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Article

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DEVELOPMENT AND OPERATIONALIZATION OF A MODEL OF INNOVATION MANAGEMENT SYSTEM AS PART OF AN INTEGRATED QUALITY-ENVIRONMENT-SAFETY SYSTEM

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Abstract

The results of the research, presented in this article, have the purpose to contribute in the area of innovation management and its relation to other management systems. The research objective is to give to organizations a model of innovation management system as part of an integrated management system.

Defining the model of innovation management system is based on the four perspectives of the balanced scorecard tool, namely: financial perspective, learning and development, internal processes and customers. In the process of defining the model several steps were taken, such as: literature review, data collection from the enterprise level through a questionnaire, analysis and correlation of data and finally the proposed model has been operationalized.

In order to have a working model that can be easily adopted by any interested company, the research was deepened to the organizational processes, identifying nine processes specific for innovation that exist in an organization. Each of the nine processes have been operationalized using a SIPOC model (Suppliers – Inputs – Process – Outputs – Customers). The system for managing innovation may therefore have a positive influence on the ability and awareness of enterprises in innovation actions, and by defining this model the research conducted in this article helps to improve the efficiency of innovation, with direct implications in business performance.

Keywords: integrated management systems, innovation management system, quality management system, the performance of organizations

JEL classification: O32, M21

Introduction

The results of the research presented in this article come in a period characterized by the globalization of business, this involving many changes in the economy, in communications, in personal and organizational areas. The current socio – economic context is marked by a dynamic which force companies to find new ways to maximize profit and thus increase their performance.

Periods of progress and growth are followed by periods of crisis and economic instability having a domino effect, so the restrictive nature of resources is being felt ever more strongly in terms of a high consumer demand and also the environment protection issue and finding alternative resources is becoming a priority. Significant changes are taking place within companies, generated just by the diversity needs to adapt, the businesses around the world, at local or national specific culture.

Not long ago, quality and productivity were the key elements for the competitiveness of an organization (El Sakka, 2013); today it requires a new strategy: the strategy of innovation – innovation of products and services, innovation processes and production methods, organizational structure innovation etc., all requiring the existence of an adequate management of innovation (Xu, 2010).

Integrated management systems perspective requires the orientation of managers of various organizations toward reformulating strategies and redefine the mission by changing the vision. Integration of multiple management systems brings most diverse benefits for organization, this benefits can be translated into a more efficient organization activity and, consequently, increase business performance.

An organization oriented towards becoming more effective and optimizing the processes and the use of resource has a high chance of becoming competitive in a highly competitive environment. With as many organizations are competitive, the more the whole local, regional or even national business environment becomes more competitive, ultimately leading to increased economic competitiveness.

The existence of an adequate innovation management and its inclusion in an integrated quality – environment – safety management system already implemented, can be considered a viable solution to increase the performance of an organization. The novelty, of the research in this article, is also given in terms of lack of studies for this subject in the literature.

The presentation of the results are structured in three part, in the first part are the results obtained by applying the questionnaire, in the second part the model of innovation management system is presented and in the final part is the process of operationalized it. Before presenting the results a short literature review is performed and the research methodology is presented. The end of the article is reserved for a part of conclusion and discussion.

1. Literature review

Organizations survival and prosperity in a globally increasingly competitive environment is an intense subject addressed in the literature. Researchers have tried to find solutions and methods to meet the new requirements imposed by economic globalization, so it came to the development and implementation of several management systems such as quality management system, information management system, environmental management system, occupational health and safety management system etc.

Managers had to comply with the new requirements and to find solutions in order to resist on the market, in the first phase, and then to become competitive (Brad, 2008). Implementation of various management systems was a solution in this regard. Quality management system already had a huge spread and implementation of other management systems has become just a matter of time (Maier, 2013).

Commitment to produce and offer quality services, to preserve and protect the environment and to take care of the safety and health of employees has become a very important part in the long-term strategy and image of organizations (Olaru, 1999). By addressing these issues, organizations take responsibility for their work and this is felt in trust and loyalty of partners and at the same time the economic indicators are improving (Jorgensen, 2006).

An integrated management system must include both common elements of the chosen management systems and also specific elements whose definition can be performed from the external environment requirements. Regarding the common elements, it appears that approximately 80% of the workload is similar for all management systems, which is the most important argument pleading for their integration (Suditu, 2005).

Integration is the complete harmony and alignment of organization strategy and operations. This means that different departments and levels speak the same language and are tuned to the same wavelength. Most studies in literature on the integration of management systems focused on the integration of quality management system, environmental management system, health and safety management system and the information security management system (Asif, 2008).

