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The impact of TQM practices on organizational learning case study

Automobile part manufacturing and suppliers of Iran

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Abstract

Purpose – The purpose of this paper is to determine the correlations between total quality management (TQM) and organizational learning in the context of automobile part manufacturing and suppliers of Iran.
Design/methodology/approach – A research project is carried out in 191 automobile part manufacturing and suppliers plants, using the questionnaire method. Confirmatory factor analysis is applied to assess the measurement instrument reliability and validity. The correlations between latent constructs are examined through partial least squares method.
Findings – Findings indicate that, both, the core and infrastructure aspects of quality management (QM) practices have significant positive effect on organizational learning. At the lower levels, HRM and information and analysis contribute to enhancement of the organizational learning.
Research limitations/implications – It is recommended that a more complete construct be designed for measuring the organizational learning. Some contextual factors such as culture need to be noticed in future researches.
Practical implications – In this paper some beneficial insights are addressed to assist managers in recognizing the organizational problems which weaken the organizational learning.
Social implications – By improving the quality of management practices and organizational learning, the society gains benefits such as customer satisfaction.
Originality/value – This study contributes to the TQM advance, organizational learning research literature and provides better foundations for organizational learning improvement through TQM practices in the Middle East. By investigating the correlations between infrastructure and core QM practices and organizational learning, this study fills the current gap in this field.

Keywords Iran, Organizational learning, PLS, Infrastructure and core practices, Quality management practices
Paper type Research paper

1. Introduction

A culture of knowledge sharing and transfer can be developed easily in organizations with successful total quality management (TQM) implementation (O'Dell and Grayson, 1998). These organizations tend to learn more (Martinez-Costa and Jiménez-Jiménez, 2008;

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Hung *et al.*, 2011). According to Iyer *et al.* (2013), a successful TQM implementation can create sustainable quality and productivity improved in long term by developing a learning culture. Some authors believe quality management (QM) implementation is impossible without organizational learning (Chiles and Choi, 2000; Ittner *et al.*, 2001; Senge *et al.*, 1994; Ruiz-Moreno *et al.*, 2005). Organizational learning is simulated and promoted by staff when top managers begin to implement TQM in organizations (Hung *et al.*, 2011), therefore some researchers claim that organizational learning is an expected outcome of TQM (Ittner *et al.*, 2001; Hung *et al.*, 2011; Yusr *et al.*, 2013; Akgun *et al.*, 2014)

Despite the important role of organizational learning for a successful TQM implementation, an in-depth review run on TQM by the authors here, it is found that few studies have investigated the correlations between QM practices and organizational learning.

There are two main categories for TQM practices which many researchers have focussed on: infrastructure QM practices that are people-and culture-oriented and core QM practices which are technique and methodology oriented (Flynn *et al.*, 1995; Wilkinson, 1992; Zu, 2009). There is little perception on how the infrastructure and core QM practices lead to learning and knowledge creation (Choo *et al.*, 2007). The authors here of this paper did not find any empirical study where the impact of these two main practices on organizational learning are investigated but some ideas are addressed about it. Hackman and Wageman (1995) and Sousa and Voss (2002) claim that the core practices can influence learning, unlike Flynn *et al.* (1995), Ho *et al.* (2001), Sousa and Voss (2002) and Zu (2009) who claim that infrastructure practices create learning and a cooperative environment for QM implementation.

Sila and Ebrahimpour (2003) proposed that QM researches need to transfer to industry-specific and cross-cultural studies. It is impossible that QM practices are valid in all organizational contexts throughout the world (Sousa and Voss, 2002); the differences between national cultures and perceptions of employees in emerging economies and developed countries (Jain and Tabak, 2002), may be influenced as how QM practices are implemented (Laohavichien *et al.*, 2011). Practices that are considered useful in one country, may not be the same in another country (Prasad and Tata, 2003; Laohavichien *et al.*, 2011). Hence, QM practices, developed in the USA and Japan should be examined throughout the world as models to realize their applicability (Mellat-Parast *et al.*, 2011). Researches in particular industries improve their understanding about determinants of performance and other organizational factors. Despite this fact, there is very little knowledge about quality initiatives in different industrial contexts (Mellat-Parast *et al.*, 2011; Lai and Cheng, 2003).

This study is run on automobile part manufacturing and suppliers of Iran. Automobile industry is the second most active industry in Iran after oil and gas. According to Abedini and Peridy, the capacity of this industry is very high. It should be noted that currently many quality improvement programs are being implemented in different organizations in Iran (Shahin and Zairi, 2007), while the TQM faces some barriers in manufacturing industries. Only a few empirical and quantitative studies are conducted in Iran in this respect. In the past decade, heavy investments are made to develop the automobile part manufacturing and suppliers industry in order to enhance quantity of their products; consequently 80 percent of the needed parts for Iranian automobile industry is manufactured and supplied through the domestic sources (Iranian Auto Parts Manufacturers Association (IAPMA), 2014). The growing rate of automobile production at 25 percent has led to growth in parts consumption in the recent years (IAPMA, 2014). Despite the quantitative growth, the low quality of the products is the biggest problem faced by the industry (Mojtahedzadeh and Arumugam, 2011). In this industry promoting quantity is more important than quality (Akbari *et al.*,

2012; Rahmati and Yousefi, 2013). Another major problem in Iranian automobile industry is the quality fluctuation among products (Mojtahedzadeh and Arumugam, 2011). As Iran makes move to stimulate WTO accession talks, the quality will become more important issue to Iran automobile industry in order to compete with international competitors. These companies are under pressure to produce higher quality at lower prices; wider product range with shorter lead times; and customization of products (Singh *et al.*, 2007; Panwar *et al.*, 2013). Barnes and Morris found that in order to survive in the global automotive industry, developing economies have to upgrade and adopt world class manufacturing standards (Panwar *et al.*, 2013).

