METHODOLOGY OF ENVIRONMENTAL MANAGEMENT SYSTEM PROCESS MODELLING

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Summary
The requests of interested parties, amongst which the customer has the central position, are the starting points of a quality management system that complies with the requirements of the ISO 9000ff and ISO 14000ff international norms. Regardless of whether we want to arrange a management system to meet the requirements of these norms, one should be able to recognize the exact requests of interested parties. A classic structural model of organization must be upgraded through developed, documented and implemented processes. Processes are one of the structural elements of each management system, and of environmental management systems, too. Scientists and experts do not agree about a generally accepted methodology of process modelling.

Keywords
Environmental Management System, methodology of process modelling.

OBJECTIVE
Despite the fact that only 332 organizations in Croatia possess the ISO 14001 certificate as international confirmation of the required quality level of their environmental management system (EMS), the idea of organization, as marketing orientation and as business philosophy and everyday practice, is more and more to be found in Croatian organizations. Independently of the degree of awareness of management in an organization, processes can be developed in any of the following ways: 1) in a long-established manner – which is based on “know-how” of the most important parameters of business processes, with interventions only in situations where reliability of business process is seriously affected, 2) without any control, where in extreme cases the business process develops in completely uncontrollable conditions, 3) in partly controllable conditions – characterized by a business process model according to the chosen methodology, in conditions which are controlled to the same degree as the basic parameters that define them, and 4) in completely controlled conditions – those business processes whose basic parameters of definition are under complete control.¹

¹ At the end of 2008 there were 332 organizations with the ISO 14001 certificate. The first one in Croatia was issued to the Split Ship Management organization on 12th May, 1997. Quality Pages, Croatian Society for Quality.

² The basic parameters for definition of business processes are: a) object of activity (material, information, product, service and similar), b) frequency of operation (continually, sometimes, only once, and similar), c) area...
In order to create a completely controlled environment for the development of all processes in an organization, and EMS too, it is necessary that organizations’ processes be: 1) named, 2) described, 3) structurally organized, 4) controlled, 5) managed, and 6) always improving. In order to fulfil this, business processes in an organization need to be conceived, i.e. developed according to a chosen methodology. The problem lies in the fact that the ISO 9001:2000 norm (Quality Management Systems – Requirements), and ISO 14001:2004 (Environmental management Systems – Requirements and guidance for use) require proof that business processes are managed, but a methodology of business process development is not suggested. The choice of methodology, and often its definition, is left to be made by the organization’s management.

METHODS

The word “process” evolves from the Latin word “procedere”, which originally means “move” or “go ahead”. This word form was followed by the noun “processus”, which is translated as “process”, and means “… a series of actions, phases or events, development (in any direction or form) and transformation (inputs → outputs) of anything taken under consideration (element, structure, sub-system, system, etc.)”.

![Figure 1. Process presentation](source)


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3 In writing about the methodology of business process development, the authors avoid presenting final solutions, because a methodology of business process development represents intellectual ownership (know-how) by the author or consultant. Rare examples in Croatian literature are: Ivan Mamuzic, "Procesni pristup u sustavu upravljanja kvalitetom", Kvaliteta, Broj 3, Infomart, Zagreb, 2002, pp. 3-4, in which the author presents a possible methodology of business process development and shows part of a diagram of process flow; Miroslav Drlica, "Proces kao ishodište modela ISO 9001:2000", Kvaliteta, Broj 3, Infomart, Zagreb, 2002, pp. 5-6, in which the author presents a methodology of business process development and shows the break-up of one business process; Zivko Kondic, Kvaliteta i ISO 9000, Tiva, Varaždin, 2002; and partly: Nenad Vulić, Sustavi upravljanja kvalitetom, Veleučilište u Splitu, Split, 2001. A complete presentation of methodology of business process development is written in: Nenad Injac i Marko Bešker, Metodologija izgradnje poslovnih procesa u sustavu kvalitete, Oskar, Zagreb, 2003.
Process can be also defined as “a course, evolution or manner through which something was born or transformed, it is a development, a procedure ….” \(^4\) HRN EN ISO 8402:1996 norm defines the process as a “group of mutually independent resources and actions which transform input elements into output elements.”\(^5\) Transformation of input elements into output is in fact a transformation of one into the other. Each process thus becomes unique and special. Transformation of input into output is a system of complex interactions of operations and resources. It is a technology. It is “know-how”. International norm ISO 9000:2000 defines the process as a “group of connected or mutually dependent activities which transform input into results”\(^6\). The application of a process system in a company, its definition and mutual interaction, as well as the management of the process system, can be called a “process approach”\(^7\). The process approach has the advantage of the permanent managing of links between particular processes (within the process structure), which is the structural element of management system, and the combination and mutual interaction of these elements.\(^8\) When applied in the EMS context, this process approach underlines the importance of the following:

- understanding and meeting of interested parties’ requests,
- need of supervision of EMS in value-added conditions,
- achieving the results of EMS and its efficiency, and
- permanent improvement of EMS, based on impartial estimation.

