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A Model for Ranking and Optimization of Key Performance Indicators of the Strategy Process

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Abstract:
Small and medium sized companies are faced with a series of challenges in order to improve the quality of their key business processes. Quality management system and the requirements of ISO 9001:2008 are usually reliable when defining the key performance indicators of processes, and the process approach enables monitoring of the process indicators' effectiveness for the whole organization. Evaluation, monitoring and ranking of key performance indicators can provide quality improvement of strategy process performance in different SMEs. A model based on genetic algorithms has been developed in order to rank key performance indicators of the strategy process. This model can have a great practical use for a company's management team in the quality assessment of strategy process performance in their company.

Keywords: *strategy process, quality management, fuzzy sets, genetic algorithm, indicators*

1. INTRODUCTION

Under competitive pressure, many manufacturing companies continuously seek ways to improve quality. A Quality Management System (QMS) is a central activity associated with continuous improvement in the performance of organizations. Quality management includes all the activities that organizations use to direct, control, and coordinate quality. These activities include formulation of a quality policy and setting quality objectives. According to the literature review [1-3], it could be stated that achievement of quality objectives leads to improvement of the competiveness, effectiveness and flexibility of a company. This is a reason why the considered problem has become a topic of research for both industry and academia in the last decades.
The quality goals and objectives could be considered as part of the strategic goals and objectives. Identifying and defining strategic objectives and strategies of an organization are included in the strategic approach to managing manufacturing companies. It is based on a continuous process of constant adaptation of manufacturing companies in a variable environment.
A strategy subsystem defines ways to address future situations and problems. In order for a manufacturing company to achieve its goals it is not enough just to have formulated a strategy, it is necessary to implement the strategy in all operational and budget plans and to continuously improve.
Performance and quality measurement is an essential element of effective planning, improvement and control as well as decision making. The measurement results reveal the effects of strategies and potential opportunities [4]. Top managers define goals and critical success factors (CSFs) – which the organization must accomplish to achieve the mission by examination and categorization of the impact [5]. These CSFs are sufficient for the mission to be achieved and to be used for identification of the key business processes in an organization. Business Process Management (BPM) defines objectives of key business processes, with respect to CSFs, which must be accompanied by measurable key performance indicators (KPIs). Improvement of key business processes could be achieved if objectives can be measured through KPIs. In this paper, the focus is on the development of an assessment approach for the ranking of strategy process quality using the fuzzy set and genetic algorithm approach. The process approach is used for the analysis and the decomposition of the strategy process for typical small and medium sized manufacturing companies as well

as companies in manufacturing clusters and the requirements of ISO 9001:2008 are analyzed and used as a background for the definition of specific sub processes and indicators. The weight values of indicators and sub processes were defined using the experience of 197 managers from 142 small and medium sized manufacturing companies in Serbia, using their statements described by linguistic expressions which are modeled by triangular fuzzy numbers. The defined KPIs are ranked using MATLAB GA toolbox. The presented approach also provides the possibility to present the current status of the quality of a strategy process compared with the average value.

2. LITERATURE REVIEW

The relation between implementation of quality management systems such as ISO 9001 (ISO 9001:2008) and the quality of processes and outcomes is clear and has been identified in many researches. Obtaining a clear understanding of business process quality constitutes the most important prerequisite [6]. Koc [7] provides results showing that ISO 9000's implementation makes a significant difference to a firm's performance when comparing certified and non-certified firms. There are various ways in which a company can claim that its QMS meets the requirements of ISO 9001. These include certification and third party assessment or even self-assessment (in some cases using mathematical approaches and different models). A number of researches have focused on the application of different approaches in the selection, ranking and assessment of parameters, or even management systems [8-12]. Identifying variables for measuring organizational performance, relative to QMS implementation, is the basis of work for research on the relation between QMS and organizational performance [13]. Identifying quality improvement opportunities in a manufacturing company is not an easy task [14]. One of the first steps in improvement is identification and assessment of weak spots and self-assessment. The assessment model could identify impacts on the existing system as well as provide the result of introducing new standards [15]. The assessment of the quality of processes provides a platform to compare and benchmark different strategy processes and indicators as well as define actions for their improvement.

