Received March 2008
Revised May 2008
Accepted September 2008

Quality management practices

An empirical investigation of associated constructs in two Kuwaiti industries

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Abstract

Purpose – The purpose of this exploratory study is to survey quality management practices in two industrial sectors in the state of Kuwait. It aims to provide reliable and valid constructs for measuring quality management practices and to test the effect of type of industry and plant size on the implementation level.

Design/methodology/approach – A questionnaire was administered, with the help of the Kuwaiti Public Authority for Industry (PAFI), to a stratified sample of 105 Kuwaiti plants. Confirmatory factor analysis and internal consistency tests were used to verify scales validity and reliability. The two independent samples *t*-test and analysis of variance (ANOVA) were utilised to investigate the statistical effects of type of industry and plant size respectively.

Findings – The results revealed four reliable and valid constructs: customer focus, total quality management (TQM) human practices, process quality resource, and quality measurements. While type of industry showed no significant effect on the level of implementation of the four quality management constructs, plant size was a determinant factor of the implementation of customer focus and process quality practices.

Originality/value – The study is the first quality management survey in Kuwait. No valid or reliable TQM scales were developed before in such rigorous methodology. The study contributes to the unresolved issue of the size effect, especially when considering plant rather than company size. The need for governmental support, especially for small plants, in quality management implementation was reinforced.

Keywords Quality management, Working practices, Total quality management, Manufacturing industries, Kuwait

Paper type Research paper

Introduction

The last decade has witnessed a considerable research surveying manufacturing quality practices in several countries or regions. Documenting quality practices and total quality management (TQM) implementation in the USA (Benson *et al.*, 1991; Richardson, 1993; Roethlein *et al.*, 2002), India (Motwani *et al.*, 1994; Jain and Tabak, 2002; Mahadevappa and Kotreshwar, 2004), China (Tuan and Ng, 1997; Yu *et al.*, 1998; Li *et al.*, 2003; Lau *et al.*, 2004), Australia (Sohal *et al.*, 1991; Mandal *et al.*, 1999; Terziovski *et al.*, 1999), Singapore (Ghosh and Hua, 1996; Yong and Wilkinson, 2001), Malaysia (Eng and Yusof, 2003); Scotland (Masson and Raeside, 1999), Germany (Zink and Schildknecht, 1990), Turkey (Ozgur *et al.*, 2002), and Spain (Martinez-Lorente *et al.*, 1998), represents some efforts in this direction. Other studies examined differences between organisations and nations in terms of specific quality management practices. In particular, quality practices in several countries were benchmarked against those of

International Journal of Quality & Reliability Management
Vol. 26 No. 3, 2009
pp. 214-233

0265-671X
DOI 10.1108/02656710910936708

the USA. Comparisons of TQM practices in the USA and Mexico (Knotts and Tomlin, 1994; Solis *et al.*, 2000), USA and Russia (Pooley and Welsh, 1994), and USA and Taiwan (Madu *et al.*, 1995) are some examples. Similarly, Zhao *et al.* (1995) benchmarked quality practices in India, China and Mexico and Raghunathan *et al.* (1997) compared the quality management practices in the USA, India, and China. Along the same lines, the differences in quality management between Shanghai and Norway (Sun, 2000), the USA, India, China, Mexico and Taiwan (Solis *et al.*, 2001), the UK, Portugal and Finland (Mathews *et al.*, 2001) and between Hong Kong and Shanghai (Chin *et al.*, 2002) were investigated.

Most of this literature has been based on the experience of developed economies in Western and Southeast Asian nations. Thus, newly industrialising countries, especially those in the Middle East and Arab nations, remain under-researched. Mink (1992) indicated the difficulties of translating quality management concepts into different cultures. Raghunathan *et al.* (1997) also stressed the need for understanding the status, commonalties and differences of quality practices in developed and developing countries to facilitate insights into quality practices in an international context. The main contribution of this research is to provide reliable and valid constructs for measuring quality management practices in a developing country such as Kuwait. The need for the development and validation of such research instrument was frequently called for in quality management research (see for example, Anderson *et al.*, 1995; Grandzol and Gershon, 1998; Rao *et al.*, 1999; Zhang *et al.*, 2000; Jain and Tabak, 2002). Another contribution of this study is to use these reliable and valid constructs in surveying quality practices of different-sized plants in two Kuwaiti manufacturing sectors: food processing and refractors. This provides a multi-dimensional description of these practices in different manufacturing sectors and for different-sized groups. This, in turn, can help Kuwaiti manufacturers and governmental agencies in assessing the implementation level of quality management practices and take effective initiatives to enhance these practices in the Kuwaiti industry. Finally, the study investigates the effect of type of industry and plant size on the implementation level of different quality practices. With the contradictory results of several empirical studies concerning the relationship between firm size and quality practices, as will be seen in the next section, this study contributes in this direction by trying to resolve this research issue in a less-developed, rather than well-developed, manufacturing environment. Briefly, the findings of this research provide insights about quality practices in a developing manufacturing sector in one of the newly industrialising Gulf States, Kuwait.

