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THE PATH OF TOTAL QUALITY MANAGEMENT IMPLEMENTATION IN A DEVELOPING COUNTRY: PERU

Abstract: *This research examines the implementation of Total Quality Management (TQM) in Peru based on nine factors. The questionnaires were sent in 2006, 2011 and 2017 to the presidents and managers of Peruvian companies. The objective is to study the evolution of quality in Peru. The results showed an improvement from 2006 to 2011; in 2011 and 2017 the companies maintained a steady state result.. The Quality Management System (QMS) is a key element used to explain a statistically significant difference in two factors for companies that have implemented or not from 2006 to 2011. However, the studies conducted in 2011 and 2017 had significant differences in all success factors.*

The contributions of this paper are: (a) Information on TQM factors in Peruvian companies in more than a decade; (b) a comparison in three periods (2006, 2011 and 2017) about the implementation of TQM in Peru and (c) the identification of the areas that Peruvian companies need to improve if they want to be more competitive.

Keywords: *Total Quality Management, TQM, ISO 9001, QMS, Peruvian Companies*

1. Introduction

Quality is a very important subject in all organizational process, areas or levels. For this reason, many companies decide to improve quality and implement a Quality Management System (QMS) to have a better performance. Studies in developed countries were conducted several decades ago but in developing countries, the studies are recent.

This research is a case study about Peruvian companies that implemented Total Quality Management (TQM) in three periods (2006, 2011, 2017). The objectives of this investigation are to identify if there is an improvement in the nine TQM factors and, with this information, determine which factors and variables should be improved to enhance the performance of Peruvian companies.

The methodology consisted of sending a questionnaire to the Presidents, General Managers and Area Managers of the companies in Peru.

The 2006 research conducted in Peru demonstrates a poor quality performance. In 2011, Peru improved the quality level and it only obtained a statistically significant difference in two factors (Top Management and Quality Planning) in the firms that have implemented a QMS, as well as those without such system. In contrast, the study conducted in 2017 had significant differences in all success factors.

2. Literature Review

This section has three parts that include a brief summary of Total Quality Management and ISO 9000 concepts. The last part includes

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a discussion on the relation between these two concepts.

2.1. Total Quality Management- TQM

Total Quality Management is a concept used in organizations to improve the quality of a product (good or service). Nowadays, managers and business people take TQM as a set of guiding principles to improve their companies.

The concept of TQM combined three quality management styles developed by Deming, Juran and Crosby. Each author had a particular view about quality, but their visions converged in an important set of common ideas about quality development.

On the one hand, Deming (1986), considered the father of TQM, affirmed that the client's needs defined the quality. In order to satisfy those necessities, each company had to invest in consumer research. On the other hand, Juran & Gryna (1988) defined quality as the client's capacity to demand some characteristics in a product. In their work, they identified three key areas in the decision-making process of an organization: planning, control, and improvement of quality processes. Finally, Crosby (1979) redefined quality as a medium to provide standards set by the organization or industry to have "zero defects".

Several institutions have made another important group of quality definitions. One of them is the International Organization for Standardization (ISO 9000), which defines quality as "the degree to which a set of inherent characteristics of an object fulfils the implicit and explicit requirements" (ISO 9000, 2005, p. 8). This organization also defines the concept of requirement as the "need or expectation that is stated, generally implied or obligatory" (ISO 9000, 2005, p.8). Moreover, the American Society for Quality (ASQ) established two basic meanings. The first meaning conceives quality as the characteristics of a good or service that allows meeting the customers' explicit and implicit

needs. The second meaning stated that quality is a good or service that does not have deficiencies. In addition, according to the standard ANSI/ASQC3-1987, "the characteristics of a product or service that bear on its ability to satisfy stated or implied needs" (ASQ, n.d.).

A current TQM definition proposes it is a management philosophy characterized by principles, implementation, and strategies, which emphasize a continuous improvement in quality. Increase of workers empowerment and performance, support from the top management, teamwork, transformative leadership, supplier management system, and incentives and rewards are examples of this TQM philosophy (Dedy et al., 2016).