There are different solutions for QMS assessment and steering. For instance, the CQMA Expert is programmed by using MATLAB's GUI components and its Fuzzy Logic Toolbox [16] or the Pareto Analytical-Hierarchy Process (PAHP) and Multichoice Goal Programming (MCGP) [17]. This approach does not cover all the requirements of ISO 9000 but is limited to one section of the standard and PAHP is very difficult to use in the presence of simultaneous quantitative and qualitative constraints because there are several types of interactions between different criteria. On the other hand, Genetic algorithms (GA) support multi-objective optimization and they are easy to implement using elementary quality management tools such as statistical process control (SPC), Pareto Analysis and Business Model Assessment. GAs work in environments where traditional TQM methods are predicted not to work [18]. GAs have already been successfully used for solving production and operation management problems, such as production control, scheduling facility layout, line balancing, production planning and supply chain management [19].

KPIs, on the other hand, are measures that quantify management objectives, along with a target or threshold, and enable the measurement of strategic performance. Each process should be measured with one or two metrics that characterize the essentials of its performance [20]. It is very important to provide a formal model for assessment of the KPIs and their values as well as for the influence of specific objectives on quality of process. This is important for companies because it provides a platform to find weak spots and provides improvement actions by comparing different strategy processes.

In this paper, weight values of indicators and sub processes were defined using the experience of decision makers, using their statements described by linguistic expressions which are modeled by triangular fuzzy numbers. Further issues are the ranking of KPIs' and the calculation of the overall strategy process rank using the values from real-life companies. The presented model is novel because it combines the determination of KPIs weights using the fuzzy approach, and the ranking and optimization of criteria and process performances based on genetic algorithm.

3. THE DECOMPOSITION OF THE STRATEGY PROCESS IN A MANUFACTURING COMPANY

Standard ISO 9001:2008 specifically emphasized the importance of the business process approach which is one of eight basic principles in QMS. According to the process approach, the strategy can be viewed as a network of interconnected sub-processes that are directed towards achieving the defined objectives. The requirements of ISO 9001:2008 relating to top management and the strategy process are defined in paragraph 5. For this paper, paragraph *5.4.1 Quality objectives* and paragraph *5.4.2 Quality management system planning* are particularly significant.

In paragraph 8 of standard ISO 9001:2008 (8.1 and 8.2.3) the requirements which are related to measurement, analysis and process monitoring are given. In this paper, the strategy subsystem is analyzed using the process approach in accordance with the requirements of ISO 9001:2008.

Many authors have presented a similar model of the strategic process [21-23]. Common to all strategy models is that the strategy process is seen as a continuous, iterative process that begins with situational analysis of internal and external factors of the organization's environment and the formulating of a strategy for the organization, followed by its implementation in all the organization's processes and controls. In this paper, the strategy process is decomposed by using Structural system analysis (SSA), which is one of the process approach methods, into the following five sub-processes:

- Development of a strategy business plan,
- Implementation and control of the manufacturing organization's SBP,
- Improvement of business processes and performance of the manufacturing organization,
- "Know-how" transfer and knowledge management within the manufacturing organization and
- Corporate risk management.

Besides the basic processes given in the literature, from the experience of the authors and from the Center for Quality, the Faculty of Engineering in Kragujevac, three more sub-processes that occur as part of the strategy in manufacturing organizations as well as companies in manufacturing clusters have been added. Having in mind different levels of complexity in an organization's environment, in this paper, only manufacturing organizations whose environment can be partially predicted are analyzed.