Over the period 1995-2000, the industrial sector made about 11.8 per cent of the total GDP in Kuwait. Yet, if petroleum and petrochemical products were excluded, the sector's contribution would be 2.8 per cent only. Aside from these oil-related industries, the main five manufacturing activities in the country are food processing, paper processing and printing, chemical products, building materials (refractors), and fabricated metallic products. Together, they contribute about 80 per cent of the gross value-added generated in the manufacturing sector (Industrial Bank of Kuwait, 2001).

With the oil price fluctuation, most oil-producer countries in the Gulf area, such as Saudi Arabia, United Arab Emirates, and Kuwait, have adopted manufacturing as a strategic choice to achieve their long-term income-diversification goal. Each of these countries aims at broadening its economic base and reducing its dependency on crude-oil exports.

In pursuing this goal, the Kuwaiti government adopted a long-term strategy of providing different forms of support and incentive programmes for Kuwaiti manufacturers. Some of these attractive incentives are long-term loans with nominal interest rate, an almost-free lease of industrial lots, free infrastructure facilities for all industrial zones, tax exemption, and securing very low-cost utilities for manufacturing units.

Most of all, the Kuwait government, through the Kuwaiti Public Authority for Industry (PAFI), help manufacturing units to assess and enhance their managerial systems and practices. The current study is part of an initiative that was financed by PAFI to survey and assess managerial practices in two Kuwaiti industrial sectors: food processing and refractors. Therefore, diagnosing weaknesses and recommending avenues for improvement will be possible. These two sectors were selected by PAFI as a pilot project with the intention to cover the rest of the manufacturing sectors in subsequent projects. As percentage of the gross value-added generated in the Kuwaiti manufacturing sector, food processing and refractors products represent about 16 per cent and 13 per cent respectively (Industrial Bank of Kuwait, 2001).

Manufacturing sectors in Gulf countries, including Kuwait, represent newly developed industries that are working in highly competitive free-market systems. Thus, it is inevitable that the demand for extraordinary quality-action programmes to be one of the most critical factors for manufacturers in these countries. Several empirical studies confirmed the positive effect of quality practices on corporate performance, cost reduction, customer satisfaction and on some other operational results (for example, see Powell, 1995; Madu *et al.*, 1995; Curkovic *et al.*, 2000; Solis *et al.*, 2000; Agus, 2004; Terziovski, 2006).

To that end, the objectives of the research presented in this paper are threefold:

(1) develop valid and reliable scales for measuring quality practices in the Kuwaiti industry;

(2) survey and contrast the level of implementation of quality management practices in two industrial sectors in Kuwait; and

(3) study the effect of plant size on quality practices in the Kuwaiti manufacturing units.

Research hypotheses

Since this research aims at testing the effect of type of industry and plant size on the implementation level of quality management practices, the literature related to these propositions and the formulated hypotheses are presented in this section.

Industry effect

The operations management literature suggests the existence of different practices in different industries because of the unique business environment they face and the need for fit (Reed *et al.*, 1996; Corbett and Rastrick, 2000). This uniqueness in each industry's business environment, in terms of customer expectations, competition, and technology change, is expected to create different opportunities and threats. Therefore, different corporate and manufacturing strategies among industrial sectors should be expected. Curkovic *et al.* (2000) argue that the dimensions of quality may differ in number or identity from one industry to another. Understanding these differences in various

sectors could help managers in each industry to adopt suitable approaches to the implementation of quality practices. Owing to the exploratory nature of this study, the first null hypothesis is formulated as follows:

H1. The two industrial sectors do not differ significantly in the level of use of quality management practices

Plant size effect

Investigating the effect of company size on quality management implementation was subject of several empirical studies (Benson *et al.*, 1991; Luzon, 1993; Goh and Ridgway, 1994; Ghobadian and Gallear, 1997; Martinez-Lorente *et al.*, 1998; Yong and Wilkinson, 2001; Ozgur *et al.*, 2002; Zhao *et al.*, 2004). While Benson *et al.* (1991) failed to find any relationship between company size and the application of TQM, some other studies were able to confirm this relationship. Martinez-Lorente *et al.* (1998) were able to find a positive and significant correlation between size of the organisation and quality management implementation. Yong and Wilkinson (2001) also showed that larger companies in Singapore, in terms of number of employees, were better acquainted with some quality practices than the small ones. They argued that large companies tend to have more resources for management innovations that affect the use of some practices. Zhao *et al.* (2004) showed that small service firms in China can achieve very good performance results when using soft quality system. By assigning a special award for small-sized companies, the Malcolm Baldrige National Quality Award (MBNQA) implicitly assumes the effect of size on quality practices. Accordingly, the second hypothesis proposed in this study is as follows:

H2. Plant size has significant effect on quality management practices implemented by Kuwaiti manufacturers

Research methodology

Sample and data collection

The data used in this study are part of a large-scale research project, which is aimed at documenting and assessing the manufacturing practices in two of the largest manufacturing sectors in the State of Kuwait: food processing and refractors. The project was financed and administrated by PAFI. Only the information related to quality practices is reported and analysed in this paper.

