



The Role of Quality Management System in Promoting Innovation in Companies

Marouane Saadia

National School of Business and Management, University Hassan II of Casablanca, Morocco

Abstract:

This article makes it possible to verify the role of quality management in strengthening the innovation process. The first hypothesis, according to which the quality (certification ISO 9001) influences the innovation positively, is confirmed for certain innovation indicators. Another hypothesis indicates that there are the levels of quality which develop the innovation process in diverse ways. The results indicate that for some domains of innovation, the performance of innovation of enterprises that have a very increased level of quality is higher than those of enterprises with an average quality, which in return is higher than those enterprises having a low quality level. Therefore, we discovered that the difference of performance innovation among enterprises having an average quality and those having a low level quality is not significant. This study suggests, thus, that in order to significantly ameliorate its innovation performance, the company must possess a quality system that is solidly established.

Keywords: Quality management system, innovation, propensity score matching.

1. INTRODUCTION

Innovation constitutes certainly a fundamental factor in ensuring the development and the continuous existence of organizations. Conceiving innovative products, develop innovative technologies, predict new modes of organization, or even develop new types of relations with partners (suppliers, clients, inventors...) are few examples which illustrate the different facets of innovation. However, the dilemma which the enterprise has to face nowadays is to structure itself in a way that reduces uncertainty by benefiting from it in order to innovate.

We have moved from a bureaucratic and taylorian – style organizations which, characterized essentially by stability, to another type which knows an increased competitiveness at the level of national and international markets. It is furthermore, the mobility and uncertainty which characterize the organization of the majority of enterprises. As the evolution of many sectors in Morocco taking place, from the automobile or bank sectors, the technical systems, as well as the constant development of employment as an infinite process, the competences are themselves unstable because they are tied by the constant evolution of the nature of jobs and objectives.

In addition, analyzing the functioning of enterprises can not be limited to their capacity of organization, those which consist of programming, standardizing and coordinating tasks. They have also to take into consideration their capacity of innovation which consists of elaborating new combinations among the different resources which the enterprise has in order to react to new constraints or opportunities.

These two logic situations are largely complementary: an enterprise has both to know how to organize itself and innovate. In fact the present literature reveals contradictory arguments regarding the effect of the quality management on innovation process. A first series of results defend the connection between the quality and innovation process, asserting that enterprises which put some quality systems into action, improve also their performance of innovation [1-3]. Another line of arguments support the

*Email: saadia.marouane@yahoo.com

opposite; that the quality hinders enterprises from innovating. These ones possess intrinsic characteristics which are incompatible with the objectives of innovation [4-6].

The objective of this article is to highlight the role of the management approach through quality in the instauration of appropriateness between the analysis of needs and the expectations of clients and the market, their strategies of development, the tools and the resources which they have as a way to develop a culture of continuous development in order to adapt to the evolution of their ecosystems.

The study tries to answer the following research questions:

- How can the initiation of quality be integrated in the process of innovation?
- Can innovation succeed through quality?
- How can quality stimulate the innovation for enterprises?
- This article will present, the first place, a review of the literature concerning the certification ISO 9000, the performance of innovation and the role of quality management in improving innovation process. Then we will present the hypotheses, the methodologies and the results of our empirical study.

2. ISO 9001 CERTIFICATION : DEFINITION AND FUNDAMENTAL PRINCIPLES

In the present study, we will concentrate on the certification ISO 9000 as a reference base of quality level. The ISO 9001 have been created to facilitate the mutual comprehension of the demands of different systems of quality management in national and international exchange.

They are applied to any organization, whatever size it is, its type of products, or the economic sector where it operates. The companies which adopt the norms ISO 9001 have the insurance that the quality of their programs are supported by the practices in the subject of modern quality and are solidly based.

The certification ISO 9001 is a voluntary initiation. It is delivered by diverse organisms of certification called saving organisms, which include public laboratories, organisms of private sectors, enterprises adopting the norms ISO for a long time, professional organizations and auditing cabinets [7]. The certification necessitates a detailed exam and a documentation of the process of the enterprise production, conforming to the criteria of the quality system, specified by ISO. These criteria do not focus on the quality of the product/service, but on the quality of the associated processes, gathering the sum of relations the enterprise belongs to.