Androniceanu (2017) proposed a three-dimensional approach of TQM as a strategic option for achieving business excellence. This author stated, "TQM is both an instrument and a management philosophy that should be approached three-dimensionally" (p. 64). Therefore, it must be address in three dimensions: technical, social, and economic. According to the author, business excellence can be achieved with the professional implementation of the above-mentioned parameters.

2.2. ISO 9000

The International Organization for Standardization (ISO) is an important quality institution headquartered in Geneva, Switzerland. For ISO, the principal goal is to "promote the development of standardization and related activities in the world with a view to facilitate an international exchange of goods and services, and to develop cooperation in the spheres of intellectual scientific, technological and economy activity" (as cited in Pekovic, 2008, p.2). It developed guidelines for quality management, and the firms of the members of European Union (UE) diffused and adopted them.

One of the most implemented standards of ISO is the family of ISO 9000 standards. These standards not only provide guidelines to improve the quality management of a company, but to implement them in almost any kind of industry (Ramesh & Jain, 2013). The first ISO 9000 certificate was issued in 1987, and it was initially adopted by a large number of firms in Europe (Cobett, 2012). In fact, most companies that obtained the ISO 9001 certification operated part of their businesses in Europe and they were obliged to have this kind of certification to prove their quality (Pekovic, 2008).

ISO 9000 family standards specify the requirements to develop an optimal quality management system that can be used internally to obtain certifications or for contractual purposes (INDECOPI, 2010). The more recent and actual standard is ISO 9000: 2015 which is based on the process model concept, and it has eight quality management principles (ISO, 2015).

In addition, ISO 9001 is a certificate that specifies the requirements for QMS, and is applicable to all the organizations that need to demonstrate compliance with the relevant regulations. This rule intends to increase customer satisfaction and is applicable to any organization, regardless of the company size or type (ISO, 2015).

2.3. Relationship between ISO 9000 certificate and the implementation of TQM

ISO 9000 and TQM are the mostly used quality approaches to achieve organizational objectives. In a sample with manufacturing companies in Malaysia, a study showed that, in general, the approach based on ISO 9001 promotes the adoption of TQM practices. In addition, the study results revealed that ISO 9001 and TQM can coexist in a single organization and, consequently are interrelated without conflicts in production organization (Al-Khalili & Subari, 2014).

Another research in Colombia evaluated a sample of 207 companies in relation to the nine success factors. The results found significant differences in all TQM factors between the ISO certified and uncertified companies (Benzaquen and Convers, 2015).

In United States, Aba et al. (2016) conducted a study with a sample of 397 companies that obtained the ISO 9001 certification from 1991 until 2002. In the study, certified and non-certified companies were also included. The authors concluded that there was a significant performance improvement with regard to the year before the certification year. In addition, certified companies had a better performance than uncertified companies.

Benzaquen and Pérez-Cepeda (2016) conducted a research in Ecuadorian companies to analyse the impact of the nine TQM factors in a sample of 163 companies. The results confirmed that ISO 9001 certified companies obtained a better score in the nine TQM factors analysed in the study.

Knežević et al. (2017) studied the implementation of TQM and customers' satisfaction in the hotel sector in Romania. They measured the customers' expectations and results showed that customers who stayed at TQM-certified hotels were more satisfied.

3. Quality in Peru

One of the first institutions interested in the international quality standards was the Peruvian National Society of Industries (SNI, by its Spanish initials). It was established in 1896 to represent the industry and to protect the interests of the private industry. The SNI has focused on the international promotion of Peruvian products in compliance with international quality standards (SNI, n.d.).

A more recent institution interested in those subjects is the Centre for the Development of Industry (CDI), which provides training and technical assistance to companies. CDI is also in charge of an organization that certifies or re-certifies its management systems (CDI,

n.d.). In 1989, the CDI promoted the creation of the Quality Management Committee. At first, four institutions constituted the committed. Nowadays, there are 21 organizations. These organizations signed a cooperation agreement to promote quality in Peru (CDI, 2011).

It is important to note that, in the 1990s, Peruvian companies have had to deal with a different reality. New trends, such as globalization and technological innovations, emerged internationally. Markets had a greater openness, state-owned enterprises became private entities and the country suffered controlled inflation that led to regional integration. These are just some of the significant impacts on the business environment and on consumers' behaviour (Mundaca et al., 2003).