4. DEFINITION OF STRATEGY A PROCESS'S METRICS

The formulation of quality goals and a quality strategy is based on the strategy development process and proposed in different researches [24]. The quality goals are defined by top managers with respect to vision (how the organization wants to be perceived by the world), mission (what the organization wants to achieve) and values (prescribing its behavior, character and culture). By measuring the strategic results, we can determine performance evaluation of a manufacturing organization. The realization of only an acceptable financial performance is not enough because the organization must achieve competitive advantage and improve its market position. In this paper, in order to collect the data, a questionnaire is used which was conducted in 142 small and medium sized manufacturing companies as well as companies in manufacturing clusters in Serbia. In order to reduce the impact of specific indicators, we needed this many companies. The managers of these companies were given a list of key indicators for each strategy sub-process for evaluation. Based on these lists, we chose the most relevant KPIs for the strategy sub processes for all manufacturing companies.

These KPIs are presented in Table 1. The statements of managers were described by linguistic expressions which are modeled by triangular fuzzy numbers.

Table 1. Strategy Process KPIs

Strategy sub process	KPI	Indicator	Target value	Description
Development of a strategy business plan	KS1.1	Time	20-40	The time required for the development of SBP in relation to the planned time (weeks)
	KS1.2	Effectiveness	4%	The effectiveness of human resources involved in the process, expressed as a number of SBP's audit %
Implementation and control of the manufacturing organization's SBP	KS2.1	Implementation of manufacturing organization's SBP	8	The level of SBP implementation, expressed as a number of strategic initiatives
	KS2.2	Action Plans	8	Number of action plans to achieve the strategic objectives
	KS2.3	BSC	8	Number of BSCs for parts of the organization
	KS2.4	Success	12-16	Number of specific actions undertaken in the company during the SBP implementation stage, based on the deviation from the target value
Improvement of business processes and the performance of the manufacturing organization	KS3.1	Approved proposals for improvement	16-18	Number of approved proposals for process improvement
	KS3.2	The success of improvement	8%	Percentage of improved processes for the reporting period based on a ratio of the number of improved processes and the total number of processes (x100)
	KS3.3	The success of the process	105%	Performance ratio of improved and existing processes
"Know-how" transfer and knowledge management	KS4.1	Percentage value of KPI	103%	Percentage value of KPI for knowledge management in relation to the previous period (x100-100)
	KS4.2	Intellectual capital	103%	The level of intellectual capital in the previous period
	KS4.3	Success	10-45%	Percentage of employees covered by knowledge transfer in relation to the total number of employees (x100)
Corporate risk management	KS5.1	The level of corporate risk	115%	The level of corporate risk in relation to the plan
	KS5.2	Success	5%	Reduction of corporate risk on an annual basis
	KS5.3	Proposals for improvement	8	Number of proposals for improving the process

It is realistic to assume that decision makers use linguistic expressions for their judgments instead of precise numbers. In this paper, the fuzzy rating of each decision maker is described by linguistic expressions which can be represented as triangular fuzzy number $\tilde{W}_k^e = \left(x; l_k^e, m_k^e, u_k^e\right)$ with the lower and upper bounds

l_k^e, u_k^e and modal value m_k^e, respectively.
Values in the domain of these triangular fuzzy numbers belong to a real set within the interval [0-1].
In this paper, the fuzzy rating of each decision maker can be described by using five linguistic expressions which are modeled by triangular fuzzy numbers:

very low importance - $\tilde{R}_1 = (x; 0,0,0.2)$

low importance - $\tilde{R}_2 = (x; 0.1,0.3,0.5)$

moderately important - $\tilde{R}_3 = (x; 0.2,0.5,0.8)$

high importance - $\tilde{R}_4 = (x; 0.5,0.7,1)$

most important - $\tilde{R}_5 = (x; 0.8,1,1)$.