Many attempts are made to achieve better quality, for this purpose part manufacturers acquire QM certifications, so they could provide good capacity for new management knowledge which could assist them to improve competitive positions. Based on some studies due to low knowledge on quality, lack of information, education, and training, and not being familiar with the QM "know-how" in the Middle East, more empirical and quantitative studies are necessary to investigate the effect of QM practices on organizational factors such as organizational learning. In this paper the effect of QM practices on organizational learning at two levels of: infrastructure and core QM practices; leadership, HRM, strategic planning, customer focus, process management and information and analysis are studied. Conducting such researches in emerging economies and developing countries such as Iran, enables the researchers to obtain valuable information that differ from prior studies.

The remainder of this paper is organized as follows: in the next section, the theoretical framework of the paper and the scholarly literature on QM and organizational learning is discussed. Next, the methodology of the empirical investigation the effect of QM practices on organizational learning as well as data collection and analysis are discussed. Then, the results and the implications to the theory and practice are discussed. Finally, limitations and future studies are presented.

2. Literature review

2.1 Infrastructure and core QM practices

New segmentation of QM practices named infrastructure and core QM are proposed by Flynn *et al.* (1995), which is supported by Ho *et al.* (2001), Rahman and Bullock (2005) and Sousa and Voss (2002).

Although there are many disagreements among researchers about how QM practices distribute between infrastructure and core (Laohavichien *et al.*, 2011) but most of them follow a specified logic. Because of this powerful logic, Sousa and Voss (2005) stress that dividing TQM practices into infrastructure and core was a successful idea. They point to some researches like Spencer, Sitkin *et al.* (1994) and Dean and Bowen (1994) as evidences for their claim. All of these researches had used the same logic but in different words like mechanistic/process/technical and non-mechanistic/socio-behavioral QM practices (Sousa and Voss, 2002).

What is the specified and powerful logic in segmentation of QM practices? It is soft and hard concept used several times in management studied. Soft TQM practices include HRM dimensions. This idea is very similar between management and TQM literature (Rahman and Bullock, 2005). Infrastructure or soft TQM practices include HR dimensions. These practices are people-and culture-oriented focus on organizational change and development in the areas of management commitment and leadership, relations with external customers and suppliers, and HRM; while core QM practices are technique and methodology oriented (Zu, 2009).

Researchers have approached QM practices into infrastructure and core in different manners. Flynn *et al.* (1995) considered the top management support, customer relation, supplier relation, workforce management and work attitudes as infrastructure practices and product design, process management, SPC/feedback as core practices. Samson and Terziovski (1999) investigated infrastructure QM practices through leadership, strategic planning, people management, customer focus and core QM practices via process management, information and analysis. Laohavichien *et al.* (2011) considered management support, supplier management, customer focus, organization cooperation and human resources as infrastructure and process management, statistical process control and design QM as core. The leadership, people and certain sub-criteria concerning policy and strategy were identified as soft dimension, while the strategic management of partners and resources and processes management defined as technical factors. Shahin and Dabestani (2011) implied that committed leadership, closer customer relationship, benchmarking and process improvement have the most correlations among the TQM soft factors.

The effect of core and infrastructure practices on organizational performance is investigated by some researchers. Some authors like Dow *et al.* (1999) and Samson and Terziovski (1999) found that the effect of infrastructure QM practices on performance was stronger than core QM practices (Zu, 2009). Flynn *et al.* (1995), Ho *et al.* (2001) and Sousa and Voss (2002) found that better implementation of infrastructure QM practices; highly improve the level of core QM practices (Laohavichien *et al.*, 2011). Also core practices directly promote quality performance (Flynn *et al.*, 1995; Ho *et al.*, 2001) and it fully mediated the effects of the infrastructure practices on quality performance (Flynn *et al.*, 1995; Laohavichien *et al.*, 2011); while infrastructure practices support the implementation of core practices which directly affect quality performance (Flynn *et al.*, 1995; Laohavichien *et al.*, 2011). According to these evidences, the present study will examine the relationship between infrastructure practices and core practices:

H1. Infrastructure practices positively relate to core practices of TQM.

2.2 Organizational learning

Two approaches have identified learning as a fundamental strategic asset (Bueno and Salmador, 2003). These are resource-based views of the firm and knowledge management. They consider competitive advantage as a result of abilities and capabilities of a company (Lopez *et al.*, 2006). By accumulating several definitions, Lopez *et al.* (2006) defined organizational learning as "a dynamic process of creation, acquisition and integration of knowledge aimed at developing the resources and capabilities that allow the organization to achieve a higher performance."

At the beginning, Huber (1991) developed a model for organizational learning with three sub-processes: knowledge acquisition, knowledge sharing and knowledge utilization. Later, Slater and Narver (1995) and Tippins and Sohi (2003) considered four sub-processes for organizational learning: information acquisition, information dissemination, shared interpretation and development of organizational memory.

Jiménez-Jiménez and Sanz-Valle (2011) and Lopez *et al.* (2006) believe that organizational learning process includes four sub-processes as the following:

(1) knowledge acquisition: by this process, organization gets needed information and knowledge;

(2) knowledge distribution: by this process, employees share and transfer knowledge throughout the organization;

(3) knowledge interpretation: by this process, employees transform information to useful knowledge for organization; and

(4) organizational memory: by this process, knowledge is stored in considered places for future use.

2.3 TQM and organizational learning

Many researchers discuss the potential role of TQM in organizational learning (Hendricks and Singhal, 2001; Martinez-Costa and Jiménez-Jiménez, 2008; Martinez-Lorente *et al.*, 2000; Terziovski and Samson, 2000; Hung *et al.*, 2011), in parallel some others believe that learning is an output of TQM if it has been implemented effectively (Sohal and Morrison, 1995; Martinez-Costa and Jiménez-Jiménez, 2009).

