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A REVIEW AND ANALYSIS CONCERNING THE EFFECTS OF QUALITY ON INNOVATION PERFORMANCE

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Abstract: *The paper is result of studies conducted at the Center for Quality-Faculty of Mechanical Engineering-Podgorica and it specifically includes a detailed study and analysis of literature sources concerning innovation, quality management systems, total quality management-(TQM). The main objective of this paper is to analyze the current research in the previously mentioned subject areas and to come to certain conclusions that would relate to the specific characteristics, trends and connections in the areas under consideration. The goal is to create a basis for further exploration and definition of hypothesis-based experiments that will be conducted in certified Montenegrin companies. Accordingly, this paper is the first that analyses literature sources about opportunities and benefits of QMS and TQM and development of innovation performance.*

Keywords: *QMS, TQM, innovation*

1. Introduction

Following the changes that are reflected in the globalization of the market, there is a need for development of uniformity, that is, the standardization of products and systems management. In this sense, the standards for systems management are adopted and periodically, according to the needs, revised. In this way a large number of standards is developed in the field such as standards of quality management system, management system, environmental protection, information security management systems and many others.

Quality Management System (QMS) has now become a recognizable guarantee of trust in certified business system. Standard

ISO 9004 directs a business system to the sustainable success. Sustainable success is based on endeavors for constant improvements, learning and innovations. Securing the continuity of success is possible by respecting 8 principles of QMS. The operating systems that want to be successful and make progress in market terms have to be innovative.

Total Quality Management is a philosophy that emerged in the U.S. as an explanation of the philosophy that was used in their companies. Total quality control is the term first used by an American scientist AV Feigenbaum in his book "Total Quality Control" in 1961.

That was the beginning of the development about whose significance, Bill Ginodo, Executive Director Association for Quality Manager said: "The leading companies implement TQM principles - and believe that

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is concept or philosophy for the management of operations." This is a set of principles and ideas for management practice.

Under terms of innovation, in this paper, we do not consider only the creation of high-tech products. Neither it refers only to research that leads to the creation of new products. Innovation in a broad sense means a new approach to work and the attitude toward business and manufacturing processes. In addition, new knowledge and ideas do not lead themselves to the creation of successful innovations. Successful interaction between business, academia and public administration is becoming critically important for the transformation of new knowledge and ideas into commercially exploitable products, economic growth and social welfare. The interplay of these interacting entities is covered by the term "triple-helix" and "innovation system". But innovation is not limited to these subjects.

2. Quality Management System and TQM

Occurrence of such standards and their revisions, certainly are not formal but essential need for adjustment of the application and resolution of any problems that arise in the application around the world. In this sense, ISO 9000 standards for quality systems management is developed. Implementation of quality management system is certainly essential for sustained success of the organization (Pekovic, 2010; Pekovic and Galia, 2009; Grolleau *et al.*, 2009).

ISO 9000 series of standards, which is particularly highlighted in the new edition of ISO 9004, presents a guarantee or success, efficiency and effectiveness. There are a number of studies that address the gains and losses obtained by the implementation of the quality management system (Pekovic, 2010; Pekovic and Galia, 2009; Grolleau *et al.*, 2009). Majority of research points the actual benefits (operational, financial, customer

satisfaction, employee's satisfaction) from the implementation of ISO 9001 what opposed to those who say that the cost of implementing and maintaining QMS - is greater than the profit it achieves (Pekovic, 2010; Pekovic and Galia, 2009; Grolleau *et al.*, 2009). The negative notions are supported by the authors (Abraham *et al.*, 2000; Casadesus and Jimenez, 2000; Romano, 2000; Gupta, 2000; Withers and Ebrahimpour, 2000; Santos and Escanciano, 2002) that consider ISO 9001 mainly in terms of managing defects.

