PROCESS MODEL AND ITS REAL APPLICATION IN THE SELECTED MANAGEMENT AREAS

Zuzana Závadská, Ján Závadský, Mária Sirotiaková

Introduction

Since their creation, the ISO 9000 international standards have been reviewed several times and the reviews have advanced these standards for quality management systems from originally reviewing especially technical and quantitative aspects of enterprises to performing managerial and qualitative assessments [15]. The requirements to quantify some economic aspects remained even after the latest review of the ISO 9001 standard in 2008. The essential and fundamental change was the integration of a process approach into existing enterprise management systems. However, the requirement to apply a process approach has been carried out only declaratively by many enterprises. The particular requirements, included in clauses 4.1., present the demand to identify enterprise processes, to determine their interaction and sequence, to determine criteria and methods needed to ensure that both the operation and control of these processes are effective, to assure sources and information in processes, and to monitor and improve them.

The goal of the research is to find out how companies which have already introduced business process model apply it to management. Companies with introduced quality system following the standard ISO 9001:2008, which must apply process approach and develop business process model were chosen as a sampling set. The goal of the research is not to examine quality management system but the application of business process model in management. After process approach implementation the system of management is understood as business process model, since primarily managed subsystem are not organizational units as in functional orientation, but company processes. Business process model of management presents a process model which contains the description of all company processes and objects and its outputs may be utilized in company managerial practice.

Business process model is the model of an enterprise management system which contains, at the minimum, a list and description of enterprise processes and their activities ordered in a logical sequence, inputs and outputs of activities and processes, the allocation of resources to activities in the identified processes, and indicators for measuring and assessing enterprise processes [17]. Under the business process model we understand a model of management system which contains company processes, sequences of activities, processes inputs and outputs, human resources allocated to activities, equipment necessary for execution of activities, organizational units, external documents not worked out directly by the company and indicators of processes efficiency. Business process orientation of management system may be created when a new company is established or by transformation of functional orientation to the process one. The change from functional orientation to the process one is carried out through the implementation of process approach based also on requirements of ISO 9001:2008. Theoretically also companies without certified quality management system could be selected as a sample set. Implementation of process approach may be independent on implementation quality system following the standard ISO 9001. If the independence is discussed in this paper, it is understood as independence on

implementation of quality management system. Companies might decide whether they implement process approach as an individual project or as a sub-project of information system development. Process approach is an integral part of many others quality management systems. Often implemented are EFQM model, ISO 9001, Malcolm Baldrige model and Six Sigma and many authors describe these concepts [15], [6], [14], [16], [18]. All of the above mentioned concepts contain the requirement for process approach whose output is also business process model. Its utilization in management, however, depends on the fact whether process model as the whole or its part become obligatory for management practice. Process model offers a lot of possibilities for its application in management. If it is not obligatory then it is not used in management as well. If it is obligatory then it is necessary to find out how its outputs are applied in management. The main problem enterprises with a quality management system certified to the ISO 9001 may face is the antagonism between the declarative and real application of a process approach in their management systems. Managers should avoid the declarative application of a process approach. Declarative application of a process approach is on the one hand presented through the fulfilment of ISO 9001 standard requirements, but on the other hand, its practical application in enterprise management is minimal. Process approach and its real application can prevent those problems, especially in case the business process model is obligatory for managers. We did not explore tools for business process modelling in our study. They are irrelevant for research results and given research questions. We focused on four selected management areas where enterprises could apply developed business process model: (1) to control the processes, (2) to control all activities and their sequences, (3) to create and to control organizational standards and (4) to measure and to evaluate the process performance.

Declarative or real application of any management systems depends on managers. The real application of a process approach enables organizations especially to [17], [1]: (1) focus on goals and process outputs regardless of different organizational units, (2) define the intra-organizational market of internal suppliers and customers (in many organizations based on a service-oriented architecture), whose basis are intra-business service-level agreements between the process owners (managers responsible for individual business processes), (3) identify critical places of value creation for customers faster, as in the case of hierarchical functional structures, (4) optimize cost structures concerning products and services.

The aim of the research is to point out the dominance of the declarative over the real application of the process approach as one of the essential requirements of the ISO 9001, and to check the linear dependence between the scope of the business process model and its application in enterprise management. In the sample set of surveyed enterprises, we did not concentrate on particular requirements of ISO 9001, but we checked the global application of the process approach. Declarative application of process approach may be proved through non-obligation of business process model and its outputs utilized in managerial practice. On the contrary the real utilization of business process model in management is proved through its obligatory utilization by managers and employees. A process approach represents a business process model and the obligation of this model for enterprise management may confirm or exclude the mere declarative application of the process approach.

Linear dependence of the business process model scope and its application in management was studied by means of a correlation analysis between a set of business process items and a set of possibilities for its real application to meet the needs of managers. This paper presents the results of whole sample enterprises and it is a baseline for future survey to explore dependencies by correlation scatter graphs in selected enterprise categories. In the first set, ten minimal model elements were determined, and in the second set twenty-one minimal possibilities for the application of a business process model in the real utilization of the process approach were defined. The process approach presents an enterprise process-based management system. There are three basic orientations of management systems: (1) functional, where the dominance of organizational units as the base for enterprise management prevails, (2) process, where the basis for management is a cyclical

process with repeating outputs and (3) the project one, where it is a non-cyclical project with usually non-repeating output for a customer.

