

Defining Preventive Action For Improvement Business Process Performances By Using Expert System

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Abstract: This paper presents own approach for improvement business process performances through improvement in area of quality management system by using expert system. In that way it is defining own approach of analogy between quality management system and human body in part of unwilling function. It was used a global approach for looking for arise of nonconformity or anomalies in quality management system. On identified places it was defined preventive action for improvement. Like the support it was realized an expert system which in the exit, depend of input data, give set of measurement for improvement.

Key words: Expert system, improvement, preventive action

1. INTRODUCTION

There are numerous studies that deal with researches of benefits and disadvantages in systems with implemented quality management system. Premises on insignificance of the system of quality regarding improvement of performance are based on allegations that by that system, procedures are over-emphasized through excessive care of implementation or non-coverage by procedures, and real quality is neglected [1,2,3]. However, most researches point to real benefits of ISO 9001 implementation, contrary to those who claim that the price of implementation and maintenance of QMS is bigger than profits realized by it [4,5]. There are negative premises in literature related with TQM model regarding influence on organizational performances, as it is the case with ISO 9001 model too. Such premises point to its inapplicability, and therefore, in this paper and in idea of association of ISO 9001 and the model of business excellence in direction of improvement, comparison with performances of organizations that are winners of the award for excellence as a measure of level of TQM implementation, was pointless. Therefore

author has chosen to point here to pessimistic attitudes and to promote optimistic premises through review and analysis of literary sources related to that subject. [6,7] Include premises that TQM has no efficiency regarding organizational performances. This premises are accompanied by researchers that indicate how it is very hard or almost impossible to establish a relation between TQM and organizational values and believe that such a relation is unreal [8,9].

There are many studies that indicate how TQM model implemented into organizational management is not just effective but also efficient even in terms of financial results of the organization [10,11,12,13,14].

On such defined basis and assertions that present majority in literary sources, and point to positive influence of ISO 9001 and TQM on organizational performances even in the part of finance, an opportunity emerges that improvement in these models would directly contribute to improvement of organizational performances. This is one of directions that this work followed in its realization. Every inconsistency i.e. disagreement with

requests of ISO 9001 model brings results in weakening of quality management system performances and thereby organizational performances. Hereby conditions are created to identify inconsistencies with a term of error and apply the theory of learning based on errors or CBR- Case Based Reasoning in this paper. Through application of this theory or learning based on experiences of others, system is being developed to predict a possibility of error occurrence in identified areas of ISO 9001 and to present measures for preventive action in that direction as to indicate possibilities and places for improvement for organizations. Through established analogy with the human organism and division of its activity to willing and unwilling, an opportunity is created to act upon analogy with e.g. sportsman, and to perform a comparison between middle-class sportsmen (quality management system) and top-class sportsmen (system with the award for business excellence) according to these activities (ISO 9001 standard requests). Thereby it is possible to point to areas that are critical in view of performances and indicate priorities regarding improvements with the aim of achieving top performances.

2. ESTABLISHMENT OF THE ANALOGY BETWEEN THE QUALITY MANAGEMENT SYSTEM AND THE HUMAN ORGANISM

In need to establish the analogy between the process modulated organizational structure and the human organism, so as to create the system that is independent from organizational functions and based only on the process model, following division of man functions was made [15,16]:

- willing and
- unwilling functions.

Willing functions¹ are those dependent on man's profession and performed by man's will. They are variable and dictated by a central control of the organism. For example, when a worker at the construction site lifts his hand, it is not the same as when a referee at the game lifts his hand and etc. Willing functions refer to functions of external motoric organs.

Second category is made of unwilling or automatic functions and their use is given by their very existence. Those are functions that are same in all professions and all people (considering that they exist, i.e. that organism is healthy) and do not depend on the man will but are simply executed. For example, those are functions of secreting enzymes, hormones, heartbeats, and similar, that regulate organism functioning, and functions that cannot be controlled [17,18].

With such a ratio of functions in the organism, we can establish the analogy of the system with implemented quality management system. In order to meet requirements of this paper, only analogy in terms of unwilling functions has been considered. Analogy that regards unwilling functions goes in the direction of:

- Identification of weak spots, namely organizational performances through acquisition of inconsistencies and isolation of critical areas by Pareto method,
- Comparison with top organizational performances in accordance with assessment applied in the competition for the Oscar for quality award,
- Analysis and conclusion on capacities and opportunities of particular area of ISO 9001 standard accordance to business excellence and top form,
- Defining the preventive action depending of on number of nonconformities in area on one hand and degree of readiness on the other hand.