As a logical step, after the implementations of quality management systems, the implementation of TQM model should be considered. TQM is a way of life, culture and thinking. TQM is a framework for improvement and has the power to elevate the organization to unimaginable limits (Krivokapic, 2011). These visions joins TQM explanation - as a systematic approach to management, which aims to continually improve customer value design and constant improvement of organizational processes and systems in general (Rampersad, 2001). The concept of TQM is considered as the best multidisciplinary management for long-term sustainable development of dynamic organization that wants to be the best in the industry. TQM is an approach that improves the competitiveness, effectiveness and flexibility of the entire organization (Oakland, 2004). Values, methodologies and tools of TQM - are the basis for the application of modern organizational models, models of excellence to the integration of different standards in the strategy and policy of the organization (Heleta, 2004).

TQM is a method of gradual improvement of the entire organization, systematic approach through hard work, discipline and self-discipline, intense training, use of existing and new techniques and tools (Rampersad, 2001). TQM approach is based on standards as it is the case of the quality management system, which is based on the ISO 9001 standard. However, in addition to the

approach presented in this paragraph, TQM is based on the ISO 9000 series aiming to deepen its detail. Since there is a need to revise the standards, so it appears the need for modification in the degree of fulfillment of the presented approach, that is, hence the move "the boundaries of TQM".

In order to understand the approach or, as is often cited in the literature, philosophy of the TQM, Figure 1 presents the levels of implementation of TQM (Evans and Lindsay, 1994). Therefore, the zero level of

non-alignment and organizational "wandering" or non-orientation through the application of TQM principles - and come to world class. Such a sequence of events in the implementation of TQM - and, his directions to the superior performance and achievement of world-class, and its permanence and constancy also indicates its importance in the study for the purpose of improving and getting top performance.

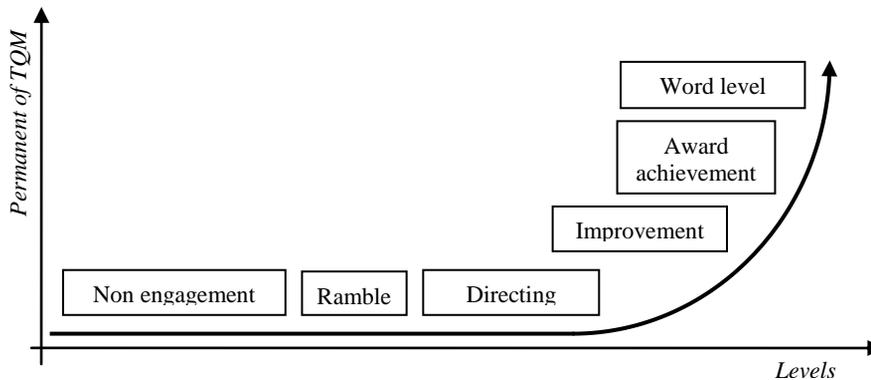


Figure 1. Levels of TQM implementation

Especially, the new approach to TQM - highlight customer satisfaction and shows that every business has four goals which are (Evans and Lindsay, 1994):

- Customer satisfaction,
- Competitive advantage in terms of customer satisfaction,
- Long retention time and
- Gaining larger market.

Hence, the impression is the same as in the standard ISO 9001 that is the main feature of the basis or TQM strategy, customer satisfaction, and predicting its future needs and thus expand the market, which includes improving organizational performance to meet these needs.

3. Innovations

One of the major business segments both in the developed and developing countries is

the promotion in the field of innovation. The concept of innovation can be seen by the definition of innovation as the application of new and improved ideas, procedures, goods, and services, processes that bring new benefits or quality in the application. In a broader sense, innovation makes improvements in the area of:

- Products design (technological innovations),
- Processes innovation,
- Innovation in the field of organization of labor and business operations,
- Marketing
- Innovations of services, etc.

Most widely accepted classification of types of innovation is as follows:

- Product innovation - a product or service that is new or significantly improved. It includes a significant improvement in the technical specifications, components or

materials, improvement in terms of approaching the customer requirements and benefits for the use, or some other functional characteristics,

- Process innovation - new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software,
- Innovation of marketing - a new method of marketing that involves significant changes in product design or packaging, product placement, product promotion or pricing,
- Innovation of the organization - a new method of organization in business practice, workplace organization or external relations organization.