The small number of enterprises in Romania that have implemented an integrated management system made us to limit the research only on models of integration the quality management systems, environmental management system and the occupational health and safety management system.

A common part of the three reference documents, is that it takes into account the needs and requirements of customers and also the needs and acceptance of all stakeholders. Each of the three management systems are focused on achieving goals this make measurable the progress in implementing those policies. For this reason, developing and implementing an integrated management system, cannot be achieved without taking into account the correlations that exist between the three management systems (Wilkinson, 2001).

Integration modality is chosen according to the situation in the enterprise at a certain time. The concepts that can be used for integration of management systems, can be: the additional / auxiliary / helper model, partial integration model, common elements model and integration model based on processes (Jorgensen, 2006).

The same global economic context, in addition to management systems it appears more natural and necessary the need for innovation. The importance of innovation for enterprises is felt especially by fierce competitiveness both locally and especially globally. Many specialists (Varis, 2010) states that innovation becomes mandatory not only for success in business but also for the survival of businesses, and in these circumstances any research aimed at introducing innovation into everyday practice businesses is always welcome (Maier, 2014).

The major importance of innovation leads to attempt to develop solutions for easier deployment within enterprises (Piiranien, 2010). Finding solutions is a difficult process just

because of the novelty and hardly predictable nature of innovation. Innovation is by definition creating something new, bringing added value or profit for the enterprise, in the same time innovation requires allocation of resources, both material and human, and the result of the innovative process is difficult to control or predict (Perdomo, 2009).

The research conducted in this article is intended to create some links between innovation and integrated management systems by proposing a model of innovation management system as part of an integrated quality-environment-safety management system. This topic is not yet treated in the literature probably because until recently there was no innovation management system. In recent years it was developed at EU level the Innovation Management System CEN / TS 16555-1: 2013 (Real Cloud Project, 2013). This document was not developed with the intention of being used for certification organizations in terms of innovation, this is part of a series of seven parts to be developed under the general title of Innovation Management.

The successful implementation of innovation management system, proposed by the technical specification CEN / TS 16555-1: 2013 is given by the organization's ability to respond to internal and external conditions influencing innovation capacity and the factors influencing the innovation process at organization level such as: the level of involvement of the organization's top management, the innovation strategy, factors favoring innovation process or different management techniques for innovation (Finn Kollerup, 2015).

2. Research methodology

The main objective of the research presented in this article was to propose a model of innovation management system as part of an integrated quality-environment-safety management system and in this sense the research was divided into several components.

A first component was the one related to identification at organizations level the data on the current state regarding the implementation of integrated management systems, awareness of innovation and its implementation at organization levels and the identification of possible connections between management systems vision and innovation management from managers point of view.

The second component of the research aimed to analyze and identify patterns in the literature of management systems integration and models for managing innovation. The next part of the research aimed at defining and operationalizing the model of innovation management system as part of the integrated quality – environment – safety management system and the significance of this model in the current economic climate.

Data collection among companies in Romania was done through a questionnaire developed by the authors. The studied phenomenon was innovation process and integrated management systems. The statistical community was made up of enterprises in Romania through their specific activity are potential suppliers of innovations and the statistical unit was the general manager or manager with responsibility for innovation or management systems.

The questionnaire was divided into three parts, the first part for identification elements and information about respondents, the second part to identify the existing management systems in the organization, the models of integrated management systems and the main benefits of them. The third part included questions about the identification on each segment of the degree of innovation in the enterprise and the main barriers to innovation.

To establish the sample were used data provided by the Statistical Yearbook of Romania, so were achieved a total of 7988 enterprises in the North-West of Romania by size according to number of employees. It took into consideration a 95% and a maximum permissible error of $\pm 5\%$, so that for 7988 the population of enterprises were obtained a minimum sample of 381 companies. Given the minimum sample size over 500 questionnaires were sent for which was obtained a few number of answers, namely 122 questionnaires completed and validated. Data from the questionnaire did not significantly influence the process of defining the model of innovation management system, it only played a supporting role, for information about the general situation in practice. For these reasons the obtained data were considered in the research although the response rate was very low.

Defining the model of innovation management system as part of the integrated quality-environment-safety management system is based on four perspectives of the balanced scorecard tool, namely, financial perspective, internal processes, learning and development, customers. For the model defining several steps were follow:

- analysis of the literature on innovation management models, at international level and checking for a model of innovation management system or other attempts to create connections between innovation and management systems;
- analysis of the results collected by questionnaire and their correlation with data obtained from literature review to identify the expectations of the direct beneficiaries of the proposed model;
- the effective defining and operationalize of the model of innovation management system as part of the integrated quality – environment – safety management system.