Business process management is the discipline whose subject of research is enterprise processes. The main supporters of this discipline were M. Hammer and R. Champy [9] with their publication *Reengineering* and T. Davenport [5]. Since that period a lot of papers which deal with this topic have been published, e.g. Hammer [10], Burlton [2], Kubiš [12], Řepa [17], Závadský [19], and Broomfield [1]. In 2000 the requirement concerning the process approach was included in ISO 9001 and the management system process orientation became obligatory for enterprises certified to the ISO 9001. However, if these requirements are reviewed only by an internal or external quality audit, it is possible to apply a process audit or specific business process maturity models and several authors have focused their attention on these aspects, e.g. [10], [4]. These models are known as business process management maturity models and they verify the real application of a process approach in enterprise management. The application of maturity models is sometimes identified with the term "process audit" [10]. Maturity models contain individual criteria focused on defining processes, then on measuring and assessing performance, and improving processes, the organizational layout of the business, mutual communication and information system. Important is measuring and assessing performance based on Balanced Scorecard, writes Gavurová [8], Gavurová [7], Lesáková [13]. From our point of view, M. Hammer's PEMM model (Process and Enterprise Maturity Model) is considered as the key one.

The research, which was carried out, is based on the assumption that a business process model exists in companies which are certified according to the requirements of the ISO 9001 standard. This model may have: (1) a different scope (number of defined items in a model) and (2) applications by managers (number of items and outputs of the business process model applied in management). A business process model is a simplified representation of a process oriented management system, which is consistent with the real system in essential characteristics. According to Řepa [17], the basic items of each business process model are: processes, activities, incentives, and relations – consequences. Process modelling/simulation are not considered to be among the main content of process management. Košturiak [11] provides critical views on process modelling as a dominant activity, and according to him a lot of companies have invested a large amount of money and time into process descriptions and into the implementation of various programmes. The expected results were not often achieved. Why? Because no process diagram has managed to improve company's internal organization yet. Based on literature, we managed to find research starting points which are formulated in the following: (1) requirements (criteria) for a process approach are defined in the ISO 9001 standard, (2) specific requirements for a process approach are defined in business process management maturity models, (3) an audit of the requirements concerning the process approach may be carried out to the ISO 9001 and maturity models independently, (4) the process approach is represented by the enterprise business process model, (5) the application of the business process model management system may be declarative and real, and (6) there is a linear dependence between the scope of the business process model and its application in practice.

1. Research Methods

Due to the character of the separate parts of the research, with the aim of achieving its goal and verifying the two research hypotheses, the following methods were utilized: (1) a content and comparative analysis of literature sources applied in the research of theoretical approaches towards process management, the determination of business process models and maturity models, (2) primary research based on enquires in the form of questionnaires to analyze the application of the process approach in a selected set of businesses, (3) a systems analysis and synthesis to form a set of items in a business process model which determines its scope, and to form a set of possible application, which determine the usage of the business process model in the managerial practice and (4) a correlation analysis to search for linear dependence.

To search for the linear dependence of two variables (the scope of the business process

model and extent of its application in managerial practice), we have applied Spearman's rank correlation coefficient. Spearman's rank correlation coefficient is a non-parametric measure of statistical dependence between two variables. It assesses how well the relationship between two variables can be described using a monotonous function. Spearman correlation of +1 or -1 occurs, where each of the variables is a perfect monotonous function of the other. The sign of the Spearman correlation indicates the direction of association between X (the independent variable) and Y (the dependent variable). If Y tends to increase when X increases, the Spearman correlation coefficient is positive. If Y tends to decrease when X increases, the Spearman correlation coefficient is negative. A Spearman correlation of zero indicates that there is no tendency for Y to either increase or decrease when X increases. To show linear dependence, we used the following formula [15]:

$$r = \frac{\frac{1}{n} \times \sum_{i=1}^{n} (X_i - \bar{X}) \times (Y_i - \bar{Y})}{s_X \times s_Y}; \qquad (1)$$

where X_i and Y_i are X and Y parameter values, $\bar{X}$, $\bar{Y}$ are arithmetic averages of the parameters of X and Y; s_x and s_y are the standard deviations of the values of X and Y; n is the scope of the selected set.

2. Research Hypothesis

In the primary research two hypothesis were defined: (1) it is supposed that in enterprises with a certified quality management system, according to the requirements of ISO 9001, a process approach declarative application prevails over its real application and (2) it is supposed that there is a linear dependence between the scope of the business process model and its real application in managers' control work. To verify the first hypothesis, the absolute and relative number of responses to the question of whether a business process model is obligatory, informative or partially obligatory for company management was used. To verify the second hypothesis, a correlation analysis, where the two variables are the scope of the business process model and its application in management, was used.

3. Survey Results and Discussion

3.1 Identification of the Selected Set of Enterprises

The selected set to be researched is represented to the ISO 9001 certified enterprises, which have a certified quality management system. The research was carried out based on enquires in the form of questionnaires from 30th June, 2011 to 30th January, 2012. During this period, we received responses from 193 enterprises. By means of statistical testing, the representativeness of the sample set was confirmed by application of Pearson's chi-squared test (χ^2 – test).

Basic set is generated from certified organizations due to the requirements of the international standard ISO 9001:2008. In the process of representativeness verification company size was considered. Calculation was done with the selected level of importance $\alpha = 0.05$. Expected values were achieved from the certification bodies. We distributed questionnaire by three selected Slovak certification bodies. Expected and actual frequencies n of individual enterprises categories are defined according the size in table 1. The number of variance degrees $(k - 1)$ is equal to three, since four categories of enterprises were defined.

Tab. 1: χ^2 **– test Due to Enterprises' Size**

Company category	np_i	n_i	$(n_i - np_i)^2$	$\chi 2$
Micro companies	10	13.5	12.25	1.2250
Small companies	50	49.7	0.09	0.0018
Medium companies	30	27.5	6.25	0.2083
Large companies	10	9.3	0.49	0.0490
Total				1.4841

Source: authors

Null hypothesis of good compliance test claims statistically non-important difference between the basic (all certified companies to the ISO 9001 standard) and selected sets (responded companies). The value we achieved χ^2 is lower than the value χ^2 at the level of importance α = 0.05 for 3 levels of variance (4 – 1), what particularly presents 7.815. Since 1.4841 < 7.815, we accept null hypothesis and we state that the selected set well represents the basic one.

