year, one and two years before it. Obtained results from both algorithms have been summarized in Table 11.

Table 11. Algorithm test based fuzzy c-means

Model	SVDD			FCM		
Period of financial distress	t	t-1	t-2	t	t-1	t-2
financial distress prediction	0.92	0.85	0.78	0.97	0.83	0.77

6   Conclusion

To the best of our knowledge, this paper is the first to model financial distress using SVDD. We show the flexibly of the proposed measure with noise rejection capability. Mapping input vectors into a high-dimensional feature space, SVDD transforms complex problems (with complex decision surfaces) into simpler problems that can use linear discriminated functions, and it has been successfully introduced in several financial applications recently. Particularly in this study, we utilize a grid-search technique using 3-fold cross-validation in order to choose optimal values of the upper bound C and the kernel parameter g that are most important in SVDD model selection. Selecting the optimal parameter values through the grid-search, we could build a going concern prediction model with high stability and prediction power. Results from algorithm test based on support vector data description show that model accuracy in classifying financial distress samples in the financial distress occurrence year, One and two years before it, is 91.9%, 85% and 78% respectively. Noticeable point about this model is lack of falling in predicting accuracy in experimental sample relative to educational sample, which could represent relevant general ability of this model.

Results from algorithm test based fuzzy c-means indicated that model accuracy in classifying financial distress samples in the financial distress occurrence year, One and two years before it, is 96.67%, 83.44% and 77.34% respectively.

Our experimental results showed that SVDD approach obtains better prediction accuracy than the FCM approach in developing a financial distress prediction model.

Acknowledgements

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Predvidevanje finančnih pretresov v iranskih podjetjih z uporabo rudarjenja podatkov

Odločanje na področju evaluacije finančnega statusa podjetij so zelo pomembne: napačne odločitve zelo verjetno povzročijo pretres in finančno krizo podjetja. Predvidevanje finančnih kriz in pretresov v proizvodnih podjetjih je pomembno za managerje, investitorje, revizorje, finančne analitike, državne uradnike in zaposlene. Cilj tega članka je analizirati predvidevanje finančnih pretresov v iranskih podjetjih. Naša študija uporablja metodo SVDD (Support Vector Data Description) za predvidevanje finančnih pretresov in predlaga nov bolj stabilen model predvidevanja z večjo močjo razlage. V ta namen smo uporabili tehniko preiskovanja mreže in uporabili 3-kratno prečno validacijo, da smo poiskali parametre jedrne funkcije SVDD. Da bi ocenili natančnost predvidevanja SVDD, smo jo primerjali z metodo FCM (fuzzy c-means). Rezultati eksperimenta so pokazali, da je SVDD uspešnejša od drugih metod v letih pred pojavam finančnega pretresa. Podatke, ki smo jih uporabili v naši študiji, smo dobili s teheranske borze in baze podatkov računovodskih raziskav. V skladu s podatki iz obdobja 2000 in 2009 smo izbrali 70 parov družb, ki so bile uvrščene na teheransko borzo.

Ključne besede: predvidevanje finančnega pretresa, SVDD, FCM

The Impact of The Intellectual Charm of Physicians on the Healthcare Organizations

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The recession has greatly affected the business operations of every undertaking, including healthcare organizations. Change is required. This also concerns the relationship towards employees in terms of their influence on the successful business operations of an organization. Among employees, physicians possess a special, now already traditional status; therefore, their influence needs to be taken advantage of. In the empiric part of the study, we have identified twelve key physician competencies, based on the rankings of physicians, which, in their mind, influence successful business operations of their respective healthcare organizations during an economic recession. The comparison of the collected results to the findings on intellectual charm of managers has indicated that the collected key competencies, that are creativity, quality, education and personal development, attitude towards others, team work and cooperation, communication skills, problem management, business integrity, motivation and stimulation, multidisciplinary thinking, attitude towards culture and ethics, and acceptance of differences, form a whole which is named the intellectual charm of physicians.

Key words: intellectual charm, physician competencies, successful business operations, healthcare organizations, factor analysis

1 Introduction

The recession has affected different countries and businesses to a different extent. The pressures on organizations are growing stronger, and demand even better knowledge of consumers (Klemenčič et al, 2012). In this period of recession, where managers are faced with complex business-related issues, only those managers will prove successful who, besides expert knowledge, also possess intellectual charm, which is the sum of communication skills and attitude towards speaking partners, attitude towards teamwork, attitude towards culture and ethics, creativity, encouraging motivation and stimulation, professionalism and correctness, multidisciplinary thinking, and solving problems. In this period, genius and charisma, or apparently beneficial personal characteristics of leadership, are no longer enough (Devetak, 2012).

During an recession, the enhancing of leadership is especially important. The situation is the same in the field of healthcare (Gregorič Rogelj, 2010), as financing in the public domain is tightly interwoven with the economic situation. A solution will have to be found not only in financial abstinence, but also efficient leadership and management. The hierarchy of healthcare organizations is headed by physicians who are content with their posts, which they wish to retain (Marulc, 2011). This has proven problematic to leaders who wish to introduce adjustments aimed at more successful business operations during an economic recession. Healthcare organizations will not be changed overnight. This is why, in the current period of crisis, the situation in healthcare would most easily be resolved by considering the said hierarchy and using the existing organizational culture in order to enhance business operations. Therefore, unexploited competencies of physicians, which are unrelated to formal education (medical, economic), as well as the physicians' desire to reach the top of the healthcare hierarchy, must be taken advantage of with a view to improving the operations of healthcare organizations. The article only deals with physicians who are part of the medical staff.

The *purpose* of this study was to examine the key competencies of Slovenian physicians, which are unrelated to formal education (medical or economic) and which influence suc-

cessful business operations of healthcare organizations during an recession.

