

ANALYSIS OF BUSINESS PROCESS MANAGEMENT DEFINING AND STRUCTURING ACTIVITIES IN MICRO, SMALL AND MEDIUM-SIZED ENTERPRISES

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Abstract. *Business process defining and structuring influences the evolution of organizations' business activities. It represents the starting point on the path to establishing of an process mature organization. A number of elements is needed to be met to get the organization out of a state of complete unstructuredness. Micro, small and medium enterprises are interesting for considering the adoption of the concept of business process management (BPM), not only because of their size but also because of managerial role of the owner, the way of managing and decision making, as well as assigning multiple roles and responsibilities to one employee. This paper analyzes the defining and structuring of BPM within groups of micro, small and medium sized enterprise. The TOPSIS method was applied for the purpose of ranking enterprise groups in accordance with the establishment of defining and structuring elements.*

Key words: *business processes, defining, structuring, business process management (BPM), micro, small and medium enterprises, TOPSIS*

1. Introduction

Business processes can be viewed as a chain of events, activities and decisions (Dumas et al., 2013). It can be stated that business processes pass the boundaries of organization units within an organization, but also the boundaries of multiple organizations, if we take into consideration inter-organization processes in which core lies cooperation (Smirnov et al., 2012; Knuplesch et al., 2012). The process gets to be established by structuring the activities of all process participants, as well as forming necessary communication connections between them (Fleishmann et al., 2012).

Well-structured business processes influence the evolution of business activities (Böhringer, 2010). Organization needs to establish the system of execution of

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business processes in wright manner, but also to ensure that the right business processes that contribute to the business are executed (Schmiedel et al., 2015). Whereby it should be borne in mind that the transformation from the current state to the more mature and more structured state is not linear (Fisher, 2004).

Research of BPM systems implementation are mostly conducted taking into consideration the business of large organizations (Pejić Bach, et al., 2019). SMEs are very important for successful market development of countries in transition (Urošević, 2011). They differ from large companies not only by the number of employees and capital. The main differences are in management, decision-making processes and organizational structure (Ghahramany Dehbokry & Chew, 2014). In many SMEs, especially micro enterprises, the owner takes the role of manager, so the decisions and business moves are under the influence of its own subjectivity (Johnson, 2002; Delavande et al., 2011).

Standardization and formalization of core processes is necessary in order to adopt and apply certain business practices within micro, small and medium-sized enterprises (Handayani et al., 2013).

It is being approached to the research in this paper with the assumption that the pace of formulating and adopting the basic elements of business process management practice is of great importance for the functioning of this practice within the enterprise, and that it depends on the size of the organization, bearing in mind the mentioned differences. Therefore, by considering the defining and structuring elements of business process management, this paper seeks to understand the level of readiness of micro, small and medium-sized organizations to establish the basic elements of process orientation and to build process mature organization on a solid base.

The following section covers the literature overview of BPM defining and structuring elements. Conducted analysis is based on expert assessment of extracted elements and assigning weights to each of them, and ranking micro, small and medium-sized enterprise groups based on the mean of each group's response to the elements of defining and structuring by the TOPSIS method.

2. Literature overview of defining and structuring elements

Defining and structuring elements are present through all levels of process maturity. Patig et al. (2010) present the description of four levels of process maturity of organizations. Undefined processes and existence of functional structure characterize first level, according to these authors. Within second level, core and most used processes, are being defined. At third level of process maturity all processes are defined, BPM is applied with strategic intension and process roles and responsibilities are being deployed. Establishment of company relations with external environment, first and second order suppliers and first and second order buyers describes fourth level. Within this level, the functional organizational structure becomes subordinate to the process organizational structure.