In the first part of the research, we focused on identifying the researched enterprises. Identification meant to determine the enterprise size and its management system (or several management systems simultaneously). The criterion used to structure the enterprises according to their size was the enterprise's number of employees. The biggest share in the structure of Slovak enterprises belongs to micro enterprises, but in our research they account only for 13.5 %. The reason for this is the fact that a quality management system according to the requirements of ISO 9001 has not been introduced in micro enterprises at the same extent as in other enterprises. Mostly small enterprises participated in the research; they represent 49.7 % of the enterprises researched, the percentage of medium enterprises is 27.5 % and the percentage of large enterprises is 9.3 %. These data are summarized in table 2.

Tab. 2: Distribution of Enterprises by Size

	Micro (≤ 9 employees)	Small (10–49)	Medium (50–249)	Large (≥250 employees)
No.	26.0	96.0	53.0	18.0
%	13.5	49.7	27.5	9.3

Source: authors

The selected enterprises of questionnaire surveys all had certified management system. All of them responded that they apply a quality management system due to the requirements of the ISO 9001. An environmental management system according to the requirements of ISO 14001 was introduced in 27.5 % of the examined enterprises, especially in the group of large enterprises, where all the enterprises claimed its existence. In the group of medium enterprises, the existence of an environmental management system was claimed in 30.2 %. The system according to OHSAS 18001 was implemented in 16.1 % of the enterprises surveyed, and again the greatest number of enterprises is in the group of the large ones. Data concerning management systems are stated in table 3.

Tab. 3: Distribution of Enterprises by Certified Management Systems

		ISO 9001	ISO 14001	OHSAS 18001	ISO 22000	ISO 27001	AQAP	ISO TS 16 949
Micro	No.	26.0	3.0	0.0	0.0	0.0	0.0	0.0
	%	100.0	11.5	0.0	0.0	0.0	0.0	0.0
Small	No.	96.0	16.0	8.0	0.0	0.0	2.0	3.0
	%	100.0	16.7	8.3	0.0	0.0	2.1	3.1
Medium	No.	53.0	16.0	7.0	0.0	0.0	5.0	0.0
	%	100.0	30.2	13.2	0.0	0.0	9.4	0.0
Large	No.	18.0	18.0	16.0	0.0	1.0	0.0	0.0
	%	100.0	100.0	88.9	0.0	5.6	0.0	0.0
	Total	193.0	53.0	31.0	0.0	1.0	7.0	3.0
	%	100.0	27.5	16.1	0.0	0.5	3.6	1.6

Source: authors

3.2 Commitment of the Business Process Model for Management

The goal of the first part of the research was to verify the hypothesis that in companies with ISO 9001 certified quality management systems, a declarative application of the process approach prevails over its real application.

Tab. 4: Reasons for the Application of a Process Approach

		As an independent BPM project	For implementing ISO 9001	For implementing an information system
Micro	No.	0.0	23.0	3.0
	%	0.0	88.5	11.5
Small	No.	15.0	81.0	0.0
	%	15.6	84.4	0.0
Medium	No.	11.0	34.0	8.0
	%	20.8	64.2	15.1
Large	No.	11.0	5.0	2.0
	%	61.1	27.8	11.1
	Total	37.0	143.0	13.0
	%	19.2	74.1	6.7

Source: authors

The research indicates that as much as 74.1 % of enterprises applied a process approach to the quality management system introduction project. The introduction of a process approach is a part of the quality management system requirements of ISO 9001. In addition, due to the fact that the enterprises examined have implemented a quality management system, the result of this response achieved such a high value/score. The individual application of a process approach is the assumption that the enterprise will also apply it in management practice. This application of a process approach was executed by 19.2 % of enterprises. The larger the size the enterprise is, the higher the share of the separate application process approach. In the group of large enterprises, it is 61.1 %. The lowest number of responses is in the application of a process approach in the implementation of the enterprise information system (6.7 %). As it is stated in table 4, three micro enterprises also provided the response that they applied a process approach in connection with implementing their information system.

Tab. 5: Obligation of Business Process Model for Management

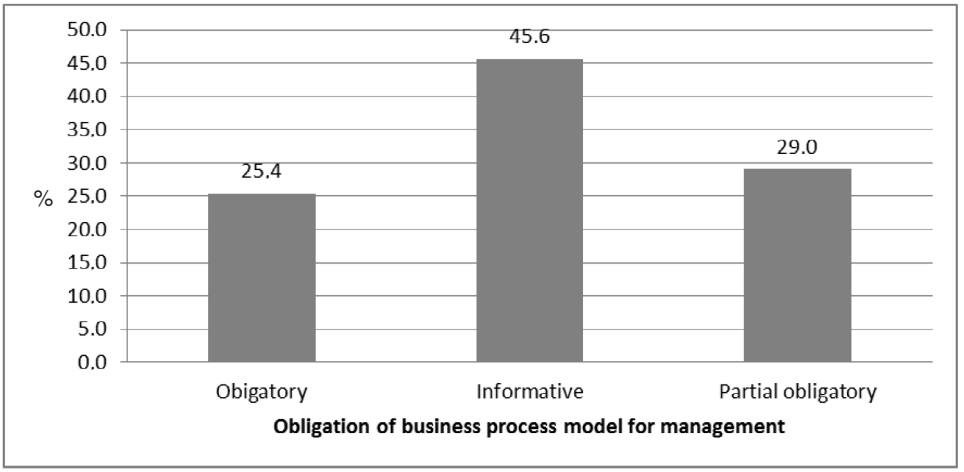
		Obligatory	Informative	Partial obligatory
Micro	No.	0.0	22.0	4.0
	%	0.0	84.6	15.4
Small	No.	15.0	54.0	27.0
	%	15.6	56.3	28.1
Medium	No.	22.0	12.0	19.0
	%	41.5	22.6	35.8
Large	No.	12.0	0.0	6.0
	%	66.7	0.0	33.3
	Total	49.0	88.0	56.0
	%	25.4	45.6	29.0