¹ Term "functions" is used in medical terminology, although it is equally correct, to use a term "activities" in view of ISO 9000 standard terminology. For reasons of consistent referencing and use of theories from the field of medicine, the author has chosen to use the term functions.

Analogy established like this justifies the approach to work, which is, just as it is with the man, to monitor process performances in process modulated structure and based on, in medical terms, their condition and diagnostics of non-functionalities, to perform preventive actions in order to maintain the top form.

All functions (willing and unwilling) exist in the organism i.e. they are carried out, of course on condition it is a healthy organism, better said organism that has all organs performing their given functions. Analogically with that, systems observed from the standpoint of this paper are certified quality management systems, which meet all requirements i.e. perform all functions provided by ISO 9001 standard. That is of course confirmed by the certificate relating mentioned referential.

3. APPLICATION OF ANALOGY AND DATA ANALYSIS

Unique database consisting of **1009** inconsistencies, identified in over **350**

organizations was created to meet demands of this paper, and in that way, a basis was found to carry out analysis with the aim of defining critical areas, specificities of an organization and guidelines for improvement in direction of defining preventive measures and decrease of corrective action that would be in the spirit of ISO 9001 standard also. If you consider that there are 500 certificates in Serbia and Montenegro in the part of the most competent certification bodies, then the number of 350 makes 70% out of total number, which indicates significance of the sample for analysis. Inconsistencies represent findings of external revisers who underwent demanding trainings mostly with foreign and competent trainers, which of course increases significance of data for analysis. These inconsistencies were stored in the database classified in relation to requests of standard and activities of the organization by application of realized DSS (*Decision Support System*) i.e. system for the support of decision-making. One of forms of that system is shown in Figure 1.

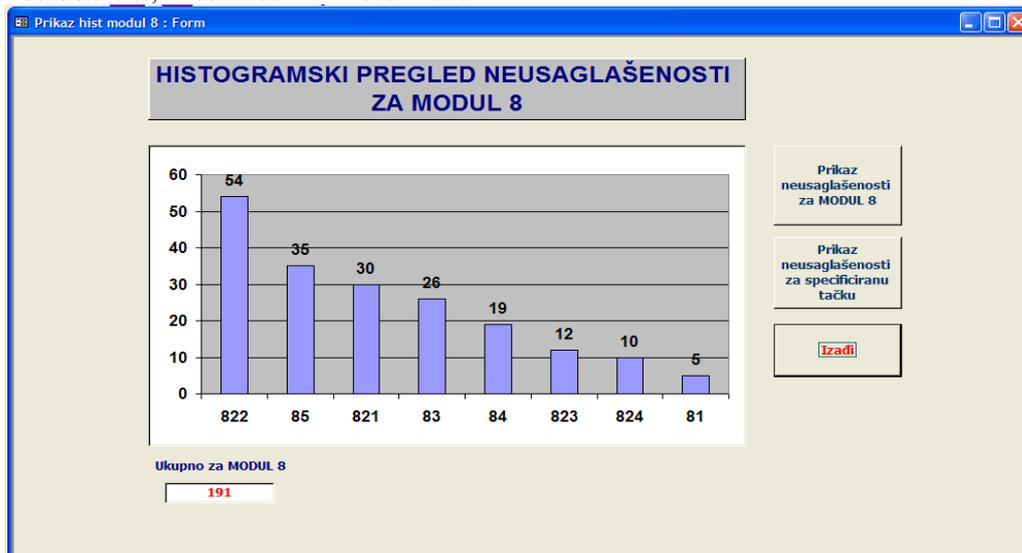


Figure 1

According with analogy with unwilling function, we provide collecting of all nonconformity and his separation by module of ISO 9001 standard. Like the output on the DSS system is histogram view on nonconformities in decreasing mode. On that way it is possible to apply

Pareto method and separate critical requirement of ISO 9001 model or area which is critical according to nonconformities arise and that particularly for all module. That critical area is show in Table 1.

Table 1.

Module name	Critical areas
Module 5	5.6 - management review 5.4 - planning
Module 6	6.2 - human resource 6.3 - infrastructure
Module 7	7.5 - producing and service 7.4 - purchase 7.6 - management by facilities for measurement and attend
Module 8	8.2.2 - internal audit 8.5 - improvement 8.2.1 - satisfaction of user 8.3 - management by nonconformity product

On the other hand, by using methodology AHP (Analytic Hierarchy Process) we are defining significant of particular requirement of

standard based on their importance for organisational performance improvement [19]. Results are shown in Table 2.

Table 2.

