THE PROCESS APPROACH AS A FRACTAL STRUCTURE FOR CONTINUOUS IMPROVEMENT OF THE ORGANIZATIONS

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În această lucrare, autorii încearcă să definească conceptul „Abordarea procesului ca structură fractală" pentru procesele manageriale şi pentru îmbunătăţirea continuă a acestora, cerute de standardul ISO 9001:2008 pentru ca o organizaţie să obţină succes durabil. Conform standardului ISO 9004:2009, pentru ca o organizaţie să obţină succes durabil, aceasta trebuie să îşi îmbunătăţească continuu procesele, care conform standardelor sunt procese manageriale, şi rezultatele. Având în vedere cele menţionate, în acest studiu de caz au fost formulate recomandări obţinerea succesului durabil de către organizaţiile contemporane, aflate într-un mediu în continuă schimbare.

In this paper, the authors intend to define the „Process approach as a fractal structure" concept, for managerial processes and also for their continuous improvement, demanded by ISO 9001:2008 standard, for a sustained success of an organization. According to ISO 9004:2009, for an organization to obtain sustained success, it must continuously improve its processes, which are managerial processes according to the standards, and results. For this purpose, in this case study, recommendations were formulated for the contemporary organizations in order to achieve sustained success in an ever changing environment.

Keywords: process, quality management, continuous improvement, fractal structure, sustained success

1. Introduction

Nowadays organizations evolve in a highly dynamic environment. To adapt to this environment, organizations must have a proactive approach.

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By a proactive approach, an organization can prevent errors and costs, and does not repair the errors [1].

According to ISO 9004:2009 standard, "To achieve sustained success, top management should adopt a quality management approach".

ISO 9004:2009, "Managing for the sustained success of an organization – A quality management approach", is the third edition of the standard first published in 1987. It is intended to support the achievement of sustained success by any organization, regardless of size, type or activity, by a quality management approach.

The just-published new edition of ISO 9004 provides organizations with a model for "sustained success" in today's complex, demanding, and ever-changing environment.

The definition of sustained success is: "result of the ability of the organization to achieve and maintain its objectives in the long term" [2].

As a requirement of ISO 9004:2009 standard, once the processes are identified, an organization must ensure that thy are effective (the right process is followed the first time), and efficient (continually improved to ensure processes use the least amount of resources).

The effectiveness of the entire system is determined by the effectiveness of each process and the interactivity of these processes within the system.

ISO 9004:2009 provides guidance for the continuous improvement of an organization's overall performance, efficiency and effectiveness based on a process approach concept. ISO 9004:2009 provides wider focus on quality management than ISO 9001 because it focuses on meeting the requirements and expectations of customers and other relevant parties, over the long term, and in a balanced way.

The combination of ISO 9001 and ISO 9004 will allow an organization to get the most of its quality system. All the processes mentioned by ISO 9000 family standards are managerial processes. For an organization to achieve continuous improvement, it must improve its processes.

So ISO 9004:2009 is about what an organization should do after establishing and implementing a quality management system to keep it going and to make sure both organization and its customers continue to obtain benefit from the organization.

It also addresses one of the basic truisms of our universe: things change. Hence, the new ISO 9004: 2009, is heavily weighted toward monitoring and periodically assessing, so that an organization can respond to change.

Although the continuous improvement must be a permanent objective for organizations, this does not ensure the fact that an organization will always obtain good results. For an organization to obtain sustained success, it must continuously improve its processes and results.

2. Methods for Improving the Quality Management System Processes

In order to improve processes, an organization must consider all categories of processes, both managerial, that are requested by the quality management system and the operating ones.

The necessary steps for improvement are:
- Establishing the objectives
- Identifying problems
- Problem analysis
- Determining the causes of the problem
- Establishing solutions
- Develop an improvement plan

To identify the problems, an organization can follow the steps of the "Problem Solving" process.