The *objectives* of the article are as follows: to collect the competencies of physicians, which are unrelated to formal education (medical or economic) and which influence successful business operations of healthcare organizations during an recession, to identify key physician competencies from the collected competences, based on the physicians' rankings, which influence successful business operations of the physicians' healthcare organizations during an economic recession, and to propose a model of key physician competencies which will assist their healthcare organizations in more successful business operations during an economic recession.

2   Overview of the literature

Various researchers (Calhoun et al., 2008; Stoller, 2008; Scott Derue et al., 2011; Çitaku et al., 2012;) have proposed ideas for successful organization management. Trying to more accurately define management and leadership is a difficult task, as first, a detailed list of the valuable characteristics of leaders must be prepared (Wagner et al., 2011). Here, competencies may be applied. A competency is an underlying characteristic of a person in that it may be motives, traits, skills, self-image, social role and knowledge (Boyatzis, 1982; Spencer & Spencer, 1993).

Economists have been trying to explain the connection between key employee competencies and the successful operations of an organization. It should be emphasized that the results of studies on key competencies may differ, since the activity, country, level of technological development, and the organizational culture may significantly affect the results (Levy & Murnane, 2001). Therefore, in practice, key competencies for each individual case must be defined separately.

2.1   Competencies in healthcare

Although physicians have a great influence within healthcare organizations, there have been few studies conducted on the matter (Hamilton et al., 2008). Studies have mainly concentrated on managers, or physician managers, in healthcare (Smith, 1990; Decker, 1999; Stefl, 2008; Garman & Scribner, 2011). The emphasis on measurable outcomes and competencies did not happen overnight (Stefl, 2008). Defining competencies and measurement criteria is a lengthy process, which results in a model of competencies for a specific employment, profession, or organization. Today, there are several healthcare competency models available, with a different number of competencies.

Models (Chafee & Mills 2001; Decker, 1999; Dye & Garman, 2006; Garman et al., 2004; Garman & Scribner, 2011; Healthcare Leadership Alliance, 2005; National Center for Healthcare Leadership, 2006; Ross et al., 2002; Shewchuk et al., 2005; Smith, 1990; Wagner et al., 2011; Wallick & Stager, 2002;) based on studies of the US healthcare provide structures comprised of a varied number of competences. The scope of models is dependant on the decision of authors on how many organisational aspects to include in the model.

The review of the literature, the purpose of which was to find non-US healthcare competency models, has yielded modest results in terms of quantity and content. In the United Kingdom, based on the assumption that today, physicians must possess more than just the ability to practice medicine, the Medical Leadership Competency Framework has been developed (NHS Institute for Innovation and Improvement, 2010).

The review of Slovenian literature on healthcare competencies has indicated that researchers have mainly concentrated on nurses, health technicians, junior nurses, and qualified midwives (Železnik et al., 2008; Kvas & Seljak, 2011). The greatest examination of competencies of physicians is conducted by the Slovene Family Medicine Society (2008).

In the past, physicians were not concerned with the problems of successful operations of healthcare organizations. Most studies connected to the issue at hand were conducted before the current period of recession. Therefore, their findings cannot be applied to the current period. A new study must be conducted.

In view of all above findings we set basic research hypothesis:

Hypothesis: Among the competencies of Slovenian physicians that contribute to successful operations of healthcare organizations also belong the characteristics of intellectual charm (communication skills and attitude towards interlocutors, attitude towards teamwork, attitude towards culture and ethics, creativity, fostering motivation and stimulation, professionalism and integrity, multidisciplinary thinking, and problem management).

3   Research methodology

After reviewing the literature, we have decided to elaborate a list of competencies based on the most extensive foreign study on healthcare competencies (Healthcare Leadership Alliance, 2005) comprising 802 competencies, and the most extensive Slovenian study on physician competencies (Slovene Family Medicine Society, 2008) with 319 competences. The elaborated list contained 1,121 competencies. It was not our purpose to encourage physicians to abandon their medical activities, but rather to inform them that they can contribute to the successful business operations of organizations while performing their duties. This is why business competencies, along with medical ones, were removed from the list. A list of 376 competencies was obtained. The empirical part of this article is composed of the qualitative and quantitative studies.

3.1   Qualitative Study

The qualitative study was conducted among employees in healthcare organizations selected from the list of 1,626 organizations obtained from the Agency of the Republic of Slovenia for Public Legal Records and Related Services, the principal activity of which, according to standard classification, are hospital activities, general medical practice activities, and specialist medical practice activities. 20 organizations were randomly selected and requested to participate in small focus groups, each of which was composed of 4 individuals from the same

organization, namely 2 physicians, 1 employee concerned with human resources, and 1 member of top management. Five organizations responded to our invitation.

In May 2012 participants in each focus group selected the influence of individual physician competencies on the successful operations of healthcare organizations during a recession, with the use of printed list of 376 physician competences and a projector. All participants also received 376 competences cards, which they sorted into 3 equivalent groups: most influential, influential and less influential competences. Once individuals completed their classification independently, a comparison of decisions and coordination of various grades followed among them (Gruban, 2004). Since in groups they could not decide on elimination of precisely 2/3 of the competences, but a few less (difference of 2 to 3 competences less per group), we also retained these competences. Duplicated competencies were only listed once. Participants were requested to give 5 additional different suggestions, which were in turn included in the list. The obtained list contained 141 physician competencies. The quantitative part of research followed.

3.2 Two Quantitative Studies

First study. From the list of all 5,300 physicians registered with the Medical Chamber of Slovenia (2012), we initially randomly selected 5 physicians for testing the pilot questionnaire. We then additionally selected another 100 physicians from the list for the survey at random. The survey was conducted between 4 and 29 June 2012 across Slovenia; anonymity was guaranteed, the questionnaires were sent and delivered in envelopes. The questionnaire included demographic data (gender, age, level of medical education, ownership structure and number of employees of the healthcare organization), a list of 141 physician competencies and 141 competence cards with instructions for use (classify in 3 equivalent groups: most influential, influential and less influential competences; following classification, circle the 47 most influential physician competences on the list). 29 respondents returned the questionnaires. In total, they selected 60 different competences (Figure 1).

