

Measuring the impact of soft and hard total quality management factors on customer behavior based on the role of innovation and continuous improvement

Impact of soft and hard TQM factors

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Abstract

Purpose – Total quality management (TQM) is a part of the total quality assurance perspective. This system, which is considered as a type of managerial philosophy, employs all organizational levels to constantly ameliorate the quality of goods and service. The purpose of this paper is to measure the effect of hard and soft TQM factors on the behavior of customers based on the role of innovation and continuous improvement.

Design/methodology/approach – The research model was extracted from TQM variables in hard and soft parts, customer behavior, innovation and continuous improvement by reviewing the literature and research background. Based on this, a questionnaire was prepared and then, distributed among the statistical population including 374 project managers, quality assurance managers as well as quality control managers by using simple random sampling. All sub-criteria of questionnaire were determined using Delphi technique, to test the research model. Having gathered the questionnaire, the hypotheses were analyzed by using structural equation modeling and AMOS software.

Findings – According to the statistical analyses, TQM has a significant effect on customer behavior through continuous improvement of the quality and innovation. Also, regarding the obtained results, the highest effect was related to the effect of hard TQM factors on customer behavior through innovation as 0.62. Furthermore, TQM soft factors such as human resource management have significant effect on customer behavior through quality improvement and innovation. Moreover, TQM hard factors are effective on customer behavior through quality improvement and innovation.

Research limitations/implications – The questionnaire was designed and distributed in order to evaluate the hypotheses in this study. One of the primary rationales behind utilizing this method instead of other methods such as interview was high geographical distribution of organizations. Using other moderator variables such as knowledge management, customer knowledge management and customer emotions can be conducted in the future in this area.

Practical implications – Changing the organizational relationships from task orientation to the process orientation, and controlling the organizational performance by measuring process innovations and improvements, while paying attention to the customer satisfaction system are suggested in this paper. These implications should be implemented in construction projects by department of project management office. Furthermore, providing different communication for receiving the opinions of the customer and imposing them in the product and service, paying attention to the response system and customer complaint, implementation of this process in the organization, and having a process approach for presenting and developing services are the main subjects in this regard.



Originality/value – Unlike previous studies on this subject, a structural equation model is used for assessing unobservable latent constructs and their related interrelationship in measuring the impact of TQM factors. Focusing on customer behavior which is a broader domain than customer satisfaction through continuous improvement of the quality and innovation is another value of this research.

Keywords Total quality management, Innovation, Customer behaviour, Construction industry, Continuous improvement

Paper type Research paper

1. Introduction

Today's uncertain business environment has led to the emergence of many new business models along with the reinvention of the available business models. These inventions and emergence of new business models are necessary for the survival in an environment where the rules of the game in it continually change (Sassen, 2016). Some of the requirement to achieve competitive advantage are destructive and achieving the competitive advantage in the current changing condition needs the rapid response to environmental changes and flexibility of the organizations which are the characteristics of innovative organizations (Rex and Baumann, 2007). Therefore, having an innovative business model which finally leads to the innovation in the organization, provides this possibility for the organization to provide suitable responses by considering the type and amount of the pressure and environmental threats (Guajardo *et al.*, 2015). Furthermore, total quality management (TQM) with the participation of employees and customers leads to continuous improvement of the quality of an organization (Zeng *et al.*, 2015). This clever and meticulous step toward achieving the organization's goals ends in customer satisfaction, increased purchasing and competitive ability of the organization in the market (Gelbard *et al.*, 2018).

Although purchasing levels are an important part of customer behavior, broader views today emphasize the entire consumption process that includes factors affecting the behavior of customers before, during and after the purchase, thus implementing a comprehensive system that includes all of these factors (Wang *et al.*, 2018). In an organization, the operational setup for implementing a comprehensive system in the organization sometimes leads to the processing of new ideas and ultimately leads to the production and supply of industry or service to the market or leads to a change in organizational processes and innovation.

This concept of quality had been developed from product-oriented quality to the user-oriented quality (which can meet the needs and expectations of the user) which is an important source of quality competition, and a special tool for the long-term growth of the company (Parasuraman *et al.*, 1985). TQM focuses on the user-oriented approach and it is a tool for the strategic follow-up of continuous quality improvement obtained from all the processes. User satisfaction has been considered through different models in order to evaluate user judgment about the service experience (Zeithaml *et al.*, 1996).

Rahman and Bullock (2005) distinguished quality management (QM) dimensions into soft and hard categories. Based on this categorization some new researches are done on the role of soft and hard TQM factors on the customer behaviors (Anil and Satish, 2019; Pattanayak *et al.*, 2017). Furthermore, the role of innovation in the customer behavior is studied in some independent studies (Fidel *et al.*, 2018; Sukwadi, 2017).

On the other hand if TQM philosophies are appropriately implemented in an organization continuous improvement would be an inevitable outcome (Jung and Wang, 2006). Robbins and Stylianou (2010) indicated that organizations must set measurable, specific relationship-marketing objectives and key performance indicators (e.g. retention rate, share of wallet, customer lifetime value and customer satisfaction). Formal feedback and formal evaluation of relationship-management strategies and processes are important for continuous improvement (Ershadi *et al.*, 2018; Vazifehdust *et al.*, 2012). Then two main

mediating factor which their impact on customer behavior are independently investigated are innovation and continuous improvement.

Quality of the construction industries can be defined from the aspect of the owner and designer (Arditi and Gunaydin, 1997). Good appearance, aesthetics are the requirements of the owner, while the legal and functional requirements are for the designers and engineers. (Rajiv and Harinath, 2018). In construction industries, similar to other types of industries, there is difference between the “Quality in perception” and “Quality in fact.” The goods or products, services that meets the specifications, drawings are the quality in fact (Crosby *et al.*, 1990). The goods or products, services that meets the customers’ expectations are the “Quality in perception.” Also in construction industry there is many difference between the process quality and product quality. Product quality refers to the quality of the materials that is used for the project while the process quality refers to the effectiveness of methods that are used (Lau *et al.*, 2015). For example, technology, machineries, methods which are used for the construction works refers to process. The product quality refers to the quality of the materials that go into the buildings such are sand, cement, aggregates, admixtures, etc, that in turn effects the strength and durability.