Two lines of researches in studying relationship between QM and organizational learning is distinguished (Ruiz-Moreno *et al.*, 2005). In the first line, the possibility of implementing QM practices with any organizational learning capabilities is analyzed. These types of researches suggest that beginning QM programs is theoretically possible, but for attaining more profound results, principals of organizational learning are vital (Senge *et al.*, 1994). In the second line, learning as an output of TQM are discussed (Ittner *et al.*, 2001; Ruiz-Moreno *et al.*, 2005).

Ruiz-Moreno *et al.* (2005) investigated the relationship between QM practices and organizational learning. Their results reveal a strong relationship between QM practices and organizational learning. Yusr *et al.* (2013) investigated 139 Malaysian manufacturing companies and found that TQM has significant and positive effects on organizational learning. Also Akgun *et al.* (2014) studied 193 firms in Turkey. They confirmed that TQM affected organizational learning capabilities. Martinez-Costa and Jiménez-Jiménez (2008) exposed that TQM affect learning significantly and positively in Spanish firms.

There is little understanding on how core and infrastructure QM practices lead to learning and knowledge creation (Choo *et al.*, 2007), but some ideas have been put forward about this relationship. Hackman and Wageman (1995) and Sousa and Voss (2002) believe that core practices can influence learning. Iyer *et al.* (2013) suggest that if TQM core practices are implemented successfully, they would be able to bring benefits by induced learning and subsequently results in sustained quality and productivity improvement. On the other hand some authors like Flynn *et al.* (1995), Ho *et al.* (2001), Sousa and Voss (2002) and Zu (2009) assume that infrastructure practices create learning and cooperative environment for QM implementation.

With regard to previous studies, the correlations between QM practices especially infrastructure and core and organizational learning are ambiguous. Some elements of infrastructure such as leadership and HRM show a positive relationship with learning (Tari *et al.*, 2007; Lee *et al.*, 2011) whereas others such as strategic management and customer focus affect learning in different ways (Lee *et al.*, 2011). Also process management and information and analysis which are the elements of core practices relate positively to learning. Consequently, based on the above mentioned reviews the following hypothesizes are being proposed:

H2. Infrastructure practices positively relate to organizational learning.

H3. Core practices positively relate to organizational learning.

2.4 TQM practices and organizational learning

Quality management practices do not have similar characteristics so they affect organizational learning in different ways. Khanna *et al.* (2002) claim that there is a total of seven enablers of TQM in the auto sector: leadership, strategic planning, human resource focus, customer and market focus, supplier focus, process management and information management. These influence results: impact on society, human resource satisfaction, customer satisfaction supplier satisfaction and company-specific business results. Khanna *et al.* (2007) indicated that in Indian automobile sector the main contributing variables to enhance TQM index are leadership, strategic planning, customer and market focus, and human resource focus. Simatupang and White (1998) argue that leadership and management support create suitable culture to organizational learning. Leadership promoted intellectual simulation, individualized consideration and inspirational motivation so it can facilitate organizational learning (Ruiz-Moreno *et al.*, 2005). Lee *et al.* (2011) found out that leadership is significantly related to learning organization. The findings of Tari *et al.* (2007) revealed that leadership is directly related to learning. Shan *et al.* (2013) found direct impact of vision statement and top management support on knowledge creation process. So:

H2a. Leadership has a positive effect on organizational learning.

TQM creates an organizational culture of trust and sharing that causes employee involvement. Some elements of TQM such as individual development, personal motivation and training, improve individual learning and some others such as quality circles and problem solving teams foster group learning (Aune, 1998, Ferguson-Amores *et al.*, 2005). Lee *et al.* (2011) reported that HRM which involved empowerment influence learning organizations positively. Hung *et al.* (2011) examined the impact of TQM and organizational learning on innovation performance. They indicated that by allowing employees to participate in decision-making processes, or by increasing autonomy, organizational learning can be improved. Tari *et al.* (2007) indicated that HRM directly affects learning. Shan *et al.* (2013) designed a research to find the impact of QM practices on knowledge creation process. They found that employee training; employee involvement and recognition and rewards has a significantly direct impact on the knowledge creation process as a part of organizational learning. Therefore:

H2b. HRM has a positive effect on organizational learning.

Customer focus and conformance to turbulent environment, promote organizational learning (Chiles and Choi, 2000). Through customer focus, employees become familiar with customers' need and expectations and learn from them (Ruiz-Moreno *et al.*, 2005). Jayaram *et al.* (2012) investigated TQM in auto supplier industry in the USA and claimed that the most important principle in TQM is customer focus. They claimed that collecting information about customers' expectations through surveys and disseminating this information within the manufacturing firm for improvement purposes are simple and yet key steps in inculcating customer focus in auto supplier industry. Khanna *et al.* (2004) studied the Indian auto sector and illustrate that organizations in auto sector are in no position to improve their results without effective strategic planning and it is very detrimental to the survival and growth of such organizations. Although Lee *et al.* (2011) reported opposite results. They found no significant relationship between, strategic planning, customer focus and learning organization:

H2c. Strategic planning has a positive effect on organizational learning.

H2d. Customer focus has a positive effect on organizational learning.

Chiles and Choi (2000) stated that "Organizational learning is lined to theoretical underpinning of QM through customer focus, continues improvement, teamwork and adoption in dynamic markets." According to their research, organizational learning is promoted by continuous improvement and information and analysis. On the other hand, information and analysis practices enable employees to collect and analyze data, consequently improved organizational learning (Sitkin *et al.*, 1994). Lee *et al.* (2011) revealed that process management is significantly related to organizational learning. Shan *et al.* (2013) found a positive relationship between product design, benchmarking, supplier QM and quality information and knowledge creation process as a part of organizational learning. Hence:

H3a. Process management has a positive effect on organizational learning.

H3b. Information and analysis has a positive effect on organizational learning.

3. Research methodology

The review analysis method is adopted in this study to introduce a new model regarding the title of this study.