Then, in 2013, the Executive branch of the government created the National Quality System (SNC, by its Spanish initials) and the National Institute of Quality (INACAL, by its Spanish initials). In 2014, the structure was passed into law (Supreme Decree No. 046-2014-PCM published on July 1, 2014). In addition, the National Policy for Quality was approved (SNI, 2014), whose aim is to promote the participation of public and private entities of the National Quality Infrastructure (Gestión, 2014). The system includes the following institutions: (a) National Council for Quality (CONACAL), (b) National Institute of Quality (INACAL) and its technical committees, and (c) public and private entities of the quality infrastructure (INACAL, 2014).

INACAL, as the leading quality organization and the executor of the national quality policy, has the objective of promoting the culture of quality (INACAL, 2017). INACAL's spokesperson, during the National Forum entitled "Crusade for the life and safety of products and services" said that "there are 1,329 ISO-certified companies in Peru of 1'382.899". This is important because it would mean that less than 1% of formal active companies have implemented a QMS.

4. Methodology

In this research, our case study is the implementation of TQM practices in Peruvian companies in 2006, 2011 and 2017. For this purpose, the study compares the surveys conducted in 2006, 2011 and 2017 in Peru. The samples consisted of 245, 212 and 211 companies, respectively. In the three years, the majority were services and medium and large-sized (more than 51 employees) companies, and more than 65% of the respondents were top managers (general managers or presidents).

The questionnaire included a group of key elements identified by academic authors of Principles and Practices of Quality Management, including TQM instruments (Ahire et al., 1996; Rughunathan et al., 1997; Sun, 2000; Zhang et al., 2000; Li et al., 2003; Sila et al., 2002; Li et al., 2003, between others), with some modifications. This instrument or measurement tool of principles and practices allows identifying the TQM level in an organization.

To create the questionnaire, in 2005 a focus group with experts in the field of quality management was conducted. The members discussed and analysed the elements of quality to adapt them to Latin American companies' reality. The idea was looking for the possibility to replicate it in Peru and Latin America.

As a result, a measure of quality management implementation established nine factors, thirty-two (32) variables –as questions- in 2006 and 2011, and thirty-five (35) variables in 2017 (see appendix). These questions are measured on a 5-point Likert scale (1= "completely disagree", 2= "disagree", 3= "neutral", 4= "agree", and 5= "completely agree"). The results are an average of the responses. These were subsequently compared during the studied periods of time.

The nine (9) factors proposed to measure the implementation of TQM are divided into four (4) blocks (see figure 1):

Top Management Block: Mokhtar and Yusof (2010) affirmed that top management has an influence on organizational performance. Top Management is necessary to give a clear sense of direction to employees and to guarantee their companies' policies and systems support the quality and motivation of the leaders in the members, and these actions, in turn, help to increase the performance of quality (Teoman & Ulengin, 2018). The important role of this is clear but as Foster and Editorial Board Members (2019) mentioned, the role of the leader to work with persons with different cultures and, at the same time, managing quality standards could be challenging.

Suppliers block: Fernandes et al. (2014) stated that the good management of suppliers could help companies to be more competitive and specialized. Therefore, the choice and improvement of suppliers, especially with a long-term view, can allow getting fast deliveries, product quality and awareness to customer's needs (Terziovski & Hermel, 2011).

Process Management block: Dedy et al. (2016) pointed out that employee

involvement and job performance influenced by TQM require participative activities to have an adequate process and, most importantly, have a good performance to increase customer satisfaction. Sharing knowledge and experience of quality circles encourage innovative ideas that lead to successful new product developments (Intalar et al., 2018).

Customer block: Kim and Choi (2013) suggested that there is a positive relationship between service quality and customers' satisfaction: when the experience improves, the customer loyalty increases too. In addition, they suggested the importance of monitoring customers' perception in regard to the quality experience. Improve service quality and maintain or increase customer satisfaction are important to form loyal customers (Sitorus & Yustisia 2018). In addition, customer loyalty depends on the degree of satisfaction they have with the product and service instead of their personal characteristics (Stranjancevic & Bulatovic, 2015).