Core processes, or organizations identity processes, represent the primary resources of value creation. Dimitrijević et al. (2019) state that the basic processes are management, planning, technology and product development, procurement and supply, production management, equipment maintenance, sales and monitoring and management of economic and financial flows. Interactions with customers and suppliers are the driver of core processes, and their outcome is directed at customers. Support processes are internal processes, which enable functioning of core processes (zur Muehlen & Ho, 2005). Harmon (2010) emphasizes the division of basic operating processes and support processes based on Porter's value chain, which is used as an organizational principle for defining and editing the processes themselves, and process structure within different organization, as he states, more than two decades. Many BPM teams try to understand which business processes are priority for business and which problems should be solved for each of the given processes (Dumitraşcu i Seremeta, 2011). Core processes consist of functions intended for development, production, providing specific products to specific customer groups (Laguna i Marklund, 2013). Isoherranen et al. (2016) state that within SMEs sales, production and supply processes take the form of core processes.

Business processes can be defined as set of activities that transform inputs into outputs (Lindsay et al., 2003). For the process to function, that is, the activities to be adequately implemented within process, it is necessary to define inputs, but also to describe the expected output of certain business process activities (Kuong i Kawalek, 1997). Outputs generated within one process may represent the input for next business process (Scheer et al., 2005).

Standardized processes allow execution of standardized tasks, given that they are performed in a consistent manner while respecting the rules and specifications. However, rigid rules are a barrier to innovation, so companies should take into account the nature of the process (Trkman, 2010). This applies to creative processes within the creative industries such as clothing and fashion of micro, small and medium-sized enterprises as well as the large ones (Metz, 2006; Jelić-Aksentijević, 2009). Standardized processes are a success factor, so organizations can perform in a broader environment by performing standardized and streamlined processes (Bask et al., 2010; Milošević & Patanakul, 2005).

The adoption of a process approach entails the need to create new patterns of responsibility and thus new roles. Process owners, process managers, and chief process officers (CPOs) are some of the roles that a successful implementation of the BPM concept requires (Becker et al., 2013). Introducing formal roles and responsibilities of human resources into BPM practices ensures the presence of horizontal discipline and rebalancing the organization for the purpose of horizontal job integration and customer focus (vom Brocke et al., 2014). In this regard, it is necessary to redefine roles and responsibilities for managers to monitor processes instead of activities and to work on the development of people within the organization (Hammer, 2007). The literature most commonly describes the role of the process owner, that is, the person in charge of the process functioning, but also includes roles such as process manager, process supervisor, and process director (Becker et al., 2000; Burlton, 2015). In large organizations, these roles can be assigned to different people. In small and medium-sized enterprises, especially micro-organizations, one person may be in charge of multiple roles (Burlton, 2015).

Many SMEs do not provide sufficient human resources or assign roles in managing business processes (Pejić Bach, 2019).

Process businesses are characterized by multidimensionality with demands for constant learning and problem solving (Tang et al., 2013). As they are not just ordinary tasks, employees need adequate training in order to acquire new skills and knowledge to manage them (Vukšić & Štemberger, 2010). The description of all jobs by business processes should be defined (Mičić, et al., 2019).

The goal of a process-oriented organization in terms of organizational structure is reflected in the achievement of profitability and practicality of the organization. Which is true for any type of organizational structure (Becker et al., 2013).

A more significant difference between traditional and process structures is the existence of process teams. These teams replace the structure in which the division is made into sectors. Process teams include line-independent individuals who work together to complete a range of activities to complete the process. The responsibility for carrying out the whole process is equally shared among the members of the process team (Bojanić et al., 2013; Hernaus, 2016).

The ownership of the process must be permanent. In line with business changes, there are changes in the design of the process and the process owner is the one in charge of implementing the changes. Absence of a strong process owner can lead to a return to traditional functioning patterns and abandonment of process orientation (Hammer & Stanton, 1999).

Research methodology

Separating the dimensions of process orientation adoption and separately considering their presence in micro and SMEs can contribute to a better understanding of how these businesses adopt business practices and how they adapt to change. In this case, considering the defining and structuring of BPM, the establishment of the basic elements of process orientation and the willingness of micro, small and medium-sized organizations to build the organizational process maturity is covered by the research, as already pointed out earlier.

Input data from the analysis were collected between January and June 2019. Two instruments were involved in the data collection, one intended for gathering the answers of experts who are involved in BPM activities in practice or at a scientific research level familiar with the concept, the other intended for collecting the responses of executives in micro, small and medium-sized enterprises in Serbia. On this occasion, a sample of 8 expert responses and 238 responses from the executives of micro, small and medium-sized enterprises was collected.