3.1 Research model

The related literature is rich with the relations between QM practices and organizational learning. Accordingly, the conceptual model of the three introduced hypothesizes are presented in Figure 1. Considering the research model, the interrelation between infrastructure and core QM practices and the effect of them on organizational learning will be investigated. At the lower level the relationship between leadership, strategic planning, human resource focus and customer focus which are considered as infrastructure practices and process management and information and analysis as core practices with organizational learning will be studied.

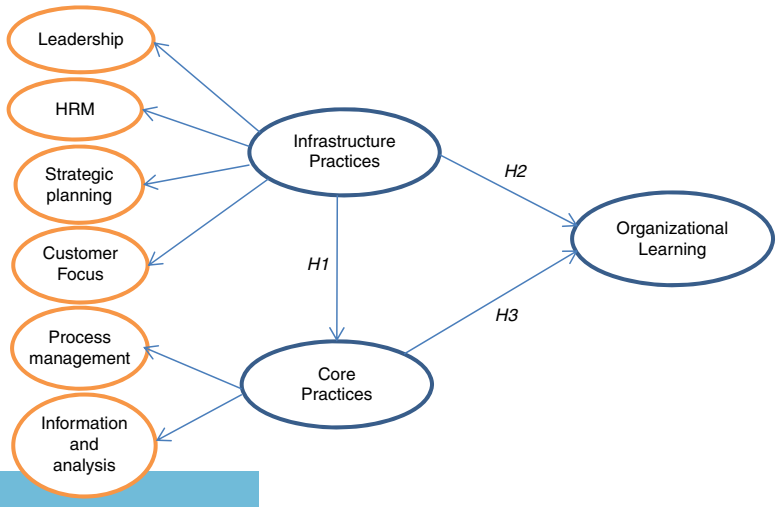

Figure 1.
Research model

3.2 Questionnaire

A self-administrated questionnaire is used here to compile data. The QM practices are being considered based on MBNQA. According to MBNQA, in general there are six QM practices: leadership, information and analysis, human resource focus, customer focus, strategic planning and process management (Jitpaiboon and Rao, 2007; Lau *et al.*, 2004). Since there is a resemblance between the study conducted by Samson and Terziovski (1999) and this study, the same proportion of the six QM practices introduced above are adopted: leadership, strategic planning, human resource focus and customer focus for infrastructure and process management, and information and analysis for core.

Most of the items are extracted through an in-depth research on the pervious articles in this field. The items with their references are tabulated in Table AI.

In this study the scale developed by Lopez *et al.* (2006) and Jiménez-Jiménez and Sanz-Valle (2011) is applied for extracting organizational learning-related items.

The five-point Likert scale is used for this questionnaire: 1 = very low, 2 = low, 3 = medium, 4 = high and 5 = very which are labeled as high from strong disagree (representing 1) to strongly agree (representing 5).

3.3 Data collection

Almost 1,200 auto part manufacturing and suppliers of Iran are registered by IAPMA (2014). The target population is the ones who are aware and have implemented the QM principles and practices. There exist are five major auto manufacturing plants in Iran. Among these companies, Iran Khodro and Saipa have the majority of market share (Shahin, 2010). Auto part manufacturing and suppliers have contracts to fulfill the auto manufacturing plants' requirements according to QM certifications especially ISO TS. Since Iran Khodro is the biggest auto manufacturer, a personal interview is conducted with its management and it is revealed that all of the 388 part manufacturing plants supplying this company have QM certificates.

For data compilation, the key personal involved in QM implementation of all the 388 organizations were contacted by phone, with respect to accepting and filling the questionnaire. The informants were mostly management representatives in quality, quality managers and quality assurance managers. A total of 319 managers agreed to participate in this project. The survey questionnaire with a cover letter was e-mailed or faxed to every participant.

The distribution, follow up and the respond details of this project are tabulated in Table I.

Out of 319 questionnaires only 191 were filled and returned, that is a 60 percent response rate.

Descript	Number of respondent
Transmitted by e-mail	237
Sent by fax	133
Transmitted or sent (both systems)	51
First contact	319
Second contact	116
Third contact	37
Response by e-mail	135
Response by fax	56

Table I.
The process of data compliment from 6 September to 30 December 2013

3.4 Data analysis procedures

Estimation of the research model is made through partial least squares (PLS). PLS is a second generation structural equation modeling technique developed by Wold (Haenlein and Kaplan, 2004). The structural equation models which contain latent variables and some cause-and-effects relations fit well with PLS (Gustafsson and Johnson, 2004; Haenlein and Kaplan, 2004). PLS path analysis has several advantages in comparison with covariance-based structure analysis. PLS needs smaller sample size, where normality assumption is not required (Sarstedt, 2008).

Multiple regression is used to investigate the most influential practices on HR results. In this study the Smart-PLS 2.0.M3 developed by Ringle *et al.* (2005) and SPSS 21.0 for data analysis is used.

4. Findings

4.1 Demographic information

Here, 60 percent of the participants are quality assurance managers and 23 percent of them are quality managers. The lowest educational level of 95.8 percent of respondents is BA and BS. The 76.8 percent of participants are male and 23.2 percent of participants are female. The average work experience of participants in their skills is about 8.5 years with 35 years of age average.

As mentioned, the samples are gathered from the organizations that certified for QM. ISO TS is implemented in all of the auto part manufacturers. The average age of QM certification is about seven years. It seems that seven years is a suitable time to implement a QM system effectively (Jayaram *et al.*, 2010).

4.2 Empirical validation of the measures

4.2.1 Scales reliability. A confirmatory factor analysis (CFA) is made for the entire measurement tool including TQM practices, HR results and customer satisfaction in order to check whether they measure their assigned concepts. The results of CFA indicate that some items did not have statistical significance regarding factor loadings. According to Hulland (1999) items with factor loadings of 0.4 or less, are eliminated. All items with the amount of factor loading and *t*-values are presented in Table AI. The factor loadings of majority of the items are greater than 0.7 indicating the property of items for measuring-related concept.