Although recent studies only considered the basic TQM factors in construction industries (Jong *et al.*, 2019) but an integrated model which considers other main complementary factors has not been developed until now (Ajayi and Osunsanmi, 2018). Thus in this paper two well-known and most effective factors namely innovation and continuous improvement are investigated as mediating role for appraisal the impact of soft and hard TQM factors on customer behavior. Structural equation model (SEM) is employed for analyzing relationship among different dependent and independent variables of the conceptual model. The rest of this paper is structured as follows. Section 2 provides literature review on TQM factors, innovation, continuous improvement and customer behavior. Then Section 3 describes theoretical framework. Research methodology is explained in Section 4. Analysis of data is mainly discussed in Section 5. Hypothesis testing and its results are showed in Section 6. Section 7 presents discussion and conclusion. Finally, Section 8 provides suggestions and recommendations for future researches, respectively.

2. Literature review and hypotheses development

2.1 *The studies about the effects of quality management factors on the performance and results of the organization*

Zeng *et al.* (2015) in a study, identified the soft and hard factors of TQM in the organizational excellence model and studied the relationship between these factors and their effects on the results of the business. Factorial analysis and structural equations, especially least squares technique, was used in this research. In total, 116 private companies were examined in this study. Finally, they identified three dimensions of TQM’ soft factors (management and human resources, participation and resources’ strategic management and process management) and showed that how these dimensions form the management system with a significant effect on the business consequences.

Baidoun *et al.* (2018) developed a framework for TQM assessment in healthcare organizations. Goharshenasan and Shahin (2017) prioritized QM principles based on critical success factors of TQM using multicriteria decision making approach. Dubey and Gunasekaran (2015), in a study investigated the effect of control variables (number of employers, supply and demand uncertainty) on the company’s performance by using multiple linear regression. Four important dimensions of soft QM, including human resources, quality culture, motivational leadership and communication management, were considered for the successful TQM implementation in this study. Results indicated the positive and significant relationship of these four dimensions and performance of the

company as well as the significant effect of control variables on the exploratory power of each soft QM dimensions. Attafar *et al.* investigated the effect of TQM on organizational learning. In an independent research Yazdani *et al.* (2016) studied the similar effect on automobile part manufacturing and suppliers of Iran. In another study in India in the same year, Dubey (2015) studied soft TQM and its effect on the performance of cement production companies. Data in this research were gathered with the researcher-constructed questionnaire. Exploratory factor analysis has been used to extract the hidden soft factors of TQM, and linear regression analysis has been adopted to study the relationship between the discovered factors with the performance of the companies. Results of this study indicated the positive and significant relationship of domestic and foreign partners, quality culture, human resource concentration, perspective leadership with the performance and consequences of the companies. Chiarini (2016) studied the effect of TQM' social factors on the organizational consequences by using TQM technical factors as the mediator variable in the relationships. Findings of this research showed that TQM' social factors are important basis for the success of the quality system. TQM' technical factors encompass somehow the relationship between social factors and TQM' quality. The results also reveal this fact that social factors and managing TQM processes are the major predictions of operating performance and there is a considerable difference between the implementation of TQM and key consequences of the companies based on their size.

2.2 Studies on the effect of quality management factors on innovation

Zeng *et al.* (2017) studied the relationship between soft and hard quality TQM factors with innovation by the intervention of quality performance as a potential moderating variable. Data from 283 factories from 8 countries were used. Structural equations model was used for data analysis. The findings of this study indicate the direct relationship between hard TQM and innovation performance, and the indirect relationship through its effects on the hard quality performance. Therefore, quality performance has a partial moderating effect on the relationship between hard TQM and innovation performance. It is concluded that companies need not to leave aside the QM to achieve innovation. It is recommended that companies establish an integrated QM system and appropriate performance measures. Staub *et al.* (2016) considered the effect of the organization identity on stability and innovation strategies. This study examines six organizational aspects (soft and hard) and four innovation strategies' aspects. The structural equation modeling indicates the effect of soft organizational identity on the innovation in the market and innovation in the process, although hard organizational identity influences the organizational innovation, innovation in the market, innovation in the process and innovation in the product. Innovation influences the process and innovation in the product also influences the sustainability of the company; organizational identity is effective on stability. This study emphasizes that organizations should develop innovative strategies for the stable performance, and especially, hard organizational identity. Bon and Mustafa (2013) studied the effect of soft and hard quality factors on the service innovation and organizational performance. They examined the effect of soft factors on the hard factors, the effect of each soft and hard factor on service innovation and organizational performance in the presence of hard factors as the moderating effect and finally, the moderating effect of service innovation on the relationship between quality factors and organizational performance. A sample consisted of 318 operators filled in the researcher-constructed questionnaires and the obtained data were tested by using the structural equation modeling technique. Results of this study indicate the innovation improvement in providing services and organization performance caused by quality factors, while service innovation has a positive effect on organizational performance. Therefore, telecommunication operators should consider quality factors as well as innovation in services in order to improve organizational performance. Bourke and Roper (2017)

studied the short-term and long-term effects of innovation and QM in Irish companies. This study has used econometric analysis to examine the effect of short-term and long-term acceptance of quality improvement methods on the product innovation which indicates destructive short-term effect and useful long-term effect, respectively. The results of this study show that maximizing innovation application and quality improvement needs the attention to the soft or hard nature of individual quality improvement methods, scheduling and acceptance sequence. In another study by Zeng *et al.* (2015), the relationship between related organizational factors (the power and integration concentration among functions) in two soft and hard dimension of QM and innovation performance was studied among 238 factories in three industries of 8 different countries. Results of this study indicate the moderating effect of both hard and soft QM on the related organizational factors and innovation performance. These results also show that the hard TQM is directly effective on the product innovation space.

Esmailpour and Barjoei (2016) studied the relationship between TQM and product innovation by considering the mediator variable of business innovation capability in the food industries of Gilan. The results of correlation analysis and regression also showed the mediator role and moderator role of business innovation capability in the relationship between TQM and the product innovation. Therefore, TQM improves and promotes product innovation through its direct and positive effect on the business innovation capacity. The interaction between TQM and business innovation capacity would change the direction or intensity of the effect on the product innovation. Ramezani *et al.* (2016) examined the role of business innovation capacity in the relationship between TQM and innovative technology in Guilan province industries. The data on this study were gathered by using a questionnaire distributed among 119 companies in Guilan province. Pearson correlation, regression analysis and structural equations modeling were used for data analysis. The results indicate that there is a direct and significant relationship between TQM and innovation capacity. The mediator role of business innovation capacity between these two variables was proved by using mediating regression, although the moderator role of business innovation capacity between two variables was not confirmed.