The aggregation of individual opinions into a group consensus is given by the average value method. The algorithm of the proposed method is presented in the following:
Step 1. Input fuzzy matrix of the relative importance of sub-processes of the strategy process

$$\tilde{W} = \left[\tilde{W}_k^e \right]_{KxE}, k = 1,..,K; e = 1,..,E$$

Step 2. Calculate the average value of the fuzzy rating of decision makers, $\tilde{W}_k = (x; l_k, m_k, u_k)$ by using fuzzy arithmetic operations:

where: $l_k = \frac{1}{E} \cdot \sum_{e=1}^{E} l_k^e$, $m_k = \frac{1}{E} \cdot \sum_{e=1}^{E} m_k$, $u_k = \frac{1}{E} \cdot \sum_{e=1}^{E} u_k^e$,

Step 3. The representative scalar of fuzzy number $\tilde{W}_k, k = 1,..,K$ is denoted as W_k and is given by the moment method. The weight vector is represented as $W_p = [W_k]_{1xK}$.

After normalizing W_p, we get the normalized weight vector W:

$W = (w_1,..,w_k,...,w_K)$

W is a non-fuzzy number and this gives the priority weights of one sub-process over the other.
According to the procedure, the weight values of all strategy process indicators have been determined:

- Development of a strategy business plan w_1 = 0.25;
- Implementation and control of the manufacturing organization's SBP w_2 = 0.3,
- Improvement of business processes and the performance of the manufacturing organization w_3 = 0.15,
- "Know-how" transfer and knowledge management w_4 = 0.15 and
- Corporate risk management w_5 = 0.15.

The weight values of KPIs of the Development of a strategy business plan:
$w_{11} = 0.5,\ w_{12} = 0.5$.
The weight values of KPIs of Implementation and control of the manufacturing organization's SBP:
$w_{21} = 0.25,\ w_{22} = 0.25, w_{23} = 0.25,$
$w_{24} = 0.25$
The weight values of KPIs of Improvement of business processes and the performance of the manufacturing organization:
$w_{31} = 0.3,\ w_{32} = 0.3, w_{33} = 0.4$.
The weight values of KPIs of "Know-how" transfer and knowledge management:
$w_{41} = 0.4,\ w_{42} = 0.3, w_{43} = 0.3$.
The weight values of KPIs of Corporate risk management:
$w_{51} = 0.4,\ w_{52} = 0.4, w_{53} = 0.2$.
Every manufacturing company can change these weight values slightly, according to their experiences and needs, because they are not strictly fixed.

5. GENETIC ALGORITHMS FOR RANKING OF CRITERIA AND EVALUATION OF STRATEGY PROCESS QUALITY

Difficulties in solving real problems in manufacturing companies as well as companies in manufacturing clusters usually occur because of mutual opposition of goals. Genetic algorithms are especially suited for solving complex optimization problems. They perform the objectives' optimization using the function vector, whose elements are the objectives' functions, in order to find the optimal solution.
In this paper, the MATLAB GA toolbox is used to rank KPIs (and analyze KPIs' values, finding minimal, average, maximal and optimal ones) as well as to rank companies. MATLAB is used as an easy to learn and reliable environment and the following parameters were set:

- The population type was double vector,
- The selection function was stochastic uniform already existing in MATLAB,
- The mutation function used was constraint dependent,
- The crossover function used in this model was scattered, and
- The stopping criteria for this function were 100 generations set by default.

The criteria used for the ranking of strategy process and sub process indicators were the maximization of the sum and the variance of weight amounts. In this paper, the sum and the variance of weight amounts of the strategy process and sub process indicators in 112 manufacturing companies were analyzed. Five strategy process indicators and 15 strategy sub process indicators were considered to determine the individual rank of each manufacturing company.
The total sum of the manufacturing companies' indicators can be expressed by the formula:

$$S_{total} = \sum_{i=1}^{m} \sum_{j=1}^{n} \sum_{k=1}^{l} a_{ijk} * Kp_j * Kp_{jk} \quad (1)$$

where a_{ijk} is the value of the strategy sub process indicators, Kp_j is the strategy process indicator coefficient, and Kp_{jk} is the coefficient of the participation of each strategy sub process indicator.

By using equation (1) the weight parameters w_i, could be defined, which represent the participation of the *i* type of manufacturing company in the total sum.

$$w_i = \frac{\sum_{j=1}^{n}\sum_{k=1}^{l} a_{ijk} * Kp_j * Kp_{jk}}{S_{total}} \qquad (2)$$

After the defining of weight parameters, the variance of weight amounts of all the strategy process and sub process indicators could be defined.