The other coefficient used to evaluate reliability is Cronbach's α (CA). CA is a reliability index which indicates the extent of one item belonging to a certain concept (Straub *et al.*, 2004). When CA value is 0.7 or greater, the level of reliability is suitable and good internal consistency for established scales can be considered (O'Leary-Kelly and Vokurka, 1998; Sila, 2007). As shown in Table II CA values for all constructs except information and analysis are higher than 0.7, also five constructs from nine constructs have the CA higher than 0.85. These results indicate that most constructs are highly reliable.

Another measurement employed to evaluate reliability is composite reliability (CR) (Werts *et al.*, 1974; Jayamaha *et al.*, 2008). It is used to measure the internal consistency (Jayamaha *et al.*, 2008). Vinzi *et al.* (2010) believed that in structural equation, CR is a better measurement than CA. In calculating CA all questions are given equal weights, whereas for calculating CR, questions are weighted to their relative importance measured by their factor loadings. CR values more than 0.7 show suitable consistencies of constructs (Nunnually and Bernstein, 1994). According to Table II all of the latent variables have CR values greater than 0.7.

No index entries found Latent variable	Statistics on reliability Factor loading	AVE	CA	Convergent validity CR	Structural model fit R^2	Q^2
Leadership	0.934	0.555	0.884	0.908	0.872	[c]
HRM	0.928	0.507	0.858	0.89	0.861	[c]
Strategic planning	0.855	0.655	0.736	0.85	0.732	[c]
Customer focus	0.748	0.539	0.714	0.823	0.560	[c]
Process management	0.983	0.479	0.843	0.88	0.966	[c]
Information and analysis	0.815	0.634	0.4479	0.773	0.664	[c]
Organizational learning	[a]	0.594	0.773	0.854	0.486	0.273
Infrastructure QM practices	[a]	0.756	0.939	0.756	[b]	[c]
Core QM practices	[a]	0.815	0.8625	0.815	0.523	0.211

Notes: [a]The latent variable; [b]R^2 is not calculated for dependent variable; [c]Q^2 is calculated for an endogenous latent variable

Table II. Statistics on reliability and convergent validity

4.2.2 Scales validity. Convergent validity is defined as, the degree to which two or more items measure the same concept (Sila, 2007). In PLS, average variance extraction (AVE) is used to measure convergent validity and suggested that when AVE is more than 0.5, an acceptable convergent validity is obtained (Fornell and Larcker, 1981). In this research, the AVEs are greater than 0.5 except in process management. This is accepted due to the proximity of 0.5 (Table II).

4.2.3 Structural model fit. In PLS, model fit is measured through *t*-values, R^2 and Q^2 (Stone-Geisser Criterion) (Gomez Gomez *et al.*, 2011). Chin (1998) suggested three values of 0.19, 0.33 and 0.67 for R^2 indicating a weak, moderate and strong structural model fit. In this study the amount of R2 for leadership, HRM, strategic planning and process management are more than 0.67 indicating strong model fit for these constructs. Information and analysis, latent variable has the amount of R^2 in approximation of 0.67. Customer focus and HR results are moderate in R^2 (Table II).

The other measurement used in assessing the structural model fit is Stone-Geisser's Q^2 indicating the model's predictable capability (Gomez Gomez *et al.*, 2011). If the amount of Q^2 for a certain endogenous latent variable is zero or less, it indicates a weak prediction power. Henseler *et al.* (2009) suggested three amounts of 0.02, 0.15 and 0.35 for Q^2, believing that if Q^2 values for a certain variable is lower than 0.02, it would indicate a weak predictive power. HR results have the value of 0.276 for Q^2, indicating moderate prediction power.

The mean and standard deviation along with measures of skewness and kurtosis for each variable were calculated and the results are provided in Table III.

Variable	Mean	SD	Skewness	Kurtosis
Leadership	3.64	0.67	−0.374	0.067
HRM	3.2	0.68	−0.137	0.274
Strategic planning	3.5	0.7	0.001	−0.205
Customer focus	3.63	0.67	−0.102	−0.002
Process management	3.92	0.57	−0.181	−0.228
Information and analysis	3.85	0.7	−0.406	0.000
Organizational learning	3.38	0.71	−0.085	−0.282

Table III. Descriptive statistics

4.3 Structural model and testing the hypothesis

To test significance of the relationships and estimation of the standard errors, PLS employs bootstrapping (Efron, 1988; Haenlein and Kaplan, 2004). According to each specific situation, the number of bootstrap resampling should be identified. In the literature, some guidelines for the number of resampling have been indicated (Andrews and Buchinsky, 2000, 2001, 2002). In this study, 500 resampling have been done for 191 samples.

In the present study, the correlation between QM practices and organizational learning is investigated at two levels, infrastructure and core QM practices, and functional QM practices. The analyzing results of the first level are shown in Table IV. According to this table, the path between infrastructure and core QM practices is significant (path coefficient = 0.723, *t*-value = 13.389). This result indicates that infrastructure practices positively relate to core practices; hence *H1* is supported. Also in structural model the direct link between infrastructure QM practices and organizational learning is significant (path coefficient = 0.405, *t*-value = 3.62); therefore *H2* is also supported. On the other hand, the direct path between core QM practices and organizational learning is significant (path coefficient = 0.345, *t*-value = 2.62). This result supports *H3*.

At the second level, the relationships between QM practices and organizational learning are investigated. The results are presented in Table V. According to the results only two paths show significant relationships. The paths between HRM (path coefficient = 0.0262, *t*-value = 2.52) and information and analysis (path coefficient = 0.274, *t*-value = 3.924) with organizational learning are only significant. It concludes acceptability of *H2b* and *H3b*. Other paths between leadership (path coefficient = 0.143, *t*-value = 1.513), strategic planning (path coefficient = 0.016, *t*-value = 0.336), customer focus (path coefficient = 0.032, *t*-value = 0.610) and process management (path coefficient = 0167, *t*-value = 1.703) with organizational learning are not significant; Hence, *H2a*, *H2c*, *H2d* and *H3a* are not accepted.