Operationalization of the model was done by extending the research to organizational processes where nine organizational processes specific to innovation were identified. The new organizational processes have been operationalized with a SIPOC template (Suppliers - Inputs – Process – Outputs – Customers).

SIPOC method is an effective tool for analysing organizational processes to improve their action. This summarizes the inflows and outflows of one or more organizational processes in a synthetized form, a table. The acronym SIPOC (supplier, input, process, output, customer) comes from the name of the specific layout information contained in this instrument i.e. suppliers, inputs, processes, outputs and customers. All these elements are found in a tabular form.

The most important information from a SIPOC model refer to the following:

- Suppliers – systems, people, organizations or other sources of material, information or other resources that are consumed or transformed in the process.
- Input – materials, information and other resources provided by suppliers that are consumed or transformed in the process.
- Process – set of actions and activities that transform inputs into outputs.
- Outputs – products or services that the process produce and the customer uses.
- Clients – individuals, groups of individuals, companies, systems and processes downstream processes that receive the outputs.

By choosing the SIPOC method can be created the basis for the processes definition and characterization, for measuring and evaluating them. It creates also the basis for analyzing and identifying areas for improvement or change. Using this method to evaluate the specific

processes of innovation at the organizational level is essential in the process of increasing the efficiency of these processes. The information provided for each process are helpful both to resources management and also in remodeling processes whose outputs are not powerful enough.

3. The research results

3.1 The results obtained from applying the questionnaire

By applying the questionnaire were obtained information about the existence of integrated management systems at the enterprise level. From the received responses a very small percentage, 3% of enterprises had not implemented a management system and in case of integrated management systems almost 70% of respondents had already implemented a model of integration of their own. Most of integrated management systems are made up of quality management system. Implementing the integrated quality-environment-safety management was made in about 40% of enterprises surveyed.

Also by applying the questionnaire were obtained some information about the existing situation on the importance of innovation, the importance of external factors on innovation and even identify issues that lead to block the innovation or significantly influence the decision to innovate.

The main factors that have a negative effect on innovation capacity are those related to corruption, excessive bureaucracy and development of legislative framework. Although these factors do not have a direct influence on the innovation process their impact is felt by the effects for the enterprise, often managers are busy finding solutions to problems caused by these external factors and in consequence there is a lack of time allocation for innovation, the time needed to be transformed into added value and then in to profit.

Benefits that managers have in mind when they want to implement an integrated management system was another item in the questionnaire. It was formulated so that respondents could choose from a list of benefits and to obtain more conclusive choices were limited to a maximum of five benefits of the 11 benefits including the option "Other" benefits that were not listed. Interpretation of results was done by analyzing the number of choices for each benefit separately and are shown graphically in Figure no. 1. In the set of benefits choices, a benefit related to increasing innovation capacity was introduced, aiming to analyze the importance given to innovation and innovation expectations especially in the context of implementing an integrated management system.

Looking at the Figure no. 1 it can be observed that the benefit with the highest percent of choice is the one for a more efficient management system 16%, followed by increasing business profitability (13%) and reducing the maintenance costs for the management systems (11%). The increased capacity of innovation is not considered one of the main benefits of an integrated management system, although the current economic context propels innovation as vital for future businesses. Not considering innovation as part of the integrated management system is yet another reason to find solutions for implementing it in the existing models of integrated management system.