2.3 Studies on the effect of TQM factors on the customer behavior

Mashhadiabdol *et al.* (2014) studied the effect of TQM on customer behavior through production symptoms, financial symptoms, innovation and quality in the agencies and after-sale service center of Bahman Group. The analysis of the results showed that the effect of TQM on the customer through quality and innovation was positive and high, and through production and financial symptoms was also positive and significant. The relationship between TQM and customer satisfaction was studied by Rahmani Norozabad and Rostami Norozabad (2014). The data were gathered in this field research by Fuentes *et al.* standard questionnaire distributed among 135 managers and employees of Sanandaj province companies. The relationship between research variables was analyzed by the structural equations modeling. The results indicate that concentration on the customer, continuous improvement and teamwork have a positive significant relationship with customer satisfaction.

Fai Pun and Jaggernath-Furlonge (2012), in a study, examined 90 Egyptian food companies. This study has used exploratory factor analysis to extract the hidden factors, and linear regression to study the effect of soft and hard TQM factors effect on QM benefits. The analysis of the modes confirmed the binary characteristics of TQM (soft and hard elements of TQM) in the food companies as well as the internal and external quality advantages. The results indicate the direct effect of soft TQM factors on quality improvement, employees' advantages and customer satisfaction. This is while the hard TQM factors indirectly impose their effects on QM advantages through the soft factors.

3. Theoretical framework

The model proposed in this research was developed based on the studies conducted on the effect of TQM factors on the customer behavior which were reviewed in Section 2. Innovation and continuous improvement were considered in this model as two main moderating factors which their mediation effect on the effect of TQM factor were investigated. Figure 1 demonstrates research framework in which soft factors and hard factors of TQM are independent variables where their effects on customer behavior are investigated. Thus the customer behavior is identified as dependent variable in this research. Because of the importance of innovation and continuous improvement, the effects of these two moderators were studied in this research. Figure 1 shows the effect of soft and hard factors of TQM on customer behavior after their effect on moderating variables. Based on this conceptual model, the research objectives and hypotheses could be defined, which were shown in the next subsection.

3.1 Theoretical framework and hypothesis development

According to the studies, reviewed in Section 2, although there were researches investigating the effect of TQM factors on customer behavior, extending this effect by considering innovation and continuous improvement as two mediator variables has been rarely studied. This study was conducted in order to fill the research gap through studying the effect of soft and hard TQM factors on customer behavior by defining the moderator role of the innovation and continuous quality improvement. Furthermore, determining the criteria of TQM factors influencing on customer behavior was another objective of this research which was achieved using Delphi technique (as discussed in Section 4.2). In the next section main criteria of soft and hard TQM factors are presented which were extracted from literature review and then were categorized. Following in this subsection, the research main hypothesis and sub-hypotheses are presented.

3.2 Research main hypothesis and sub-hypotheses

Most of the prior studies have focused on the effect of TQM on customer behavior (Anil and Satish, 2019; Pattanayak *et al.*, 2017; Mashhadiabdol *et al.*, 2014; Rahmani Norozabad and Rostami Norozabad, 2014). However, some studies investigated the relationship between TQM and innovation and continuous improvement (Zeng *et al.*, 2017; Staub *et al.*, 2016). Therefore, the main hypothesis of this research was suggested as follow:

H1. TQM has a significant effect on customer behavior through continuous improvement and innovation.

According to the study by Dubey (2015), TQM has main effect on improvement of the organization. Similarly, Goharshenasan and Shahin (2017) investigated success factor of

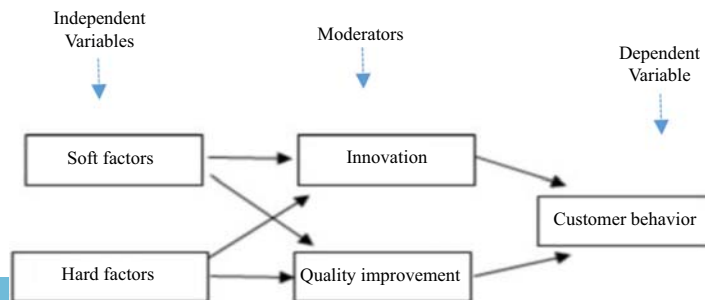


Figure 1. Conceptual model of research variables

TQM on organizational performance. Also Fai Pun and Jaggernath-Furlonge (2012) studied the effect of TQM on customer satisfaction. In the light of the above main hypothesis the following hypotheses were proposed:

- H1a.* TQM soft factors have significant effect on customer behavior through quality improvement.
- H1b.* TQM hard factors have significant effect on customer behavior through quality improvement.

The relationship between soft and hard quality TQM factors and innovation has been studied by Zeng *et al.* (2017). Bon and Mustafa (2013) developed a model for studying on the effect of soft and hard quality factors on the service innovation and organizational performance. Hence, according to above the following hypotheses were proposed:

- H1c.* TQM soft factors have significant effect on customer behavior through innovation.
- H1d.* TQM hard factors have significant effect on customer behavior through innovation

Based on the main hypothesis and its related sub-hypotheses, research methodology is presented in the next section.

4. Research methodology

As explained in the previous section, the main objective of this paper was to investigate the effect of TQM factors on customer behavior through mediation roles of continuous improvement and innovation. To do this, a conceptual model was developed which was described in Section 3. Research methodology employed for analyzing the research hypotheses was comprised of six steps, and it is shown in Figure 2.

