

Understanding the Linkage between Soft and Hard Total Quality Management: Evidence from Malaysian Manufacturing Industries

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Abstract:

This paper investigates the linkage between TQM two dimensions, namely Soft (ST) and Hard (HT). Few empirical studies examined the interrelatedness between these dimensions especially in the developing economy of Malaysia. Thus, the paper proposed a theoretical multidimensional integrated framework in order to examine the link between TQM dimensions. Seven variables were used to measure ST and Eight variables used for HT. the hypothesis of the study is that there is a significant and positive relationship between the two dimensions. To show the validity of the proposed model, it was tested in 40 ISO 9000 certified Malaysian manufacturing industries. To test the hypothesis, a structured self-administrated questionnaire was developed. It is based on the common five point likert scale for quality management for all the items included in the survey. The multiple regression analysis was used in order to test the corollary hypotheses, utilized from the statistical package for social science. Data analysis indicated: [1] the instrument was valid and reliable; [2] the results supported the proposed theoretical framework; [3] there is a significant and positive link between ST and HT such that they could be linked and integrated together in the same framework if they are implemented and practiced correctly by the quality and production managers; and [4] Malaysian managers have awareness to ST and HT. Results showed that All seven variables of ST were significantly associated with some HT variables. This paper contributes to quality management by: [1] theoretically proposing and empirically investigating the theoretical framework; [2] examining the integration between TQM two dimensions; [3] using the multidimensionality of ST and HT; and [4] the application of this study in the developing economy of Malaysia. It is concluded that ST and HT can be integrated together, the relationship was supported and that Malaysian quality managers can utilize these dimensions if implemented and practiced correctly. This paper provides essential guidelines for Malaysian managers dealing with quality management inside organizations.

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Key words: Integration; ST; HT; Multidimensional; Questionnaire.

1. Introduction

According to Islam and Haque [10], the definition of TQM is a source of confusion, and there is no consensus on what constitutes TQM. Abdullah and Tari [1] indicated that there is a disagreement about what constitutes the ST and HT elements of quality management. Implementing TQM involves defining and deploying several key elements or factors [26]. Review of TQM literature showed that the key elements of TQM could be classified as "ST" and "HT" quality factors. Both the "hard" practices (such as measurement and analysis, systematic planning, fact-based decision making), and the "soft" practices - or the humanistic factors- (such as visioning

and establishing organization values, recognition of individual and group behavior, empowering workers, teamwork and consensual decision-making) have a mechanism for systematically reexamining and reinforcing their understanding of type especially when organizations put a TQM effort in place [11].

According to Hellsten and Klefsjo [8], TQM is much more than a number of critical factors; it also included other components such as tools and techniques for quality improvement, which is consistent with the view of [24]. Bunny and Dale [4] considered TQM tools and techniques vital to support and develop the quality improvement process. Different views and opinions showed that there were many reasons behind that. The first is from the quality gurus, who often are seen as fathers of TQM do not

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like TQM concept. Another one is that there are several similar names for roughly the same TQM idea. The third, which is probably the most severe one, is that there are many vague descriptions and few definitions of what TQM really is; hence, these reasons are partly related to each other [8]. Based on Evans and Lindsay [6], TQM philosophy consists of two related components: The first one is the management system; the second is the technical system. The management system is concerned with planning, organizing, controlling, and managing human resource processes as they relate to quality products or services. In other words, it is an aspect of ST. On the other hand, the technical system involves the assurance of quality in product design, the planning and design of manufacturing processes, and the controlling of incoming materials, intermediate production and finished goods, in other words, it is aspects of HT. Although these two systems, namely ST and HT, deal with different aspects of quality, they are tightly intertwined and integral to the TQM philosophy, and, therefore, cannot function independently. For instance, the application of statistical methods in improving product quality cannot be successful without management support, employee involvement and teamwork, which are all instilled by a proper management system. As a result, the management system supports the installation of a technical system; in other words, ST supports the use and utilization of HT elements. The view of [28] is that TQM is based on the premise that all activities in a firm contribute to quality. Categories of TQM are the so-called HT and ST aspects. Thus, TQM contributes to both production oriented and employee relations oriented elements.