Ranking is performed based on the variance of all weight amounts. The variance could be expressed by the formula:

$$Var = \sqrt{\frac{\sum_{i=1}^{m}\sum_{j=1}^{n}\sum_{k=1}^{l}\left(a_{ijk} * Kp_j * Kp_{jk} - \bar{a}\right)^2}{m * l}}$$

for i =1,…, *m*, j = 1,…,*n* and k = 1,…

where *m* is the total number of manufacturing companies (in this case 142), *n* is the total number of strategy process indicators (in this case 5), *l* is the number of strategy sub process indicators (the number of strategy sub process indicators is not the same for each strategy sub process) and $\bar{a}$ is the average value of all strategy process indicators of all the manufacturing companies. The *m·l* gives the total number of grades.

The main goal of ranking is weight value determination w_i, which leads to the definition of the variance minimum of all weights for strategy process and sub process indicators, and the sum of maximum weight for all strategy process and sub process indicators.

The ranking was performed using MATLAB tools for multi-objective optimization by GA. Both objective functions are defined separately. So, the formal definition of the optimization problem is:

maximum $S_{total} = \sum_{i=1}^{m}\sum_{j=1}^{n}\sum_{k=1}^{l} a_{ijk} * Kp_j * Kp_{jk}$,

and minimum $Var = \sqrt{\frac{\sum_{i}^{m}\sum_{j}^{n}\sum_{k=1}^{l}\left(a_{ijk} * Kp_j * Kp_{jk} - \bar{a}\right)^2}{m * k}}$,

with the condition $\sum_{i=1}^{m} w_i = 1$, $0 \le w_i \le 1$, where ***m*** is the number of manufacturing companies, and ***k*** is the number of strategy sub process indicators.

The ranking of indicators of a process and sub process of a strategy was done using a similar procedure. The only difference is the weight parameters definition *w*

$$w_j = \frac{\sum_{k=1}^{m}\sum_{k=1}^{l} a_{ijk} * Kp_j * Kp_{jk}}{S_{total}}$$

where w_j is the participation of the *j* type of strategy process indicator in the total sum and

$$w_{jk} = \frac{\sum_{k=1}^{m}\sum_{j=1}^{n} a_{ijk} * Kp_j * Kp_{jk}}{S_{total}}$$

where w_{jk} is the participation of the *jk* type of strategy sub process indicator in the total sum.

6. DEVELOPMENT OF A SOFTWARE SOLUTION FOR RANKING AND OPTIMIZATION OF KPIS AND STRATEGY PROCESS PERFORMANCE

For the ranking of strategy process performance indicators, based on an evaluation of indicators, a software solution, based on the previous model, has been developed. This will lead to identifying and correcting deficiencies of the process and to evaluation opportunities for improvement of the quality and to the need for change in the strategy process.

The general task is to develop a software solution, based on MATLAB GA toolbox, the appropriate graphic user interface, presented in Fig. 1. For each strategy sub process, their indicators and weights are presented (from KS1 to KS5), as well as the indicators and weights for each sub process (from KS1.1 to KS5.3). After the data input, the results are calculated: the total rating of the strategy process of all analyzed manufacturing companies, the analyzed manufacturing companies' rank, the strategy process rank for one chosen manufacturing company, the strategy process rank for all analyzed manufacturing companies, the strategy sub process rank for one chosen manufacturing company and the strategy sub process rank for all analyzed manufacturing companies.

