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BUSINESS PROCESS MODELLING IN THE FRAMEWORK OF A SAFETY MANAGEMENT SYSTEM

Abstract: *Business processes are a structural element of the management system of every organization. They take place in all organizations regardless of their level of awareness. If there is no awareness of the business processes in the organization, they become spontaneous and not managed. If the level of awareness about the ongoing processes is high, and if the processes were identified, documented and managed, business process management can be discussed. When modelling business processes, it is possible to apply different methods and use different tools. In this research, the author has applied both general and special scientific methods of cognition and research methods of business processes modelling in the Safety Management System, citing their advantages and disadvantages. The result of the research is a proposal for a method that can be used to model business processes of a Safety Management System and to ensure continuous improvement of the system.*

Keywords: safety management system, the methodology of business process modelling.

INTRODUCTION

The international standard ISO 9000:2000 defines a process as "a set of interrelated or mutually dependent actions that convert inputs into results" [9]. The process can be conceptually defined as "the course, the path and the way something becomes or is, the development, the procedure ..." [10]. The HRN EN ISO 8402:1996 standard defines the process as "a set of interrelationships and actions that transform the input elements into outputs" [11]. In one of the shortest definitions of the process, it is described as the transformation of the inputs into the output. Transforming inputs into output converts customer requirements into a result, making each process original. The area of the transformation of inputs into output is characterized by a system of complex interactions between actions and resources. It is recognized as a technology and the "know-how." In the Instruction that Supports the Application of Revised International Standard ISO 9001:2008, the process is conceptually defined as "a set of interrelated activities that transform the inputs into outputs. These activities require the allocation of resources such as people and materials". [12] Business processes represent a number of logically related activities that use resources to ultimately meet customer and interested parties' needs for products or services of the appropriate quality and price, within the appropriate timeframe, while at the same time realizing some value [12]. The process approach involves systematic definition and management of processes and their mutual action in order to achieve the planned results in accordance with the safety policy and strategic orientation of the organization [12]. Process and

system management can be achieved by using a PDCA cycle (Plan-Do-Check-Act) (Fig. 2) [10].

The subject of research in this paper is the methodology of business process modelling in the framework of a Safety Management System (SMS). Modelling and mapping business processes are not the same things. Business Process Mapping is a graphical representation of a process that implies a logical sequence of activities or phases of a process.

The research is based on a hypothesis that the application of a uniquely well-structured business process modelling methodology contributes to demonstrating a process approach and enables an SMS of the organization.

Modelling of business processes implies creating models of each specific process. The model is an approximate representation of a system or process that serves to understand the system, to change or control it. Models should be as simple as possible and yet correct for the purpose for which they are made. Models provide a description of complex phenomena, their better understanding, as well as the communication between those who are solving the problem. In engineering and economics, models are used to design new solutions, to test the properties of solutions and to choose the best solution. The recommendation is to develop a model in simple modules with well-defined functions, which facilitates the development and verification of the model.

Uneven approaches to business processes create problems in practice, both for safety managers and process managers, as well as for auditors. It is,

therefore, necessary to choose a suitable methodology for modelling business processes and apply it for the modelling of all processes in the organization.

The aim of this research is to offer a methodology of business process modelling that will be complex enough to demonstrate the complexity of process phenomena and, at the same time, so simple that it can be easily understood and applied to all business processes in organizations, regardless of their physical size and activities.

METHODS

From the multitude of scientific methods, the following ones were applied: systems theory (where the hierarchy and the structure of the business process are researched); the modelling method (which was used in designing a business process); analysis (for understanding of the philosophy of the business process, the role of the process steps or process phases for the functioning of the entire system), and a synthesis method (for the purpose of understanding the results of a process).

RESULTS

A business process has also been defined in this context and it could be satisfactorily implemented in an organization's SMS. In this way, it can fulfill requests to prove the process approach and improve SMS, too. Finally, this will result in increased satisfaction of the customer and other interested parties who could fulfill their requirements.

"To make an organization's activities efficient, a number of interrelated actions should be established and managed. Using resources enables the transformation of inputs into outputs, which is a prerequisite for the existence of a process. The output from one process becomes an input in the next one.

The application of the system of processes in an organization, the identification, interaction, and management processes can be termed a "process approach".

The advantage of the process approach is the fact that this way it is possible to ensure permanent monitoring of the links between individual processes within the process system, their combination and mutual action [10].