The norm ISO 9001 is based on eight principles which define the fundamental values and concepts of marketing and quality [8] (Table-1).

Table 1-The fundamental principles of the standard ISO 9001

Principle	Description
leadership	The managers build the purpose and the orientations of the organism. They aim at creating and maintaining an internal environment where the persons can be totally involved in the realization of the objectives of the organism
Client orientation	Organisms depend on their clients. It's thus clear, that they understand the present and future needs, they satisfy their criteria and try hard to achieve their highest expectations
The approach process	A discount result is reached in a more efficient way when the resources and related activities are managed like a process
Continuous improvement	It is convenient that the continuous improvement of the global performance of an organism has to be a permanent objective of the organism
The involvement of the staff	Persons at all levels are the source of an organism and a total involvement on their part allows using their aptitude for the benefit of the organism
The management through the approach system	Identifying, understanding and managing correlated processes to improve the effectiveness and efficiency of the organism
Factual approach	The decisions are based on the analysis of data
The relationship gain-gain with suppliers	An organism and its suppliers are interdependent and this relation can be mutually beneficial by increasing the capacities of the two organisms to create value

The overview of the existent literature reveals that the certification ISO 9001 can, in a general way present a competitive advantage for an enterprise. Terlaak and King (2006) [9] have noticed a coherent increase in the turnover with signal models which contribute to the adoption of ISO 9001. Terziowski et al (2003) [10] considered that the certification ISO 9001 has a positive effect on the results of the enterprise. Corbett et al (2005) [11] suggest that the certification ISO 9001 brings a significant improvement to the financial results. Diaye et al (2009) [12] reveal that the certification ISO 9001 increases the productivity of the enterprise.

In spite of these successful examples, the certification ISO 9001 presents also some minor inconveniences. Some qualify its application as costly and which may discourage some enterprises, especially the small ones.

3. THE INNOVATION POLICY

Innovation consists of applying an invention or a new idea to an industrial, commercial, social, or an organizational domain. The innovation can be qualified as a major element when it profoundly modifies the conditions of product use or is involved in a technological breakdown. It allows the enterprise to create a breakdown or an upheaval in the market. The innovation is considered incremental when it does not profoundly shake the conditions of use of the technical situation. This type of innovation allows the enterprise to reinforce its offer.

In big enterprises, the process of innovation is more frequently formalized with the objectives and the adapted structure (R and D). In the SMBs it results, as a plus, in an (unplanned) empirical initiation. The OCDE (1996) defines the innovation as “the application of new ideas which create value”, which makes reference to different types of innovation, such as the development of products, the application of new technical procedures, and the new practices in management.

The examination of the existent literature reveals that the measure of innovation can be shown difficult, given an extensive range of innovation activities. However, one of the methods which allow the evaluation of innovation consists of making a distinction between the input and the output of the innovation process. The literature also defines other methods or measurement of innovation as output: the number of innovative products or new applied procedures, the percentage of the turnover ensuing from products or new and ameliorated procedures, results of intellectual possession such as the number of patents, commercial markets, drawing, etc. Concerning the input of innovation activities, the textbook of O'slo (2005) considers that R&D represents the indicator of the base input (OCDE, 2005). The enterprises can engage themselves in the road of innovation for multiple reasons. Their objectives can be related to the products, the markets, the effectiveness, the quality or the capacity to learn and apply change.

4. THE ROLE OF QUALITY MANAGEMENT IN THE PERFORMANCE OF INNOVATION

The literature shows the existence of contradictory arguments about the effect of quality management on the innovation process. The positive effect of the quality management on the innovation process can result in existent similarities between determinants of the quality and of the innovation, internal determinants in particular. In fact, some studies [13] show that, if all the measurements of Total Quality Management are well-linked to the capacity of the enterprise innovation, three of which are neatly distinguished: the management of the procedures, the conception of products and of human resource management. The arguments in favor of this existence of a relation between the management of quality and the innovation suggested, according to which the questions of quality to their functioning and their culture are integrated by enterprises, creates thus a favorable environment for innovation, since the embodying of principles of quality is compatible with innovation [14], [15].