In sum, ST aspects are the soft dimensions of total quality management. According to Zairi and Baidoun [29], they could be characterized by:

- long-term nature;
- something cannot be switched on and off;
- must be addressed accordingly in the implementation plan;
- intangible factors;
- difficult to measure quality factors;
- initial inputs to the implementation of TQM;
- humanistic factors (people aspects); and
- tacit and behavioral resources [16]

On the other hand, according to Zairi and Baidoun [30], the hard aspects of TQM can be characterized by:

- impact the internal efficiency of the organization;
- focus on TQM tools and techniques, systems, processes
- Considered as tactics rather than strategies;
- utilizes quantitative (technical) methods; and
- the emphasis on the hard aspects reflects the production orientation of the TQM gurus [27].

With reference to the above matters, there is no clear consensus concerning ST and HT content, and this is due to some factors being regarded as ST by some authors and HT by others [31]. Due to these reasons, the purpose of this paper is to introduce the relationship between the two dimensions of TQM, namely, ST and HT, and thus, it will investigate the linkage between them in the developing economy of Malaysia. The ultimate goal of this paper is to answer the following main question:

Is there is any link between ST and HT?

The following sections start with reviewing the literature of ST and HT, proposing the theoretical framework, and empirically testing the hypothesis. The last sections are concerned with data analysis, results, implications and conclusions.

2. Literature Review

2.1. Theoretical Framework and Study Proposition

To fill the gap concerning the nature of relationship between ST and HT, an empirical study was designed to unravel the gap by testing the relationship between the two main TQM dimensions (ST, HT). To guide the direction of the analysis and test the study hypothesis, a multidimensional theoretical framework was proposed. It was derived from a recent study in quality management area [18], aimed at contrasting the different factors of ST and elements of HT. This study was built based on the suggestion of Rahman and Bullock [18] that:

- ST elements has a direct role on the utilization of HT elements inside organizations; and
- successful organizations are those that apply a combination of ST and HT policies to respond to changing customer requirements.

Hence, the proposed theoretical framework for this study is illustrated in Figure1

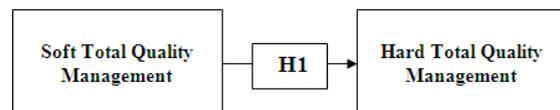


Figure1. The Theoretical Proposed Framework.

Source: Rahman and Bullock [18]

Based on the proposed theoretical framework, the main hypothesis of this study reads as follows:

H1: *There is a significant and positive relationship between ST aspects and HT Variables*

Main variables of the study

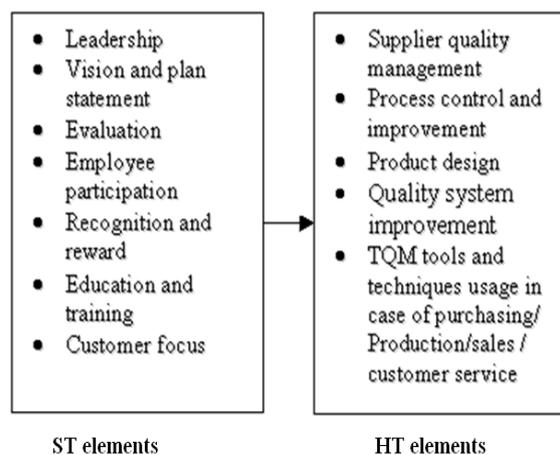


Figure2. Schematic Presentation of the Theoretical Framework

Tata *et al.* [25] recommended using pre-tested constructs from past empirical studies to ensure their