Innovation also represents introducing a new, hitherto unknown product or process, or significant improvement of the existing organizational scheme leading to the development of a new generation of products and their distribution (which contributes to the improvement of social and industrial distribution).

In economic terms, innovation represents:

- The successful creation, development and marketing of new/improved goods,
- Successful application of new/improved technology or
- Mode that leads to improving the efficiency of individuals or organizations.

In terms of complexity innovations can be divided into the following:

- Radical - a completely new product or process that is significant in scientific or developmental sense,
- Incremental - small modifications of the existing technology.
- Adopted - the successful application of existing technology.

Today, Total Innovation Management is applied as a particularly important concept in sustainable business systems. It is the synergy between culture, creativity, technology, business processes and organizational structure. This system is

focused on building excellence and competitiveness. Such system manages to promote the significance of innovations in the organization and relies on four basic principles, namely:

1. Orientation on the user,
2. Employees' involvement,
3. Review and implementation of ideas,
4. Realization of freedom in business and communication.

One such system is implemented through a pyramid structure that is shown in Figure 2.

With the development of innovative capacities in a country one should consider the possibility that the process is localized in a particular space having the greatest potential in that area. In this way, financial investment and the development of human resources would localize or, better to say, focus and would lead to recognition of the locality and to spread of general awareness and culture of innovation across the whole country.

One highly important aspect in encouraging innovation is also the efficient protection of knowledge and support for knowledge transfer. The issue of intellectual property protection is being imposed as one of the main issues to be settled at the institutional and legal level, to ensure equal participation and recognition in the global market. Innovation is recognized as a key element for the recognition and economic development of a country in the global market. These and many other elements that are associated with the notion of scientific research, innovation and entrepreneurship are incentives to many scientists and experts to develop models and provide concrete solutions aimed at strengthening capacity in these areas.

When it comes to improving the capacity of innovation, they should be implemented through:

- Strengthening the mechanisms for the protection of intellectual property,
- Strengthening the mechanisms for following innovative solutions

- (databases, communication within and outside the country, etc.),
- Strengthening the promotive mechanisms,
 - Strengthening the mechanisms of rewarding, incentives, benefits, through
 - the development of national model for the incentive of innovation development,
 - Creating policies of innovation development, which relies primarily on improved human potential, etc.

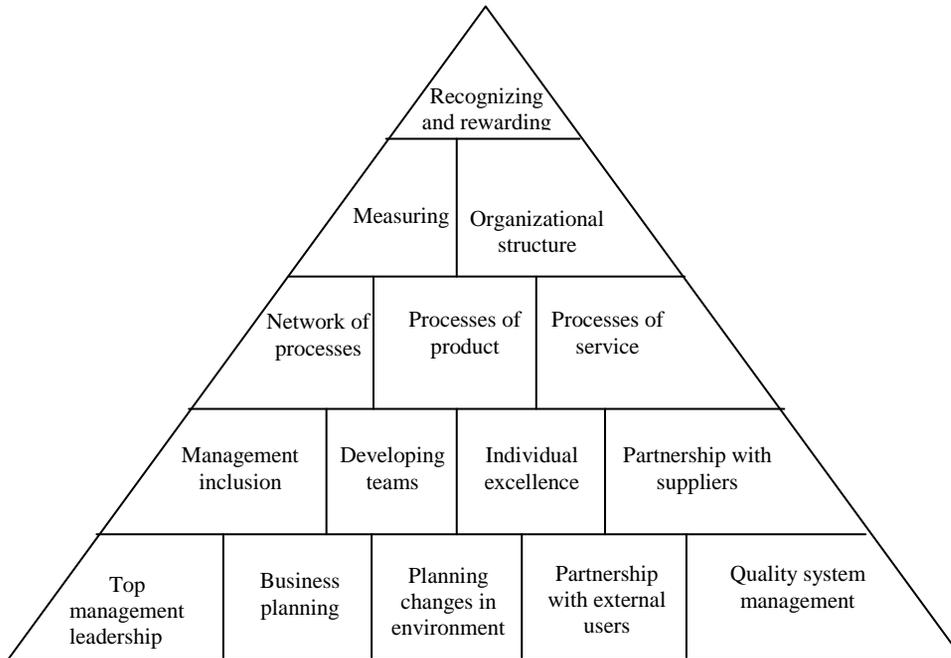


Figure 2. The pyramidal structure of the total innovation management system

Priorities in development of policies to support innovation in developing countries have to be reflected in the following:

- Extraordinary potential in human resources,
- Investment in scientific research and technological development and related activities,
- Strengthening the existing forces and starting the technological modernization,
- Initiating the development of new technologies (information technology, communication technology, bio engineering, nanotechnology, power engineering),
- Strengthening the institutional capacity to support the above,

- Defining the scope for strengthening regional cooperation in development plan of policies for innovation policy innovation, and more.

As previously noted and emphasized, the basis for the establishment of a sustainable innovation system is the establishment of efficient and effective management systems that by the synergistic effect based on the principle of small improvements can achieve synergistic effect and significantly improve organizational performance. The basis of the integrated system should be a quality management system that will through the correct implementation, application and maintenance enable the improvement of organizational performances and functioning of all other associated systems.

4. The influence of Quality Management System on the development of innovations in the organization

Operating conditions that are highly variable and uncertain, especially characterized by the expansion of global market and increase competition, impose an obligation to modern business systems to establish management systems to guarantee their stability and sustainability. The strongest activities are directed towards the establishment of integrated management systems in which operate quality management system. Despite such attitudes, opposite opinions can also be found in the referenced literature in the sense of importance of quality management systems for organization's operations. Under dynamic conditions of market changes, sustainable and quality management system is very important and brings corporate values to organizations, implementation of tools for improving business performances and development of innovation (Heleta, 2004; Lascelles and Dale, 1991). By the application of quality management systems, many successful companies have encouraged the development of innovation in order to adapt and survive under conditions of challenging business environment and thereby develop very efficient and effective quality management systems that specifically develop knowledge management systems for the purpose of improvements and innovations development (Evans and Lindsay, 1994).

It is important to note that the standard on which the quality management system is based during the audit cycles has moved in the direction of promoting the idea of continuous improvements, innovations and goals, and more, leading to the establishment of sustainable and successful business system. Such attitudes lead to realization of cumulative effect and achievement of significant improvements through small financial investment and gradual

improvement of innovation. The strategic approach to managing the organization, which has been discussed a lot about in managerial circles, is not possible to be carried out through radicalization, but by accepting a series of activities that build a process seeking to improve organizational performances (Nair and Boulton, 2008; Svensson, 2006) in an environment where people are a priority in relation to equipment and space. An organization that accepts new ideas and which has restructured old approaches to operations in a quality manner is an innovative organization (Casadesus and Jimenez, 2000). As such it represents a "healthy" participant in terms of business, political, economic, technological, information and other market changes. The need for adaptation and new approaches have to be primarily developed in the management structures in order to, through their missionary function in the company, come to changing of opinions also with all the employees and their absolute involvement in the mainstream of development and the struggle of the company for market and victory over the competition more. Precisely, this environment can be established if the quality management system is consistently implemented, applied and sustained. Newer experiences in establishing sustainable business structures bring new concepts within the quality management system such as the establishment of sub-systems for the measurement within the scope of quality management system. These systems are defined as »Innovative measurement system« and operate within the quality management system (Reiner, 2008). These systems are usually characterized as systems that have the ability to recognize the critical phases in the systems and define innovative ideas that define levels of performances.

A step forward in efforts to establish sustainable and strategically oriented business system also represents the setting of a successor of quality management system or total quality management - TQM. The

continuous improvement and innovation (Koc, 2007; Jha *et al.*, 1996; Imai, 1986) are one of core values of TQM. TQM approach is implemented in organizations mainly after a successfully established effective and efficient quality management system (Muppavarapu, 2011). Such a commitment that must be strategically planned and based, is applied in terms of establishing links between leadership and human resources management for development of innovation performances and capacity, general satisfaction of customer requirements and improvement of organizational performances in general (Sila and Ebrahimpour, 2002; Vujovic, 2006). Also, some scientists believe that by the establishment of TQM approach best business practice can be more easily understood and applied in the world's best companies and which encourages and develops innovative capacities and enables sustainable development (Bugdol, 2005). The application of TQM strategy that builds on a successful quality management system is a guarantee for the establishment of a sustainable system for innovation development and improving organizational performances (Haar, 2008). Consistent to these views are also the attitudes indicating that the TQM model and a system of innovation in business are absolutely two compatible systems that complement and enable progress and organization's sustainability (Feng *et al.*, 2006).