Prajogo and Sohal (2004) [1] have analyzed the role of quality management in innovative product and concluded that the leadership and human resource management exert a significant influence, by evaluating the practices of TQM.

According to the author [3], the TQM influences the performances of R&D in a significant way. The empirical results of Santos-Vijande and Alvarez-Gonzales (2007) [16] confirm that the TQM measurements influence the technical and administrative innovation process.

The authors affirm that the application of TQM contributes actively to giving the paid workforce an important role in the organization management, liable to influence the fundamental beliefs and values of the enterprise in the subject of innovation performance.

All these research studies lead to the conclusion that the TQM exerts a significant positive influence on the degree of newness and particularly on the number of new products and commercialized services. As arguments against the former ones, a lot of authors reject the role of quality management in innovation process, justifying that this one possesses liable characteristics to stop innovation. If the standardization is necessary for matters of conformity and minimization of errors, it can be accompanied by certain rigidity concerning innovation. Furthermore, the standardization can open a disambiguation of the conception of tasks, which serve the innovation. It is translated in other terms as the least flexibility level and the least opening opportunities, given the fact that the tendency it leads to is to reproduce the same behavior.

After reviewing all these studies, we can say that we miss statistical data to conclude that the TQM is correlated to the innovation. In the majority of studies, the authors underline that the presented model translates a linear relation between the concepts of TQM and innovations which is simplistic enough. They conclude by affirming that the links between the TQM and innovation are in fact much more complex.

5. THE EMPIRICAL STUDY

5.1. Methodology

Our study is based on a survey of 50 companies operating in several production and service sectors. The companies were asked about the economic objectives of organizational change and the context in which these decisions were made.

The Companies responded to questions mainly on the category of technological creativity, control of this creativity (innovation projects), the internal and external sources of R&D, the objectives of technological innovation, the main sources of information, cooperation for innovation and the difficulties encountered in the management of the innovation projects.

The second step is to classify companies into three categories, which makes it possible to elaborate empirically the different levels of quality in order to understand their effects on the improvement of innovation performance:

The first category of companies with an excellent quality level and ISO 9001 certification. The second category (medium quality level) includes non-certified ISO 9001 companies but have another certification and whose suppliers are ISO certified. The third category (poor quality level) includes non-certified companies and whose suppliers are not ISO certified.

The third step is to define indicators for measuring innovation. To achieve this, three comparisons allow us to study innovation performance: product innovation, process innovation and innovation activities.

Thus, nine indicators of innovation process can be used (Table-2):

Table 2-Performance indicators for innovation

Product innovation	Process innovation	Innovation activities
Indicator 1: The new or improved product for the company	Indicator 5: Process innovation in general	Indicator 8: Total innovation expenditure
Indicator 2: The revenue generated by new or improved products	Indicator 6: Technologically new processes	Indicator 9: The number of innovation projects
Indicator 3: New or improved products introduced into the market	Indicator 7: New processes (Non-technological)	
Indicator 4: The proportion of new or improved products on the market		

5.2. Assumptions and estimates of propensity score

Our objective here is to study the positive effects of quality systems on innovation performance. To this end, we formulate the following hypothesis:

H1: ISO 9000 certified companies improve their innovation performance.

H2: Different quality levels improve innovation performance in a different way.

However, the position in the quality hierarchy may not be random because it may depend on the individual characteristics of the company. This implies a selection bias. To deal with this problem, we

use the matching method on the propensity score. This method was developed by Rubin (1974). The principle of the method is :

Model 1, T = 1 if the company is ISO 9000 certified and T = 0 if the company is not ISO 9000 certified.
Model 2, T = 1 if the company has an excellent quality level and T = 0 if the company has an average quality level.

Model 3, T = 1 if the company has an excellent quality level and T = 0 if the company has a low quality level.

Model 4, T = 1 if the company has an average quality level and T = 0 if the company has a low quality level.

(T: Treatment)

5.3. Results and discussion

The average of the innovation performance of the sample of companies is calculated according to Table -3.