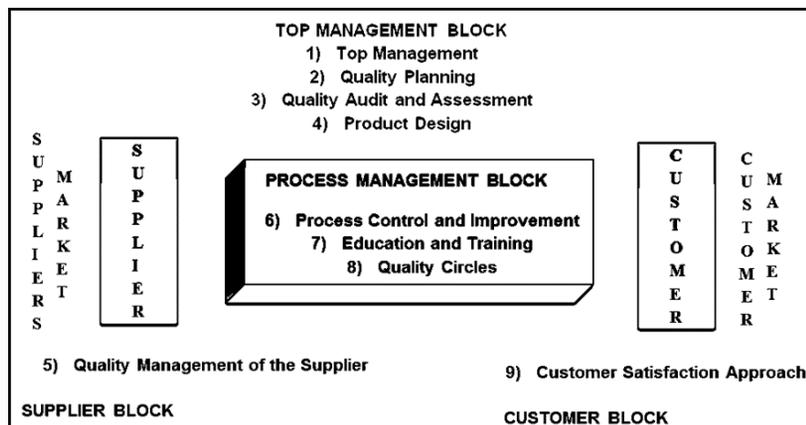


Figure 1. Nine factors model of TQM in business (Benzaquen & Convers, 2015)

5. Research Questions

The main objective of this study is to study the evolution of quality in Peruvian companies in 2006, 2011, and 2017. For this

purpose, we formulated the following research questions:

- [Q1]: What is the performance of Peruvian companies in the proposed nine (9) TQM factors in 2006 and 2011?

- [Q2] What is the performance of Peruvian companies in the proposed nine (9) TQM factors in 2011 and 2017?
- [Q3]: Which factors and variables are necessary to improve the performance in Peruvian companies?

6. Population and sample

In the three years (2006, 2011 & 2017) the populations were selected from the TOP 10,000 companies in Peru. The objective of the questionnaire was to collect the opinions of the Presidents, General Managers and Area Managers about the implementation of Total Quality Management (TQM) in Peruvian companies.

In 2006 and 2011, the surveys were given to 3,000 companies in Peru. 245 and 212 responses formed the study sample, respectively. The study conducted in 2017 had a population of 7,924 companies, and 211 companies' voluntary responses were obtained and used in the study.

7. Results and discussion

This section was divided into two parts

according to the studied periods. The division is also important to understand the differences among the results obtained in 2006, 2011 and 2017.

7.1. 2006-2011 Period

More than 70% of the Presidents or General Managers answered the surveys in 2006 and 2011. In addition, more than 66% were medium and large-sized companies (with more than 51 employers) and more than 55% provided services (Benzaquen, 2013).

There is no information of ISO 9001 in 2006. From the 2011 sample, 60 companies had ISO 9001 certification, while the remaining 152 were not certified. In 2011, the companies with ISO 9001 certification had a significant difference in only two (2) factors: Top Management and Quality Planning.

Figure 2 shows the difference and the variation in the results obtained in 2006 and 2011 for each factor. The comparative analysis between the two years shows a trend towards the implementation of quality practices in Peruvian companies. This result might be the consequence of the economic openness in Peru during the study period and the international trading partners' requirements in the global market.