Second study. From the main list of physicians, we excluded the names of participating physicians, and 10% (526) of the remaining physicians were randomly selected. The second survey was conducted between 2 and 27 July 2012. The selected physicians were sent a questionnaire with a list of 60 physician competencies selected in the pilot study and competence cards with instructions: first divide the cards in half; one pile with influential competences, the other with less influential physician competences; then, the selected 30 cards with influential physician competences are to be classified based on a drag and drop system, i.e. card by card picked from the left pile, and then on the right, so they are classified by order (Blasius, 2012) of influence from 1 to 30, where 1 is the most influential and 30 the least influential physician competence.

Key physician competencies were established through a factor analysis.

Several *assumptions* were made: the list of physicians of the Medical Chamber of Slovenia was accurate; participants in focus groups and the selected physicians ranked competencies in accordance with their beliefs and opinions; the ques-

tionnaires were completed by physicians to whom they were addressed.

Also, *limitations* were defined: the possibility of dishonest answers and rankings, and missing answers; time and cost of implementation of the study borne solely by the study authors; possibility of unreal results due to missing physician competencies.

The guideline for sample size in factor analysis is according to the number of variables, i.e. a minimum 100 studied persons for factor analysis (Kline, 1979; Gorsuch, 1983; MacCallum, Widaman, Zhang and Hong, 1999) or at least 51 cases more than the number of variables (Lawley and Maxwell, 1971). With 116 respondent physicians we exceed both criteria.

The study is only missing values for five variables. The overall summary of missing values indicates that for 5 variables there is at least one missing value, i.e. 2.6% missing data of variable No04, 2.6% of variable No03, 0.9% of variable No05, 0.9% of variable No02, and 0.9% of variable No01.

3.3 Results of the Quantitative Study

3.3.1 Sample

116 or 22.1% of the distributed questionnaires were properly filled out and returned. The collected results were statistically processed through SPSS 20. The majority of the respondents were female (71.6%). Most respondents, who completed the questionnaire, were between 46 and 55 years of age (42.2%). The majority of the remaining respondents were older physicians aged above 55 (30.2%); there were fewer younger physicians aged 35 to 45 (18.1%), and the fewest physicians aged below 35 (9.5%). The majority of the respondents had a university education (91.3%), while a small share had a master's (5.2%) or a doctor's degree (3.5%). Most of the respondents were employed by public healthcare organizations (81.0%). Almost half of the physicians were employed by healthcare organizations with 50–249 employees (48.3%), fewer by organizations with 10–49 employees (35.3%), and the fewest by organizations with 250 or more employees (12.9%), or fewer than 9 employees (3.5%). With regard to gender, age, education, the ownership structure and number of employees of the healthcare organization, the sample was unbalanced.

3.3.2 Questionnaire reliability

In studies, questionnaire reliability is extremely important, as it must be known to what extent identical or similar results can be expected if the same questionnaire was applied to future studies. Cronbach's alpha amounts to 0.808. Based on this, it can be assumed that the reliability of the applied scale is satisfactory.

3.3.3 Factor Analysis

A correlation matrix was made prior to the factor analysis. It indicated that the problem of multicollinearity does not exist, since not a single correlation reaches 0.9.

No01:Facilitate group discussions and meetings.
No02:Provide and receive constructive feedback.
No03:Provide effective communication linkages within the organization and to its external environment.
No04:Recognize and use non-verbal forms of communication.
No05:Speak clearly and effectively before individuals and groups in formal and informal settings.
No06:Build collaborative relationships.
No07:Demonstrate effective interpersonal relations.
No08:Develop external relationships.
No09:Network with colleagues.
No10:Participation in professional associations and networks.
No11:Build effective teams.
No12:Creates a climate that encourages teamwork and trust.
No13:Facilitate group dynamics, process, meetings and discussions.
No14:Foster teamwork between clinical and administrative staff.
No15:Participate in community service.
No16:Create an organizational climate that facilitates individual motivation.
No17:Keeping all colleagues motivated to achieve better business results with the health organization.
No18:Keeping patients motivated to be active, which lead to a faster recovery.
No19:Encourages the motivation of the environment for donations to healthcare.
No20:Motivating all employees for better collaboration.
No21:Anticipate and plan strategies for overcoming obstacles.
No22:Resolve and manage conflict.
No23:Share views in a non-judgmental, non-threatening way.
No24:Understand and manage expectations.
No25:Use effective negotiation skills.
No26:Create an environment which recognizes and values differences in staff, physicians, patients, and communities.
No27:Establish an organizational culture that values and supports diversity.
No28:Represent the organization to non-healthcare to non health care constituents within the community.
No29:Synthesize and integrate divergent viewpoints for the good of the organization.
No30:Cooperating with other experts and services at the level of primary public health.
No31:Create an environment that facilitates the team to initiate actions that produce results.
No32:Provide visionary thinking on issues that impact the healthcare organization.
No33:Recognize one's own reaction to change and strive to remain open to new ideas and approaches.
No34:Support and mentor high-potential talent within the organization.
No35:Support innovation and creativity.
No36:Follow through on promises and concerns.
No37:Foster an environment of mutual trust.
No38:Professional roles, responsibility and accountability.
No39:Use factual data to produce and deliver credible and understandable reports.
No40:Hold self and others accountable for actions and outcomes.
No41:Adheres to ethical business and professional standards.
No42:Integrate high ethical standards and core values into everyday work activities.
No43:Organizational business and personal ethics.
No44:Serve as the ethical guide for the organization.
No45:Respect the four principles of medical ethics.
No46:Demonstrate and promote cultural sensitivity.
No47:Cultural and spiritual diversity for patients and staff as they relate to healthcare needs.
No48:Confront inappropriate behaviors and attitudes toward diverse groups.
No49:Analyze population data to identify cultural clusters.
No50:Recognize one's own method of decision making and the role of beliefs, values and inferences.
No51:Acquire information and skills from a variety of sources to stay current with market and industry trends.
No52:Promote continual organizational learning and improvement.
No53:Create an environment wherein professional and personal growth is an expectation.
No54:Learn from setbacks and failures as well as successes.
No55:Develop effective interpersonal skills.
No56:To provide quality and accreditation of the departments.
No57:That it is necessary to care for quality improvements on the basis of quality indicator monitoring.
No58:That it is necessary to include patient opinions into the system for improving the quality of work.
No59:The importance of constant quality improvement on the basis of monitoring of the quality indicators.
No60:Foster all employees to meet quality standards.