Requirement	K_z	Requirement	K_z
823	0.083	83	0.036
821	0.082	52	0.035
85	0.069	81	0.033
84	0.067	822	0.032
55	0.066	73	0.026
824	0.064	61	0.022
56	0.056	72	0.022
53	0.054	42	0.019
71	0.04	76	0.018
41	0.038	62	0.008
51	0.038	74	0.008
75	0.038	63	0.005
54	0.037	64	0.005

K_z – Coefficient of significance

Now, based on presented results and on one side critical of area in part of nonconformity arise and on the other side depend of coefficient of significance for attain business excellence, we can talking or judge about “strength” of measurement for improvement which must be defining for that requirement. Therefore, for the higher level of critically and higher level of coefficient of significant, that must be making a greater or stronger preventive action for improvement this area.

4. IMPROVEMENT OF BUSSINES PROCESS PERFORMANCES BY USING EXPERT SYSTEM

Like one of tools in area of artificial intelligence, which could be using for making the knowledge is expert system. Expert szstem is deferent of other system in area of artificial intelligence because they try to explicitly embody expertise and knowledge by using software [21]. Expert system are also marking

like one of most comercial area and also according to number of project like one of most using tools in area of artificial intelligence [20, 22]. For example, it is predict that for the first part of 21. century, almost 75% of all document in low will be written by help of expert systems [23]. Or some prediction tell that expert system will be of vital signficiant for measurement of quality of product and service [24]. Expert systems is very important and growing area in modern condition of business [25, 26], with special focus on economy in country which is on the high level of development. This research talking about growing trends and significant and usefulness of making one expert systems.

For needs in this papers, like the best solution for developing expert system, we choose the ACQUIRE tool. That is results of analises of all available tools for developing an expert systems [19]. Expert systems which is show in this paper, start from the array of forms which propose a number of answer and through which users input data in to the system (Figure 2). This forms is rotate one after the other dependence of answer and movement through decision tree of expert system

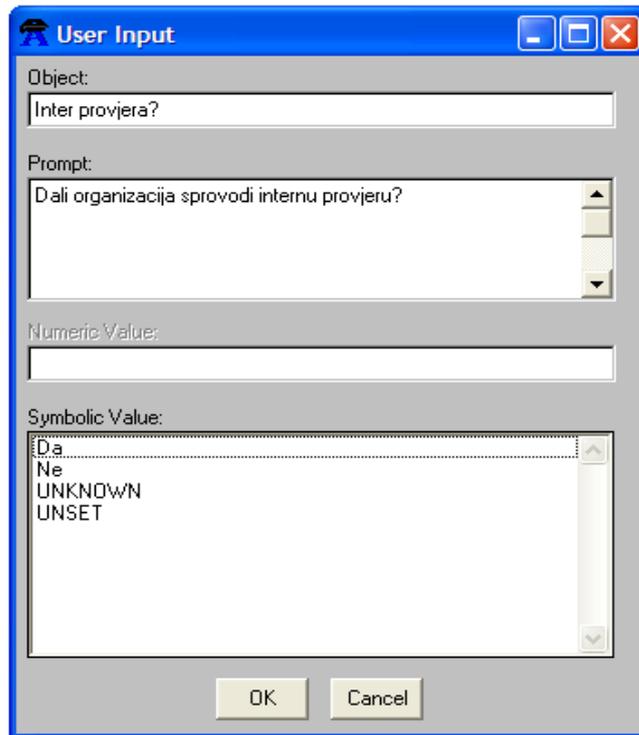


Figure 2.

After number of forms, dependence of answer of users, on the exit this system give propose of preventive

action for improvement (Figure 3) accordance with approach which was presented in poit 3 of this paper.