Table IV.
Hypothesis table with *t*-statistics

Path	St. *B*	*t*-statistics	*p*-values*	Hypothesis test
Infrastructure practices →core practices	0.723	13.389	0.000	*H1* accepted
Infrastructure practices→organizational learning	0.405	3.62	0.000	*H2* accepted
Core practices→organizational learning	0.345	2.62	0.0088	*H3* accepted

Note: *p-values for two-sided test

Table V.
Hypothesis table with *t*-statistics

Path	St. *B*	*t*-statistics	*p*-values*	Hypothesis test
Leadership→organizational learning	0.143	1.513	0.131	*H2a* not accepted
HRM→organizational learning	0.262	2.52	0.0118	*H2b* accepted
Strategic planning→organizational learning	0.016	0.336	0.4338	*H2c* not accepted
Customer focus→organizational learning	0.032	0.610	0.5418	*H2d* not accepted
Process management→organizational learning	0.167	1.703	0.0892	*H3a* not accepted
Information and analysis→organizational learning	0.274	3.924	0.000	*H3b* accepted

Note: *p-values for two-sided test

5. Discussion

This study confirms the positive effect of infrastructure and core QM practices on organizational learning. In previous studies, the impact of QM practices on organizational learning are investigated separately where the researchers did not consider the infrastructure and core QM practices that are mostly referred to as soft and hard aspects of QM practices. Despite, the lack of understanding on how the infrastructure and core QM practices lead to learning and knowledge creation (Choo *et al.*, 2007), there are some assumptions. Hackman and Wageman (1995) found that the use of TQM core elements can be a supportive tool for learning. According to the results of this study, both aspects of technical and non-technical QM practices promote organizational learning in automobile part manufacturing and suppliers of Iran. In parallel, the positive effect of infrastructure practices on core practices is confirmed. Zu (2009) reveal that core practices are influenced by the infrastructure practices.

The results indicate that in macro level, both the infrastructure and core QM practices both influence the organizational learning. Previous studies by Rahman and Bullock (2005) and Fotopoulos and Psomas (2009) illustrate that successful implementation of both the soft and hard aspects of TQM are vital. Their major role in organizational learning process; the findings of this study corresponds with their findings. It appears that the infrastructure and core QM practices are complementing each other's functions. Laohavichien *et al.* (2011) also suggested that organizations need to implement both the practices to achieved desirable performance. Lin (2009) studied the global auto industry and found that TQM principals, such as the commitment to continuous improving philosophy, facilitate manufacturers in auto industry to a great extent. Iyer *et al.* (2013) found a link between quality certification and the adoption of TQM programs, and conceptual and operational learning in Indian automotive industry.

Despite the illustrated effects of QM practices in macro level, in lower level where the functional QM practices are analyzed, some applications of each engaged with organizational learning. HRM and information and analysis indicate positive effect on organizational learning similar to that of the majority of past studies (Tari *et al.*, 2007; Lee *et al.*, 2011; Hung *et al.*, 2011; Shan *et al.*, 2013) but some other practices such as leadership, strategic planning, customer focus and process management show no correlation with organizational learning. While, in some studies the findings indicate the opposite (Tari *et al.*, 2007; Lee *et al.*, 2011; Ruiz-Moreno *et al.*, 2005).

The results reveal that there is no significant correlation between leadership and organizational learning. This finding does not correspond to the previous findings. On the contrary Ruiz-Moreno *et al.* (2005), Tari *et al.* (2007) and Lee *et al.* (2011) emphasized on the existence of significant correlation between leadership and organizational learning. Regarding it knowledge creation as a part of organizational learning, (Lopez *et al.*, 2006; Jiménez-Jiménez and Sanz-Valle, 2011), Shan *et al.* (2013) did not find any significant correlation between leadership and knowledge creation. Leadership can facilitate learning by "intellectual stimulation, individualized consideration and inspirational motivation" (Ruiz-Moreno *et al.*, 2005). Senge focussed on the role of leadership to create an organization where people can improve their abilities and learn how to learn by themselves and with another (Chang and Sun, 2007). Choo *et al.* (2007) emphasized on the supportive role of leadership for learning and knowledge creation in quality improvement.

Ahire and O'Shaughnessy (1998) found that variations among the other TQM practices implementation constructs do not affect product quality significantly in

manufacturing auto parts firms with high top management commitment. According to Mosadeghrad (2005), there are numerous difficulties in implementing TQM in most of the industries in Iran. With the assumption that lack of strong leadership is one of the main factors, in Iranian automotive industry lacks strong and capable leadership, hence another problem (Haeri, 2005). Yaghoubipoor *et al.* (2013) proposed that to succeed in today's fast-changing industrial environment, the automobile industry management should adopt a transformational leadership style as opposed to the traditional leadership style in Iran. These findings indicate that better managerial understanding of participative management techniques could contribute to the auto part manufacturers' management regarding their awareness in organizational learning.

At the end of designed questionnaire of this study, an open-end-question is adopted which asked the participants ideas about the situation of QM systems regarding automobile part manufacturers and suppliers. In parallel, interviews are conducted with some managers of this industry. The most important problems and challenges that the managers and participant focus on are: low commitment of leaders and managers to quality programs, their low familiarity with QM principals, incomplete information about QM programs, autocratic leadership style, lack of management support in team-work, participation and empowerment of employees, low delegating, periodically perception of QM as a project and low familiarity of managers with scientific management.