validity and reliability. The variables of ST and HT in this study were mainly adopted from [32], [4], and [14]. Most of the variables included in the questionnaire were based on Zhang *et al.* [32] instrument; this can be justified as: (1) According to [32], the instrument has unique characteristics in that it covers a broader scope of TQM in comparison with other instruments developed by other researchers (Ahire *et al.* [2]); (2) the instrument is integrated to a certain extent in the constructs of many researchers (Saraph *et al.* [19]; Flynn *et al.* [7]; Ahire *et al.* [2]), and this is what researchers recommended to use in future research, a blending of instruments which should yield highly stable, reliable and valid constructs of quality management; (3) it included constructs which were not found in other instruments (i.e., vision and plan statement); (4) it clearly separated the aspects of soft and HT, where most of the variables included are consistent with the literature; (5) researchers can use it because it is empirically tested and validated and can generally be used in different countries since it is developed on the basis of an extensive review of TQM literature [32]; (6) industrial practitioners and managers will also be able to use this instrument to evaluate their TQM implementation so as to target improvement areas and to identify problem areas that should be improved; (7) it described the primary quality management methods, which may be used to assess an organization's present strength and weaknesses with regard to its use of quality management methods [32]; (8) it covered the basic essential elements of all definitions of TQM, which are: the continuous process improvement, people orientation, quantitative methods, and customer focus, which cover both the soft and hard aspects of TQM in a clear picture;. (9) it is valid and reliable and has the highest external validity when it is compared to other instruments such as [19] and the instrument used for testing of its validity and reliability in nine industrial sectors for large sample size; and (10) it included dimensions from the most important models of MBNQA and EFQM.

3. Method

Since the primary objective of this study is to examine relationship, rather than developing new constructs, it used pre tested constructs from past empirical studies. A cross sectional mail survey was developed, consisting of two parts, which relate to the variables ST and HT. The five point likert scale was used for all the items of the questionnaire. The variables, included in the survey, are as described in (Figure 2). To establish the validity and reliability of the questionnaire, two steps were followed. First, a panel of experts evaluated the questionnaire. Based on their suggestions, some items were changed. Second, the revised questionnaire was piloted with 40 ISO 9000 certified Malaysian companies; the data collected from the pilot test were coded and analyzed using the statistical

software (SPSS) to find any unanticipated difficulties, and no significant problems were found. Cronbach's alpha was used to determine the internal consistency of the instrument. All scales were highly reliable and consistent. Then, the proposed theoretical framework was tested in 250 ISO 9000 certified Malaysian manufacturing companies, selected randomly from SIRIM directory [21], which encompassed various industries to generalize the results. The unit of analysis is the manufacturing company. To encourage the respondents to complete and return the questionnaire, several efforts, such as a telephone follow up campaign, a reminder letter, and pre-paid attached postage envelope, were made. A total of 87 companies responded to the postal survey, 8 of them were discarded since they are not completed. The total number of questionnaires accepted for analysis was 79. The final response rate accounted for 32 %, which is considered acceptable when compared with those experienced by others, conducting similar surveys. This can be justified as a considerable success with Malaysian companies and is higher than the suggested minimum in Malhotra and Grover [12], which is 20 percent.

4. Results and Analysis

Testing the hypotheses.

Two steps were followed in order to test the main hypothesis of this study. The first step is the correlation analysis, while the second is the multiple regression technique, which utilized from SPSS.

4.1. Correlation Analysis

Correlation between ST elements

Table 1. Correlation between ST elements (values of r, at p less than.)

0	ST1	ST2	ST3	ST4	ST5	ST6	ST7
ST1	1						
ST2	.78**	1					
ST3	.65**	.62**	1				
ST4	.34**	.34**	.55**	1			
ST5	.23**	.29**	.48**	.31**	1		
ST6	.25**	.28*	.47**	.28*	.13	1	
ST7	.38**	.39**	.55**	.27*	.23*	.76**	1

** Correlation is significant at 0.01 level (2-tailed)

Results show that all ST elements were positively and significantly correlated with each other, except for the correlation between ST5 and ST6. Thus, relationships are as hypothesized.

Correlation between HT Elements

The correlation between HT elements is depicted in Table 2

Table 2. Correlation between HT elements (values of r, at p less than.)

	HT 1	HT 2	HT 3	HT 4	HT 5	HT 6	HT 7	HT 8
HT 1	1							
HT 2	.62**	1						
HT 3	.56**	.84**	1					
HT 4	.56**	.67**	.74**	1				
HT 5	.55**	.67**	.64**	.60**	1			
HT 6	.57**	.57**	.56**	.59**	.81**	1		
HT 7	.47**	.45**	.45**	.49**	.58**	.61**	1	
HT 8	.77**	.62**	.60**	.59**	.49**	.46**	.64**	1

** Correlation is significant at 0.01 level (2-tailed)

Results show that all HT elements were positively and significantly correlated with each other. Thus, relationships are as hypothesized.