The main task for managers during the modelling of processes is to establish, direct and describe events during the transformation of input into output (Fig. 1). In order to accomplish this task, management should have a suitable methodology of business process modelling as a part of an SMS. Different companies use dissimilar methodologies. Modelling of methodology mostly depends on knowledge. Regardless of the methodology used, the teams who develop business processes should remain consistent

when applying it in modelling all business processes in organization. Management should create its own methodology, or choose already existing one. In practice, teams for business process modelling often encounter the problem of verification of their own solutions. This paper presents one of the possible approaches.

- **Identification of the process** is an initial task in business process development and in formulating demands (from a team): naming the process, appointing the leader (manager) of business process, defining its objective(s), defining input and output requests, description of mechanisms, rules, and controls. Afterward, they must determine external and internal users of business process results and designate process steps as elements of the business process.
- **Diagram of the context** is a simple display of a business process from the highest level of interaction which implies rules, controls, and mechanisms during the transformation of input into output (Fig. 1). The context diagram actually shows a process as a transformation of the input requirements in the output, according to the rules and the application of the control, and by using mechanisms or resources.

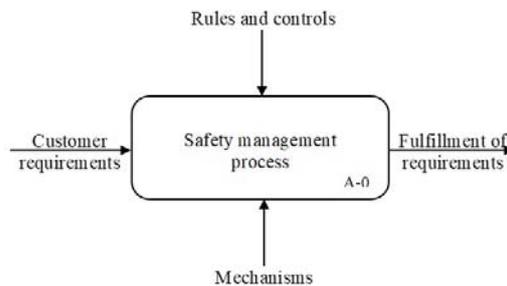


Figure 1. The context diagram of a safety management process

- **Display of the static model** of the business process presents a logical sequence of process steps modelling as an element of a business process. This phase of business process modelling identifies structural units where each individual process step is taking place and locates control points at which measurements will be performed. The static model of the process allows further phases of the process modelling methodology.
- **Description of the process** describes customers' requests and needs, and requirements derived from specifications, standards, and regulations. The methods and resources, objectives, as well as allowed tolerances are also described. Defining allowed tolerances, in fact, determines the minimum quality level of a business process. This is important since later one should determine the reliability of the process as one of its most demanding characteristics.

- **Diagram of decomposition** of the business process is a methodologically confirmed graphical representation of the process with all its consisting parts - process steps. It represents a logical sequence of process steps modeling. It specifies input, rules, and controls, mechanisms and output of each process step. A diagram of decomposition represents a technology applied. It shows the process per process steps that logically develops in sequence. At the exit from a process step there is an entry into the next one. Process steps in a safety management process are identified as follows:
 - A-0.1 Analysis of requests,
 - A-0.2 Planning,
 - A-0.3 Organization,
 - A-0.4 Implementation of safety measures,
 - A-0.5 Reporting,
 - A-0.6 Analysis of results.
- **Description of process steps** must specify input, output, mechanisms, rules, and controls of each process step, and it must locate the organizational unit in which certain process step develops. Also, if any of the process steps should be additionally documented, there should be a written procedure.

The procedure graphically and textually shows which activities are to be taken within a process step and who is responsible for their execution or control, i.e. the documents related to the activity.

- **Presentation of a dynamic model** of the process is a plan for implementation of the modelled business process into the functional structure of the organization. The plan shows which organizational unit develop activities of each process step, and which organizational unit is responsible for their execution. Making a presentation of dynamic model business process is a precondition for the process organization itself. It is, in fact, very important to ensure the compliance with ISO 9001 standards (2000 substantial revision and later revisions), which is a transformation of a functional organization in the process-oriented one (Table 1).
- **Establishing responsibilities for the process** is a logical continuation of work on business process modelling. It implies the appointment of a responsible individual for each process step. After assigning responsibilities, there are preconditions for the establishment of a management team for a specific process. The management team is headed by a business process manager. This ensures a process-oriented organization of teamwork [7].