The statistical population of this research included all major construction contracting companies in Tehran, Iran. The sampling was done by distributing the questionnaires among the

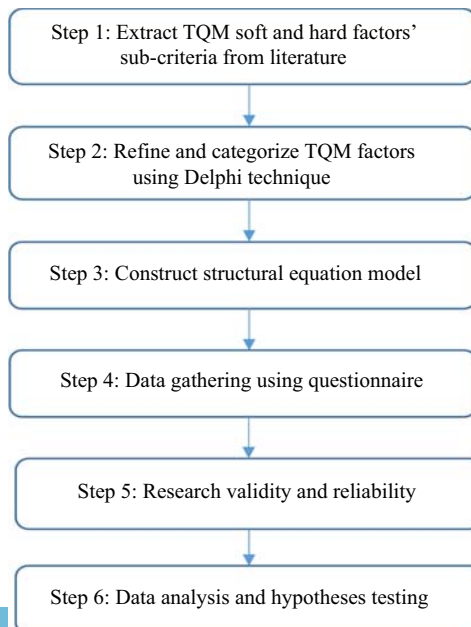


Figure 2. Steps of the research methodology

project managers, quality assurance managers and quality control managers. The cumulative number of these experts which are employed in the registered firms in government website was about 100,000. Therefore, the population size was equal to 100,000 and using Cochran's formula the sample size was obtained, which was equal to 384. Out of this sample, 65 percent were men and 35 percent were women. In total, 72 percent of them had BA degree, 22 percent had MA degree and only 6 percent of them had PhD degree. The highest job experience was reported to be between 4–7 years which accounted for 29 percent of the sample size, followed by 11 years (26 percent), 1–3 years (24 percent), 8–11 years (18 percent) and less than one year of job experience, respectively (2 percent). The sample constituted of 50 percent project managers, 30 percent quality assurance managers and 20 percent quality control managers.

The questionnaire consisted of questions about demographic information and specific questions based on the literature and the extracted criteria from the Delphi panel. The questions were designed to evaluate the effect of the TQM hard and soft factors on customer behavior based on the mediation role of the innovation and continuous improvement. The respondents were asked to specify their responses in a questionnaire using five-point Likert scale (Table I).

4.1 Extracting TQM soft and hard factors

By reviewing the related studies, and with aim of designing a questionnaire and extracting sub-criteria of soft and hard factors, a summary of the reviewed papers was prepared, and it is presented in Table II. Then, sub-criteria were determined based on the highest frequency in the reviewed papers.

4.2 Refining TQM soft and hard factors using Delphi technique

Delphi technique was used in order to ensure the agreement of attitudes and opinions of experts about the criteria and sub-criteria of the questionnaire. The procedure of two rounds of Delphi which have been applied in current research is briefly described as follows.

4.2.1 Selection of expert panel. In this paper, the Delphi technique panelists with more than 10 years working experience, who met the criteria of working in relevant organizations in the construction industry were selected. Having sufficient expertise in both QM and project management was another criterion. In this stage, seven experts are identified for Delphi technique.

4.2.2 Round 1: listing and ranking TQM soft and hard factors. In first round, sub-criteria which were extracted from Table I were distributed to the experts. TQM soft factors which were listed in this step were leadership and perspective; cooperation and relationship with suppliers; human resources management and education. After the completion of the first round survey, the measures were carefully analyzed and a list of ranked TQM factors was formed. At this stage, a five-point Likert scale was used, which ranged from 1 “not important,” 2 “less important,” 3 “moderate,” 4 “important” and 5 “very important.” In this research, the mean score of 3.0 was adopted as a cut-off point. Focus on customer as a factor is suggested as TQM soft factor.

4.2.3 Round 2: re-assessment and final ratings. In the second round, the experts were asked to reconsider the ranking of the factors for the last time, after they were provided with the first round results. The responses were analyzed and finally the questionnaire is composed of sub-criteria to test the dimensions of research model (Figure 3).

Item	Very low	Low	Average	High	Very high
Score	1	2	3	4	5

Table I.
Likert scale

Literature	Strategic	Quality date	Education	Continuous improvement	Computer-based technologies	Leadership and perspective	Process management	Human resources management	Cooperation and relationship with suppliers
<i>Hard factors</i>									
Measuring the impact of soft and hard quality practices on service innovation and organizational performance (2016)		1		1	1		1		
The impact of hard and soft quality management on quality and innovation performance: an empirical study (2014)							1		
The impact of organizational context on hard and soft quality management and innovation performance (2017)		1							
The effect of quality management' soft and hard factors on key consequences of the organization (2016)	1						1		
<i>Soft factors</i>									
An insight on the soft TQM practices and their impact on cement manufacturing firms' performance: does size of the cement manufacturing firm matter? (2013)						1		1	
Exploring soft TQM dimensions and their impact on firm performance: some exploratory empirical results (2014)								1	
Measuring the impact of soft and hard quality practices on service innovation and organizational performance (2016)			1			1		1	2
Measuring the impact of soft and hard quality practices on service innovation and organizational performance (2016)			1			1		1	2

(continued)

Table II.
Frequency of sub-criteria in previous researches

Table II.

Literature	Strategic	Quality date	Education	Continuous improvement	Computer-based technologies	Leadership and perspective	Process management	Human resources management	Cooperation and relationship with suppliers
Quality management benefits through hard and soft aspect of TQM in food companies (2014)								1	2
The impact of hard and soft quality management on quality and innovation performance: an empirical study (2014)			1						
The impact of organizational context on hard and soft quality management and innovation performance (2017)			1						
The relationship between soft-hard TQM factors and key business results (2013)						1		1	
The effect of TQM soft and hard factors on organization performance (2016)						1		1	
Total	1	2	3	1	1	5	3	6	4

4.3 Development of the structural equation model

SEM was employed for analyzing the relationship between different dependent and independent variables of the conceptual model (Sambasivan *et al.*, 2017). A structural model imputes the relationships between latent variables. The preference regarding the use of this approach is that, the structural model considers the interrelationship between the variables. In Section 5 all constructed diagrams are shown and analyzed.

4.4 Validity and reliability of the research tool

In order to ensure the suitability of the measurement tool, the measurement tool was evaluated in terms of the content validity using content validity ratio and content validity index. According to the opinions obtained by 30 experts, the validity of the questionnaire was reported to be equal with the validity value determined in the table as 0.33; therefore, content validity was confirmed (Table III).

The reliability of the questionnaire was estimated by Cronbach’s α in the SPSS software. The reliability was reported to be higher than 0.7, which showed that the reliability of the scale was acceptable.