Source: authors

The reason for applying a process approach in existing management systems is that it has a great impact on the real future application in enterprise management practices. The application of a process approach requires its execution as a separate project, especially if the size of enterprises grows. The research confirmed this assumption because the biggest share of responses concerning the independent application was achieved in the case of large enterprises. If the reason for introducing a process approach was the implementation of an information system, a paradoxical result is that the business process application is not as high as in the case when it was developed due to the implementation of a quality management system. The reason may be that the business process model is used only for the implementation of an information system and it is not applied in managing the enterprise. One of the main goals of this paper is, however, to confirm the prevalence of the declarative application of the process approach over its real application in the management of the enterprises surveyed. This statement can be verified by means of a survey to find out if the process approach is applied or is not applied in the management practices of the enterprise. The application of a business process model in management practice was tested by three questions in the questionnaire. The enterprises could either respond that a business process model as a whole is obligatory for management, partially obligatory or only informative. In this way, the statement could be uniquely confirmed or rejected. If it is obligatory as a whole, then it is applied in managing the enterprise. On the contrary, if it is informative, the enterprise does not apply it to managing itself or its processes. In case it is partially obligatory, enterprises have developed a business process model, but its parts (some processes) are only informative and some parts of the model are obligatory for management and form the basis for creating organizational regulations (especially organization guidelines and working procedures.)

To interpret the statement concerning the dominance of the declarative approach, the application of the business process model in practice is defined as its obligation to it. The research indicated that the application of a business process model is obligatory in the management practices for 25.4 % and partially obligatory for 29.0 % of the enterprises surveyed. An informative character of the business process model was found in 45.6 % of the enterprises. In table 5 we can see that the larger the size the enterprise is, the higher the total obligation of the business process model is in the management practice of the enterprise.

Fig. 1: Percentage of Enterprises with an Obligatory Business Process Model (see also Table 5)



Source: authors

On the contrary, if the size of the enterprise is smaller, the business process model becomes often only informative for management. The statement that in enterprises with an ISO 9001 certified quality management system, the declarative application of the process approach prevails over the real one was confirmed. This assertion is also supported by figure 1.

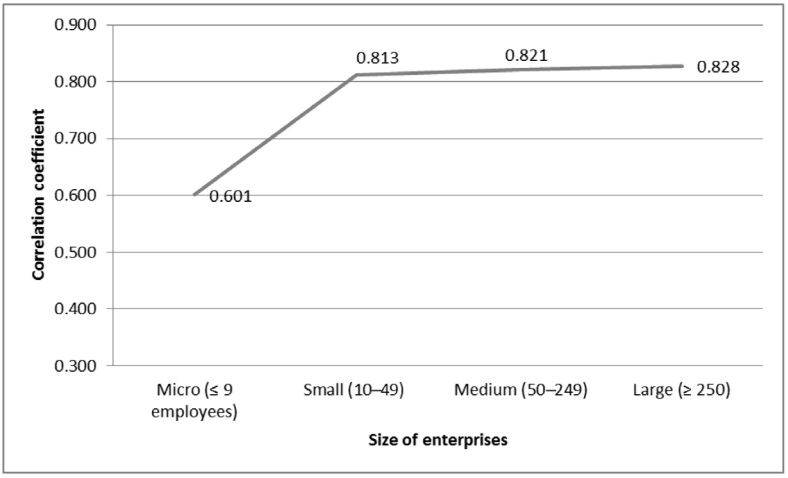
3.3 Linear Dependence between the Scope of the Business Process Model and its Real Application for Management

Verification of the hypothesis claiming that there is a linear dependence between the scope of the business process model and its real application for management is the aim of the second part of the research.

To describe the business process model, 10 items were specified. It is possible to define them in the business process model (in theory there are more items in a business process model and process attributes), but from our point of view, to meet our research goals, only the most important ones were used. To review the application of a business process model in management practice, enterprises could choose from 21 alternatives which were classified in four areas. This enabled them to assess the application of the business process model in enterprise processes management, in the management of activities of particular processes, in the creation of company documents which resulted from the model, and the measurement and assessment of the performance of the enterprise processes.

The result of the research shows that the dependence between the scope of the business process model and its application in practice is linear. Figure 2 shows that linear dependence increases with the growing size of the enterprise. The research found out that the closest linear dependence between the scope of the business process model and its application in management practice is in the group of large enterprises, where the correlation coefficient achieves the value of 0.870. The value of this coefficient corresponds with the verification of the results of the first hypothesis, where in table 5 we may observe that in the group of large enterprises, the business process model in management practice is totally or partially obligatory. No enterprises from the group of large companies marked the possibility that the business process model has only an informative character in management practice. In the group of medium enterprises, the value of the correlation coefficient is 0.821; in the group of small enterprises it is 0.813, and in case of micro enterprises this value is equal to 0.601.

Fig. 2: Correlation Coefficient Distributed by Size of Enterprises



Source: authors

Just to remember – our hypothesis is not based on the assumption of dependence of business process model scope and enterprise size. Our assumption was that there is dependence between the scope of business process model and its application in companies' management. It means that the scope of business process model is determined by the number of items included in the model. Possible items are provided in the table 7. Application in management is determined by the number of competencies which a company applies in management and which are presented in the figures 3–6. Theoretically two extremes may exist. The first is that a company will include all 10 examined items into the model but will not apply it in its management. The second is that a company will include all 10 items to the model and will apply all of them in management, what in our research presents 21 abilities. So the scope of business process model and its application in practice is not related to the enterprise size.