These models underline more attention to the competencies and skills, what is reflected financial gains (Fasil and Osada, 2009). Thus, it is not only enough to know the values of profits in the sense of gain or loss, but also the great importance is achieving the explanation of the driving forces that stand between success and failure. It is highly significant to understand organizational excellence, which potentially leads to business excellence of the organization in the future and innovatively oriented learning organization (Fasil and Hiroshi, 2010). Lots of business performances indicators such as, for example, quality, customer satisfaction,

innovation and market share, may no longer reflect the economic condition of the organization and development than we can do by the report of earnings (Lorente *et al.*, 1999). These and many other attitudes established in the scientific literature and proven in practice show the importance of quality management system and total quality management in achieving sustainable, financially stable, strategically-oriented and innovative business system.

By the implementation of QMS, organizations are becoming much more oriented towards the objectives; respond more quickly to changes within and outside the organization and have the ability to be more open to innovation. However, it should be noted that each implemented QMS does not have to be also effective. There are situations in which the organization does not really pay enough attention to the QMS, but implement it only in order to win a certificate and therefore can hardly expect any significant positive effects. Therefore, the statement is often come across in the literature that only organizations that have the effective and efficient QMS are better predisposed to develop innovation and can expect improvements (Kwai - Sang *et al.*, 2003).

What is the actual market situation and how much QMS actually influences on the development of innovation is evidenced on empirical analyzes and researches of numerous authors. Thus, in the paper (Kanji, 2001) it is stated that the process of standardization does not actually motivating on employees, moreover, it reduces the creativity and inventiveness of employees are increasingly reduced. This statement is quite worry given the fact that innovations are materialized knowledge of employees so that the organization's ability to develop innovations depends on the knowledge and capabilities of employees (Eccles and Pyburn, 2002). Similar results are reached by the authors of the paper (Baronien and Neverauskas, 2005), where they analyzed 194 organizations from Australia and

concluded that TQM in practice does not have a significant impact on organizational performances. Also, the empirical analysis conducted on a sample of 418 Australian organizations (Kondo, 2000) indicates that there is no relationship between QMS practices and innovations. The paper (Baronien and Neverauskas, 2005) based on a sample of 93 ISO 9001 certified organization determined that the QMS affects only the administrative innovation and that there is no significant correlation with technological innovations.

In contrast to all these findings, which indicate that in fact QMS does not stimulate innovation in the organization, there a number of other analyzes that the state completely opposite conclusions. Specifically, this paper (Prajogo and Sohal, 2004) indicates that ISO 9001 promotes innovation, which still depends on the efficiency QMS. In the paper [42] the survey was conducted in 249 Spanish organizations. The survey was conducted in order to empirically provide an answer to the question "Do the management system standards inhibit innovation processes?" The results of this survey are quite encouraging. As many as 64.3% of the organizations found that management system standards cannot inhibit innovation processes, while only 7.2% gave the opinion that the standards of management systems actually inhibit innovation processes. In support of it is the assertion (Jovanovic, 2009) that for the development of innovative processes in the organization, it is necessary to implement the management system standards. The analysis conducted over 252 organizations (194 from Australia and 58 from Singapore) (Castillo *et al.*, 2008) also confirms the positive correlation between the QMS and innovation. Similar claims are proved in the works (Bossink, 2002; Vujovic *et al.*, 2011; Vujovic *et al.*, 2012; Krivokapic *et al.*, 2012; Perdomo-Ortiz, *et al.*, 2006). Using French Microeconomic surveys, (Pekovic and Galia, 2009) indicate that ISO 9000 certification impacts positively certain areas of

innovation performance. The paper (Abrunhosa *et al.*, 2008) an analysis was conducted on 223 ISO 9001 certified organizations and determined that QMS has a strong influence on the development of both administrative and technological innovation but still more present are the innovations in the processes than in the products.