Regardless of many possible types of processes, and much diversity of process structures, all processes in an organization can be divided into four types:\(^9\)

- processes for the management processes of an organization (management processes),
- processes for managing resources (support processes),
- realization processes (core processes), and
- measurement, analysis and improvement processes (MAI processes).

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\(^8\) Apart from process structure, the structural elements of the management system of every organization are:: 1) strategic documents of the company (mission, vision, strategy, politics, general and special managerial aims), 2) organization, 3) resources, 4) partnerships, and 5) communication and notification.
\(^9\) After the revision in international norm ISO 9001:2008 on 15\(^{th}\) November 2008, we now talk about four typical processes that can be identified. Before that revision, we had three types of business processes: management processes, core processes and support processes.
Many industries have more than one core or “macro” group of business processes, including: management of the business system, management of resources, realization of products and services, measurement and control.\(^\text{10}\)

*Management* processes are important for the progress of core processes, as well as of support processes. These are processes of development, planning, quality management, management of the organization, and environmental management, too. Because of the entirety and directions of their influence on core processes, Management processes are called *vertical* processes.

*Support* processes, which are also called logistical or resourceful processes, are directed towards producing the satisfaction of internal users within the organisational structure. They are able to create added value for the customer. However, this influence on making added value is indirect and is fulfilled through the support of core processes. Support processes are auxiliary business processes and represent a support for core processes. With regard to the direction of activities onto core processes, they are also called *vertical* processes.

*Core* processes are focused on the achievement of the satisfaction of customers (buyers/users). They directly add new value to the product, meaning service. They meet the requests of the customer and are a generator of their contentment. Core processes, processes of fulfilment or realization, are processes whose result – in the form of a product or service – has direct value confirmation on the market. The plan and the product in their creation are strongly integrated in core processes. Core processes are called *horizontal* processes.

*Measurement, analysis and improvement processes* (*MAI*) include the processes needed to measure and gather data for performance analysis and improvement of effectiveness and efficiency. They include measuring, monitoring, auditing, performance analysis and improvement processes (e.g. for corrective and preventive actions). Measurement processes are often documented as an integral part of the management, resource and realization

processes, whereas analysis and improvement processes are frequently treated as autonomous processes that interact with other processes, receive inputs from measurement results, and send outputs for the improvement of those processes.

Numerous management, support, core and MAI processes develop within this process structure simultaneously. They have a series of interactions. Each interaction in certain measure affects the business process result in terms of meeting the interested parties’ requests.

RESULTS

In identifying processes in an EMS as an integral part of an integrated management system in organization and dividing them into types, it is necessary to avoid the identification of business function and business process in an organization, too. The essential differences are at least those which follow:

Table 1. Types of business processes of an environmental management system


Source: Made by author.

- business function is a static category, while process is a dynamic category,
- business function mostly operates within one structural unit of an organization, and is usually named after it, while process implies more participants from more structural units in an organization,
- business function operates within an organization, while process can have participants from outside the structural organization, but who are important for the progress of a concrete process,
- business function is run by a functional manager, and process is run by a process manager, and identification of these roles must be not a rule but an exception,
- process is one of the possible inner aspects of the supervision of costs, quality costs as well, while function is not,
- due to all these differences, function is a narrower concept than process.

The basic task of management of an organization during process development is in fact establishing, directing and describing events during the transformation process of input into output. In order that this task can be accomplished, we must have a suitable methodology of business process development within the quality system, an EMS, too. Different companies use dissimilar methodologies. The modelling of methodology in great measure depends on knowledge of quality and environmental management, too. Regardless of which methodology is used by teams developing processes, they should remain consistent when they apply it in developing all processes within an organization. The management in an organization must create its own methodology or choose an already existing methodology of process development and process of EMS, too. Teams for process development in practice often encounter the problem of verification of correctness of their own solutions. This paper presents one of the possible approaches to a methodology of process development including processes of EMS, too.