Figure 1: List of 60 physician competences; items marked No01 through No60 represent the competences selected for the second study.

We checked with the KMO and Bartlett's test if the dataset is suitable for a factor analysis. The results show that the Kaiser-Meyer-Olkin measure of sampling adequacy is 0.9 and the Bartlett's test of sphericity value is statistically relevant. Values of KMO testing between 0.8 and 0.9 are great. Our value is in this interval; thus, we can say we obtained a great value. It can therefore be derived that the factor analysis with our dataset is viable.

First, the decision on the selection of the appropriate number of factors to be used in a factor analysis must be made. The Guttman-Kaiser criterion is the cut-off criterion most frequently used. The popularity of this criterion, as against other criteria, is its ease of use, its minimal judgemental element and its intuitively acceptable justification (Yeomans and Golder, 1982). The results of factor elimination through principal component analysis (Table 1) have indicated that, according to the Guttman-Kaiser criterion, only 12 components meet the conditions for preservation and that they explain 84.89% of the total variance. The first component bears the highest eigenvalue of 7.170 and explains 11.95% of the total variance. The twelfth component has the lowest eigenvalue of 1.875 and explains 3.13% of the total variance.

In some cases, the Guttman-Kaiser criterion can exclude too many factors; therefore, the factor structure was also examined graphically. From Figure 2, it is apparent that the slope of the curve after the twelfth principal component is smaller, which indicates the inclusion of the first twelve components. This corresponds to the previous finding.

A final solution is obtained with a rotation of factors, particularly by orthogonal varimax rotation, the advantage of which is its ease of understanding and interpretation (Brown, 2009). Due to better visibility, all factor loadings not considered significant, e.g. factors between -0.3 and 0.3 (Kline, 2002) are erased from Table 2. The correlations between factors and the input variables show that the first factor has the highest factor loading for variable No. 15, and a high factor loading for variables No. 13, 12, 11 and 14. The first factor has a strong positive correlation with the compe-

tencies related to teamwork, attitude towards teamwork, and cooperation, therefore, it has been titled teamwork and cooperation. The latent variable was obtained by adding the values of variables from which the factor is composed. The obtained sum is then divided by their total number. A latent variable obtained in such a way is named after the variables of which it is composed.

In a similar manner in this chapter we obtain another 11 groups of variables, which are defined by one factor: variables No. 36, 37, 38, 39 and 40 have a strong positive correlation with factor 2, entitled business integrity; variables No. 21, 22, 23, 24 and 25 have a strong positive correlation with factor 3, entitled problem management; variables No. 26, 27, 28, 29 and 30 have a strong positive correlation with factor 4, entitled multidisciplinary thinking; variables No. 46, 47, 48, 49 and 50 have a strong positive correlation with factor 5, entitled acceptance of differences; variables No. 6, 7, 8, 9 and 10 have a strong positive correlation with factor 6, entitled attitude towards others; variables No. 41, 42, 43, 44 and 45 have a strong positive correlation with factor 7, entitled attitude towards culture and ethics; variables No. 31, 32, 33, 34 and 35 have a strong positive correlation with factor 8, entitled creativity; variables No. 51, 52, 53, 54 and 55 have a strong positive correlation with factor 9, entitled education and personal development; variables No. 01, 02, 03, 04 and 05 have a strong positive correlation with factor 10, entitled communication skills; variables No. 16, 17, 18, 19 and 20 have a strong positive correlation with factor 11, entitled motivation and stimulation. The final factor No. 12 has a strong positive correlation with competencies No. 56, 57, 58, 59 and 60, whose factor loadings range between 0.918 and 0.633 and deal with quality. Factor 12 is therefore entitled quality.

3.3.4 Variability and normality of the obtained factors

The Results of Kolmogorov-Smirnov test, which is exact test for testing normality (Table 3) indicate that the distribution of all factors is not normal.