1. **Establishing the objective**:
- Technical level: product characteristics, process capability;
- Economical level: costs, time, productivity.
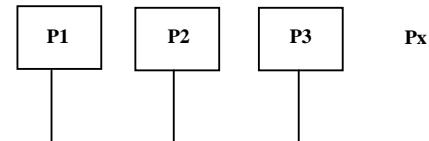
2. **Identifying problems**:
- Identifying the barriers for an effective and efficient activity (process): no mistakes, value added
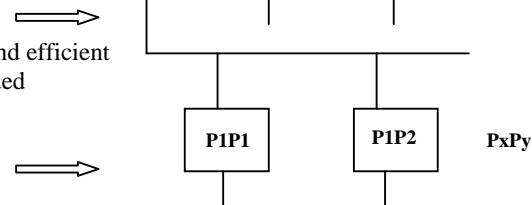
3. **Analysis**:
- Dividing the problem;
- Dividing the process into operations.
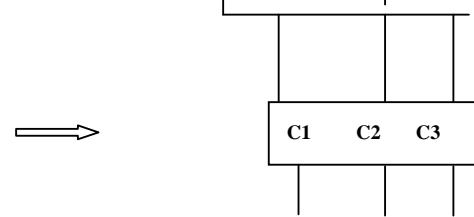
4. **Determining the causes**:
- Using specific methods.
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5. **Establishing solutions**
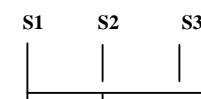
6. **Developing measures (planning):**
   -priorities are established
7. **Implementing the improvement plan:**
   - process monitoring;
   - results evaluation.
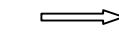
Fig. 1 - "Problem Solving" Process

This very concise scheme is designed to highlight the fact that there are more problems. Each problem can be composed of several issues and for each issue several causes, solutions and measures can be determined.

In the literature, the methods for solving these steps are structured according to periods in which they have been developed [3].

Table 1

Methods for quality improvement

Methods for quality improvement	
7 classical instruments of quality management	Pareto chart
	Cause-effect diagram
	Histogram
	Correlation diagram
	Tracking data sheet
	Inspection sheet
	Flowchart
7 new instruments of quality management	Affinities diagram
	Factorial analysis
	Relationship diagram
	Tree diagram
	Matrix diagram
	Action decisions diagram
	Activities network
Other methods for improving quality	The 7 questions of the supplier
	Force field analysis
	Nominal Group Technique

Other methods that can be used to improve processes within the organization are:
- Approach the process as a fractal structure;
- Benchmarking.

In the next chapter it will be explained why the process approach as a fractal structure represents the best method for improving the quality management system processes, which are managerial processes for an organization in order to achieve continuous improvement of the organization.

3. Process Approach as a Fractal Structure – Theoretical Elements

The opportunity to improve a process, and also its results, can be obtained by using the fractal structure approach of the processes.

In order to meet internal and external customers' requirements, for obtaining favourable economic results in the organization, a unitary concept and vision of all the processes and each process are required. This is achievable by approaching organization (a set of processes) and its processes as fractal structures [4].

The process approach as a fractal structure implies satisfying the following basic requirements [5]:

- Application of fractal for each process and stage of the process;
- Knowing internal / external customer requirements;
- Ensure the "visibility" of the process.

Improvement of fractal structures is done by two control loops, in fact two decisions that help verifying that, from a set of processes / process / stage of the process outputs (results) required in terms of efficiency - added value, adequate for resources consumption can be obtained.

Thus, the questions that have to be answered in order to adopt the two decisions are:

- First loop control - "are the activities set correctly?" ("it is done what it has to be done");
- A two loop adjustment - "are the activities developed correctly?" ("it is well done what it has to be done?").
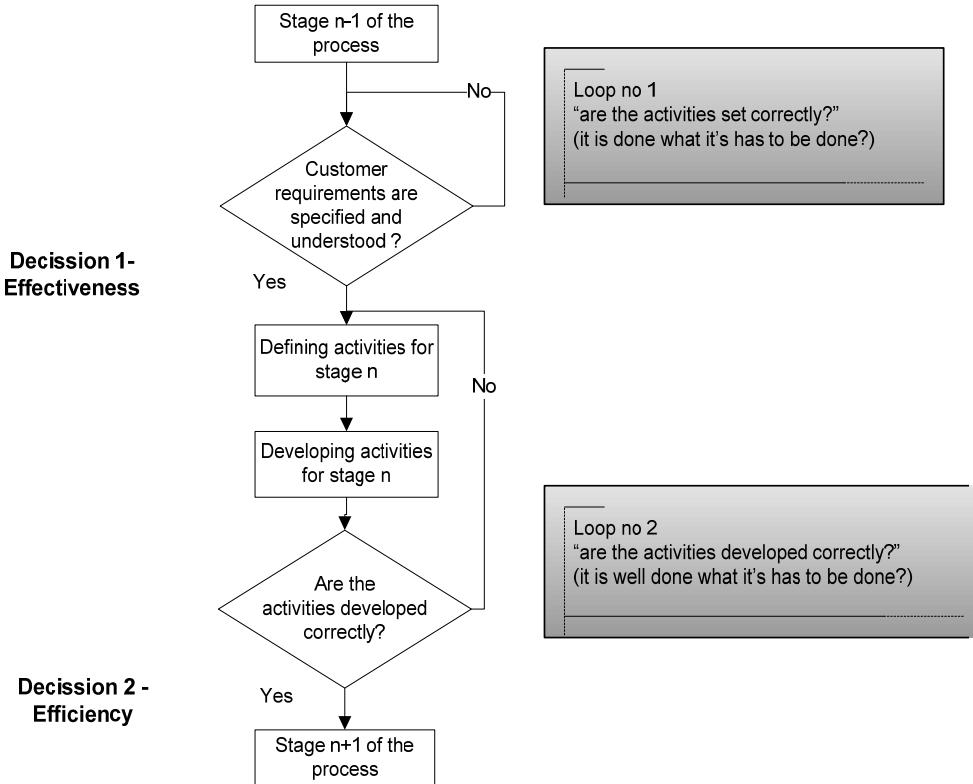

Fig. 2– Fractal analysis

If the relevant decisions of the two control loops are not adopted, the organization supports losses due to excessive consumption of resources and inadequate results of any phase / process. [1].

The fractal analysis allows the process analysis in terms of its purpose as a component of the quality management system, namely, both processes and activities must satisfy the requirements of the implemented quality management system.

With the question: "are the activities set correctly?" the organization can appreciate the processes effectiveness in terms of process requirements.

With the question: "are the activities developed correctly?" the organization can appreciate the efficiency in terms of process requirements

ISO 9001:2008 standard, requires an organization to develop and implement an effective and efficient quality management system. For the system to be effective and efficient it is necessary that all processes and all activities ensure effectiveness and efficiency.

ISO 9001:2008, Ch. 4.1 [6]:

"The organization shall establish, document, implement and maintain a quality management system and continuously improve its effectiveness in accordance with the requirements of this International Standard.

The organization shall:

a) identify the processes needed for the quality management system and their application throughout the organization,

b) determine the sequence and interaction of these processes,

c) determine criteria and methods needed to ensure that both the operation and control of these processes are effective,

d) ensure the availability of resources and information necessary to support the operation and monitoring of these processes,

e) monitor, measure and analyze these processes, and

f) implement actions necessary to achieve planned results and continuous improvement of these processes."

In fact, an organizational problem is, in terms of management and operation, a process that does not lead to proper results.

Approaching the process as a fractal structure provides accurate resolution, in two directions:

1. Effectiveness - The ability to achieve desired outcomes

2. Efficiency - The results are obtained with reasonable consumption of resources, to a minimum.

4. Process Approach as a Fractal Structure – Case Study

The IT organization presented in this case study is an information technology organization specialized in offshore software development services and telecommunications, with more than 7 years of experience. Their well defined processes and highly skilled and dedicated engineers enable them to work with companies from all over the world. Adaptable, flexible, and open, they meet their demands and exceed their requirements, overcoming geographical and cultural differences. Rated as one of the best Romanian employers, ITNet organization provides its customers with a profitable software development source, fast time to market and low operating costs [7].

The "Training" process is part of the "Competence, Training and Awareness" from "Human Resources" chapter, in ISO 9001:2008 standard. In this section are mentioned requirements regarding the training that has to be provided by the organization that has implemented a quality management system. This must be done before implementing the objectives of an improvement plan.