The definition and structure of business processes can be assessed on the basis of the criteria presented in Table 1. These criteria are extracted from previous research (McCormack, 2001; Škrinjar & Trkman, 2013). Each of the criteria in the list and its importance for the definition or structuring of business processes is explained in the section on the literature review of the elements of defining and structuring.

Table 1. Criteria for defining and structuring business processes

Code	Criteria
C1	Defining of core and support business processes
C2	Defining of business process inputs and outputs
C3	Standardized methodology usage for business process description
C4	Process roles and responsibilities defining
C5	Multidimensionality of process jobs
C6	Coherence of organizational structure with process approach
C7	Functioning of teams of employees from different organizational units
C8	Defining of process ownership

The analysis covers two parts. The results of the first part are actually inputs of the second part. An illustration of the research structure is shown in Figure 1.

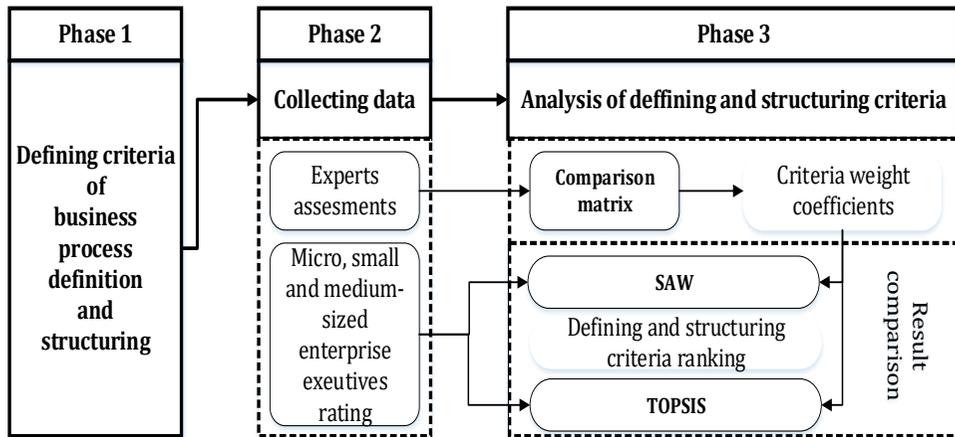


Figure 1. Illustration of research structure

First phase of the research begins with construction of a list of business process definition and structuring criteria. The second phase includes the data collection according to expert and micro, small and medium-sized enterprise executives evaluations. Third phase involves the use of a comparison matrix to generate weighting coefficients of each of the criteria, which are of importance in the further analysis of the BPM defining and structuring. After the calculation of the weight coefficients, a consistency test of expert ratings is conducted. The second section of third phase focuses on the implementation of the multi-criteria decision-making methods called SAW (Simple Additive Weighting) and TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution), which in this case applies to the ranking of micro, small and medium-sized enterprise groups based on the responses of 238 executives. In order to provide a more clear solution, the comparison of SAW and TOPSIS solution is provided. Calculations by Comparison Matrix represent an integral part of the implementation of the SAW method, therefore the ranking of alternatives is done using two methods, SAW and TOPSIS, in order to compare solutions. SAW represents the simple method for alternative ranking while TOPSIS has a characteristic of providing a solution not only closest to the hypothetically best,

but also farthest from the hypothetically worst (Gadakh, 2012). This method differ in the way of conducting, but the weight criteria, obtained by Comparison Matrix, are included in both methods in addition to the mean scores of the respondents based on the extracted criteria obtained using descriptive statistics in the SPSS v20 software package.

3.1. Description of the comparison matrix

The interval comparison matrix should provide the result in the form of estimated interval weights (Wang & Elgah, 2007). There are different approaches to determining weights, among them a comparison matrix that describes the relationship of the scale between goals and alternatives (Jones & Mardle, 2004). Examples of applying a comparison matrix for the calculation of weight criteria can most often be found within methods such as AHP (Analytical Hierarchy Process) and SAW (Simple Additive Weighting), (Zolfani et al., 2012; Jain & Raj, 2013).