5. Data analysis

KMO index and Bartlett test were used in order to ensure an appropriate number of data for factor analysis. Sufficient data mean was equal to 81; therefore, the sample size (number of respondents) was appropriate for factor analysis.

5.1 Normality test

Shapiro–Wilk or Kolmogorov–Smirnov tests were used to evaluate the normality or skewness of data and ensure the data normality. Data normality was tested by null hypothesis in 5 percent of error level. Therefore, the significance level ≥ 0.05 represents a normal distribution of data.

The results presented in Tables IV–V show the data normality at the significance level of 0.05.

5.2 Goodness of fit and research dimensions

This section investigates the fit of the diagram belonged to each hidden variable. First, soft factors were considered and the results were presented in Figure 4 and related tables.

Results of the model goodness of fit are presented in Table VI.

The SEM for hard factors is presented in this section (Figure 5).

Results of the model goodness of fit are presented in Table VII.

The SEM for continuous improvement is presented in this section (Figure 6 and Table VIII).

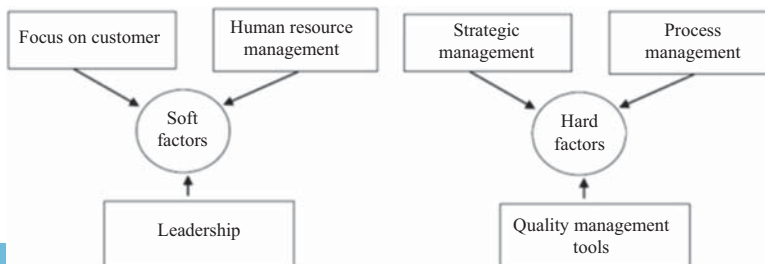


Figure 3. The soft and hard factors' sub-criteria

TQM	Question	CVR	CVI
31,6	1	0.4	0.83
	2	0.67	0.86
	3	0.53	0.9
	4	0.67	0.9
	5	0.8	0.9
1104	6	0.87	0.93
	7	0.73	0.96
	8	0.67	0.8
	9	0.6	0.83
	10	0.53	0.83
	11	0.67	0.96
	12	0.8	0.8
	13	0.73	0.86
	14	0.87	0.96
	15	0.47	0.86
	16	0.4	0.9
	17	0.67	0.93
	18	0.67	0.8
	19	0.67	0.93
	20	0.53	0.8
	21	0.8	0.86
	22	0.73	0.8
	23	0.53	0.86
	24	0.4	0.96
	25	0.6	0.86
	26	0.73	0.9
	27	0.8	0.83
	28	0.87	0.83
	29	0.4	0.96
	30	0.47	0.8
	31	0.53	0.86
	32	0.6	0.9
	33	0.8	0.93
	34	0.67	0.8
	35	0.73	0.93
	36	0.87	0.8
	37	0.53	0.86
	38	0.53	0.86
Table III.	39	0.67	0.93
Validity assessment	40	0.4	0.86
results	41	0.4	0.86

Dimensions	Cronbach's α (reliability)
Soft and hard TQM factors	0.81
Customer behavior	0.79
Innovation	0.83
Continuous improvement	0.78
Total	0.82

Table IV.
Reliability assessment results

The structural equations model for innovation is presented in this section (Figure 7 and Table IX).

The structural equations model for customer behavior is presented in this section (Figure 8 and Table X).

Considering that the previous sections dealt with the dimensions and goodness of fit of the questionnaire, this section investigates the research structure in both standard and non-standard states (Figures 9 and 10) (Table XI).

The results of the model's goodness of fit are presented in the following table (Table XII).

6. Hypothesis testing

In this section, the hypotheses were tested using path analysis. The results are presented in Table XIII:

H1. TQM has a significant effect on customer behavior through continuous improvement of quality and innovation.

Data	Kolmogorov-Smirnov tests		Significance level
	Test statistics	Degree-of-freedom	
	159	383	165

Table V.
Normality test results

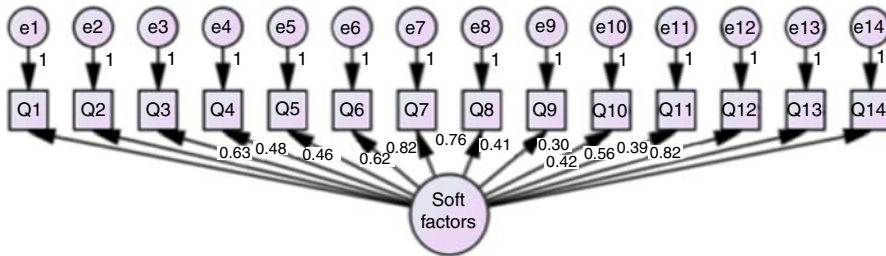


Figure 4.
Structural equation model (soft factors)

Parameter	Value	Limit
χ^2 to degree-of-freedom ratio	2.69	< 3
RMSEA	0.000	< 0.05
Comparative goodness of fit index	0.879	> 0.9
Adjusted goodness of fit index (AGFI)	0.836	> 0.8

Table VI.
Review of the general fitting of structural equations

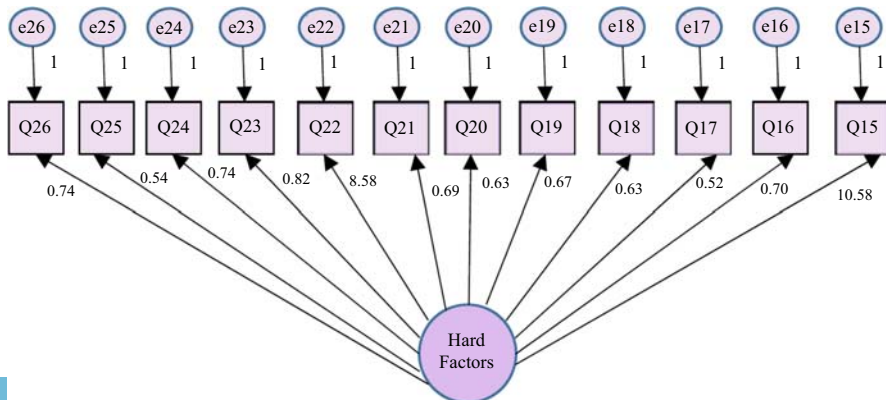


Figure 5.
Structural equation model (hard factors)

TQM 31,6

Considering that the significance level was at 0.000 and the p -value < 0.05 in the main hypothesis, this hypothesis tested the effect of independent variable on the dependent variable using a mediator in Sobel test. The results showed, t -statistics was equal to 6.652 showing the confirmation of TQM effect on customer behavior through continuous improvement of the quality and innovation. The impact factor was equal to 0.65 indicating the strong effect.