The necessary process for satisfying these requirements is very important for an IT organization, and especially ITNet, because:

- Each provided service is unique;
- Each provided service is approached as a project;
- The project team consists of: Senior Manager, Project Manager, Team Leader and engineers. The engineers are graduates of the Faculty of Computer Science and of the Faculty of Electronics and Telecommunications.

Due to the fact that a process required by ISO 9001:2008 standard is analyzed, and that in ITNet organization not all the processes are correctly developed from this point of view, we suggest, to identify in this analysis the stages of the process that have to be modified in order to conform with the standard, using fractal analysis questions.

In this way, the analyst can correct any lack of knowledge in Human Resources Management (for this process), of the managers that should have developed this process.

According to ISO 9001:2008 standard, Ch. 6.2.2, "the organization shall:

a) determine the necessary competence for personnel performing work affecting product quality,

b) provide training or take other actions to satisfy these needs,

c) evaluate the effectiveness of the taken actions,

d) ensure that its personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives, and

e) maintain appropriate records of education, training, skills and experience.“

The “Training” process flowchart will be analyzed using fractal analysis presented in Figure 3.
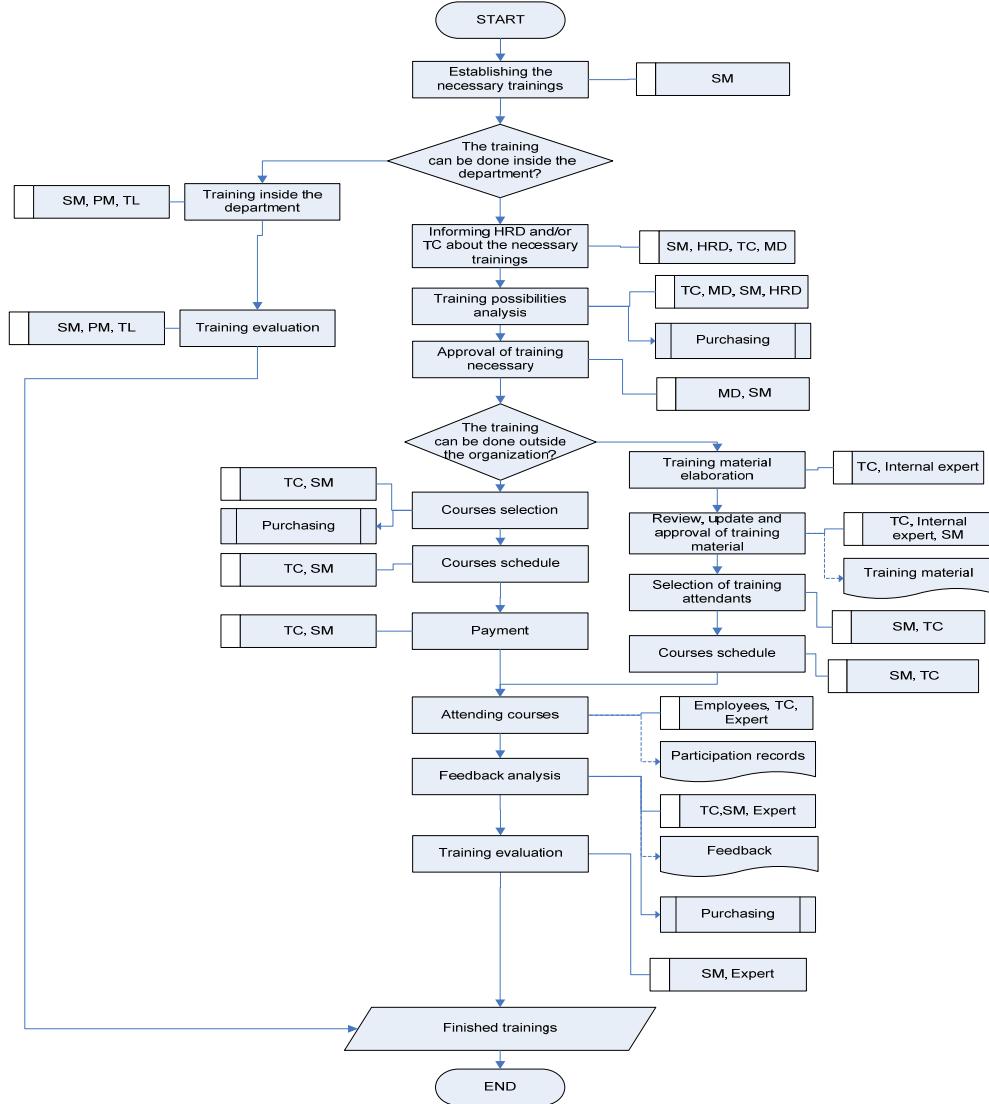