A comparison matrix (n x n) is constructed to compare pairs of criteria of relevance to the research. Comparisons are made on the basis of expert evaluations obtained using the appropriate scale. The following steps provide a description of how to calculate weighting criteria based on a comparison matrix:

(a) Construction of matrix (n x n) input of expert ratings based on scale for pairwise comparison.

(b) Calculate the sum of the columns and priority vectors according to the row averages.

(c) The weighted sum matrix is then calculated by multiplying the comparison matrix and the priority vector.

(d) Divide all elements of the weighted sum matrix by their corresponding vector priority element.

(e) Calculate the mean of the previously obtained value to calculate the value of λ_{max} .

(f) Calculate the value of the Consistency Index, CI, using the following formula:

$$CI = \frac{\lambda_{max} - n}{n - 1}, \quad (1)$$

where n denotes the number of criteria in the matrix.

(g) Calculate the Consistency Ratio, CR, using the following formula:

$$CR = \frac{CI}{RI} \quad (2)$$

The consistency estimation takes into account the previously obtained value of the consistency index and the average random consistency (RI) value, which can be read from Table 2. Consistency in expert responses is acceptable if the calculated value does not exceed 0.10. In order to obtain more consistent responses the experts'

assessments should be revised and improved by the implementation of the second round (Afshari et al., 2010).

Table 2. Average random consistency, RI (Son, 2013)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0,58	0,9	1,12	1,24	1,32	1,41	1,45	1,49

3.2. Description of SAW method

SAW (Simple Additive Weighting) method is simple method known also as WS (Weighted SUM), and it is implementable in many different problem solution cases (Urošević et al., 2018). After calculating the weight criteria using a comparison matrix, as already explained, proceeds with the SAW calculation by following the next steps (Venkateswarlu & Sarma, 2016; Afshari et al., 2010):

(a) Constructing an (m x n) decision matrix which includes collected data.

(b) Calculating normalized decision matrix for positive criteria using:

$$n_{ij} = \frac{r_{ij}}{r_j}; \quad i=1,2,3,\dots,m,; \quad j=1,2,3,\dots,n. \quad (3)$$

In addition, for negative criteria:

$$n_{ij} = \frac{r_j^{\min}}{r_{ij}}$$

$$n_{ij} = \frac{r_{ij}}{r_j} \quad i=1,2,3,\dots,m, \quad j=1,2,3,\dots,n. \quad (4)$$

(c) Evaluation of each alternative, A_i is then calculated by following formula:

$$A_i = \sum w_j * x_{ij}; \quad i=1,2,3,\dots,m,; \quad j=1,2,3,\dots,n, \quad (5)$$

where x_{ij} is the score of the i^{th} alternative with respect to the j^{th} criteria, and where w_j is the weight coefficient.

3.3. Description of TOPSIS method

Hwang & Yoon develop TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution) method in 1981. (Lotfi et al., 2011; Kahraman et al., 2007). The basic principle of the TOPSIS method is choosing alternatives with the shortest distance to the ideal solution and the longest distance from the negative extreme of the ideal solution (Opricović & Tzeng, 2004).

The TOPSIS method is applicable in many decision-making fields. It is common to use this method using fuzzy numbers (Chatterjee & Stević, 2019). Krmac and Đorđević (2019) apply the TOPSIS method to evaluate the capacity of the application of the train control information system in the case of the Railways of Serbia and Austria. Olson (2004) performs weight comparison using the TOPSIS method. Ahmadi et al. (2013) rank critical factors for the adoption of electronic medical records at the micro level using the TOPSIS method.