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Parameter	Value	Limit
χ^2 to degree-of-freedom ratio	2.587	< 3
RMSEA	0.000	< 0.05
Comparative goodness of fit index (CFI)	0.968	> 0.9
Goodness of fit index (GFI)	0.845	> 0.8
Adjusted goodness of fit index (AGFI)	0.836	> 0.8

Table VII.
Review of the general fitting of structural equations (hard factors)

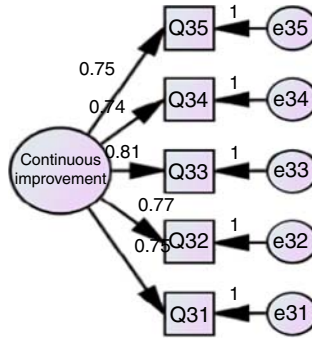


Figure 6.
Structural equations model (continuous improvement)

Parameter	Value	Limit
χ^2 to degree-of-freedom ratio	2.558	< 3
RMSEA	0.000	< 0.05
Comparative goodness of fit index (CFI)	0.957	> 0.9
Goodness of fit index (GFI)	0.859	> 0.8
Adjusted goodness of fit index (AGFI)	0.888	> 0.8

Table VIII.
Questionnaire goodness of fit (continuous improvement)

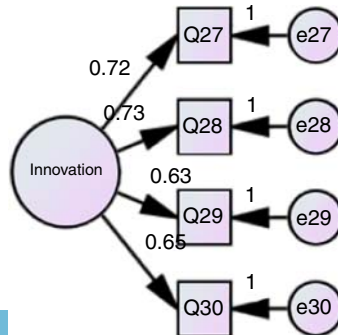


Figure 7.
Structural equation model (innovation dimension)

6.1 Sub-hypotheses testing

H1a. TQM soft factors have significant effect on customer behavior through quality improvement (Table XIV).

In H1a, the significance level was at 0.000 with the p -value < 0.05 and t -statistics was equal to 10.194. The results showed the confirmation of the effect of TQM soft factors on customer behavior through continuous improvement. The impact factor was equal to 0.43, indicating an average effect:

H1b. TQM soft factors have significant effect on customer behavior through innovation (Table XV).

In H1b, the significance level was at 0.000 (p -value < 0.05) and t -statistics was equal to 15.242, therefore, the hypothesis was confirmed. The impact factor was equal to 0.51, indicating an average effect:

H1c. TQM hard factors have significant effect on customer behavior through quality improvement (Table XVI).

In H1c, the significance level was at 0.000 (p -value < 0.05) and t -statistics was equal to 13.650, therefore, the hypothesis was confirmed showing the effects of hard factors on the

Parameter	Value	Limit
χ^2 to degree-of-freedom ratio	2.658	< 3
RMSEA	0.001	< 0.05
Comparative goodness of fit index (CFI)	0.947	> 0.9
Goodness of fit index (GFI)	0.875	> 0.8
Adjusted goodness of fit index (AGFI)	0.883	> 0.8

Table IX. Questionnaire goodness of fit (innovation goodness of fit)

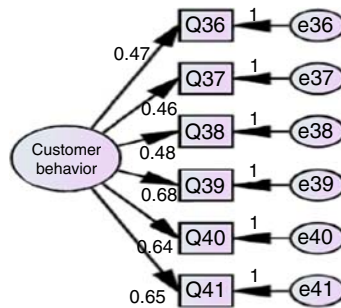


Figure 8. Structural equations model (customer behavior)

Parameter	Value	Limit
χ^2 to degree-of-freedom ratio	2.696	< 3
RMSEA	0.000	< 0.05
Comparative goodness of fit index (CFI)	0.982	> 0.9
Goodness of fit index (GFI)	0.878	> 0.8
Adjusted goodness of fit index (AGFI)	0.843	> 0.8

Table X. Questionnaire goodness of fit (customer behavior)

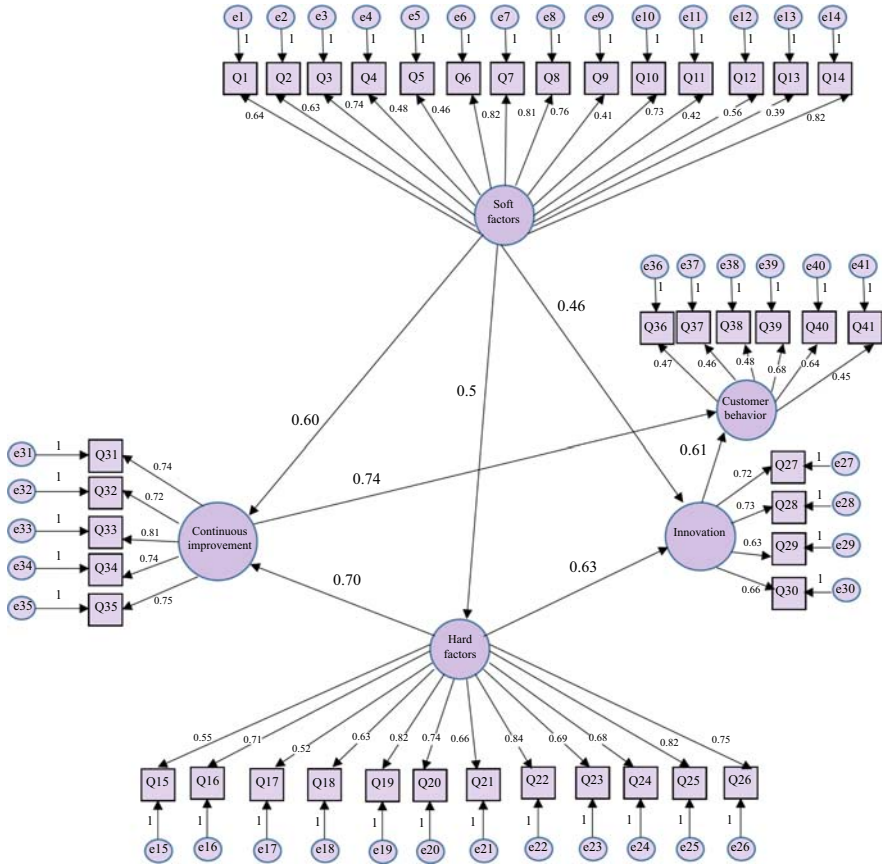


Figure 9.
Structural equations
(non-standard
construct)

customer behavior through quality improvement. The impact factor for this hypothesis was equal to 0.47:

H1d. TQM hard factors have significant effect on customer behavior through innovation (Table XVII).