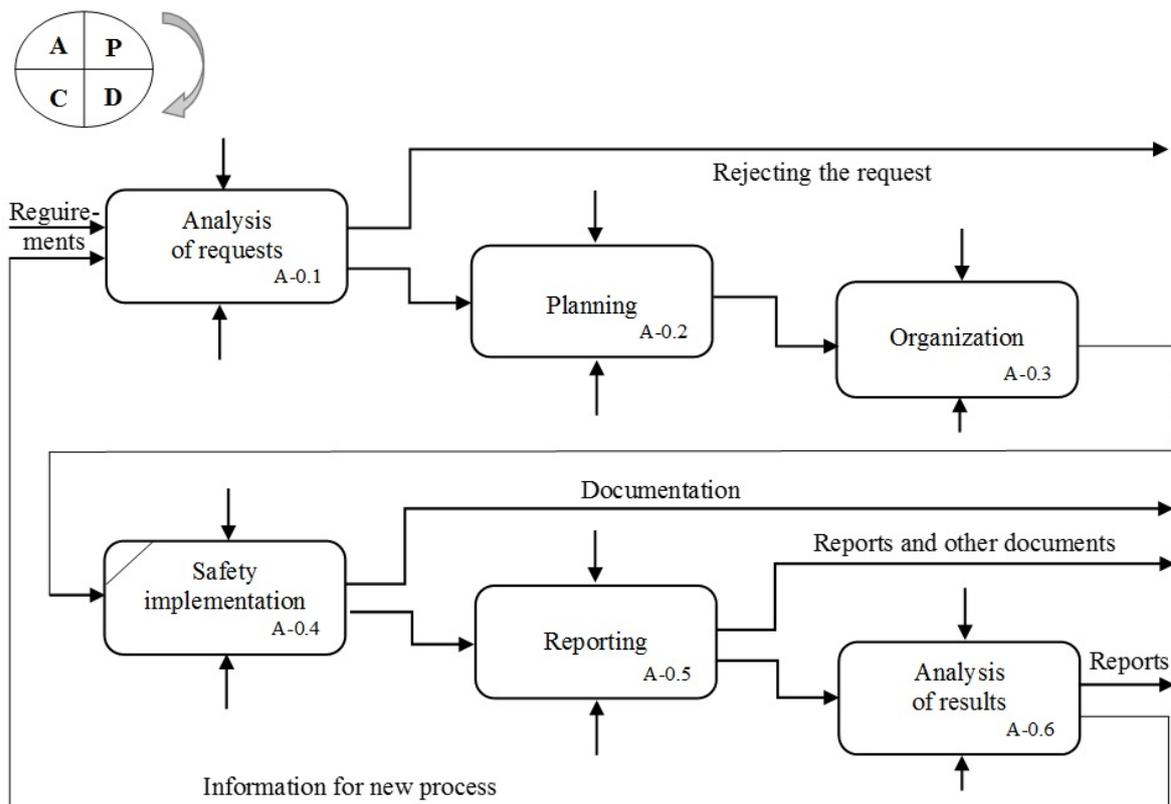


Figure 2. Decomposition of safety management process

- **Plan of measurement within the process** is based on the description of the business process, i.e. defined limits of allowed deviations, up to which business process still shows reliability (one of its crucial characteristics). The measurement plan defines the names of control points where certain measurements will be performed. It also defines target values, allowed deviations and a method of measurement. A business process is managed in accordance with the measurements, comparisons with target values, and possible corrective measures applied.
- **Plan of information flow within a process** is necessary in order to clearly define which participant of the business process provides the information, who receives it, what the form of the contents is, and when the information should be sent and received.
- **Making further process documentation** implies writing procedures for each particular process step which requires it, as well as writing supplementary documents, such as work instructions, checklists, plans of corrective measures and activities, etc.

Table 1. Dynamic model of a safety management process

Structural units	Process steps										
	General manager	Safety manager	Procurement division	Sales division	Financial division	Production division	Process manager	Safety at work	HR division	Legal division	Partners
Analysis of request A-0.1		■			□		□	□	□	□	
Planning A-0.2		■			□	□	□	□	□	□	
Organization A-0.3		□					□	■	□	□	
Safety implementation A-0.4	□	■	□	□	□	□	□	□	□	□	□
Reporting A-0.5		□					■	□	□		
Analysis of results A-0.6	□	■	□	□	□	□	□	□	□	□	□

International standards for system management require the appointment of business processes and demonstration of the process approach. However, the standard does not suggest a solution, i.e. it does not offer a methodology for modelling business processes [2].

"As a result, there are different solutions in the implementation and verification of process approaches... In practice, solutions range from minimums that barely meet requirements to maximums that exceed minimum requirements. Managers often have a problem to meet the requirements set by standards. Advisors also have the same problem and frequently offer different solutions. Consequently, auditors also come across different solutions and usually adopt them.