Coefficient of correlation was calculated based on a set of data pairs. The first value was obtained by counting the number of items included to the business process model and the second value was determined by counting the number of abilities of the model application in management. Maximum theoretical pair of data presents the combination (10, 21). In this way a pair for each enterprise of the selected set was identified and we got 193 of the following pairs: (4, 4; 4, 7; 4, 3; 5, 7; 1, 1; 4, 4; 3, 2; 2, 3; 1, 6; 4, 3; 5, 6; 1, 1; 4, 4; 3, 2; 2, 2; 1, 3; 4, 6; 4, 2; 4, 4; 4, 4; 5, 10; 1, 1; 4, 4; 3, 2; 2, 2; 1, 2; 2, 3; 5, 5; 6, 7; 9, 16; 7, 15; 2, 1; 4, 3; 7, 14; 3, 4; 4, 4; 6, 7; 4, 6; 2, 1; 3, 4; 4, 4; 3, 4; 7, 7; 3, 3; 2, 2; 5, 13; 2, 1; 5, 5; 2, 2; 8, 9; 3, 3; 5, 5; 8, 11; 2, 2; 7, 8; 6, 6; 7, 5; 4, 3; 3, 2; 6, 10; 2, 1; 8, 11; 5, 3; 8, 7; 4, 3; 6, 4; 4, 3; 6, 10; 2, 1; 8, 11; 5, 3; 8, 7; 7, 15; 2, 1; 4, 3; 7, 14; 3, 4; 4, 4; 6, 7; 4, 6; 5, 5; 6, 7; 9, 16; 7, 15; 2, 1; 4, 3; 7, 14; 3, 4; 4, 4; 6, 7; 4, 6; 2, 1; 8, 13; 5, 4; 3, 4; 7, 7; 3, 3; 2, 2; 5, 13; 2, 1; 5, 5; 2, 2; 8, 9; 3, 3; 5, 5; 8, 11; 2, 2; 7, 8; 6, 6; 7, 5; 4, 3; 3, 2; 6, 10; 2, 1; 8, 11; 5, 3; 8, 7; 4, 3; 6, 4; 4, 3; 2, 1; 7, 12; 9, 14; 6, 8; 10, 18; 8, 5; 6, 7; 6, 7; 8, 8; 10, 15; 4, 4; 10, 18; 8, 7; 5, 6; 10, 17; 7, 8; 6, 4; 5, 6; 6, 5; 9, 17; 6, 8; 5, 8; 8, 14; 6, 8; 9, 12; 6, 8; 10, 18; 8, 5; 6, 7; 6, 7; 8, 8; 10, 15; 6, 8; 6, 8; 10, 18; 8, 5; 6, 7; 6, 7; 8, 8; 10, 15; 4, 4; 10, 18; 8, 7; 5, 6; 10, 17; 7, 8; 6, 4; 5, 6; 6, 5; 9, 17; 6, 8; 5, 8; 8, 14; 6, 8; 9, 12; 8, 14; 8, 12; 9, 18; 6, 9; 10, 18; 10, 19; 9, 12; 7, 11; 9, 14; 7, 11; 8, 12; 9, 18; 6, 9; 10, 18; 10, 19; 9, 12; 7, 11; 9, 14). Based on these data, the definite result is that there is always a linear dependence between business process model scope and its application in management practice.

Tab. 6: Coefficient of Correlation for the Whole Enterprise Selected Set

	Items in process model	Abilities of model application in management	
Arithmetic average	$\bar{X} = 5.601$	$\bar{Y} = 7.332$	$\frac{\sum_{i=1}^{n} (X_i - \bar{X}) \cdot (Y_i - \bar{Y})}{n} = 10.691$
Standard deviation	$S_x = 2.481$	$S_y = 4.952$	$S_x \cdot S_y = 12.289$
			$r = 10.691/12.289 = 0.870$

Source: authors

The calculation of the correlation coefficient was automated by means of MS Excel, which calculated arithmetic averages, standard deviations and correlation coefficient for the whole selected set provided in table 6. The value of the correlation coefficient for the whole set of enterprises is 0.870.

It may be observed in table 7 that in the group of large enterprises, the scope of the business process model is the largest. Up to 100 % of large enterprises define processes, sequences of activities, process inputs and outputs, activity inputs and outputs in the business process model, and they also describe organizational units as boundaries of enterprise processes. The results from this research indicate that these items are the most frequently described items in a business

process model. The next result is that 100 % of the enterprises researched marked "defining processes" in the business process model, what is determined by the selected set of enterprises with certified system of management according to ISO 9001:2008.

Tab. 7: Elements of the Business Process Model

		Processes	Sequences	Process outputs and inputs	Activity outputs and inputs	Human resources	Technical and material resources	Organizational items	Organizational documentation	External documentation	Performance indicators
Micro	No.	26.0	17.0	20.0	11.0	3.0	0.0	0.0	0.0	0.0	3.0
	%	100.0	65.4	76.9	42.3	11.5	0.0	0.0	0.0	0.0	11.5
Small	No.	96.0	78.0	92.0	61.0	30.0	23.0	29.0	22.0	0.0	34.0
	%	100.0	81.3	95.8	63.5	31.3	24.0	30.2	22.9	0.0	35.4
Medium	No.	53.0	51.0	53.0	47.0	43.0	26.0	49.0	30.0	10.0	22.0
	%	100.0	96.2	100.0	88.7	81.1	49.1	92.5	56.6	18.9	41.5
Large	No.	18.0	18.0	18.0	18.0	16.0	12.0	18.0	13.0	4.0	16.0
	%	100.0	100.0	100.0	100.0	88.9	66.7	100.0	72.2	22.2	88.9
	Total	193.0	164.0	183.0	137.0	92.0	61.0	96.0	65.0	14.0	75.0
	%	100.0	85.0	94.8	71.0	47.7	31.6	49.7	33.7	7.3	38.9

Source: authors

Defining processes is an essential part in the existence of a business process model. The next step in defining processes in a business process model is defining process inputs and outputs. Another important item is defining the sequence of activities, which is applied in the model by 85 % of the enterprises researched. After defining the sequence of activities, up to 71 % of the enterprises researched also define activity inputs and outputs.