Inter item correlation between ST and HT elements

The correlation between the dimensions of ST and HT is depicted in Table 3

Table 3. Correlation between ST and HT elements (Values of r, at p less than.)

	ST 1	ST 2	ST 3	ST 4	ST 5	ST 6	ST 7
HT1	.53**	.55**	.57**	.29**	.17	.48**	.58**
HT2	.49**	.60**	.55**	.16	.14	.47**	.62**
HT3	.54**	.56**	.51**	.22	.19	.47**	.57**
HT4	.50**	.55**	.55**	.33**	.18	.46**	.58**
HT5	.72**	.78**	.62**	.33**	.18	.33**	.47**
HT6	.93**	.91**	.65**	.33**	.24*	.25*	.39**
HT7	.61**	.62**	.89**	.82**	.52**	.45**	.49**
HT8	.45**	.48**	.70**	.39**	.45**	.81**	.82**

** Correlation is significant at 0.01 level (2-tailed).

Table 3 indicated that the dimensions of ST are significantly and positively correlated with HT variables, except for the association between ST5 and (HT1, HT2, HT3, HT4, HT5) and the association between ST4 and (HT2, HT3).

Multiple Regression Analysis

The proposed theoretical framework in this study was multidimensional; hence multiple regression analysis is the best technique for analysis of the multi corollary

hypotheses. Eight multiple regression analyses were conducted in order to assess the relationships between the elements of ST and HT.

The main hypothesis of this study reads as:

H1: There is a significant and positive relationship between ST aspects and HT variables.

Testing of this hypothesis requires postulating 8 different corollary hypotheses; these are:

- H1A: Soft total quality management is positively associated with supplier quality management
- H1B: Soft total quality management is positively associated with process control and improvement
- H1C: Soft total quality management is positively associated with product design.
- H1D: Soft total quality management is positively associated with quality system improvement
- H1E: Soft total quality management is positively associated with total quality management tools and techniques usage in purchasing
- H1F: Soft total quality management is positively associated with total quality management tools and techniques/ production.
- H1G: Soft total quality management is positively associated with total quality management tools and techniques/ sales.
- H1H: Soft total quality management is positively associated with total quality management tools and techniques/ customer service

A detailed explanation of all corollary hypotheses in this study was depicted in appendix A. Eight multiple regression analyses were conducted in order to assess the relationships between the elements of ST and HT. The seven elements of ST were regressed on the eight variables of HT in order to shed light on the association between ST elements and every variable in HT. It is a detailed data analysis that aimed at exploring which elements of ST associated with HT variables. In other words, to examine the utilization of ST into HT. The results of the data analysis summarized in Tables 4 and 5.

Table 4. Effect of ST on HT

R	R ²	Adjust R ²	F	Coefficient
.878	.771	.768	(=255.329, p <0.05)	(β=. 878, p<0.05)

Table 4 indicated that ST and HT, as general constructs, were positively and significantly associated. The detailed data analysis of the elements of ST and HT is depicted in Table 5.

Table 5. The Results of Multiple Regression Analysis of ST to HT. (The values indicated are beta coefficients)

Variables	HT1	HT2	HT3	HT4	HT5	HT6	HT7	HT8
ST1	.09	-.115	.16	.029	.182**	.525*	.009	.019
ST2	.256**	.449*	.28*	.298*	.54*	.493*	.099*	.054
ST3	.226	.302*	.043	.145	.19**	.042	.519*	.160*
ST4	-.01	-.181**	-.070	.062	.015	-.012	.468*	.004
ST5	-.089	-.142	-.010	-.086	-.110	-.025	.088*	.23*
ST6	.13	-.011	.125	.037	-.105	-.043	.039	.46*
ST7	.20	.408*	.30*	.348*	.173**	.036	-.013	.30*
R	.691	.760	.699	.695	.853	.983	.988	.935
R ²	.477	.577	.489	.483	.73	.965	.975	.874
Adjust R ²	.425	.536	.438	.432	.70	.962	.973	.861
F	9.253*	13.85*	9.69*	9.48*	26.69*	279.56*	400.8*	70.24*