Urošević et al. (2018) lists the steps to follow when applying the TOPSIS method:

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(a) Formation of a normalized decision matrix $R=[r_{ij}]_{m \times n}$. The vector normalization procedure normalizes the values of the elements of the decision matrix. The value r_{ij} can be calculated by following formula:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \quad (6)$$

(b) Calculation of the weighted normalized decision matrix $V=[v_{ij}]_{m \times n}$. The values of the weighted normalized matrix elements v_{ij} can be calculated using formula:

$$v_{ij} = w_j + r_{ij} \quad (7)$$

(c) The calculation of the ideal solution A^+ and negative ideal solution A^- follows:

$$A^+ = \{v_1^+, v_2^+, \dots, v_n^+\} = \{(\max_j v_{ij} | j \in \Omega_{\max}), (\min_i v_{ij} | i \in \Omega_{\min})\}, i \quad (8)$$

$$A^- = \{v_1^-, v_2^-, \dots, v_n^-\} = \{(\min_i v_{ij} | j \in \Omega_{\max}), (\max_j v_{ij} | j \in \Omega_{\min})\}, \quad (9)$$

whereby Ω_{\max} indicates a set of incoming and Ω_{\min} a set of expenditure criteria.

(d) Determining the distance of alternatives from the ideal and the negatively ideal solution by applying the n-dimensional Euclidean distance.

$$d_i^+ = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^+)^2}, \quad (10)$$

$$d_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2}. \quad (11)$$

(e) Calculation of the coefficient of relative closeness to the ideal solution C_i is done by applying the following formula:

$$C_i = \frac{d_i^-}{d_i^+ + d_i^-}. \quad (12)$$

For $d_i^- \geq 0$ i $d_i^+ \geq 0$ $C_i \in [0,1]$.

(f) Ranking alternatives in ascending order based on the value of C_i , based on the following formula:

$$A^* \in \{A_i^* | \max_i C_i\}. \quad (13)$$

5. Results of the methodology application

The calculation of criteria weighting coefficients for the BPM defining and structuring is done by using the Comparison Matrix. Table 3. provides an overview of the expert pairwise comparison values and the values of the weight coefficients of each criteria.

Table 3. Calculation of weight coefficients using comparison matrix

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	Weights
C1	1	0.5	3	0.5	5	3	2	0.5	0.132
C2	2	1	4	1	5	3	4	0.33	0.181
C3	0.33	0.25	1	0.25	3	0.33	0.5	0.2	0.047
C4	2	1	4	1	5	3	4	0.5	0.187
C5	0.2	0.2	0.33	0.2	1	0.25	0.33	0.16	0.028
C6	0.33	0.33	3	0.33	4	1	2	0.33	0.087
C7	0.5	0.25	2	0.25	3	0.5	1	0.25	0.062
C8	2	3	5	2	6	3	4	1	0.277
Total	8.36	6.53	22.33	5.53	32	14.08	17.83	3.27	1

The degree of consistency of the experts' answers was obtained by applying the formula (2). For calculating using this formula, the RI value must be read from Table 2. In this particular case, the number of criteria considered is 8, so the consistency index is divided by an RI of 1.41. The obtained value of 0.039, which is less than the value of 0.10, indicates that the experts' answers are sufficiently consistent. When weight coefficients have been obtained based on expert evaluations of the selected criteria for defining and structuring business processes, and consistency test has been carried out, the analysis of the BPM defining and structuring in micro and medium organizations continues. The survey included 167 (70.2%) micro, 44 (18.5%) small and 27 (11.3%) medium enterprises out of 238 enterprises. These groups of companies evaluated the applicability of the criteria for the definition and structure of BPM in their operations. Descriptive statistics within the SPSS software package calculate the mean of the response values of each of the groups of organizations participating in the survey. These values are presented in Table 4. within which it is noticeable that the answers have approximate values although there are still differences between the groups.

Table 4. Mean criteria scores obtained by executives of micro, small and medium-sized organizations assessments

	C1	C2	C3	C4	C5	C6	C7	C8
Micro	3,9461	4,0240	4,0539	3,9521	4,0060	3,9042	3,8024	3,9222
Small	4,1591	4,2045	4,1818	4,0000	3,7500	4,1136	3,6818	4,1591
Medium	4,4074	4,2222	4,3704	4,2963	4,1852	4,1852	4,0741	4,4444

Table 5. The normalized decision matrix within SAW method

	C1	C2	C3	C4	C5	C6	C7	C8
Micro	0,8953	0,9531	0,9276	0,9199	0,9572	0,9329	0,9333	0,8825
Small	0,9437	0,9958	0,9568	0,9310	0,8960	0,9829	0,9037	0,9358
Medium	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000

Based on the collected data and calculated weight coefficients forming of normalized decision matrix according to steps of SAW method is enabled. The normalized decision matrix according to SAW method is presented within table 5.