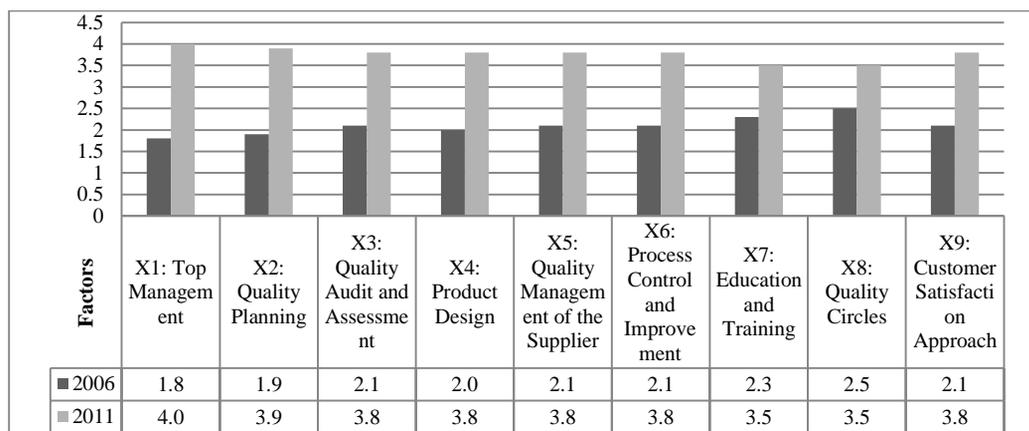


Figure 2. Results of each factor in 2006 and 2011

Note. The interpretation of the values are: From 4 to 5 means that managers are doing what it is asked; the values equal to or higher than 3.5 means that the manager tends to do it; values lower than 3.5 means that managers tend not to do and values from 1 to 2, managers are not doing it

It is important to emphasise that is an evident trend in Peruvian companies since these opted to develop quality practices through the period. The managers were increasingly aware of the importance of quality and the need to implement a QMS in order to become more competitive in a global economy and markets.

Top Management block

The average score obtained for the Top Management factor increased from 2006 to 2011. This is the factor with the most significant change. The results explained the greater focus towards the search for long-term success. The reason for that is the Top Management's commitment, active participation, motivation and the allocation of resources for accomplishing the goals.

Supplier block

Quality Management of the Supplier shows a significant improvement in 2011, probably because of the long-term relationship of Peruvian companies with their suppliers. In 2006, the companies did not perceive that the suppliers' quality was adequate.

Nevertheless, in 2011, companies stated that this is the third most important factor. In both certified and uncertified companies, it is recommended to engage more with the suppliers.

Process Management block

Process Control and Improvement factor in the 2006-2011 period had a significant improvement. The results showed that, in 2006, Peruvian companies did not focus on the maintenance of the equipment. Moreover, the use of quality tools in the process improved in the period from 2006 to 2011, which makes it necessary to promote these tools for the continuous improvement process.

In the Education and Training factor, in 2011, all variables improved. The results indicate that, in 2006, the employees were not very involved in the quality management system of the company, nor did they perceive an awareness of quality; they did not receive

adequate training in terms of quality, and they were not able to use the quality tools. In 2011 had the lower average in peruvian compasnies.

In the Quality Circles factor, in 2006, the variables that had the highest value were the perception that most of the employees knew about quality circles. From 2006 to 2011, it is observed that this factor experienced a significant variation in the perception of the respondents on all the variables, except for the perception that most employees perform quality circles. In 2011, the factor had also the lowest average in ISO 9001 certified and uncertified companies, which could mean that it is not a widespread practice in Peruvian companies

Customer block

In 2006, the respondents stated that they did not evaluate compliance with their clients' requirements and did not have the means to do so. In 2011 conducting customer satisfaction surveys registered one of the highest average ratings in the factor. Thus, it can be deduced that there are efforts to satisfy the customers. In 2011, ISO 9001 certified companies had an improvement perhaps as a consequence of the requirement of customer satisfaction in ISO standard.

7.2. 2011-2017 Period

The sample of 2011 and 2017 consisted of 212 and 211 companies, respectively. In 2017, 65.1% of the survey respondents were Presidents or General Managers. In addition, more than 75% were medium and large-sized companies (more than 51 employees) and 59.3% provided services. In addition, in 2017, 83 companies had an ISO 9001 certification, while 128 companies were not certified. The values obtained by ISO 9001 certified and uncertified companies in 2017 had significant differences in all TQM factors (Benzaquen, 2018).

Figure 3 shows the difference in the results obtained in each factor and its variation in 2011 and 2017. In both periods, the top

management factor is the highest. This is probably because managers encourage the participation of employees and leaders' in quality management to establish comply with the organizational purpose and path. Encouraging participation is essential for continuous improvement in businesses. It can be noted that the Education and Training

factor had a higher variation in 2017. In all the other factors, the values obtained in 2011 are higher or equal, but not higher than 3%. This might mean that, at present, companies are in a steady-state, putting the same emphasis on quality in a period of six years (2011- 2017). This could be understood as a period of stabilization in quality issues.