The results obtained in this study indicate that HRM has a positive effect on organizational learning. The results here are supported by Tari *et al.* (2007) and Lee *et al.* (2011) findings which confirm the HRM impact on organizational learning. Lee *et al.* (2011) specially focussed on the effect of empowerment programs on organizational learning. Aune (1998) and Chiles and Choi (2000) found that team-work improved the organizational learning. Hung *et al.* (2011) believe that employee participation creates a better environment for organizational learning. He suggests that for improving organizational learning and innovation, managers should emphasize on employee involvement. In major parts of literature of this study, employee involvement is identified as a critical factor which guarantees organizational learning (Aune, 1998; Ferguson-Amores *et al.*, 2005; Shan *et al.*, 2013). Senge identified and proposed five learning principals including: team learning principal (Chang and Sun, 2007). Lopez *et al.* (2006) revealed that selective hiring, strategic training and employee participation in decision making influence organizational learning in a positive manner. Jayaram *et al.* (2012) investigated TQM in auto part supplier industry in the USA and found that employee training influence the management design and process in a direct and positive manner. They claim that the quality of products and processes depends on employee skills in this industry. The same can be carried in Iran to a certain degree regarding TQM. Education and training have crucial role in this industry because the employees must be able to work in many sections and be familiar with new systems (Mojtahedzadeh and Arumugam, 2011).

Despite the positive effect of HRM on organizational learning, some problems are identified through interviews and the open-end-question. Some of these problems: lack of effective feedback from performance appraisal, lack of recognition and reward systems with defined criteria, job insecurity, losing qualified employee, lack of control systems, lack of qualified employees in QM, weakness in employee participation and team-work.

The results here indicate no significant correlation between strategic planning and customer focus and organizational learning. Chiles and Choi (2000) suggest that identified customer focus as a promoting tool for organizational learning.

Khanna *et al.* (2004) studied the Indian auto sector and revealed that organizations in auto sector are in no position to improve their results without effective strategic planning and it is very determinacy to the survival and growth of such organizations. Jayaram *et al.* (2012) investigated TQM in auto part supplier industry in the USA and found that the most important principle in TQM is customer focus. They claim that collecting information about customers' expectations through surveys and disseminating this information within the manufacturing firm for improvement purposes are simple and yet key steps in inculcating customer focus in auto supplier industry.

The findings of this study are supported by Lee *et al.* (2011). Some problems in customer focus practice are identified through interviews and open-end-question, creating drawbacks in organizational learning in Iran like: low sensitivity on the organizations' part to customers' opinions, low belief in getting proper feedbacks from customers, low familiarity with new customer survey methods and insufficient gathered data from customers.

Among the core QM practices, only information and analysis indicate a positive effect on organizational learning while process management does not have significant correlations. Singh *et al.* (2007) studied Indian auto component sector and highlighted the importance of the cost and quality-related strategies. They claim that for improving product quality in this industry, the organizations should adopt process management practice. The reduction of rejection/rework would contribute to the improvement of process capability. The product design and maintenance must be observed carefully in this industry.

Despite the research awareness of auto part manufacturing and supply industry of Iran on quality control techniques and statistical quality control, applying these techniques are not in a justified. Moreover, some techniques such as DOE, FMEA and QFD are considered less. While it is known that these techniques contribute to the organizational learning in a significant manner.

In addition, the following reasons can be contribute to the non-existence of significant relation between some of TQM practices and organizational learning in Iranian auto-industry part suppliers: first, some other variables such as internal quality performance which mediate the relation between TQM practices and organizational learning; second, some factors constituting the national culture can be moderated this relationship. The second reason here is true for the developing countries.

5.1 Managerial implications

From the managerial perspective, this study offers a number of implications in this industry. First, the instrument developed and used in this research will be very useful tool for evaluating the effectiveness of the current TQM practices in their management. Second, this study suggests that managers of these firms should focus on both infrastructure and core practices to improve organizational learning. At lower levels, this study suggests that HRM and information and analysis are helpful in creating organizational learning context in this industry. Third, this paper also puts forward some beneficial insights to assist managers to recognize their organizational drawbacks identified through the questionnaire and personal interviews, and seek the remedies. The strategic planning, customers focus and process management practices can be considered as the best remedy for this purpose.

6. Conclusions

The correlation between TQM practices and organizational learning is investigated at two levels: the results reveal that, both the core and infrastructure aspects of QM

practices have positive effect on organizational learning and HRM and information and analysis show positive correlation with organizational learning but the other four practices show no significant correlation.

Despite bold attempts to implement QM systems in manufacturing and supply industry in Iran, there are few studies run on that investigating the effectiveness of TQM. Mellat-Parast (2013) has pointed to the low level of understanding about quality, lack of information, education and training of QM in the Middle East.

This study provides a better understanding of TQM and its involvement toward organizational learning within part suppliers of automobile industry in the context of Middle East. Besides, by investigating the correlation between infrastructure and core QM practices, this study fills the current gap in the theory knowledge.

By improving QM practices and organizational learning, the society gains many benefits. As previously mentioned, for a long time, the part supplying units only focus on increasing their volume; hence they ignored quality. This ignorance leads to problems and difficulties in sales and after sales services in the recent years (Shahin, 2010). The low quality of products dissatisfied customers and polluted the environment. The first priority of this industry is the customer satisfaction (Shahin, 2010). Adopting scientific measures in management, provided that the involved are educated and learned on TQM this industry would be able.

Adopting TQM is not without its socio-economic benefits in general. In the recent decades almost all industries are becoming aware of these benefits in Iran which leads to innovation, quality and customer satisfaction. It should be noted that part of today's competition include better managerial approaches unlike before and the auto part manufacturing and supply organizations are one of the prisoners in this respect. Regarding the formal governmental strategic plan for developing this industry to be able to export products, it is required that auto part manufacturing and supplying of Iran invest more time and money in TQM and acquire more advantage from the good atmosphere which is created by QM systems.

6.1 Limitations

The study restrictions there are:

(1) possible exaggeration on QM practices implemented, done among quality and quality assurance managers as the most informants about QM systems;

(2) the subjective data being dependent on the perceptions of the quality managers; and

(3) not all the items are used to measure organizational learning.