Note: Significant levels: * $p < 0.05$; ** $p < 0.10$

With reference to Table 5, it is found that ST1 positively and significantly associated with HT5 ($\beta = .182$, $p < 0.10$) and HT6 ($\beta = .525$, $p < 0.05$), thus, H4E1, H4F1 were supported. ST2 found significantly and positively associated with seven variables of HT, except HT8, namely, HT1 ($\beta = .256$, $p < 0.10$), HT2 ($\beta = .449$, $p < 0.05$), HT3 ($\beta = .28$, $p < 0.05$), HT4 ($\beta = .298$, $p < 0.05$), HT5 ($\beta = .54$, $p < 0.05$), HT6 ($\beta = .493$, $p < 0.05$), and HT7 ($\beta = .099$, $p < 0.05$), hence, H4A2, H4B2, H4C2, H4D2, H4E2, H4F2, H4G2 were supported.

Findings also revealed that ST3, ST7 and ST4 were significantly associated with HT2. Both ST3 ($\beta = .302$, $p < 0.05$) and ST7 ($\beta = .408$, $p < 0.05$) were positively associated, while ST4 ($\beta = -.181$, $p < 0.10$) was negatively associated; thus, H4B3, H4B7 were supported and H4B4 were rejected since it is negatively associated. In addition, both (ST3 and ST7) are found to be positively and significantly associated with HT5 and HT8, thus, hypotheses H4E3, H4E7, H4H3, H4H7 were supported. In addition to ST2, three dimensions of ST, namely, ST3 ($\beta = .519$, $p < 0.05$), ST4 ($\beta = .468$, $p < 0.05$), and ST5 ($\beta = .088$, $p < 0.05$) were found to be positively and significantly associated with HT7, thus, H4G3, H4G4, H4G5 were supported.

ST5 ($\beta = .23$, $p < 0.05$) and ST6 ($\beta = .46$, $p < 0.05$) were found to be positively and significantly associated with HT8, thus, H4H5, H4H6 were supported.

Lastly, ST7 is found to be positively and significantly associated with HT3 ($\beta = .30$, $p < 0.05$), and HT4 ($\beta = .348$, $p < 0.05$), thus, H4C7, H4D7 were supported. Summary of the rejected hypotheses were depicted in Appendix 1

5. Discussion

TQM is a philosophy for continuous improvement. It has two dimensions, namely ST, which focuses on the humanistic aspects, and HT, which focuses on TQM tools and techniques, processes and systems Al-Khalili *et al.* [3].

This study revealed that the relationship between ST and HT was supported. All seven variables of ST were significantly associated with some HT variables. The positive and significant relationship between ST1 and two variables of HT; the positive and significant relationship between ST2 and seven variables of HT; the positive and significant relationship between ST3 and three dimensions of HT; the positive and negative relationship between ST4 and two variables of HT; the positive and significant relationship between ST5 and two variables of HT; the positive and significant relationship between ST6 and one variable of HT; the positive and significant relationship between ST7 and five variables of HT. These significant relationships indicated that Malaysian manufacturing companies have the capability to integrate TQM two sides, namely, ST and HT and, thus, can be more profitable through the implementation and practices of two TQM sides.

Findings in investigation of this relationship (ST – HT) in this study were in line with [18] in their survey in the Australian manufacturing companies; [18] found a significant positive relationship between ST and HT elements. Thus, findings explained that some ST variables have an impact on the diffusion and utilization of HT in Malaysian Manufacturing companies; in other words, findings supported the proposed framework explained in this study and provided evidence that successful organizations are those that apply a combination of ST and HT practices and policies to respond to changing customer satisfaction.

The multidimensionality of some variables also supported, which is consistent with the suggestion by a number of scholars, especially the multidimensionality of TQM ([5]; [23]; [22]).

Figure 3: MBNQA Seven Criteria for Excellent Performance

Source:[On line]

http://www.quality4results.com/enterprise_models_baldrige.php.



Figure 3. MBNQA model [13]

MBNQA model supported the claim that there is an association between the two sides of TQM; the model assumed that there is a link between human resources focus (ST dimension) and process management (HT) from one side, and between them and the performance (business results) from the other side. Findings of this study are also in line with this model, namely MBNQA (Figure 3), where ST7 (customer focus), ST4 (employee participation), which are human resources aspects, in other words, people aspects, have a significant relationship with HT2 (process control and improvement). This means that ST has a direct effect on HT. This, hence, supported the MBNQA model, and also the proposed theoretical framework in this study that ST has direct effect on HT.