Table 1: Results of factor elimination through principal component analysis

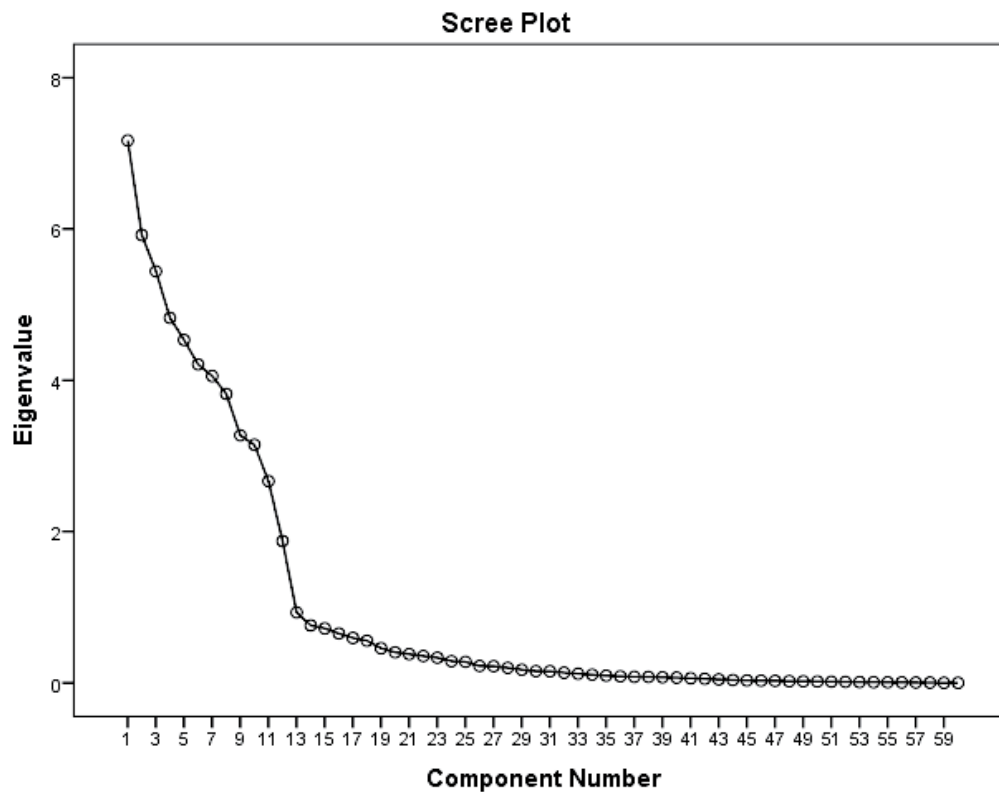| Component	Eigenvalue	Percentage of total variance	Cumulative percentage of total variance
1	7,170	11,950	11,950
2	5,921	9,868	21,817
3	5,441	9,068	30,885
4	4,824	8,041	38,926
5	4,533	7,555	46,481
6	4,211	7,018	53,499
7	4,055	6,759	60,258
8	3,820	6,366	66,624
9	3,273	5,454	72,079
10	3,147	5,245	77,324
11	2,667	4,445	81,769
12	1,875	3,125	84,894

Figure 2: Scree plot of eigenvalues of 60 physician competencies.

Thus, distribution will be assessed with the aid of skewness and kurtosis (Table 4). The variability (CV=29.01) has indicated that the group is homogeneous in the teamwork and cooperation factor. The distribution (skewness= -0.509, kurtosis= -1.040) is left-skewed and restricted, not normal. The business integrity factor has low variability (0.24); consequently, the group is homogeneous. The distribution is left-skewed (-0.992) and flat (2.000), not normal.

The variability of the problem management factor is low (14.75) and the group is homogeneous. The distribution is right-skewed (2.618) and flat (12.224), not normal. With the multidisciplinary thinking factor, it is evident (CV= 18.50) that the group is homogeneous. The distribution is left-skewed (-0.544) and flat (0.988), not normal. The acceptance of differences factor has a low arithmetic mean (only 1.338). The variation coefficient amounts to 46.39 and therefore the group is heterogeneous. The distribution is right-skewed (1.869) and flat (2.220), not normal. The attitude towards others factor group is homogeneous (CV=18.26). The distribution is left-skewed (-1.190) and flat (0.650), therefore not normal. The attitude towards culture and ethics factor group is homogeneous (CV=20.94). The distribution is left-skewed (-0.348) and flat (3.181), not normal. The variability of the creativity factor is low (7.56) and the group is homogeneous. The distribution is left-skewed (-3.206) and flat (11.113), not normal. The education and personal development factor has low variability (CV=8.95) and the group is homogeneous. The distribution is left-skewed (-2.493) and flat (6.341), not normal. The variability of the communication skills factor is low (CV=17.16)

and the group is homogeneous. The distribution (skewness = -0.040, kurtosis= -1.178) is left-skewed and restricted, not normal. In the motivation and stimulation factor, a low standard deviation and variability coefficient (6.86) indicate that the group is homogeneous. The distribution is left-skewed (-4.480) and flat (24.444), not normal. The quality factor has the highest arithmetic mean (4.874). The arithmetic mean, median value, and mode are very similar. The group is homogeneous (CV=6.26). The distribution is left-skewed (-3.333) and flat (13.522), not normal.

3.3.5 Differences between the factors according to socio-demographic variables

Since the variable distribution is abnormal in all the factors, we applied non-parametric tests in order to examine the characteristics of the groups.

The results of the Mann-Whitney test for gender indicate that p-values are between 0.266 and 0.961. Therefore there are no statistically relevant differences for any of the twelve factors when dealing with gender. As is evident, men and women rank the importance of individual factors for successful business operations of a healthcare organization during economic recession in an identical manner.

The Kruskal-Wallis test has indicated (p-values are between 0.100 and 0.850) no difference in the ranking of factors, regardless of the education of the responding physicians. Thus, there is no deviation in the ranking of the importance

Table 2: Factor loadings of excluded two factors (varimax raw factor rotation)

Factor Competency	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11	Factor 12
No15	,986											
No13	,983											
No12	,982											
No11	,973											
No14	,972											
No36		,962										
No37		,952										
No38		,951										
No39		,949										
No40		,941										
No21			,989									
No22			,989									
No23			,976									
No24			,971									
No25			,959									
No28				,957								
No29				,946								
No27				,937								
No30				,928								
No26				,846								
No47					,970							
No46					,970							
No48					,935							
No49					,918							
No50					,912							
No06						,973						
No08						,967						
No10						,918						
No07						,904						
No09						,885						
No42							,944					
No41							,943					
No45							,931					
No44							,918					
No43							,915					
No35								,965				
No33								,897				
No34								,890				
No31								,860				
No32								,824				
No54									,931			
No51									,924			
No53									,876			
No52									,847			
No55									,768			
No05										,865		
No04										,854		
No03										,842		
No02										,826		
No01										,771		
No18											,897	
No16											,818	
No20											,777	
No17											,736	
No19											,715	
No56												,918
No60												,760
No59												,745
No58												,700
No57												,633