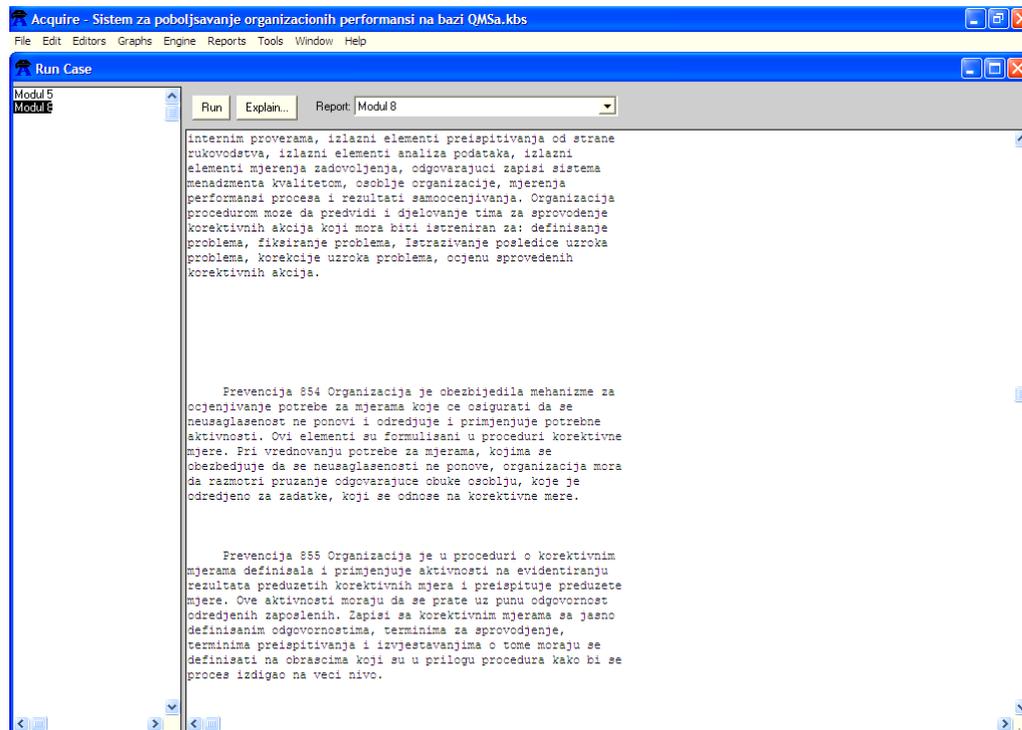


Figure 3.

This expert system give example of preventive action for module 5 and 8 of standard ISO 9001. That is because that module are most critical area. With this paper we would like just to confirm of our idea and approach and not to go in direction of comercial activities. For the defining preventive action according to presented approach, it was use the next sources of knowledge:

- knowledge of one expert from area of management of quality and business process improvement,
- experiance from eleven high level worl organization in area of quality and business process performances [27],
- standard with quidelines for improvement bussines process performances [28],
- best experiance from process of external audit of ISO 9001 system [29],
- experiance and practice of organisation which was involved in competition for Oscar of Qualiyy award [30],
- theory and TQM principle which is present in [31],
- experiance which is presented in [32] and which are show the way for attain a business excellence.

Usefulness of idea for developing this expert system is prove by validation activities in one of most imprtant and prestige organisation in Montenegro in area of quality and business process performances about that

talking next rows of this paper.

5. ACTIVITY OF VALIDATION EXPERT SYSTEM

In part of validation of expert system, it was be provided next activities:

1. cheking of funcionality of expert system in real condition,
2. cheking of expert system on few nonconformity which was find in real condition and analysis of results,

Results is show on Table 3.

3. testing a potencial client and they satisfaction and during that period also it was loking for they sugesstion.

According to: clear defining plan for testing, object in which will plan to provide testing and validation of softver (one of the most successful firm in Montenegro in area of medium service firm) and according to element from standard for evaluation software quality ISO/IEC 9126 - 1:2001, and based on [33], it was defining check list for evaluation of tehcnical and ergonomical characteristic of our expert system. Evaluation was be on scale 1-10 by the expert from previously mentioned firm.

Table 3.

	Category	Average mark	Average mark	Total average mark
Technical characteristic	<i>Short comings of presented software</i>	7.9	8.4	8.6
	<i>Benefits of new program solution</i>	8.3		
	<i>Influence this solution for job organisation</i>	8.9		
Ergonom characteristic	<i>Global ergonom characteristic</i>	8.7	8.8	
	<i>Adaptability of system</i>	8.9		

Softver is equally pozitiv evaluated in term of technical like in term of ergonom characteristics. In that term, this solution have short time of reaction, it is compatabil with most using operativ system, it have great inteface with user, it have easy way for input data and good presentation on exit, installation

is really simple, softer is very competative etc. Based on evaluation and work with system in real condition, management in the firm are express sutisfaction with presented software and his possibilities and indicate to intention to buy software and be involve in future development of software.

6. CONCLUSION

In literature it is possible to find opposite attitudes concerning the influence of quality management system on business process performances. However, the most using attitudes talk about positive influence of quality management system on improvement of business process performances. It could be conclude that any improvement in part of quality management system, lead to improvement in business process performances.

To improvement in quality management system it could be possible to do through analyses of nonconformities and

defining preventive character measurements for needs for »ruggedization« of critical places. So far as it will use analogy with human body and his unwilling function then nonconformity could be grouped. Then it could be possible to find critical area for all firms independently of his type or size.

After that, by using, very faintly or almost not using, expert system in area of quality management, through using methods and techniques for collecting and formalize knowledge, it could be possible to defining preventive action for improvement in area of quality management system and with that also improvement in area of improvement business process performances.

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