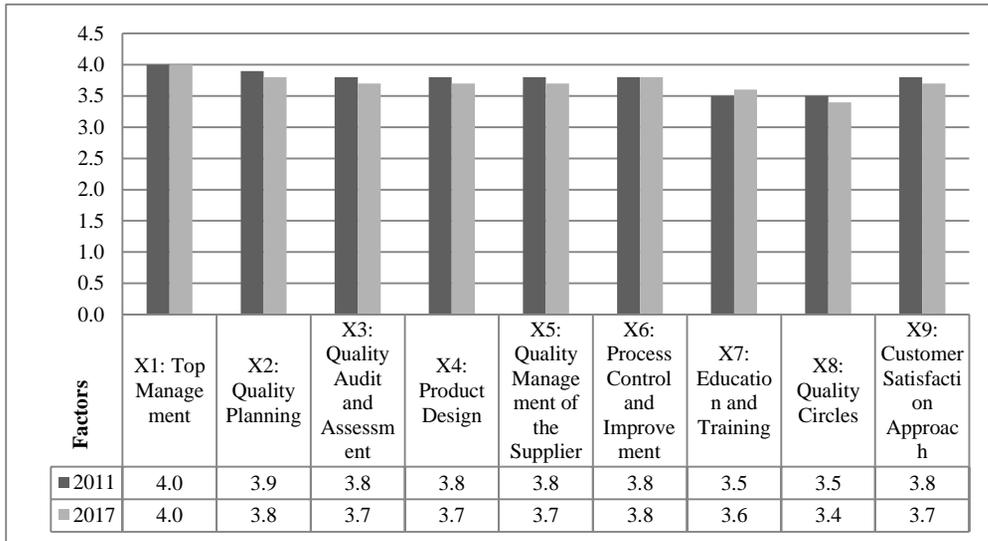


Figure 3. Results of each factor in 2011 and 2017

Note. The interpretation of the values are: From 4 to 5 means that managers are doing what it is asked; the values equal or higher than 3.5 means that the manager tends to do it; values lower than 3.5 means that managers tend not to do and from 1 to 2, managers are not doing it.

In the section below, TQM factors results in 2017, and their relation with the principles of ISO 9000:2015, will be discussed.

Top Management Block

The Top Management factor had the highest score in the variable related to long-term business success. It is important to note that the Top Management tends to work to achieve long-term objectives and to ensure business sustainability. The entrance of Peru in the global market and the need to be more competitive might motivate this. The managers' commitment to quality is driven by the management's leadership, which directly influences the performance in other factors. The ISO certified companies have linked it to the "Leadership" principle of ISO 9000:2015, which states that leaders define the conditions

to involve the staff in the organizational quality objectives.

Quality planning factor: In 2017 ISO 9001, certified companies have a higher average in all the variables because the ISO 9001 standard requires companies to implement quality policies, objectives, and plans.

Quality Audit and Assessment factor: In 2017 just as the other factors, the difference is also significant with or without QMS and the main reason may be that this factor is an essential requirement for a company in order to obtain the ISO 9001 certificate. It is also related to the ISO 900:2005 principle or factual approach to decision-making.

The Product Design factor: In 2017 uncertified companies have to work more on

a method to develop the product. For certified companies, this factor is related to ISO 9001 customer focus principle, since the goal is to meet the requirements and try to exceed the expectations to increase the value and satisfaction through a well-designed product.

Supplier Block

Quality Management of the Supplier factor: In 2017 is the third-highest factor. In the variable related to the quality of the supplied products, there is a significant difference between ISO certified and uncertified companies. According to the results, it can be assumed that companies manage their relationships with suppliers and supply products with an adequate level of quality. It is necessary to continue creating strategic connections with them, to verify that the company's inputs or indirect products (supplier's products) are adequate, and to integrate them into the company's QMS because these have a direct impact on the quality of the business processes and products.

Process Management Block

The Process Control and Improvement factor, in 2017 has the second higher value in ISO 9001 certified companies. This factor is related to the ISO 9000: 2005 "processes" principle because the activities are managed as processes that will be evaluated and improve.

In the factor "Education and Training", there is also a significant difference between uncertified and ISO 9001 certified companies because the later give more importance to the quality personnel training so that they can use the right tools to achieve better quality in organizational processes.

Quality Circles Factor obtained the lowest value of the nine mentioned factors. ISO 9001 certified companies could be influenced by the continuous improvement approach in the organization and customer satisfaction. Both certified and uncertified companies have the lowest value in this factor. It is necessary to improve this activity because it will help to reduce costs, increase teamwork, use the

quality tools in the processes, and improve a culture of continuous quality improvement in the long term.