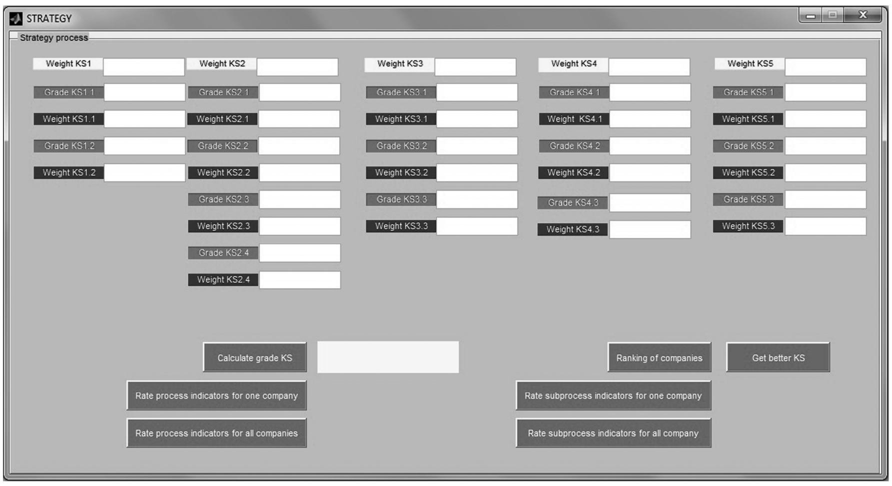

Figure 1. The GUI in MATLAB for data input of KPIs' weights and values

The ranking of the strategy process indicators (Fig. 2) showed that the *Development of strategy business plan* sub process indicator - *Time* (KS1.1) has the highest rank compared to all other indicators. This practically means that SBP of organization was developed in the shortest period of time, for managers of the Serbian manufacturing organizations, is the most important. Also, great importance is given to corporate risk management, so *The level of corporate risk* indicator (KS5.1) also stands out by its rank in relation to the other indicators.

The success of improvement indicator (KS3.2) is the third indicator for which the value stands out of – percentage of improved processes for the reporting period based on the ratio of the number of improved processes and the total number of processes. This indicator is also very important for manufacturing organizations because it evaluates the success of improvement at all three levels: strategic, tactical and operational.

The indicator of "*Know-how" transfer and knowledge management* sub process for which the value also stands out is *Percentage value of KPI* (KS4.1). It represents the percentage value of the KPI for knowledge management in relation to the previous period and points to the innovation of the process within the manufacturing organization.

All indicators of the *Implementation and control of manufacturing organization SBP* sub process (KS2.1, KS2.2, KS2.3 and KS2.4) have more or less the same rank and they are relatively significant for the strategy process of the analyzed manufacturing companies.