49.7 % of business process models contain organizational items; human resources are defined in almost half of the researched business process models. According to the research results, the least defined model element is the one of external documents, only 7.3 % of enterprises. The micro enterprises researched do not define technical equipments or organizational items, they do not generate organizational standards from the business process model and they do not have the external documents directly inserted in the process model. Additionally, in this case based on the research, it can be concluded that with the growing size of the enterprise, the scope of business process model items goes up.

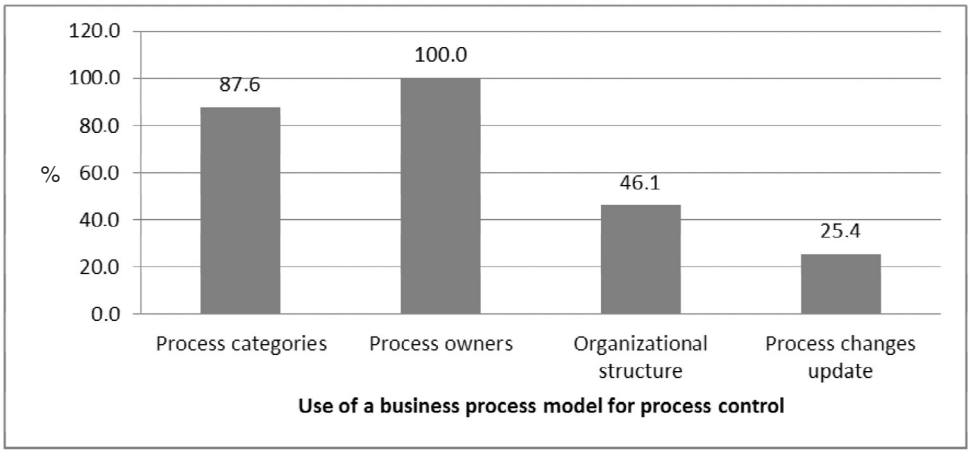
As figures 3 to 6 show, process management and a business process model as a real base for management are mostly applied for these selected management areas (the results are presented for the whole set of enterprises):

- 100 % of enterprises define process owners. If an enterprise defines the process, it is supposed to define its owner (the one responsible for running the process and for the results), what is requested to the ISO 9001. (The model element "process" is contained in the model by 100 % of the enterprises),
- 87.6 % of enterprises classify company processes,
- 83.4 % of the enterprises define in the sequence of activities a decision condition in the form of an "if – then" rule (85 % of the enterprises define a sequence of activities in the model),

- 52.8 % ex-post measurement,
- 51.8 % of enterprises describe in detail activities mentioned in particular enterprise processes,
- 30.1 % of enterprises generate organizational guidelines based on the business process model, (33.7 % of enterprises state that the model enables the generation of organizational documents),
- 23.8 % of enterprises generate job descriptions based on the business process model, (47.7 % of enterprises define a human resources in the model),
- 52.8 % of enterprises measure and assess enterprise process performance after the process completion by means of a set of indicators contained directly in the business process model (38.9 % of enterprises also state that indicators as integral part of business process model are defined in the model).

As shown in figure 2, there is always a linear dependence between the number of items in a business process model (scope of the process model) and their application in enterprise process management.

Fig. 3: Percentage of Enterprises Applying a Business Process Model for Process Control



Source: authors

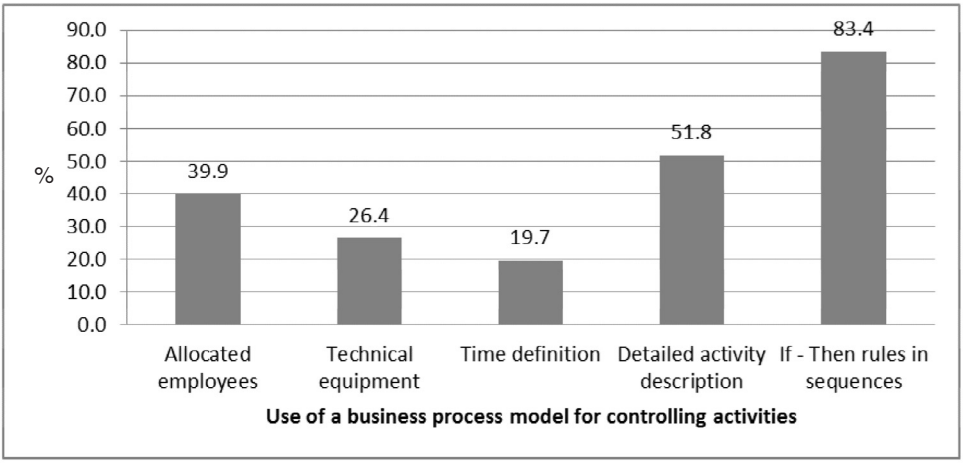
Abilities of business process model applications in processes management shown in Figure 3 present categorization of processes (for example to main and supportive), defining of processes owners, determination of organizational units as processes limits and the way of processes changes management.

Application of the model in activities management in Figure 4 presents allocation of employees directly to the activities, allocation of technical equipment directly to the activities, defining of activities duration, defining of detailed activities description, defining of passing rules if – then.

Application of the model in creation of organizational documents in Figure 5 includes the following abilities: creation of jobs descriptions, creation of organization rules, creation of working procedures, creation of consumption norms and creation of other managerial documents.