In connection with this work (Martinez-Costa *et al.*, 2008) a large number of European organizations were analyzed with the aim of determining which of the following types of innovation are the most common:

- Products' innovation,
- Processes' innovation, and
- Organizational innovations.

The results are shown in Table 1 where it is note that the most present innovations are in the field of organizational structure, most likely because they do not require significant financial investment and may contribute to promotions leading to better positioning of the organization in the market.

The analysis conducted on 373 organizations that have ISO 9001 certification (Prajogo and Hong, 2008) shows that TQM significantly improves the performance of the organization and thus the development of innovation because by it considers employees as internal users and encourages their creativity and thus indirectly influences on the development of innovations. In fact, in most of the previous empirical analyses demonstrating the correlation of QMS and innovations it is emphasized that a process approach to human resource management privileged by QMS has a significant positive impact on the development of innovations in the organization. Therefore the fact proven by the analysis (Kima *et al.*, 2012) is not surprising, in which it was found that the newer organizations are much more oriented to the development of innovations than the older ones probably due to being unburdened by the results from the past and actually more willing and open to change and

improve.

Table 1. Revealed characteristics and the three models of innovation

Revealed characteristic and the three modes of innovation	
Firms associated with the product-research mode of innovation (No. 218)	
Innovation activities were oriented to the development of new products	100%
Main source(s) of advanced technology is/includes undertaking in-house R&D	90%
Main strength(s) at innovation is/includes 'technological advance & R&D competencies'	81%
Main source(s) of advanced technologies is/includes cooperation with universities or R&D specialists	51%
Firms Associated with the process-technologies mode of innovation (No. 430)	
Innovation activities were oriented to developing new production processes	100%
Main source(s) of advanced technology is/includes acquiring machinery or equipment	93%
Main strength(s) at innovation is/include being the flexibility and adaptability of production to market needs	71%
Main strength(s) at innovation is/include being oriented to efficiency in production methods and making the best use of resources	51%
Firms associated with the organisational-cooperation mode of innovation (No. 719)	
Innovation activities oriented to organisational changes	100%
Main source(s) of advanced technology is/includes cooperations with suppliers or customers	94%
Main strength(s) at innovation is/includes qualifications and professionalism of the workforce	69%
Main strength(s) at innovation is/includes good cooperation practices with suppliers, customers and trade associations	66%

The sample of 60 certified organizations in Montenegro shows that the vast majority of certified operating systems invests in the modernization and recognizes the importance of innovation, but they do not pay much attention to it. In fact, in 80% of the operating systems the innovations are not among the 3 main priorities and in 41.17% none of the documents of business systems contain the concept of innovation (Krivokapic, *et al.*, 2012).

5. Conclusion

Quality Management System as the basis for the establishment and implementation of TQM approach in a dominant number of literature sources is a precondition for achieving sustainable business systems. The prerequisite for this is that the quality management system implemented on the basis of measure, and that the mechanisms for continuous testing and review are constantly promoted. A positive correlation

between quality management system, TQM approaches and innovation, is considered by many literature sources and research. The analyses indicate that the quality management system achieves an environment in which employees are given priority over the equipment.

In this sense, the systems are developed that rely on quality system management called "Innovative Measurement Systems". Also, continuous improvement and innovation are the core values of TQM concept. Research suggests that in terms innovation development, knowledge of staff for knowledge development represents the priority.

The examples indicate that continual improvement in certain conditions, lead to innovations in the organization. This paper aims to underline the impact of QMS on the development of innovation in the organization. The presented selected examples suggest different conclusions

about whether QMS promotes or hinders innovation in the organization. Nevertheless, there are a greater number of empirical studies that prove that the effective QMS

actually has the capacity to contribute to innovation in the organization with consistent compliance with the eight principles of quality.

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