The previous support linked the theory as depicted in Figure 1 with the empirical findings of this study regarding the relationship between ST and HT. Furthermore, the existence of a relationship between ST and HT in this study supported Sashkin and Kiser's [20] claim that TQM works when people use basic statistical tools (or HT) and behavioral techniques to account or to collect data in order to analyze and solve problems. In summary, this study found support that there was a positive and significant relationship between the two sides of TQM, especially in the important foundations of TQM which are: (1) tools and techniques that people are trained to use to identify and solve quality programs; and (2) customer as the focus of TQM [20]. This study was consistent with Hung [9] that both ST and HT were the key concepts for successful implementation of TQM, and consistent with Prajogo and Sohal [17] where they verified the proposition that both mechanistic (HT),

and organic (ST) types of practices could coexist under the umbrella of TQM; hence this study supported the multidimensionality of TQM similar to research of Prajogo and Sohal [17].

6. Recommendations for Future Research

Recommendations for future research would address the issues generated from this study. Based on the findings of this empirical study, future research may start from a relatively higher level of knowledge.

Research focusing on the two dimensions of TQM is relatively new. The perspectives are: (a) the effectiveness with which ST and HT practices are implemented. This issue deals with the role of manufacturing companies' top managers, and the quality managers in enhancing the practicing of the two dimensions; and (b) the effectiveness of these practices in producing desired results and their contribution to the performance. Few studies focused on these two issues together to date. The study in the Australian companies by Rahman and Bullock [18] was probably the only study to date examining these issues together. The present study investigated these two dimensions, namely, ST and HT, in the Malaysian industries with different variables. Other researchers are encouraged to do the same in other sectors and firms in other developing and developed countries.

7. Conclusion

This paper investigates the relationship between ST and HT. It attempts to clarify the basics and dimensions of ST and HT found in the literature. The study primary data were gathered using the postal survey; results of this proposition were tested using the multiple regression analysis and supported the proposed framework, hence, ST and HT aspects could be linked and integrated together in the same framework if they are implemented and practiced correctly by the quality and production managers. The importance and usefulness of this paper comes from different aspects. First, it focused on TQM two main dimensions and investigated empirically their linkage in a multidimensional framework. Second, it dealt with quality tools and techniques in depth which are considered as an important element for HT. Moreover, the variables used in this paper were consistent with MBNQA model such as leadership and customer focus (ST elements) and Process management and control which is (HT element). This paper is consistent with Mustafa and Bon's [15] conclusions that the majority of studies agreed that top management leadership and commitment, considered as ST elements, has a crucial role in TQM implementation.

Acknowledgements

Authors of this paper are very grateful to the editor in chief, Prof. Nabil Anagreh and the blind reviewers for

useful comments and suggestions that improved this version of the paper.

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Appendix1: Summary of Results of the Corollary Hypotheses