Customer Block

This factor, as all of them, in 2017 had a significant difference between ISO certified and uncertified companies.

The Customer Satisfaction Approach factor: for the companies with a QMS, this factor is related to the ISO 9000: 2005 customer focus principle, since the company's success lies in attracting and preserving the confidence of customers to create value for them.

Table 1 shows the lowest variables from each of the factors in 2011 and 2017. The variables' values ranged from 3.9 to 3.1. When is equal to or higher than 3.5 to 3.9, this means that the manager tends to do the activity, and values lower than 3.5 to 3.0 means that managers tend not to do it. The studies conducted in 2011 and 2017 showed a percentage difference no greater than +/-3 % among each factor except for the variables "Benchmarking is widely used in the company" and "The company invests in the product design", which have almost - 8% of the variability. Most of the values obtained in the study conducted in 2017 are at the same or less than the figures obtained in 2011.

In addition, there are two topics that Peruvian companies should consider more. One of them is the use of quality tools (flow diagram, Ishikawa or cause, and effect diagram, checklist, Pareto diagram, histogram, control charts, and relationship diagram) to improve the processes, and the other is the quality circles activities to promote communication, teamwork and high performance. The adequate tools to perform quality circles are commonly not used; companies are unaware that this practice generates savings for the company. It is evident that employees should be more involved in quality circles and use the quality tools to meet the business management's continuous improvement objectives.

Table 1. Variables with the lowest values in each factor in 2017

Factors	Variables	Lowest Values obtained in 2017	Values obtained in 2011
Top Management	The top management meets on a regular basis to discuss issues related to the quality management	3.7	3.7
Quality planning	The company pays attention to the compliance and success of the quality policies and plans	3.7	3.7
Quality audit and assessment	Benchmarking is widely used in the company	3.6	3.9
Product design	The company invests in the product design	3.6	3.9
Supplier Quality and Management	The company has detailed information about the performance of the suppliers in terms of quality	3.6	3.6
Process control and improvement	The company uses quality control tools to control and improve the process	3.2	3.1
Education and training	The majority of the company employees receive education and training related to quality	3.5	3.6
Quality circles	The majority of the company employees perform quality circles activities	3.1	3.1
Customer satisfaction approach	The company conducts an annual customer satisfaction survey	3.6	3.6

8. Conclusions

The results obtained in 2006 and 2011, proves that Peruvian companies improved in all key factors. They went from not developing quality practices to develop them. This might be the result of global market demands. It is evident that managers of Peruvian companies were increasingly aware of the importance of quality and the necessity to implement a management system to be more competitive in a global economy and to penetrate more markets.

However, the results obtained in 2011 and 2017 showed that almost all the factors remained or decreased by 0.1 or 0.3 points. Only the Education and Training factor had a higher variation in 2017 (0.1 point). This might mean that Peruvian companies are in a period of stabilization in TQM factors, which is why the factors did not increase. As a conclusion, the nine TQM factors in 2011 and 2017 have a better performance compared to 2006, but the growth stage is over and we are

currently in a stabilization stage.

In the case of the “quality circles” and “education and training” factors, the problem persists because the results in the 2006-2011 period showed that these values were the lowest (each one had 3.5 points in 2011). In contrast, in 2011 and 2017 “education and training” improved in less than 3% points, so it is necessary for companies to continue making these training efforts.

The results in Table 1 show the necessity to pay more attention to the “process control and improvement”, “quality circles” variables to improve Peruvian companies’ competitiveness.

In 2011, there were 63 certified companies with a QMS (ISO 9001) and, in 2017, 83. In both years (2011 & 2017), the total number of companies without ISO 9001 certification is greater than the number of certified companies.

The level of quality with or without QMS, according to the nine TQM factors, in 2011

had only two (2) factors that have significant differences (Top Management & Quality Planning). In 2017, there were significant differences in all TQM factors.