Figure 3 – Training Process in ITNet

Legend:
SM – Senior Manager   PM – Project Manager
TL – Team Leader   HRD – Human Resource Department
TC – Training Center

Below the answer for the two questions, for each of the stages of the "Training" process, for ITNet organization is presented.

Fractal analysis for the "Training" process in ITNet organization

No	Stage	Are the activities set correctly?	Are the activities developed correctly?
1.	Training necessary development	No	No
2.	The training can be done inside the department?	Yes	Yes
3.	Training inside the department	Yes	Yes
4.	Training evaluation	Partial	No
5.	Informing HRD about the necessary trainings	Partial	No
6.	Analyzing training possibilities	Yes	Yes
7.	Approving training necessary	No	No
8.	The training can be developed internally?	Yes	Yes
9.	Training material development	Yes	Yes
10.	Review, update and approval for training material	Yes	Yes
11.	Course attendants selection	No	No
12.	Course schedule	Yes	Yes
13.	Course selection	Yes	Yes
14.	Course program	Yes	Yes
15.	Course payment	Yes	Yes
16.	Course attending	Yes	Yes
17.	Feedback analysis	Partial	No
18.	Evaluating knowledge	Partial	No
19.	Finished training	Partial	No

From this analysis we can observe that the stages of the training process are not correctly established and also, are not correctly executed.

It is very difficult to answer to the second question, if the process is represented only through a flowchart, because one cannot appreciate exactly if it is just an activity or if it is a process sub stage.

As a recommendation, the ITNet organization can improve the process presented in Figure 3, only if it is completely redesigned.

The training purpose can be the quality management system improvement by developing the human resources, according to ISO 9001:2008 standard and / or increasing employee satisfaction, according to ISO 9004:2009.

Therefore, we propose a new variant of this process.

Recommendations on this version are listed below.

First, the input information must be properly identified. It can include:

- Legal regulations on employee training,

- Influences of the internal environment of the organization: top management, organizational structure, organizational goals and strategies etc.
- Influences of other human resource management functions.

Also, the organization must identify the jobs that influence the quality in order to establish the training necessary - before this activity, the organization should conduct the evaluation of the employees' knowledge and then to determine the training needs; the name of this stage should be training plan development. Given the specific of the organization and the large number of employees, it should be established quarterly.

According to ISO 9001:2008 standard, the employees should be competent in terms of education, training, skills and appropriate experience. It is clearly stated that the compliance with the requirements, can be affected directly or indirectly, by personnel performing tasks within the quality management system within the organization.

For analyzing the training needs, in order to determine if employees are competent to carry out the assigned activities, the training requirements should be determined. If the training requirements are not well identified, there is no guarantee that a proper training.

Sources of information for determining training requirements can be:

- Organization's requirements, for goals achievement,
- New requirements for the jobs,
- Individual requirements and so on.

The sources have to be analyzed from the following point of views:

- Long and short term objectives,
- Key performance indicators,
- Culture,
- Qualifications.

Methods for determining the training requirements can be:

- Evaluating the real dimensions of planned outputs, for example products nonconformities, customers complaints, results of employees evaluations,
- Establishing goals for the employees,
- Self evaluation using questionnaires.

The necessary trainings should not be approved because the manager must satisfy the requirement of ISO 9001:2008 standard, for providing resources.

Trainings planning should be done after they have centralized and group training requirements and after informing the human resources department.