6.2 Future research

Such studies should be conducted on all manufacturing and service-oriented organizations, that is, an ongoing trend of studies should be conducted on the contextual aspects, since the human behavior and expectations change as times goes on. Also, future researches can consider a broader range of people, not only quality assurance managers in each organization. It is recommended that a more complete construct be designed to measure organizational learning and information and analysis practice. Finally, according to the importance of performance in QM studies, future studies need to consider the organizational performance.

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Appendix

	Factor loading	*t*-values
Leadership		
Comprehensiveness of the goal-setting procedure for quality is written by top managements (Saraph *et al.*, 1989; Kaynak, 2003)	0.636	10.952
Top management provides adequate resources (finance, people and time) for quality improvement (Jayaram *et al.*, 2010)	0.787	25.516
Top management creates and communicates a vision focussed on quality improvement (Flynn *et al.*, 1994; Naor *et al.*, 2008)	0.784	26.871
Top managers make plan for creating culture of learning and change (Prajogo and Sohal, 2006; Wang *et al.*, 2012)	0.73	21.747
Top managers accept their responsibility for quality (Flynn *et al.*, 1994; Naor *et al.*, 2008; Martinez-Coasta and Jiménez-Jiménez, 2008, 2009; Rungtusanatham *et al.*, 1998, 2005)	0.789	20.938
Top managers regularly review-related results to quality (Sitki-Ilkay and Aslan, 2012; Fotopoulos and Psomas, 2010)	0.793	25.743
Top managers strongly encourage employee to involve in the production process (Flynn *et al.*, 1994; Naor *et al.*, 2008; Martinez-Coasta and Jiménez-Jiménez, 2008, 2009; Rungtusanatham *et al.*, 1998, 2005)	0.714	18.88
Top managers try to obtain the trust of employees (Sila and Ebrahimpour, 2005)	0.714	16.061
HRM		
Employee involvement-type programs (such as quality circles and suggestion system) are implemented in the organization (Saraph *et al.*, 1989; Kaynak, 2003; Santos-Vijande and Alvarez-Gonzalez, 2007)	0.751	23.675
Employees are cross-trained to do more than one job, so that they can fill in for others, if necessary (Jayaram *et al.*, 2010; Zhang *et al.*, 2012)	0.551	8.35
Every employee has been made accountable for quality of his/her work so can take decisions independently (Flynn *et al.*, 1994; Naor *et al.*, 2008).	0.648	12.49
HRM policies are aligned with organizational quality plans (Sila and Ebrahimpour, 2005)	0.754	22.98
All of the employees participate in the decision-making process (Saraph *et al.*, 1989; Sila and Ebrahimpour, 2005; Kaynak, 2003; Fotopoulos and Psomas, 2010)	0.730	19.792
Team/group rewards for quality improvement ideas are be considered (Martinez-Coasta and Jiménez-Jiménez, 2008, 2009)	0.699	16.324
Our supervisors encourage the people who work for them to work as a team (Zhang *et al.*, 2012)	0.835	36.59
The requirements for "bottom-up" communication are provided (Samson and Terziovski, 1999; Sila and Ebrahimpour, 2005; Prajogo and Sohal, 2006; Tari *et al.*, 2007; Rahman and Bullock, 2005)	0.696	13.755
Strategic planning		
Our mission has a clear focus on quality (Sila and Ebrahimpour, 2005)	0.798	27.411
Sufficient resources are allocated for the successful implementation of strategies focussed on quality (Sila and Ebrahimpour, 2005)	0.848	40.336
There is action plan measurement system that covers all key deployment areas and stakeholders (Sila and Ebrahimpour, 2005)	0.780	22.654

(*continued*)

Table AI.
Survey instrument

	Factor loading	*t*-values
Customer focus		
The results of customer satisfaction periodic survey feedback are given to managers (Ahire *et al.*, 1996)	0.728	19.83
Customer needs and expectations are effectively disseminated and understood throughout the workforce (Prajogo and Sohal, 2006)	0.768	20.577
Our company always conducts market research for collecting suggestions for improving our products (Das *et al*, 2008)	0.655	12.57
Familiar and scientific methods are used to gather customers' data (Sila and Ebrahimpour, 2005)	0.78	25.47
Information and analysis		
We have information systems that enable the online access and utilization of customer preference information (Wilkinson, 1992; Sila and Ebrahimpour, 2005; Prajogo and Sohal, 2006)	0.679	8.939
Quality tools (SPC, FMEA, QFD, etc.) are employed in quality improvement (Sila and Ebrahimpour, 2005)	0.899	49.607
Process management		
Process instructions are standardized and documented (Prajogo and Sohal, 2006)	0.645	11.653
Process instructions are well understood by employees (Prajogo and Sohal, 2006)	0.671	15.185
Production processes are designed to minimize the chances of employee errors (Baird *et al.*, 2011)	0.712	14.467
Internal or external audits are done continually to make sure, delivering quality products and services (Sila and Ebrahimpour, 2005)	0.709	19.542
We emphasize the continuous improvement of quality in all work processes (Anderson *et al.*, 1995; Sila and Ebrahimpour, 2005)	0.687	15.895
We strive to establish long-term relationships with suppliers (Prajogo and Sohal, 2006)	0.589	10.219
We use a supplier rating system to select our suppliers and monitor their performance (Prajogo and Sohal, 2006)	0.765	19.469
We monitor our suppliers' performance periodically (Prajogo and Sohal, 2006)	0.747	23.334
Organizational learning		
Employees have the ability of systematic problem solving (Sohal and Morrison, 1995)	0.785	22.5
Organization has the ability to learn from its past experiences (Sohal and Morrison, 1995)	0.802	26.026
There is a consolidated and resourceful R&D policy (Jiménez-Jiménez and Sanz-Valle, 2011)	0.746	22.29
Employees share knowledge and experiences to each other (Jiménez-Jiménez and Sanz-Valle, 2011)	0.75	19.657

Table AI.

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