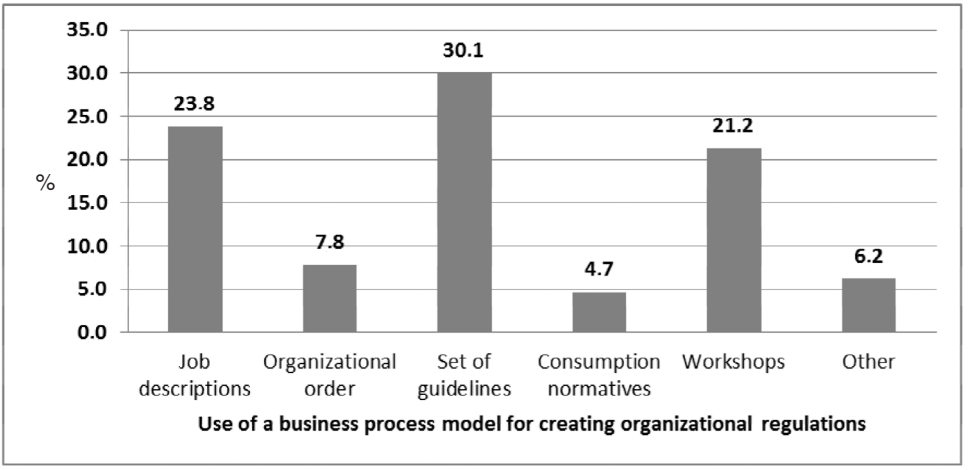
As it is shown in Figure 6 application of business process model in performance management includes six abilities. The first one is ability to define strategic relation. Strategic relation presents the relation between the indicator of strategic performance and the process. Next ability is utilization of processes performance measurement after it end, even if it is considered as minimal from the point of view of business process model application. The better is the ability to apply business process model to measure process performance in a real time when a manager gets information

Fig. 4: **Percentage of Enterprises Applying a Business Process Model for Controlling Activities**



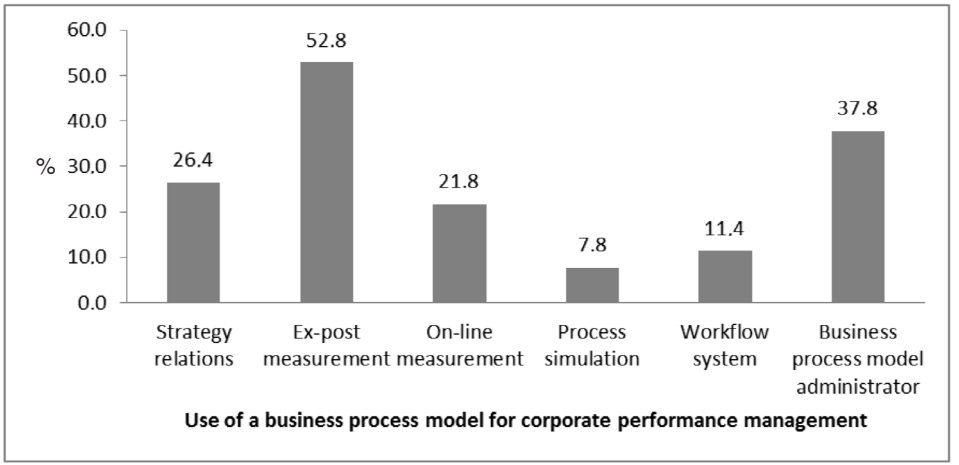
Source: authors

Fig. 5: **Percentage of Enterprises Applying a Business Process Model for Creating Organizational Regulations**



Source: authors

Fig. 6: **Percentage of Enterprises Applying a Business Process Model for Corporate Performance Management**



Source: authors

concerning the performance/efficiency continually according to the process measurements selected places. Next abilities are processes simulation, utilization of workflow system mapping the actual state of degree of completion of a particular demand of a customer due to the defined activities sequence.

Conclusions

The following conclusions of presented primary research are considered as the important ones: (1) the biggest set of enterprises generating a business process model obligatory for management belongs to the group of large enterprises, (2) enterprises which generated a business process model for the purpose of implementing an enterprise information system project mostly do not apply it in management practice, (3) the most frequently certified management system in the selected set of enterprises was the quality management system under the requirements of ISO 9001, (4) a business process model is applied in enterprise management practice mostly if it was generated independently from the implementation of other management systems, (5) in case the reason for process approach application is an individual project, all enterprises stated that a business process model is obligatory for management, (6) the scope of a business process model and its application in management practice are linearly dependent.

The primary research was carried out in a selected set of enterprises with a quality management system based the requirements of the ISO 9001. This work focuses especially on specific requirements, which presents a relevant change in the way an enterprise and its processes management are looked upon. Recommendations for enterprise management practice result from the survey are based on the organizational assumptions for the real application of a process approach. It requires the initiation of an individual project aimed at creating a business process model which, after its completion, would become obligatory for the management practice of a particular enterprise. If we want to verify the process approach in an enterprise management system, regardless of the requirements of the ISO 9001 standard, specific criteria for the process audit should be applied. Complete sets of such procedures do exist. The maturity model defined by Michael Hammer [10] is considered the best known. This study is basis for the future correlation analysis in sample enterprises divided by size as well as for exploring the causes of different business process model utilization in the management practice.

This paper was supported by the Slovak Research and Development Agency under the contract No. LPP-0384-09: "Concept HCS model 3E vs. Concept Corporate Social Responsibility (CSR).