Code: S: supported, R: Rejected

Hypothesis Statement	Result
H1A Soft total quality management is positively associated with supplier quality management.	
H1A1 There is a significant and positive relationship between leadership and supplier quality management	R
H1A2 There is a significant and positive relationship between vision and plan statement and supplier quality management	S
H1A3 There is a significant and positive relationship between evaluation and supplier quality management	R
H1A4 There is a significant and positive relationship between employee participation and supplier quality management	R
H1A5 There is a significant and positive relationship between recognition and reward and supplier quality management	R
H1A6 There is a significant and positive relationship between education and training and supplier quality management	R
H1A7 There is a significant and positive relationship between customer focus and supplier quality management	R
H1B Soft total quality management is positively associated with process control and improvement	
H1B1 There is a significant and positive relationship between leadership and process control and improvement	R
H1B2 There is a significant and positive relationship between vision and plan statement and process control and improvement	S
H1B3 There is a significant and positive relationship between evaluation and process control and improvement	S
H1B4 There is a significant and positive relationship between employee participation and process control and improvement	R
H1B5 There is a significant and positive relationship between recognition and reward and process control and improvement	R
H1B6 There is a significant and positive relationship between education and training and process control and improvement	R
H1B7 There is a significant and positive relationship between customer focus and process control and improvement	S
H1C Soft total quality management is positively associated with product design.	
H1C1 There is a significant and positive relationship between leadership and product design	R
H1C2 There is a significant and positive relationship between vision and plan statement and product design	S
H1C3 There is a significant and positive relationship between evaluation and product design	R
H1C4 There is a significant and positive relationship between employee participation and product design	R
H1C5 There is a significant and positive relationship between recognition and reward and product design	R
H1C6 There is a significant and positive relationship between education and training and product design	R
H1C7 There is a significant and positive relationship between customer focus and product design	S
H1D Soft total quality management is positively associated with quality system improvement	
H1D1 There is a significant and positive relationship between leadership and quality system improvement	R
H1D2 There is a significant and positive relationship between vision and plan statement and quality system improvement	S
H1D3 There is a significant and positive relationship between evaluation and quality system improvement	R
H1D4 There is a significant and positive relationship between employee participation and quality system improvement	R
H1D5 There is a significant and positive relationship between recognition and reward and quality system improvement	R
H1D6 There is a significant and positive relationship between education and training and quality system improvement	R
H1D7 There is a significant and positive relationship between customer focus and quality system improvement	S
H1E Soft total quality management is positively associated with total quality management tools and techniques/ purchasing	
H1E1 There is a significant and positive relationship between leadership and TQM tools and techniques/purchasing	S
H1E2 There is a significant and positive relationship between vision and plan statement and TQM tools and techniques/purchasing	S
H1E3 There is a significant and positive relationship between evaluation and TQM tools and techniques/purchasing	S
H1E4 There is a significant and positive relationship between employee participation and TQM tools and techniques/purchasing	R
H1E5 There is a significant and positive relationship between recognition and reward and TQM tools and techniques/purchasing	R

H1E6 There is a significant and positive relationship between education and training and TQM tools and techniques/purchasing	R
H1E7 There is a significant and positive relationship between customer focus and TQM tools and techniques/purchasing	S
H1F Soft total quality management is positively associated with total quality management tools and techniques/ production.	
H1F1 There is a significant and positive relationship between leadership and TQM tools and techniques/ production	S
H1F2 There is a significant and positive relationship between vision and plan statement and TQM tools and techniques/ production	S
H1F3 There is a significant and positive relationship between evaluation and TQM tools and techniques/ production	R
H1F4 There is a significant and positive relationship between employee participation and TQM tools and techniques/ production	R
H1F5 There is a significant and positive relationship between recognition and reward and TQM tools and techniques/ production	R
H1F6 There is a significant and positive relationship between education and training and TQM tools and techniques/ production	R
H1F7 There is a significant and positive relationship between customer focus and TQM tools and techniques/ production	R
H1G Soft total quality management is positively associated with total quality management tools and techniques/ sales.	
H1G1 There is a significant and positive relationship between leadership and TQM tools and techniques/ sales	R
H1G2 There is a significant and positive relationship between vision and plan statement and TQM tools and techniques/ sales	S
H1G3 There is a significant and positive relationship between evaluation and TQM tools and techniques/ sales	S
H1G4 There is a significant and positive relationship between employee participation and TQM tools and techniques/ sales	S
H1G5 There is a significant and positive relationship between recognition and reward and TQM tools and techniques/ sales	S
H1G6 There is a significant and positive relationship between education and training and TQM tools and techniques/ sales	R
H1G7 There is a significant and positive relationship between customer focus and TQM tools and techniques/ sales	R
H1H Soft total quality management is positively associated with total quality management tools and techniques/ customer service.	
H1H1 There is a significant and positive relationship between leadership and TQM tools and techniques/ customer service	R
H1H2 There is a significant and positive relationship between vision and plan statement and TQM tools and techniques/ customer service	R
H1H3 There is a significant and positive relationship between evaluation and TQM tools and techniques/ customer service	S
H1H4 There is a significant and positive relationship between employee participation and TQM tools and techniques/ customer service	R
H1H5 There is a significant and positive relationship between recognition and reward and TQM tools and techniques/ customer service	S
H1H6 There is a significant and positive relationship between education and training and TQM tools and techniques/ customer service	S
H1H7 There is a significant and positive relationship between customer focus and TQM tools and techniques/ customer service	S