In 2017, from the nine success factors, the Top Management factor had the highest average in certified companies. This factor is closely related to the leadership and customer focus principles of ISO 9000:2015 standard. Companies paid more attention to strategy and leadership issues. The organization's leaders are responsible for implementing and ensuring sustainable quality management in the company. Hence, this might be the reason why certified companies have a greater interest in these factors.

At present, companies shall also encourage the use of the tools to control and improve processes and quality circles in the company. Certified and uncertified companies have a fairly low average in the use of quality tools and quality circles factor. This means that there is a lack of appropriate training to use these tools.

Peruvian companies tend to have ceased to think that quality is a concept only related to the product that can be exclusively measured when the customer receives the product. Keeping in mind that all products are made through a process, firms need to consider more the quality of the processes to be more productive and competitive. In addition, must invest in training to improve the quality of processes. It should be noted that teamwork, communication, quality tools, and quality circles would help to increase the business competitive level.

The study results can encourage Peruvian companies to allocate the necessary resources to obtain ISO 9001 certification (2015 version) as a result of the favourable impact on their products, processes, and, therefore, on customers' satisfaction.

The government, through the National Council for Quality (CONACAL), must enact a law to include the implementation of a QMS as an essential requirement to participate in public tenders. With this, companies will be encouraged to obtain quality certifications and promote a quality culture.

Finally, it should be noted that the methodology can be used in other South American countries and, thus, make comparisons among developing countries in order to identify the strengths and weaknesses in terms of quality. Then we can know the regional situation to improve and implement action plans to close the gaps or overcome the weaknesses.

8.1. Suggestions for future research

The future research studies on TQM implementation should monitor the relevant variables that improve the top managers' and product design performance over the years and identify the best practices to improve quality planning, and audit & assessments.

Moreover, it is important to determine the variables that establish a relationship of trust, improve the logistics processes and the quality of their products, and identify the suppliers' practices used to develop the culture of continuous improvement.

It is important further analyse the importance of survey and the questions of the firms to solve customers' complaints and obtain information that helps improving customer satisfaction.

The most important variables are related to the use quality circles tools, which need to be further studied to increase training, communication and teamwork. It is also important to know how and encourage the use of quality tools helps companies to be more competitive

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Appendix:

Questionnaire

Quality factors	Variables (questions)
Top Management	The top management is actively involved in the quality management of the company
	The top management strongly encourages the employees' involvement in the quality management
	The top management meets on a regular basis to discuss issues related to the quality management
	The top management provides the appropriate resources to increase the level of quality
Quality planning	The top management looks for the long-term success of the company
	The company has specific and detailed goals in regard to quality
	The company pays attention to the compliance and success of the quality policies and plans
Quality audit and assessment	The company involves its employees in the development of the quality policies and plans (*)
	The company regularly evaluates its quality policies and plans
Product design	<i>Benchmarking</i> is widely used in the company
	The company obtains objective data for decision-making
	The customers' requirements are fully considered in the product design
Quality management of the supplier	The company invests in the product design
	The company has a method to develop the product design (*)
	The company has long-term cooperative relationships with its suppliers
	The company has detailed information about the performance of the suppliers in terms of quality
Process control and improvement	The quality of the suppliers' products is adequate
	The company audits or evaluates their suppliers (*)
	The operating process in the company meets the customers' requirements in regard to the delivery time
	The facilities and physical layout of the operational team in the company work properly
	The company uses seven tools of Quality Control for control and improvement of the process (flow diagram, Ishikawa or cause and effect diagram, checklist, Pareto diagram, histogram, control charts, relationship diagram)
	The company effectively implements quality control

Education and training	<p>The majority of the company employees receive education and training related to quality</p> <p>The majority of the company employees are able to use the tools for the quality management</p> <p>The company employees are actively involved in quality-related activities</p> <p>The quality awareness of the company employees is strong</p>
Quality circles	<p>The company is trained to perform quality circles</p> <p>The majority of the company employees perform quality circles activities</p> <p>The proper tools are used to perform the quality circles in the company</p> <p>The quality circles reduced costs in the company</p>
Customer satisfaction approach	<p>The company has the means to obtain information about the customers</p> <p>The company conducts an annual customer satisfaction survey</p> <p>All the staff pays attention to the customer complaints information</p> <p>The company carries out a general assessment of the customers' requirements</p>

(*) Variables added in the 2017 questionnaire