References

[1] BROOMFIELD, R. J. Develop a Process Based Management System. *Quality Progress.* 2004, Vol. 12, Iss. 2, pp. 56–66. ISSN 0033-524X.
[2] BURLTON, T. R. *Business Process Management. Profiting from Process.* 1st ed. Indiana: Sams Publishing, 2001. ISBN 0-672-32063-0.
[3] BUCHER, T., GERICKE, A. and SIGG, S. Process-centric business intelligence. *Business Process Management Journal.* 2009, Vol. 3, Iss. 15, pp. 408–429. ISSN 1463-7154.
[4] BUCHER, T. a WINTER, R. Project types of business process management, Towards a scenario structure to enable situational method engineering for business process management. *Business Process Management Journal.* 2009, Vol. 4, Iss. 15, pp. 548–568. ISSN 1463-7154.
[5] DAVENPORT, T. *Process Innovation: Reengineering work through information technology.* Boston: Harvard Business School Press, 1993. ISBN 978-0875843662.
[6] DŽUBÁKOVÁ, M. Integrácia vyššieho rádu alebo systémové neštandardy. In *Nové trendy v manažérstve kvality.* Trnava: Materiálovotechnologická fakulta STU, 2011. pp. 82–86. ISBN 978-80-8096-143-5.
[7] GAVUROVÁ, B. Source Identification of Potential Malfunction of Balanced Scorecard System and its Influence on System Function. *E+M Ekonomie a Management.* 2012, Vol. 15, Iss. 3, pp. 76–90. ISSN 1212-3609.
[8] GAVUROVÁ, B. *Meranie výkonnosti v organizáciách s dôrazom na aplikáciu systému Balanced Scorecard.* 1. vyd. Košice: Technická univerzita, 2010. ISBN 978-80-553-0437-3.
[9] HAMMER, M. and CHAMPY, J. A. *Reengineering the Corporation: A Manifesto for Business Revolution.* 1st ed. New York: Harper Business Books, 1993. ISBN 978-0887306877.
[10] HAMMER, M. The Process Audit. *Harvard Business Review.* 2007, Vol. 4, Iss. 85, pp. 111–123. ISSN 0017-8012.
[11] KOŠTURIAK, J. Najlepšie praktiky niekedy škodia. *Průmyslové inženýrství.* 2010, Vol. 2, Iss. 1, pp. 10–12. ISSN 1751-5262.
[12] KUBIŠ, J. *Procesy podniku a ich modelovanie.* 1. vyd. Bratislava: Ekonóm, 2007. ISBN 978-80-225-2468-1.
[13] LESÁKOVÁ, Ľ. *Metódy hodnotenia výkonnosti malých a stredných podnikov.* Banská Bystrica: Ekonomická fakulta UMB, 2004. ISBN 80-8055-914-7.
[14] MARASH, A. S. Six Sigma – filosofie jakosti pro příští tisíciletí. *Svět jakosti.* 2000. Vol. 7, Iss. 2, pp. 43–47. ISSN 1211-2011.
[15] MATEIDES, A. et al. *Manažérstvo kvality: história, koncepty, metódy.* 1. vyd. Bratislava: Epos, 2006. ISBN 80-8057-656-4.
[16] NENADÁL, J. et al. *Moderní management jakosti.* Praha: Management Press, 2011. ISBN 978-80-7261-186-7.
[17] ŘEPA, V. *Podnikové procesy.* 1. vyd. Praha: Grada Publishing, 2006. ISBN 80-247-1281-4.
[18] TÖPFER, A. et al. *Six Sigma. Koncepce a příklady pro řízení bez chyb.* Brno: Cpress, 2008. ISBN 978-80-251-1766-8.
[19] ZÁVADSKÝ, J. Procesní audit. *Moderní řízení.* 2004, Vol. 12, Iss. 39, pp. 21–23. ISSN 0026-8720.

Ing. Zuzana Závadská
Matej Bel University
Faculty of Economics
Institute of Managerial Systems
zuzana.zavadska@umb.sk

doc. Ing. Ján Závadský, PhD.
Matej Bel University
Faculty of Economics
Institute of Managerial Systems
jan.zavadsky@umb.sk

PhDr. Mária Sirotiaková, PhD.
Matej Bel University
Faculty of Economics
Institute of Managerial Systems
maria.sirotiakova@umb.sk

Doručeno redakci: 3. 10. 2012
Recenzováno: 3. 11. 2012, 16. 11. 2012
Schváleno k publikování: 17. 1. 2013

Abstract

PROCESS MODEL AND ITS REAL APPLICATION IN THE SELECTED MANAGEMENT AREAS

Zuzana Závadská, Ján Závadský, Mária Sirotiaková

The process approach became an integral part of quality management systems due to the requirements of the ISO 9001 standard as early as in 2000. However, the application of the process approach has been implemented in two different ways: (1) a declarative application and (2) a real application in enterprise management systems. The fulfilment of the ISO 9001 standard concerning the application of a process approach into practice is represented by a business process model. As the standard requests, it usually contains identified processes and activities, their interactions, the determination of responsibilities for processes, and the determination of sources and proper indicators for monitoring and improving company processes. The existence of a business process model does not guarantee its real application in enterprise management and may only satisfy a declarative fulfilment of the ISO 9001 standard requirements, which is often sufficient for external auditors.

Based on the above mentioned different approaches to application, two research questions have been defined: (1) does the declarative application of the process approach prevail over its real application in enterprises with the ISO 9001 quality management certificate and (2) what is the selected management areas where enterprises certified to the ISO 9001 standard could apply their developed business process models? The research was carried out for a sample set of Slovak enterprises. This paper was supported by the Slovak Research and Development Agency under the contract No. LPP-0384-09: "Concept HCS model 3E vs. Concept Corporate Social Responsibility (CSR). This study is basis for the future correlation analysis in sample enterprises divided by size as well as for exploring the causes of different business process model utilization in the management practice.

Key Words: *process approach, ISO 9001, management.*

JEL Classification: *M10, M20.*