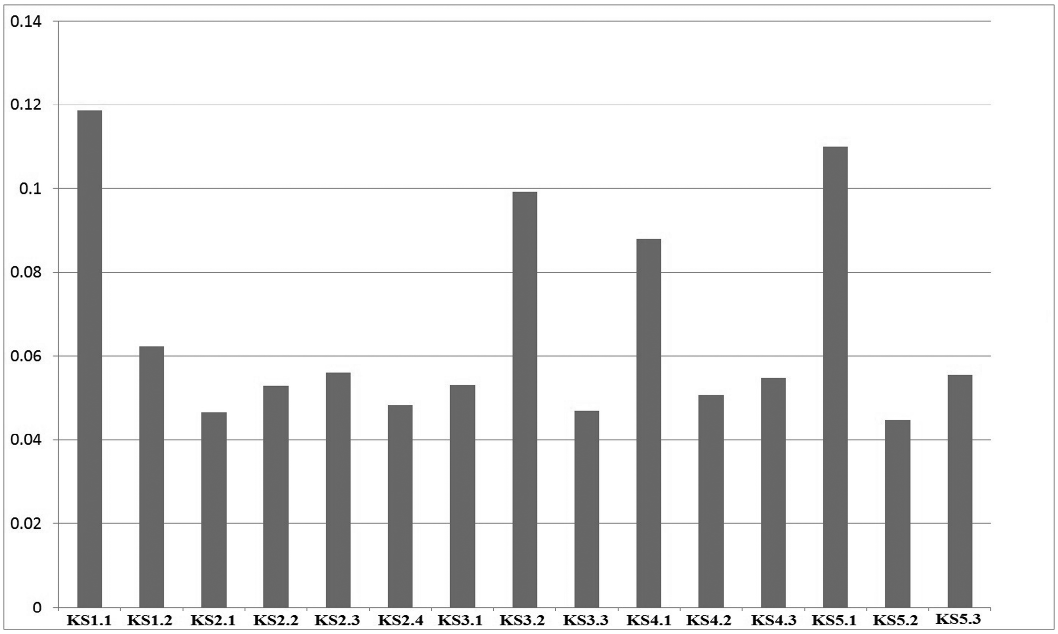

Figure 2. Rank of the strategy process performance indicators

The previous calculation provides a set of starting information: strategy process indicators were ranked according to their weights and values obtained from Serbian manufacturing companies. These ranks clearly show which KPIs were at a satisfactory level and which were not, so the necessary actions could be taken.

In order to improve the quality of the strategy process in any manufacturing company, the strategy process indicators' rank from one of the lower and one of the better ranked manufacturing companies are compared with the average value of the 142 analyzed manufacturing companies (Fig. 3).

Based on comparisons of the results, it is possible to define and develop measures to improve the quality of the strategy process which is found to have the maximum deviation from the mean average value.

The diagram shows that one of the analyzed lower ranked manufacturing companies has the largest deviation from the mean average value, with the strategy sub process with the most important indicator rank being - *Development of strategy business plan* sub process (KS1).

Significant deviations were also found in the *Corporate risk management* sub process (KS5), while deviations in other strategy sub processes are negligible. Also, one of the better analyzed ranked manufacturing companies has a small positive deviation from the mean average value, with the "*Know-how" transfer and knowledge management* sub process (KS4).

That practically means that still the top management, in the better ranked manufacturing companies in Serbia, still does not give sufficient importance to knowledge transfer and management in their companies. By comparing the indicator of one of the lower and one of the better ranked manufacturing companies different conclusions for improvement could be performed.

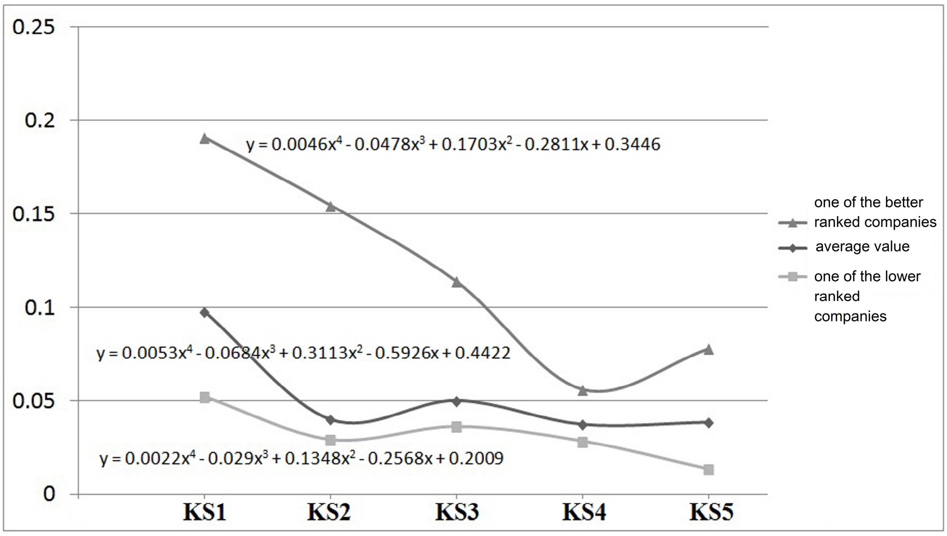

Figure 3. Diagram of the indicators' rank function of one of the lower and one of the better ranked manufacturing companies compared with the average value (142 analyzed manufacturing companies)

The manufacturing companies can improve the quality of their strategy process with appropriate actions, especially in the domain of improvement of *Development of strategy business plan, "Know-how" transfer and knowledge management* and *Corporate risk management* sub process indicators. This practically means that a manufacturing company must reduce the time required for the development of SBP and the level of corporate risk, and increase the percentage value of the KPI for knowledge management and the level of intellectual capital.