Table 6. provides a result of alternatives evaluation calculated by the formula (5). Values of alternative evaluations make it possible to rank listed alternatives.

Table 6. Ranking of alternatives using the SAW method

Alternatives	Altrernatives evaluations	Rank
Micro	0,92	3
Small	0,95	2
Medium	1,00	1

Evaluation values presented in the table 6. show slight difference between evaluated alternative. The medium-sized enterprises are the ones best ranked according to SAW method.

The calculation of the TOPSIS method was performed based on the application of the presented input data and the calculated weight criteria, as well, followed by the steps of applying the method. The final performance of micro, small and medium-sized enterprise groups in terms of the BPM defining and structuring is ranked in Table 7.

Table 7. Performance and ranking of alternatives using the TOPSIS method

Alternatives	d+	d-	Ci	Rank
Micro	0.03	0.00	0.05	3
Small	0.02	0.01	0.37	2
Medium	0.00	0.03	1.00	1

Based on the results presented in Table 7, it can be concluded that among the three ranked alternatives, or three groups of organizations grouped by size, the group of medium-sized organizations is the one that defined and structured BPM at the higher level compared to the other groups considered. The assigned rank actually tracks the size of the organizations. Therefore, it can be found that medium-sized enterprises are most prepared to move to higher stages and upgrade their process maturity.

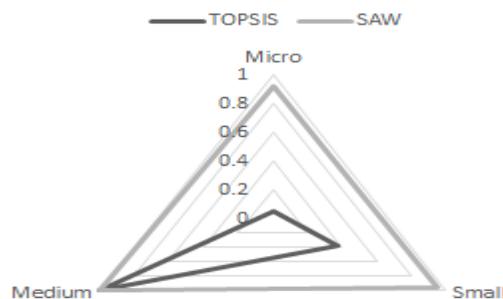


Figure 2. Comparison between results from SAW and TOPSIS method

Radar diagram is here useful, and it shows the variations in values calculated by two different MCDM methods, SAW and TOPSIS. In addition, it clearly shows the separation of medium-sized enterprises from micro and small enterprises in the case of TOPSIS method. Alternatives have the same ranking order according to each used method.

6. Conclusion

The conducted analysis of BPM defining and structuring by applying SAW and TOPSIS methods allowed the assessment of differences between micro, small and medium-sized enterprises regarding the establishment of the basic elements of process orientation. In this way, differences in the achieved willingness and ability of organizations to continue to work on the process maturity development were noted, with medium-sized companies standing out as the best-ranked ones, by both used methods.

From the results of this analysis can be concluded that the pace of the individual BPM practice elements adoption and building a process mature organization can vary according to the size of the organization. Organization size is just one of the factors, which entails a number of influential sub-factors that will largely determine this pace. Thereby we can talk about the managerial role of the owner in many small, especially micro-enterprises, then the responsibility of one worker for a large number of jobs, which are multidimensional in their nature. Only a few sub-factors are listed, but it can be seen that most of the impact is directed on human resources. Implementation of BPM practices requires, primarily, adequate top management awareness and then adequate employee education and training. All efforts to define and structure the management of business processes are pointless if they remain only a dead letter on paper. Top management is in charge of the process, but employees are assigned to work within the process.

The results of this research provide insights to micro, small and medium-sized organizations on the pace of adopting the elements of defining and structuring as part of business process management and their mutual positioning at the considered pace. Based on these results, companies can take adequate measures concerning the adoption of the considered elements and improvement of the development of mature and stable processes.

Further research will be directed towards further disaggregating the dimensions of process orientation and considering the degree of adoption of each, then developing a framework for assessing the process maturity of micro, small and medium-sized organizations operating within the textile industry.

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