Table 3: Results Of The Kolmogorov-Smirnov Test For The Obtained Factors

		Factor					
		communication skills	attitude towards others	teamwork and cooperation	motivation and stimulation	problem management	multidisciplinary thinking
N		116	116	116	116	116	116
Normal Parameters	Mean	4,029	4,388	3,864	3,916	3,034	2,814
	Std. Deviation	,6953	,8010	1,1242	,2692	,4478	,5214
Kolmogorov-Smirnov Z		1,259	3,454	2,311	5,134	5,159	4,010
Asymp. Sig. (2-tailed)		,084	,000	,000	,000	,000	,000
		Factor					
		creativity	business propriety	attitude towards culture and ethics	accepting the difference	education and personal development	quality
N		116	116	116	116	116	116
Normal Parameters	Mean	4,850	2,736	2,966	1,338	4,802	4,874
	Std. Deviation	,3672	,6815	,6243	,6177	,4338	,3059
Kolmogorov-Smirnov Z		4,307	4,594	3,858	3,737	4,776	4,597
Asymp. Sig. (2-tailed)		,000	,000	,000	,000	,000	,000

of factors for successful business operations in of a healthcare organization during the recession.

Also, the Kruskal-Wallis test has shown (p-values are between 0.068 and 0.851) that respondents of different ages bear no statistically relevant differences in terms of ranking the importance of individual physician competencies for the successful operations of a health organization during the recession.

We have also examined the differences in ranking between physicians employed by public and by private healthcare organizations. The Mann-Whitney test has shown that the creativity factor is the only statistically relevant result (p-value =0.047). This means that the views on the importance of the creativity factor for successful operations of a healthcare organization during the recession, of physicians employed by public and private sector organizations, differ. P-values of other factors are between 0.196 and 0.851 and therefore there are no statistically relevant differences for any other eleven factors when dealing with ownership structure of the organization. Physicians employed in the public sector have a higher mean rank (60.80) than those employed in the private sector (48.66). Physicians employed in the public sector have ranked the creativity factor as more important for successful operations of a healthcare organization during the recession compared to private sector physicians. No differences have been established in other eleven factors.

In regard to the correlation between the number of employees in healthcare organizations, which employ the respondents and the results obtained, the Kruskal-Wallis test has shown no statistically relevant results for any of the factors. This means that physicians employed by healthcare organizations with a different number of employees, rank the importance of factors for successful operations of a healthcare organization during the recession in an identical manner.

3.3.6 Ranking

We were also concerned with establishing the importance of individual physician competencies for successful operations of a healthcare organization during an economic recession. For this purpose, we used the method of ranking. The results (Table 5) indicate that, according to physicians' ratings, the most important competencies for successful operations of a healthcare organization during the recession are as follows: "provide visionary thinking on issues that impact the health-care organization" (No. 32), "support innovation and creativity" (No. 35), "create an environment that facilitates the team to initiate actions that produce results," (No. 31) and "support and mentor high-potential talent with the organization" (No. 34). The following competency was considered the least influential: "recognize one's own method of decision making and the role of beliefs, values and inferences" (No. 50).

Next, we have added together the ranks of individual competencies, which were then ranked according to the sum to obtain 12 ranking factors (Table 6). According to the respondents, creativity is considered the most important factor for successful operations of a healthcare organization during an economic recession. It is followed by quality, and education and personal development. Acceptance of differences was considered the least influential factor.

Table 4: Central Tendencies And The Variability Of The Obtained Factors

	Factor					
	communication skills	attitude towards others	teamwork and cooperation	motivation and stimulation	problem management	multidisciplinary thinking
Mean	4,029	4,388	3,864	3,916	3,034	2,814
Median	4,000	5,000	4,000	4,000	3,000	3,000
Mode	5,0	5,0	5,0	4,0	3,0	3,0
Std. Deviation	,6953	,8010	1,1242	,2692	,4478	,5214
Variance	,483	,642	1,264	,072	,201	,272
Skewness	-,040	-1,190	-,509	-4,480	2,618	-,544
Std. Error of Skewness	,225	,225	,225	,225	,225	,225
Kurtosis	-1,178	,650	-1,040	24,444	12,224	,988
Std. Error of Kurtosis	,446	,446	,446	,446	,446	,446
Coeff. of variation (%)	17,16	18,26	29,01	6,86	14,75	18,50
	Factor					
	creativity	business propriety	attitude towards culture and ethics	accepting the difference	education and personal development	quality
Mean	4,850	2,736	2,966	1,338	4,802	4,874
Median	5,000	3,000	3,000	1,000	5,000	5,000
Mode	5,0	3,0	3,0	1,0	5,0	5,0
Std. Deviation	,3672	,6815	,6243	,6177	,4338	,3059
Variance	,135	,464	,390	,382	,188	,094
Skewness	-3,206	-,992	-,348	1,869	-2,493	-3,333
Std. Error of Skewness	,225	,225	,225	,225	,225	,225
Kurtosis	11,113	2,000	3,181	2,220	6,341	13,522
Std. Error of Kurtosis	,446	,446	,446	,446	,446	,446
Coeff. of variation (%)	7,56	0,24	20,94	46,39	8,95	6,26

4   Discussion

Despite the unbalanced sample, the examination of differences between factors according to control variables has indicated that male and female physicians, differently educated respondents, respondents of different ages, employees in public and private healthcare organizations, with different numbers of employees, rate the importance of individual factors for successful operations of a healthcare organization during the recession in a similar fashion. The only exception is the ranking of the importance of the creativity factor, when comparing rankings by physicians from public and private organizations:

the latter, in comparison to the former, believe the said factor has a smaller influence on successful operations of a healthcare organization during the recession.