In *H1d*, since the significance level was at 0.000 (p -value < 0.05) and this hypothesis was related to the effect of independent variable on the dependent variable through the mediator role, Sobel test was used. The results showed that t -statistics was equal to 9.777 which confirmed the counter-hypothesis, showing the effect of TQM hard factors on customer behavior through innovation. The impact factor was equal to 0.62 indicating the quite strong effect (Table XVIII).

7. Discussion

The main hypothesis of the present research was that TQM has a significant effect on customer behavior through continuous improvement of the quality and innovation. The previous studies supported the findings of the study. Abrunhosa and Sá (2008) argued that the overall effect of QM on innovation cannot be generalized since QM is a multidimensional concept, including soft and hard QM practices, which might influence innovation in

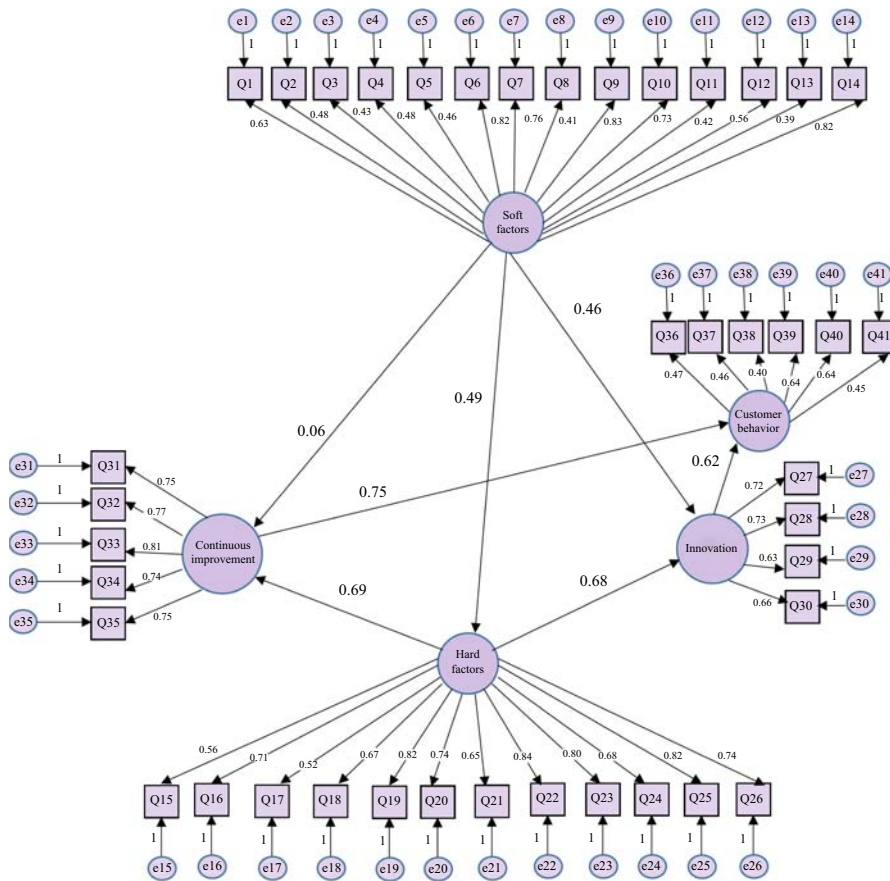


Figure 10. Structural equations model (standard construct)

Parameter	Value	Limit
χ^2 to degree-of-freedom ratio	4.987	< 3
RMSEA	0.178	< 0.05
Comparative goodness of fit index (CFI)	0.745	> 0.9
Goodness of fit index (GFI)	0.698	> 0.8
Adjusted goodness of fit index (AGFI)	0.708	> 0.8

Table XI. Questionnaire goodness of fit (non-standard construct)

Parameter	Value	Limit
χ^2 to degree-of-freedom ratio	1.283	< 3
RMSEA	0.000	< 0.05
Comparative goodness of fit index (CFI)	0.916	> 0.9
Goodness of fit index (GFI)	0.895	> 0.8
Adjusted goodness of fit index (AGFI)	0.854	> 0.8

Table XII. Structural equations goodness of fit (standard construct)

different ways. Pattanayak *et al.* (2017) and Anil and Satish (2019) also categorized TQM into hard and soft factors and investigated their effect on innovation. In the main hypothesis, since the significance level was at 0.000 (p -value < 0.05), the effect of independent variable on the dependent variable through the mediator role was studied using Sobel test. t -Statistics was equal to 6.652 which confirmed the effect of TQM on customer behavior through continuous quality improvement and innovation. The alignment of TQM and innovation was supported in this study using advanced tools such as group creativity, innovative problem solving which have been introduced by some authors (Zeng *et al.*, 2015; Osayawe Ehigie and McAndrew, 2005). The impact factor was equal to 0.65 indicating the strong effect. The results of this section are consistent with the results of the studies by Zeng *et al.* (2017), Staub *et al.* (2016) and Bourke and Roper (2017). Following in this section some discussion and conclusion for each sub-hypothesis is presented:

H1a. TQM soft factors have significant effect on customer behavior through quality improvement.