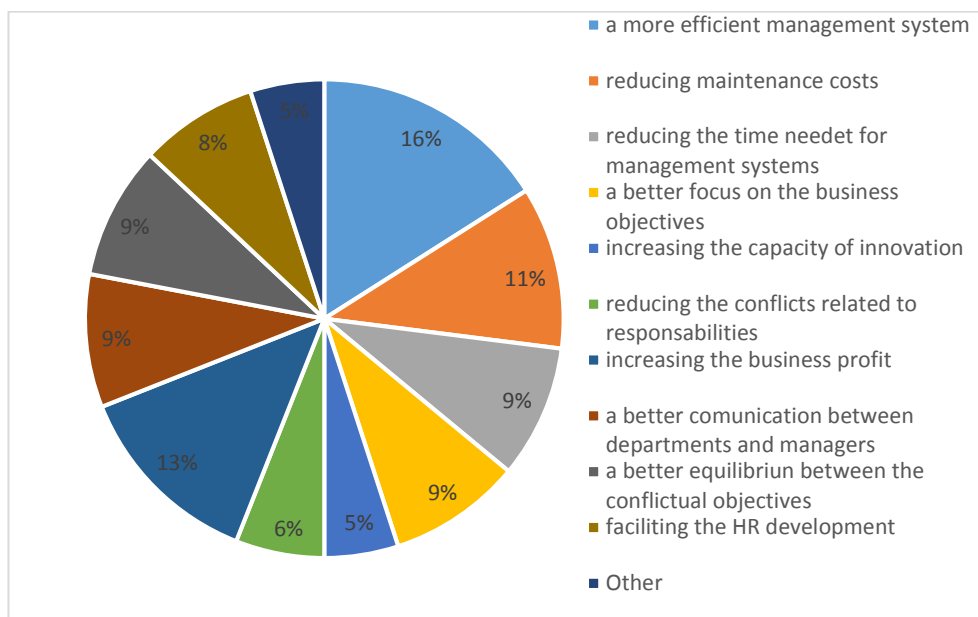


Figure no. 1: The benefits of implementing an integrated management system

Analyzing the results of applying the questionnaire study on barriers that influence the activity of innovation in enterprises, identifies that innovation is not treated as a priority activity, there are several barriers that lead to decisions not to innovate. There is a high percentage of abandoned projects from the design phase, 30%, and most times even if innovation activity is initiated almost 80% of projects are significantly delayed and then abandoned. The main factors that block the activity of innovation are the company's own lack of funds, lack of qualified personnel, the market dominated by established enterprises and even the lack of demand for innovative products. All these factors must be considered in the development of the model of innovation integration as part of an integrated management system.

3.2 Defining the model of innovation management system as part of the integrated management system

The end result of the conducted research was materialized by defining the model of innovation management system as part of the integrated quality – environment – safety management system in a globalized economy (Figure no. 2). The existing model can be seen as a range of tools, techniques and methodologies that help companies to adapt to the market circumstances and challenges, in a systematic way. It can help enhance enterprise performance and can positively influence the outcome of performance evaluation of enterprises in Romania and worldwide.

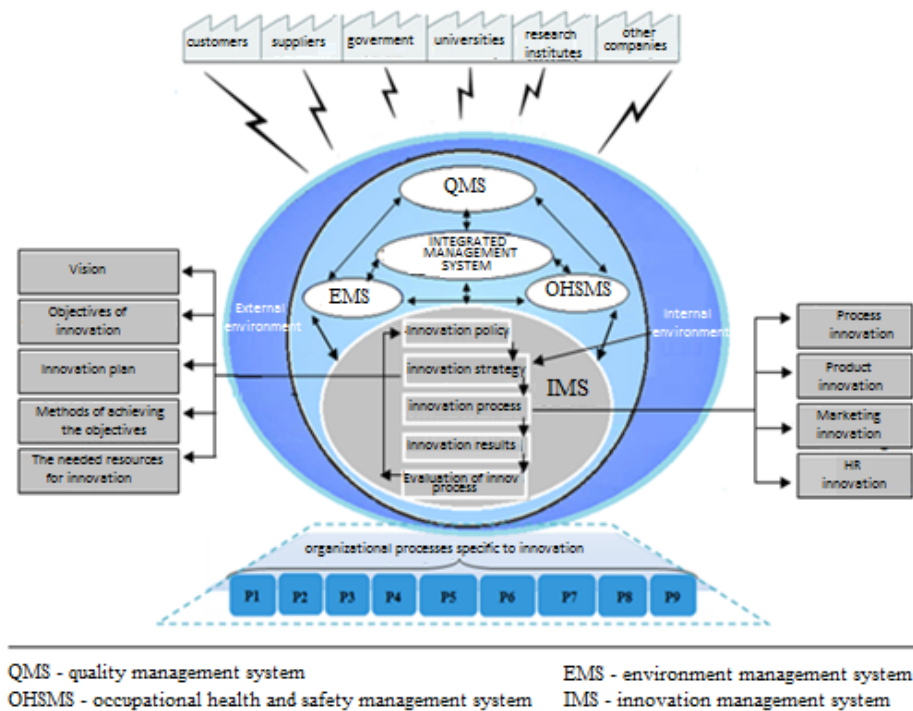


Figure no. 2: The proposed innovation management system as part of the integrated quality – environment – safety management system

The structure of the model shown in Figure no. 2 was chosen to highlight the main features of innovation and the common elements that influence an integrated management system. A number of entities outside the enterprise act and shape the integrated management system, like: customers, as direct beneficiaries of the company activities; the suppliers, that influence the entire activity and possibilities of enterprises; the government, that regulates and restricts the organization possibilities; universities and research institutes, which may have an important role particularly in terms of innovation, and ultimately other organizations active in the market that contribute to the development of the competitive environment and thus causes the enterprise to achieve and exceed its limits.