In order to develop the training program the organization should:
- Establish how the trainings will be conducted.
- Take into account the type of training - if it is for a new job or to improve employees' knowledge.

It should be mentioned also:
- What type of training,
- What training methods and techniques should be used,
- The conditions for trainings development,
- Who will participate (the group structure, the group size)
- Who is the lecturer – external or internal lecturer (if he is an employee of the organization or he should be recruited and hired),
- Where the training would take place,
- How it will be conducted.

There may be several plans of training on different topics, and therefore that training should be planned.

For evaluation of the training, the proposed activities are:
- Program evaluation,
- Employees' evaluation, in terms of results and satisfaction, done by the project manager and by the Human Resources department.

Also, during the training process, it has to be mentioned whether the obtained results are maintained- effectiveness analysis.

This can be achieved by monitoring the employees' activity by Human Resources Department.

A final stage of the training is to keep records (they are developed, but they are not appropriate).

Every time the training is developed, the records must be kept in the employee's personal file. The details refer to: the training nature, duration and results of the evaluation, if necessary. Also copies of training certificates must be kept.

Records must include the official training records and records of workplace training. Also, the records should indicate whether it was achieved the level of needed competence.

In Fig. 4, the "Training" process for ITNet organization, redesigned is presented.

```
                                    ( START )
                                       │
                                       ▼
SM                          Identifying the jobs that          Table
                              influence the quality
                                       │
                                       ▼
SM                            Evaluating the
                              awareness level
                                       │
                                       ▼
                          Do the employees
                      have the adequate skills for their    Yes
                                  job?
                                       │ No
                                       ▼
HRD          Job description    No    Enough             Job description
                update    ◄───        information?
                                       │ Yes
                Yes                    ▼
SM           Is the update        Identifying training        List
             necessary?            requirements
                No                     ▼
SM                            Centralization and grouping
                                  requirements
                                       ▼
SM                               Informing HRD
                                       ▼
HRD                          Quarterly training plan          Training plan
                                       ▼
HRD                              Course schedule
                                       ▼
HRD                          Developing stage plan            Stage plan
                                       ▼
HRD                           Lecturer selection
                                       │
                  ┌────────────────────┴────────────────────┐
                  ▼                                          ▼
             Internal                                   External
                  ▼                                          ▼
HRD      Internal lecturer                         Suppliers evaluation    Approved
            selection                                 for training         suppliers list
                  │                                          │             Training plan
                  └────────────────────┬────────────────────┘
                                       ▼
Lecturer                     Developing the training plan
  ▲                                                           Training
Lecturer                        Attending courses             participation list,
                                       ▼                       Training material
Lecturer                       Training evaluation            Training
                                       ▼                       evaluation
Lecturer,                     Attendants evaluation            questionnaire
  SM                                   ▼                       Attendants
                         No                                    evaluation
                               Efficacy?                       questionnaire
                                       │ Yes                   Diploma,
HRD                          Documents development             certificate
                                       ▼
HRD                               Records          ◄──        Training records
                                       ▼
                                   ( STOP )
```

Fig. 4 – The Redesigned "Training" Process in ITNet Organization

6. Conclusions

Although the continuous improvement of the organization's results must be a permanent objective of the economic organization, this does not ensure the fact that an organization will always obtain good results. For an organization to achieve sustained success, it should continuously improve both its processes and results.

To achieve sustained success, it is necessary to implement management systems that enable the organization to obtain sustainable development and success. In order to achieve this, we have considered two important documents:
a) ISO 9001:2008 standard, and
b) the 2009 version of ISO 9004 standard;

Contemporary economic organizations around the world would develop and grow rapidly if they would implement both documents.

As a recommendation, the organizations would gain considerable economic results if the processes would be analyzed not only in terms of ISO 9001:2008 requirements and ISO 9004:2009 guidelines, but also as fractal structures.

The fractal analysis of a managerial process was not developed until now, it was used only for operational process.

Approaching the process as a fractal structure, is a method that can be used to improve processes of any kind. It represents the best choice in terms of workload, of the number of people involved and because it provides accurate solution, in two directions: efficiency and effectiveness.

Acknowledgment

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