In order to determine the ISO 9001 certification effect on innovation performance (H1), the estimates after propensity score matching are given in Table-4.

Table 3-Average innovation performance

Performance indicators for innovation	ISO 9001 Certified Companies	Companies not certified	Excellent quality	Average quality	Poor quality
Indicator 1	0.78	0.56	0.98	0.74	0.36
Indicator 2	0.21	0.12	0.22	0.14	0.08
Indicator 3	0.66	0.33	0.58	0.44	0.22
Indicator 4	0.12	0.08	0.08	0.07	0.04
Indicator 5	0.58	0.41	0.58	0.48	0.32
Indicator 6	0.44	0.21	0.53	0.27	0.18
Indicator 7	0.33	0.26	0.29	0.29	0.21
Indicator 8	0.94	0.62	0.98	0.76	0.34
Indicator 9	0.72	0.46	0.76	0.55	0.30

Table 4-ISO 9001 Certification impact on innovation performance

Performance indicators for innovation	ensemble	treated	untreated	Average difference
Effect on the product (ISO certified companies versus companies not ISO certified)				
Indicator 1	0.18 ⁺⁺⁺	0.16 ⁺⁺⁺	0.16 ⁺⁺⁺	0.22 ⁺⁺⁺
Indicator 2	0.08 ⁺⁺⁺	0.06 ⁺⁺⁺	0.04 ⁺⁺⁺	0.08 ⁺⁺⁺
Indicator 3	0.16 ⁺⁺⁺	0.18 ⁺⁺⁺	0.14 ⁺⁺	0.33
Indicator 4	0.07 ⁺⁺⁺	0.04 ⁺⁺	0.06 ⁺⁺	0.04
Impact on processes (ISO certified company versus companies not ISO certified)				
Indicator 5	0.08	0.07	0.08	0.17 ⁺⁺⁺
Indicator 6	0.18 ⁺⁺	0.16 ⁺⁺	0.10 ⁺⁺	0.23 ⁺⁺⁺
Indicator 7	-0.05	-0.06	-0.04	0.07 ⁺⁺⁺
Impact on innovation activities (ISO certified company versus companies not ISO certified)				
Indicator 8	0.24 ⁺⁺	0.28 ⁺⁺	0.22 ⁺	0.32 ⁺⁺⁺
Indicator 9	0.06 ⁺⁺	0.05 ⁺	0.18 ⁺⁺	0.26 ⁺⁺⁺

(⁺)Indicate the importance of the parameters at 10%, (⁺⁺) 5% and (⁺⁺⁺) 1%.

The comparison of the results of the estimates (Table-4) with the results of the propensity score matching shows that the results are different.

In general, the estimates figures are different (higher) than the results of the propensity score matching, confirming some of the effects of the selection. For example, the slight difference of innovative or improved products for the company that adopt ISO certification and those who do not adopt it is 0.22 points (significant value: 1%), Whereas the difference is only 0.16 points (significant value: 1%) for the propensity score estimator. Consequently, the hypothesis that the certified ISO 9001 companies improve their innovation process (H1) is confirmed for some indicators of innovation. In order to verify the hypothesis H2, which consists of the differences between the impact of the excellent quality level and the average quality level on the innovation performance, the estimates after propensity score matching according to Table-5, And to find the differences between the impact of the average quality level and the low quality level on innovation performance, estimates were made after propensity score matching according to Table-6.

Table 5-The effect of the excellent quality level and the average quality level on the innovation performance