The research has identified that a strategic approach of the innovation process involves primarily a proactive attitude regarding the characteristics of internal organizational environment and also of the external environment that is in constant change. Thus in the composition of the model of innovation management system are nine organizational processes specific for innovation that will be detailed below. The companies that will use the proposed model must constantly analyze their innovation strategy so that it can meet with the internal needs and to be compatible with the requirements of the external environment, this includes also the requirements of organizations that innovate.

The novelty of the integrated management system is the inclusion of innovation management system and for this reason in order to emphasize this, was presented its main features. It can

be observed that as part of the innovation system composition are: policy, strategy and process of innovation and also the evaluation and results of the innovation process. Regarding innovation strategy is based on vision and the objectives of innovation, innovation plan, the means to achieve such objectives and identify the resources necessary for innovation. When it comes to the innovation process four main types of innovation must be taken into account: marketing innovation, process innovation, product innovation and innovation in human resources.

Another characteristic that can be drawn from the analysis of the model of integrated management system is that all stakeholders should innovate to achieve a high level of performance for the overall system. For each category of stakeholders must be developed specific solutions for each innovation subsystem.

Deadlines embedded in the strategy refers usually to: date of commencing implementation of the strategy, intermediary terms which marks the deadlines of significant progress in achieving the objectives set, the final term of the strategy.

Enterprise resources approach assumes that performance differences between organizations are due to differences from organization specific valuable resources, profitable resources and skills that cannot be easily imitated or substituted. The model of innovation management system, together with the other three parts of the integrated quality-environment-safety management system, it is hoped to be a factor for success in all areas of an organization and also by having the vision of innovation will help to bring added value for the ones that use it.

3.3 Operationalization of the proposed model of innovation management system using the SIPOC method „Suppliers –Inputs – Process – Outputs – Customers”

The operationalization of the model of innovation management system started from a systematic approach, designed to help an organization to optimize its activity processes to achieve more effective results, found in the literature under the name of improving business processes.

The processes approach must be seen from the perspective of the chain value, i.e. each process is influenced by the previous one and brings value to the next one. A purposeful approach particularly in the context of strategic management and organizational management in general, is that the performance of the organization can be seen from the key processes carried out to achieve its goals. The processes are structured as a set of actions, conscious, correlated, geared towards getting a result or achieving a goal, through which a number of inputs are transformed into outputs.

The practical implementation aspects of the organizational processes were done by identifying and formulating nine organizational processes specific for innovation in order to define a model of innovation management system as part of the integrated management system, a tool to increase competitiveness and business success.

The nine processes are: P1 – Identification of ideas to increase competitive advantage through innovation; P2 – Development of strategy and innovation policy of the company; P3 – Implementation of policy and strategy for innovation in the research and development activity within the company; P4 – assessment of innovation impact on customers, on environment and on the activity of the organization; P5 – Establishing the final version in

order to start the innovation process; P6 – Establishment the development plan for the chosen variant by running the innovation process; P7 – Conducting the innovation process; P8 – process of control, monitoring and periodic evaluation of the results; P9 – analysis of the results and proposing solutions to improve the processes for future innovation.

Each process has been introduced in a tabular SIPOC type layout, resulting nine layouts, one for each process. The applying scheme for the SIPOC model is presented in figure no. 3. The results of applying the method for each process is detailed in the following paragraphs.

The first organizational process is *P1: Identification of ideas to increase competitive advantage through innovation*. This is a basic process in providing market position and a favourable level of competitiveness for the organization. Identifying the innovation needs envisages a permanent analysis of the evolution of the business in economic – financial terms, an analysis of the product portfolio, the productivity and quality of products and services, the technological characteristics of equipment, methods, the production processes and recipes used, the assessment of ideas for business development and the increase competitive advantage derived from different sources: employees, external environment, customers.