	Hypothesis	Impact factor	t -factor	Significance level	Test result
Table XIII. Main hypothesis path analysis	Total quality management has significant impact on customer behavior through continuous improvement of the quality and innovation	0.65	6.652	0.000	Confirmed

	Hypothesis	Impact factor	t -factor	Significance level	Test result
Table XIV. Path analysis of <i>H1a</i>	TQM soft factors are effective on customer behavior through quality improvement	0.43	10.194	0.000	Confirmed

	Hypothesis	Impact factor	t -factor	Significance level	Test result
Table XV. Path analysis of <i>H1b</i>	TQM soft factors are effective on customer behavior through innovation	0.51	15.242	0.000	Confirmed

	Hypothesis	Impact factor	t -factor	Significance level	Test result
Table XVI. Path analysis of <i>H1c</i>	TQM hard factors are effective on customer behavior through quality improvement	0.47	13.650	0.000	Confirmed

	Hypothesis	Impact factor	t -factor	Significance level	Test result
Table XVII. <i>H1d</i> path analysis	TQM hard factors are effective on customer behavior through innovation	0.62	9.777	0.000	Confirmed

Hypothesis	Impact factor	t-factor	Significance level	Test result
<i>Main hypothesis</i>				
TQM has a significant impact on customer behavior through continuous improvement of the quality and innovation	0.65	6.652	0.000	Confirmed
<i>Other hypotheses</i>				
TQM soft factors are effective on customer behavior through quality improvement	0.43	10.194	0.000	Confirmed
TQM soft factors are effective on customer behavior through innovation	0.51	15.242	0.000	Confirmed
TQM hard factors are effective on customer behavior through quality improvement	0.47	13.650	0.000	Confirmed
TQM hard factors are effective on customer behavior through innovation	0.62	9.777	0.000	Confirmed

Table XVIII.
Results of the hypotheses testing

In this hypothesis, since the significance level was at 0.000 (p -value < 0.05) and t -statistics was equal to 10.194, the results showed the confirmation of the effect of soft factors on customer behavior through quality improvement. The impact factor of 0.43 indicated the average effect. The results of this section are consistent with the results of the studies by Dubey (2015) and Dubey and Gunasekaran (2015). Considering the results obtained for this hypothesis and *H1b*, the results suggested that both soft and hard TQM factors have a positive effect on customer behavior. This finding is consistent with the findings of the prior studies (Ershadi and Omidzadeh, 2018; Mashhadiabdol *et al.*, 2014; Fai Pun and Jaggernath-Furlonge, 2012):

H1b. TQM soft factors have significant effect on customer behavior through innovation.

In *H1b*, the significance level was at 0.000 (p -value < 0.05) and t -statistics was equal to 15.242, therefore, the hypothesis was confirmed. The impact factor was equal to 0.51 indicating an average effect. The results of this section are consistent with the results of the studies by Calvo-Mora *et al.* (2013), Zeng *et al.* (2017), Staub *et al.* (2016) and Bourke and Roper (2017). With regard to the effect of soft factors on customer behavior (0.51) compared to effect of hard factors (0.47) it is noteworthy that the effect of soft factors is slightly more than the effect of hard factors. This result is consistent with the results obtained in the study by Lemak and Reed (2000):

H1c. TQM hard factors have significant effect on customer behavior through quality improvement.

In the *H1c*, the significance level was at 0.000 (p -value < 0.05) and t -statistics was equal to 13.650, therefore, the hypothesis was confirmed showing the effect of TQM hard factors on customer behavior through quality improvement. The impact factor was equal to 0.47 indicating an average effect. This implies that the adoption and implementation of continuous improvement programs would enhance the direct effect of hard TQM on customer behavior (Calvo-Mora *et al.*, 2013; Kim *et al.*, 2012). The results of this section are consistent with the results of the studies by Jesri *et al.* (2013), Khan and Naeem (2018), Dianati Daylami and Poorchangiz (2014) and Deng and Hiu (2010):

H1d. TQM hard factors have significant effect on customer behavior through innovation.

In the *H1d*, the significance level was at 0.000 (p -value < 0.05). Sobel test was used to investigate the effect of the independent variable on the dependent variable through the mediator role. t -Statistics was equal to 9.777 which showed the confirmation of the effect of

TQM hard factors on customer behavior through innovation. The impact factor was equal to 0.62 indicating the quite strong effect. The results of this section are consistent with the results of the studies by Dianati Daylami and Poorchangiz (2014), Yoo *et al.* and Bourke and Roper (2017).

8. Conclusions and recommendations

This study has proposed a conceptual framework which provides an integrated approach of TQM soft and hard factors combined to innovation and continuous improvement. Based on the statistical analyses, TQM factors have a significant effect on customer behavior through continuous improvement of the quality and innovation. Also, regarding the obtained results, the highest effect was related to the effect of hard TQM factors on customer behavior through innovation. Furthermore, TQM soft factors such as human resource management have significant effect on customer behavior through quality improvement and innovation. According to the results of the hypothesis testing, following suggestions can be presented based on the findings of the research. In this section the suggestions were separately provided for the construction sector, for other industries and for management theory. Implementation of reward system for organizational employees, incorporating reward system for contractor's appraisal, implementing the QM systems for improving the contracts and considering all quality issues in order to ensure meeting the qualitative requirements, all are some main suggestions for construction sector. For other industries, providing the ground for customers to flourish their sense of creation and talents based on their interests, and considering the continuous improvement and integrity in meeting the needs of permanent buyers who ask for the quality are the main suggestions.

Changing the organization direction from task orientation to the process orientation; and controlling the organization processes through measuring them, paying attention to the customer satisfaction system; providing different communication ways for receiving the opinions of the customer and applying them in designing the product and service; paying attention to the response system and customer complaint; implementation of this process in the organization and having a process system for presenting and developing services are the main issues which all managers in different fields should consider in the progress of implementing TQM factors. In construction industry, considering TQM factors as well as concepts of innovation and continuous improvement leads the organization to know customer requirements and being responsive to customer demands and evaluating customer satisfaction. Finally, applying this approach would lead to an increase in cash flow, revenue growth, profitability, market share and stock price of an organization.

In future researches, it is recommended to use moderator variables such as knowledge management, customer knowledge management and customer emotions in order to study the effect of service quality on customer behavior. It is also suggested to replicate this research in the organizations and companies with the different activity types and work scopes in order to study the service quality dimensions on customer behavior. Finally, it is suggested to use multicriteria decision-making methods such as fuzzy hierarchal process, network analysis process and fuzzy DEMATEL for ranking the factors influencing on the success of service quality.

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