1. **Identification of EMS business processes** is the initial task in process development, and demands (from the team): naming of the process, appointment of the leader (manager) of the process, definition of its objective(s), definition of input and output requests, description of mechanisms, rules and controls. Afterwards, they must determine the outer and inner users of process results, as well as designate process steps as consisting parts of the processes in an EMS, too.

2. **Diagram of process context** is a simple display of the process of EMS at the highest level from which an interaction can be seen: rules, controls and mechanisms during transformation of input into output.
3. **Display of static model of process** presents a logical sequence of development of process steps as constituent parts of processes of the EMS. This phase of process development identifies structural units where an individual process step develops, and locates control points at which measurements will be performed – and thus manages the process of EMS.

4. **Process description** describes requests that result from requests and needs of interested parties, then from specifications, norms, regulations, elaborations, methods and resources. Also identified here are requests, objectives and descriptions of their fulfilment, as well as any deviations allowed. By defining allowable deviations we in fact determine the minimum quality level of processes of EMS.

5. **Diagram of process decomposition** is a methodologically confirmed graphical representation of the process with all its constituent parts – process steps. It represents the logical sequence of process step development. It specifies the input, rules and controls, mechanisms and output of each process step. The diagram of decomposition represents a technology. It shows the process of EMS per process steps that logically develop in sequence. At least one exit from a process step is also an entry into the next. Process steps in the processes of EMS improvement (for example) are identified as follows:
   - A-0.1 Interested parties’ requests.
   - A-0.2 Scanning the current situation.
   - A-0.3 Preparing the improvement measures.
   - A-0.4 Implementing the improvement measures.
   - A-0.5 Measuring process performance.
   - A-0.6 Final activities.
6. **Description of process steps in processes of EMS** must specify the input, output, mechanisms, rules and controls of each process step, as well as locate the structural organization unit in which a certain process step develops. Also, written procedure is named, if any of the process steps should be additionally documented.

7. **Presentation of dynamic model of process** is a plan of the implementation of the developed process of EMS into the functional structure of the organization. The plan shows in which structural organization unit develop the activities of each process step, and which unit of organization is responsible for their execution. The making of a presentation of a dynamic model of the process is a precondition of the process organization itself.
8. **Establishment of responsibility for process** is a logical continuation of the work on EMS process development. It implies an exact establishment of the responsibility of the concrete executor of an individual process step. After establishment of responsibility, the conditions for establishment of the management team for a concrete process are prepared. The management team is headed by the manager of the process of EMS. It can be a Quality Manager or Environmental Manager or other competent person. In this way we have a model of process organisation, based on team work.¹¹

9. **Plan for measurement within process** is based on the description of a process in EMS, i.e. defined limits of allowable deviations, up to which the process still shows reliability as one of its crucial characteristics. The measurement plan defines the names of control points where certain measurements will be performed. It also defines target value, allowable deviations and measuring method. Through all these measurements, comparisons with target values, and possible application of corrective measures and activities, we manage the process in EMS.

10. **Plan for providing information within process of EMS** is necessary in order to clearly define which participant of the process provides the information, who receives it, what its content is, and when the information is sent and received.

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11. **Producing further process documentation** implies the writing of procedures for particular process steps which definitely need them, and the writing of lower-level documents, like work instructions, check lists, plans of corrective measures and activities, etc.

![Figure 5. Generic model of integrated management system](image)

**Figure 5. Generic model of integrated management system**


**CONCLUSION**

In the audit of EMS it is necessary to document and prove the request for process approach and process management. The difficult question for organizations is: which methods were used to name, describe and organize structural units of processes, and how these processes were controlled, managed and constantly improved. There are no ready universal solutions. Imitation of another company's solutions, or adoptions of lesser adjustments of these solutions as their own optimum solutions, are delusions, and in practice will cause entropy. Every process is different. It can even have the same name, same number and same names of process steps, same inputs and outputs, but still there are no identical processes. Differences and originalities arise in the interaction of inputs and outputs, rules, and controls, as well as mechanisms in each process step – in the area of transformation of inputs into outputs. In the context of quality management systems, we may conclude that the ISO 9001:2000 international norm and ISO 14001:2004 does not suggest a methodology of process development, but demands proof that processes are being managed. It can be concluded that every methodology of process development is satisfactory, if it can prove the management of processes.

**REFERENCES**