Through factor analysis, we have isolated 12 components, which explain 84.89% of the total variance. The comparison of factors and input variables has indicated a strong correlation between certain variables. Based on these variables, the factors can be defined as follows: teamwork and cooperation, business integrity, problem management, multidisciplinary thinking, acceptance of differences, attitude towards others, attitude towards culture and ethics, attitude towards creativity, attitude

Table 5: Average or Mean Rank of Variables

Competencies	Valid	Median	Mode	Mean Rank	Competencies	Valid	Median	Mode	Mean Rank
No32	96	2,00	1	1	No24	91	21,00	21	15
No35	91	2,00	1	1	No23	75	21,00	22	15
No31	70	2,00	2	1	No20	34	25,00	22	16
No33	65	3,00	3	2	No39	40	23,00	23	17
No34	84	3,00	3	2	No30	37	26,00	24	20
No56	83	5,00	5	3	No36	56	24,00	24	18
No59	82	5,00	5	3	No40	94	24,00	24	18
No58	72	6,00	5	4	No17	63	25,00	25	19
No60	50	6,00	6	4	No18	29	26,00	26	20
No57	56	6,00	7	4	No38	82	23,00	26	17
No53	91	8,00	8	5	No27	31	27,00	26	21
No51	69	9,00	8	6	No19	37	25,00	27	16
No54	42	9,00	9	6	No28	66	27,00	27	21
No52	79	9,00	9	6	No26	18	28,00	28	22
No55	38	9,50	10	7	No42	20	28,50	28	23
No06	81	10,00	10	8	No44	24	28,00	28	22
No10	46	12,00	11	9	No41	12	28,50	29	23
No08	99	12,00	12	9	No43	65	29,00	29	24
No09	68	12,00	13	9	No45	21	29,00	29	24
No11	63	14,00	13	10	No47	39	29,00	29	24
No12	45	15,00	13	11	No46	16	30,00	30	25
No14	97	14,00	13	10	No48	43	30,00	30	25
No13	88	14,00	14	10	No49	28	30,00	30	25
No15	37	14,00	14	10	No50	12	30,00	30	25
No03	91	16,00	16	12	No07	49	12,00	10[a]	9
No04	47	17,00	16	13	No02	70	17,00	16[a]	13
No01	55	17,00	17	13	No22	62	20,00	17[a]	14
No05	80	17,00	17	13	No37	43	20,00	21[a]	14
No25	58	20,00	18	14	No16	62	25,00	25[a]	19
No21	77	20,00	20	14	No29	61	27,00	27[a]	21

Note: *a*   *Multiple modes exist. The smallest value is shown. It is evident from the frequency table that the modes are No07: 10 and 12, No02: 16 and 19, No22: 17 and 19, No37: 21 and 25, No16: 25 and 27, No29: 27 and 29.*

towards education and personal development, communication skills, motivation and stimulation, and quality.

The reliability of the questionnaire, which served as the basis for the study, as well as the gathered results was considered acceptable according to Cronbach's alpha.

The examination of variability and variable normality has indicated that all factor groups, excluding the group of acceptance of differences, are homogeneous and that the variable distribution is abnormal.

The ranking of physician competencies in regard to their influence on the successful operations of a healthcare organization during an economic recession, and the calculations of individual factor rankings have indicated that according to the responding physicians, creativity is the most important factor. Following creativity, factors ranging from most to least important are quality, education and personal development, attitude towards others, team work and cooperation, communication skills, problem management, business integrity, motivation and stimulation, multidisciplinary thinking, attitude towards culture and ethics, and acceptance of differences.

The results of the study comply with the findings on intellectual charm, which is required by present day managers, along with professional know-how, for successful business operations of their organizations during an economic recession. The comparison has shown that every constituent of the intellectual charm of a successful manager during a recession, i.e. communication skills and attitude towards interlocutors, attitude towards teamwork, attitude towards culture and ethics, creativity, fostering motivation and stimulation, professionalism and integrity, multidisciplinary thinking, and solving problems (Devetak 2012 a), is essential for present day physicians, as they help physicians contribute to successful operations of their healthcare organizations during the recession.

Table 6: Ranking of obtained factors

Factor	Factor competencies	Sum of competence ranks	Mean rank
creativity	No31, No32, No33, No34, No35	7	1
quality	No56, No57, No58, No59, No60	18	2
education and personal development	No51, No52, No53, No54, No55	30	3
attitude towards others	No06, No07, No08, No09, No10	35	4
teamwork and cooperation	No11, No12, No13, No14, No15	51	5
communication skills	No01, No02, No03, No04, No05	64	6
problem management	No21, No22, No23, No24, No25	72	7
business propriety	No36, No37, No38, No39, No40	84	8
motivation and stimulation	No16, No17, No18, No19, No20	90	9
multidisciplinary thinking	No26, No27, No28, No29, No30	105	10
attitude towards culture and ethics	No41, No42, No43, No44, No45	116	11
accepting the distinctive	No46, No47, No48, No49, No50	124	12

Based on all these findings *we confirm the hypothesis "Among the competencies of Slovenian physicians that contribute to successful operations of healthcare organizations also belong the characteristics of intellectual charm (communication skills and attitude towards interlocutors, attitude towards teamwork, attitude towards culture and ethics, creativity, fostering motivation and stimulation, professionalism and integrity, multidisciplinary thinking, and problem management)."*