The consequence of such a situation is that the modeling, implementation, and management of an SMS based on the application of the same standard, in

daily the practice has a different level of quality and gives different results, meaning that significant deviations from the objectively possible effects are achieved. Accordingly, the role of science is to offer working professionals appropriate methodologies to minimize the loss of quality". [4]

Bearing in mind the principle of systematization [3], whether or not an organization has accepted a known own methodology of business process modelling or has developed its own, the methodology must be fully mastered. It is necessary to apply the chosen methodology to all the processes. The processes are different, first and foremost, by their nature and degree of complexity. They have a specific structure. Their simplest parts or components, at the next lower level, are the underlying processes or process steps.

The application of different methodologies in the modelling of different processes that a business system consists of, or inconsistency in the application of the

chosen methodology, would hamper the recognition and perception of the links between the various processes, overshadow the process approach and make it virtually impossible to realize the very essence of the process approach.

This is because usually output from one process simultaneously provides inputs into other processes, and almost always outputs from one process step are at the same time inputs into the second step of the same process. This ensures the recognisability of the interrelationships between multiple business processes of a business system.

CONCLUSION

International standards for management systems require the establishment of process approach. However, these standards do not suggest how to fulfil these requirements. The fact that there is no prescribed methodology for business process modelling makes it very difficult for working practitioners to meet these requirements while working on the SMS implementation. The same problem exists in the process of education and auditing, too. Consequently, the situation is, in practice, characterized by a great variety of practical solutions, from minimalist to complete. Organizations are left with the ability to create their own solutions to prove compliance with process approach requirements. Researches should offer practical solutions to the experts, i.e. develop methodologies and new management tools that would be used to meet the requirements of the standard (i.e. to confirm that a process approach was applied). This paper offers a complete solution in the form of business process modelling methodology, which can be applied in various organizations of different activities and physical size. In terms of application, the methodology is universal, but also enables recognition of specific characteristics of each organization and every business process. By applying the described methodology, great differences in practical solutions would be avoided, facilitating process approaches and process management, which would reduce quality losses. Thus, this research shows how the application of a unique, well-structured business process modelling methodology contributes to an organization, and demonstrate a process approach and also enables an SMS within the organization.

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BIOGRAPHY of the author

Miroslav Drljača has a Ph.D. in economic science, management and organization. He works as an Assistant Professor of engineering science, traffic and transport technology at the University North, Koprivnica, Croatia, as well as visiting professor at several faculties. He has been engaged in quality since 1997, and gained world-recognized certifications: EOQ Quality Systems Manager, EOQ Quality Auditor, EOQ Environmental Systems Manager, EOQ Environmental Systems Auditor, EOQ Project Manager, EOQ Management System Senior Consultant, EOQ Risk Manager, EOQ Process Manager. He is the author of 150 scientific and professional papers. He is a member of numerous scientific and professional associations in Croatia and abroad, and a President of Croatian Quality Managers Society President. He is also a President of the Board and CEO at Zagreb Airport, Ltd.



MODELIRANJE POSLOVNIH PROCESA U OKVIRU SUSTAVA UPRAVLJANJA SIGURNOŠĆU

Miroslav Drljača

Rezime: Poslovni procesi strukturni su element sustava upravljanja svake organizacije. Oni se odvijaju u svim organizacijama, neovisno o stupnju spoznaje o tome. Ukoliko nema spoznaje o poslovnim procesima u organizaciji, oni se odvijaju stihijski i nisu upravljani. Ukoliko je stupanj spoznaje o njima visok i ukoliko su identificirani, dokumentirani i upravljani, može se govoriti o upravljanju poslovnim procesima. Kod modeliranja poslovnih procesa moguće je primijeniti različite metode i koristiti različite alate. U ovom istraživanju primjenom općih i posebnih znanstvenih metoda spoznaje, autor istražuje metode modeliranja poslovnih procesa u Sustavu upravljanja sigurnošću i navodi njihove prednosti i nedostatke. Rezultat istraživanja je prijedlog metode koja se može koristiti za modeliranje poslovnih procesa i dokazivanje procesnog pristupa u Sustavu upravljanja sigurnošću te osiguravanju kontinuiranog poboljšavanja sustava.

Ključne riječi: sustav upravljanja sigurnošću, metodologija modeliranja poslovnih procesa.