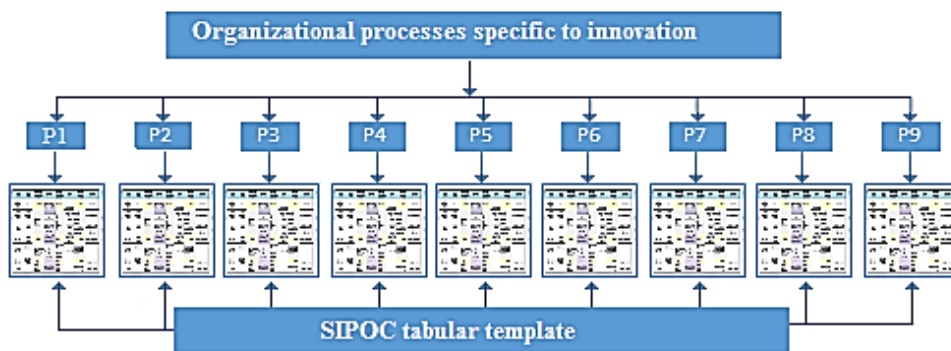


Figure no. 3: The applying scheme for operationalization of the organizational processes through SIPOC method

For the process *P2: strategy development and innovation policy of the company*, without a strategy for innovation, the interest and attention is dispersed. The most innovative companies will be the best of the best. They do not innovate just to even others, they create a vision and a goal that, if achieved, will create products that will prove their superior performance and bring to hold a distinct position in the market.

Organizational process number three *P3: Implementation of innovation policy and strategy in the research and development activity within the company*, comes as a continuation of the process two and aims to develop and transform the ideas of innovation strategy into innovative results for the enterprise such that they bring additional performance to the organization.

The next organizational process is the number four *P4: Evaluation of the impact of innovation on customers, the environment and the activities of the organization*, this process takes into account the analysis of all technical reports, feasibility studies, economic analyzes in order

to choose the variant that will be the subject of innovation. Evaluation has the greatest potential of contribution to innovative technologies and products, when achieving success is not guaranteed and the implementation of the economic agents is not without obstacles.

The next step, after technical evaluation and the impact of innovation is the process *P5: Establishing the final version in order to start the innovation process*. This process involves many specific organizational activities so as to maximize the positive effects brought by innovation.

The organizational process *P6: Establish the development plan of the chosen variant by running the innovation process* is a complex process that has many specific activities such as setting strategy and implementation plan; establishment of scenarios depending on the risks identified; establishing organizational hierarchy, the flow of documents, format documents; procedure for resolving conflicts; determine the accepted risk / failure degree; establishing the management of additional unexpected changes; the safeguards on quality; determining how monitoring post implementation by providing consultancy services and improvement; development during the implementation of studies and / or technical-economic analyzes and assessments.

The next organizational process is the process *P7: Performing the process of innovation*. If all the above processes were conducted in an effective and efficient manner it can be created the premises that all barriers and risks for innovation at this time can be successfully overcome. In this process activities targeting in particular the transition from the idea stage to finite stage by preparing innovation to market.

P8: process of control, monitoring and periodic evaluation of the results requires a technical-economic audit of completed activities and results. This process must take place throughout the implementation period and must be a managerial support to constitute substantially to the technical or economic decisions.

The last organizational process analyzed in *P9: Analysis of results and proposing solutions to improve processes for future innovation*. Substantiation of a rehabilitation or modernization plan for technology in response to the market changes, it is necessary for the decision regarding whether to continue to use the existing technology or focus on the development of new technologies.

The conduct way, the performance, the efficiency and the effectiveness of these processes have a major influence on the success of innovation activity. It can be also notes that these processes are those that influence powerful the other processes upstream or downstream of them in the specific flow of processes in the organization.

Conclusions

The research carried out in this article had its starting point the current socio-economic context characterized by the globalization of business and the challenges that businesses must respond. Innovation is now considered a viable solution to the new requirements in this context.

The purpose of this research was to create links between innovation and integrated management systems by proposing a model of innovation management system as part of an integrated quality-environment-safety management system. The small number of enterprises

in Romania that have implemented an integrated management system is one of the limitations of this research and for this reason the research were concerned only for quality management systems, environmental management system and occupational health and safety management system.

The subject of the research presented in this article is barely addressed in the literature, the authors identified as the main reason for this, that only recently was developed a proposal for an innovation management system, as the one of quality management system.

With the proposed model of innovation management system companies can make strategic planning and implement them, thus highlighting the differences between the actual performance of the company and its objectives.

The innovation management system may therefore have a positive influence on the ability and awareness of enterprises in innovation actions, and by defining this model the research conducted in this article helps to improve the efficiency of innovation, with direct implications for business performance of organizations.

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