The physicians' attitude towards quality, education and personal development, and towards differences, is important as well. Consequently, these characteristics can be considered specific for the intellectual charm of physicians. Based on these findings, we have proposed a model of a physician's intellectual charm (Figure 3). Physicians with such charm can contribute to successful business operations of their healthcare organizations during the recession. The most important characteristics are the physician's creativity and his attitude
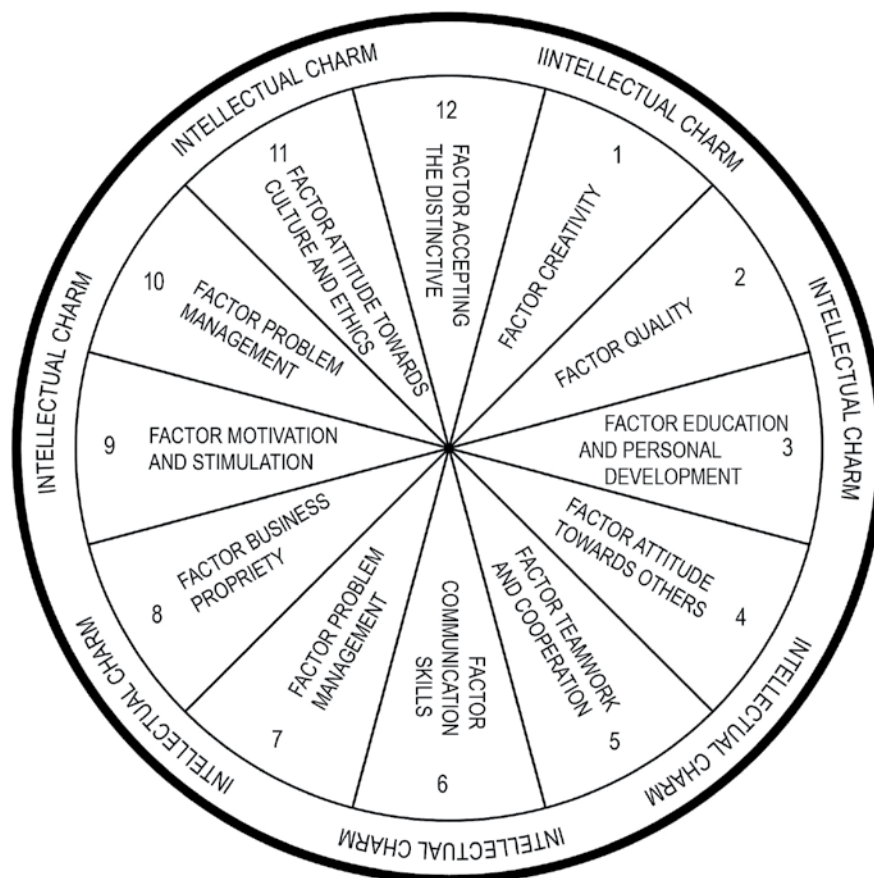

Figure 3: Model of a physician's intellectual charm (model of key physician competencies which will assist in more successful operations of his organization during the recession)

towards creativity. In the order of decreasing importance they are followed by quality, education and personal development, attitude towards others, teamwork and cooperation, communication skills, problem management, business integrity, motivation and stimulation, multidisciplinary thinking, attitude towards culture and ethics, and acceptance of differences.

5   Conclusion

The study performed among randomly selected Slovenian physicians has shown that according to their ratings, a physician's creativity, quality, education and personal development, attitude towards others, teamwork and cooperation, communication skills, problem management, business integrity, motivation and stimulation, multidisciplinary thinking, attitude towards culture and ethics, and acceptance of differences are of key importance for successful business operations of their healthcare organizations during an economic recession. All of these key competencies comprise a whole defined as a physician's intellectual charm.

Despite several studies on competencies, there has never been a study which would examine physician competencies positively affecting the operations of a healthcare organization during an economic recession, in a comprehensive manner. The expression "intellectual charm" is also considered a novelty in healthcare.

In the recession, the results of the study can be applied to benefit everyday practices. Physicians and other healthcare employees must be informed of these findings on physician competencies which benefit the business operations of their organizations; they must be reminded of their implementation, while physicians lacking in certain competencies should work to develop them to a sufficient degree.

In the future, the competencies and intellectual charm of other healthcare employees will have to be examined as well, and strive for maximizing the beneficial impact of every healthcare employee on the business operations of their organizations during an economic recession.

This model can also be applied to other activities, those concerned with production, as well as services.

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Vpliv intelektualnega šarma zdravnikov na zdravstvene organizacije

Recesija močno vpliva na poslovanje vseh organizacij, med njimi tudi zdravstvenih organizacij. Potrebne so spremembe in novi pogledi na zaposlene v teh organizacijah z vidika možnosti njihovega vplivanja na uspešnost poslovanja organizacije. Med zaposlenimi imajo zdravniki že tradicionalno poseben status, zato je potrebno izkoristiti njihov vpliv. V empiričnem delu smo na osnovi ocen zdravnikov izluščili 12 ključnih kompetenc zdravnika, ki po mnenju zdravnikov vplivajo na uspešnost poslovanja njegove zdravstvene organizacije v času recesije. Primerjava naših rezultatov z intelektualnim šarmom managerjev je pokazala, da dobljene ključne kompetence, ki so ustvarjalnost, kakovost, izobraževanje in osebni razvoj, odnos do drugih, timsko delo in sodelovanje, komunikacijske veščine, obvladovanje problemov, poslovna korektnost, motivacija in stimulacija, multidisciplinarnst v razmišljanju, odnos do kulture in etike ter sprejemanje drugačnosti, predstavljajo celoto imenovano intelektualni šarm zdravnika.

Ključne besede: intelektualni šarm, kompetence zdravnika, uspešnost poslovanja, zdravstvene organizacije, faktorska analiza

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