Performance indicators for innovation	ensemble	treated	untreated	Average difference
Effect on the product (excellent quality level versus average quality)				
Indicator 1	0.13 ⁺⁺	0.11 ⁺⁺	0.10 ⁺	0.24 ⁺⁺⁺
Indicator 2	0.08 ⁺⁺⁺	0.07 ⁺⁺⁺	0.06 ⁺⁺	0.08 ⁺⁺⁺
Indicator 3	0.10 ⁺⁺	0.10 ⁺⁺	0.09 ⁺	0.14 ⁺⁺⁺
Indicator 4	0.02 ⁺⁺⁺	0.02 ⁺⁺⁺	0.01 ⁺⁺⁺	0.02 ⁺⁺⁺
Impact on processes (excellent quality level versus average quality)				
Indicator 5	0.09 ⁺	0.10 ⁺	0.11 ⁺	0.16 ⁺⁺⁺
Indicator 6	0.16 ⁺⁺	0.14 ⁺⁺	0.18 ⁺⁺⁺	0.26 ⁺⁺⁺
Indicator 7	0.02	0.02	0.01	0.06
Impact on innovation activities (excellent quality level versus average quality)				
Indicator 8	0.24 ⁺⁺	0.26 ⁺⁺	0.23 ⁺	0.22 ⁺
Indicator 9	0.08	0.08	0.06	0.21 ⁺⁺⁺

(⁺), (⁺⁺), and (⁺⁺⁺) Indicate the importance of the parameters at 10, 5 and 1%, respectively.

Table 6-The effect of the average quality level and the poor quality level on the innovation performance

Performance indicators for innovation	ensemble	treated	untreated	Average difference
Effect on the product (average quality versus poor quality)				
Indicator 1	0.25 ⁺⁺⁺	0.26 ⁺⁺⁺	0.24 ⁺⁺⁺	0.38 ⁺⁺⁺
Indicator 2	0.03	0.03	0.04	0.06 ⁺⁺
Indicator 3	0.16 ⁺⁺	0.14 ⁺⁺	0.15 ⁺⁺	0.22 ⁺⁺
Indicator 4	0.02	0.02	0.02	0.03 ⁺⁺
Impact on processes (average quality versus poor quality)				
Indicator 5	0.09	0.07	0.08	0.16 ⁺⁺
Indicator 6	-0.02	-0.03	0.01	0.09
Indicator 7	0.01	-0.02	-0.02	0.08
Impact on innovation activities (average quality versus poor quality)				
Indicator 8	0.28 ⁺⁺	0.36 ⁺⁺	0.20 ⁺	0.42 ⁺⁺⁺
Indicator 9	0.18 ⁺⁺	0.18 ⁺⁺	0.16 ⁺⁺	0.25 ⁺⁺⁺

It can be seen from Tables 5 and 6 that the likelihood of innovation can be categorized as: excellent quality companies, medium quality companies, low quality companies.

More specifically, the results indicate that companies with an excellent quality level are more innovative than those with an average quality level and that these are more innovative than those with a low quality level.

Table-5 shows that for quality-level company, quality management have an important effect on product innovation (new or improved products for the company, sales generated by new products or Improved products and new or improved products marketed), Process of innovation (innovative or improved processes and innovative technological processes), And creative activities (total innovation spending). Consequently, being an excellent quality level company has an important effect on seven indicators of innovation process.

Table-6 concludes that there is a difference between the effects on innovation process of companies according to whether they have an average or lower quality level. Companies with an average level of quality find a positive impact on four areas of innovation among nine, Product innovation (new or improved products of the company and new and improved products introduced to the market) And innovation activities (total innovation spending and number of innovation projects).

Consequently, the evidence tends to prove the H2 hypothesis that different quality levels have a differentiated effect on innovation process.

6. CONCLUSION

This article presents empirical results that corroborate the idea that the measurements of quality management develop the innovation process. This approach is based on the argument that the abovementioned practices, both in their human dimensions is technological, Contribute to creating an environment and a favorable culture to innovation.

In addition, quality systems improve customer orientation, the involvement of staff, Promote regular meetings, and team spirit, as many favorable elements to innovations.

The results of the study confirm that the companies with the highest innovation performance those that are awarded according to ISO 9001.

This is more authentic for companies that, in addition to their own quality approaches, make contact with the suppliers who are themselves engaged in quality approach and are certified.

More the ecosystem is engaged in certification, the better is company's ability to innovate.

However, the impact of the quality approach on innovation performance also depends on the leaders' belief in the merits of the approach quality according to ISO 9001.

The results will be increased if they really integrate the practices recommended by the ISO 9001 standard into the organization's strategy: Customer orientation, leadership, staff involvement, continuous improvement, transverse process approach...

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