7. CONCLUSION

The relation between the implementation of a quality management system and the quality of processes and outcomes is clear and has been identified in many researches. The effective ISO 9001 system can significantly improve manufacturing performance of the companies. Strategy process evaluation and improvement is a comprehensive approach to organizational change and typically yields the greatest return on investment. So the measurement and ranking of process indicators and their improvement is an important task in any company.

In this paper, an approach for assessment and evaluation of the quality of a strategy process is proposed. The procedure started with decomposition of the strategy process for a typical small and medium sized manufacturing company as well as copanies in manufacturing clusters. Key performance indicators for each sub process were defined, accompanied by a specific metric for each sub process.

The specific metric was defined according to evaluation of a survey among the management in 142 Serbian small and medium sized manufacturing companies. In addition, the defined indicators and metrics needed to align with requirements of ISO 9001:2008. The weight values for KPIs were defined based on expert opinion using fuzzy sets. The approach was based on evaluations of KPI weights by experts (the fuzzy rating of each decision maker was described by using five linguistic expressions which are modeled by triangular fuzzy numbers). These weights were the input for ranking and optimization using MATLAB GA toolbox.

The next step was the development of a model based on genetic algorithms in order to perform the following tasks: ranking of indicators, ranking of specific companies according to the quality of their strategy process, and the possibility to compare and contrast the strategy processes in different organizations. This approach enables assessment of the quality of a strategy process (according to ISO 9001:2008). The survey was performed on a sample of 142 Serbian small and medium sized manufacturing enterprises. For that number of companies the ranking of indicators was performed.The solution is flexible so it is easy to include other indicators, to change weights for specific indicators and to play with different scenarios. The presented approach provides the possibility to graphically present the current status of the quality of a strategy process compared with the average value.

The limitations of the specific research are around the selection of companies (SMEs from the Serbian metal processing industry). This limitation is mostly present in the area where a specific company compares itself with the leading one, or where the upper limits for specific KPIs are defined (even they could be manually increased in the software). In further steps, analyzed Serbian manufacturing companies will be ranked based on their strategy process performance evaluation. The general task will be to provide support for optimization of the selected KPIs according to the desired level of strategy process performance. In that case, it is possible to have constraints for each KPI (or their constraints could be set as a KPI in low/average and average/best manufacturing companies). Each optimization could be stated as a single or multi-objective optimization. Since each manufacturing company could calculate its own rank according to the values of its indicators, another important issue is to find a way for optimization of the selected KPIs. The goal could be to assess its own KPIs, identifying its strengths and weaknesses by comparison with the leading and average one. In addition, each manufacturing company could develop its own scenario for improvement of learning from the leading organizations

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Model rangiranja i optimizacije indikatora ključnih performansi strateškog procesa

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Rezime:

Mala i srednja preduzeća se susreću sa nizom izazova kako bi poboljšali kvalitet svojih ključnih poslovnih procesa. Sistem menadžmenta kvaliteta i zahtevi ISO 9001:2008 obično su pouzdani kada definišu indikatore ključnih performansi procesa, a procesni pristup omogućava posmatranje efikasnosti indikatora procesa za celu organizaciju. Ocenjivanje, posmatranje i rangiranje indikatora ključnih performansi mogu da obezbede poboljšanje kvaliteta performansi strateških procesa u različitim malim i srednjih preduzećima. Model koji se zasniva na genetičkim algoritmima razvijen je kako bi rangirali indikatore ključnih performansi strateškog procesa. Ovaj model može da ima veliku praktičnu upotrebu za menadžerski tim kompanije u proceni kvaliteta performansi strateškog procesa u njihovoj kompaniji.

Ključne reči: *strateški proces, menadžment kvaliteta, fazi skupovi, generički algoritam, indikatori*