Because a plant is the level at which quality practices are implemented, the unit of analysis in this study is the plant. A corporate level sample with several plants does not allow accurate assessment of the implementation level of different quality practices. In this study, almost all of the companies making up the sample have only one single plant.

The sampling frame consisted of all manufacturing companies in the food processing (96) and refractors (198) industries working in Kuwait. According to PAFI classification, the food processing industry comprises seven different divisions while the refractory-products industry includes eight. The food-processing industry comprises dairy products, meat processing, juice and soft drinks, bread and bakery, seafood processing, chattels and chicken food, and non-classified products. The refractors industry produces most of the construction materials used in the country. It includes concrete mix, glass, marble and granite, ceramics and tiles, cement, gypsum,

and other products. Its sub-divisions stratified each industry and a proportionate number of plants were selected from each division. Therefore, a relative representation of each division within the same industry was secured in the sample.

The data collection method used was a questionnaire, which was handed to the plant manager, after an introductory phone conversation with the general manager of the sampled plant. PAFI also sent a formal letter to the plants asking them for full cooperation with the research group. A covering letter from the research project director was attached to the questionnaire, which included a brief description of the research project and assurance about confidentiality of the information obtained from the respondents. In some cases, an appointment was scheduled for the researcher to help explain the questions to the plant manager before filling the questionnaire. This contact strategy was successful since the response rate was about 59 per cent for the valid response of 62 plants.

In order to check its suitability, the questionnaire was initially pre-tested on a pilot sample of few plants in both sectors. Comments received assisted greatly in improving the questionnaire. After data collection, returned questionnaires underwent strict checks to insure completeness and consistency. In some cases, plants re-contact was necessary. Only valid and complete questionnaires were used in the analysis. Table I provides a general profile of the responses.

Research variables

The original questionnaire, developed for the above-mentioned large research project, comprised more than 400 questions covering plant characteristics, business environment, manufacturing strategies, manufacturing practices and operational performance. The study focuses on only two sets of these questions. This includes a profile of the plant and the key quality practices being pursued by the plant during the past three years. The plant's profile section included several characteristics of each individual plant. Only two of these characteristics, type of industry and plant size, are considered in this research.

Based on a comprehensive review of the quality management literature, only three dimensions of the frequently cited TQM practices were of interest in this study: customer focus, TQM human resource practices, and core quality practices. These dimensions and their corresponding measuring items were drawn from previous conceptual and empirical quality management and TQM studies (for example: Dean

	Food industry		Refractors industry		Total	
	n	(%)	*n*	(%)	*n*	(%)
Total number of plants in Kuwait	96		198		294	
Sample size (plants)	55		50		105	
Number of valid respondents	30		32		62	
Response rate		54.5		64		59.0
Plant size (employment)						
Small (35 employees or fewer)	8	26.7	15	46.9	23	37.1
Medium (36 to 70 employees)	10	33.3	9	28.1	19	30.6
Large (more than 70 employees)	12	40.0	8	25.0	20	32.3

Table I.
Sampling frame and response rate

and Bowen, 1994; Anderson *et al.*, 1995; Flynn *et al.*, 1995; Madu *et al.*, 1995; Morita and Flynn, 1997; Raghunathan *et al.*, 1997; Rao *et al.*, 1999; Brah *et al.*, 2000; Solis *et al.*, 2000; Zhang *et al.*, 2000; Sun, 2000; Yong and Wilkinson, 2001; Huarng and Chen, 2002; Lau *et al.*, 2004; Agus, 2004).

"Customer focus" is one of the major dimensions of the widely recognised MBNQA and ISO 9000-2000 models for a quality management system. Customer focus is usually seen as the starting point of any quality initiative (Sousa, 2003). In a recent empirical study, Seth and Tripathi (2005) showed that focus on customer satisfaction is critical for the effectiveness of TQM. From a total quality perspective, "customer-driven organisations" systematically integrate customer feedback into their strategic planning and delivery of products and service and show constant sensitivity to emerging customer and market requirements (Flynn *et al.*, 1995; Rao *et al.*, 1999; Sun, 2000). In this study, five items were used to operationalise the "customer focus" concept. These were "customer needs and requirements are thoroughly analysed", "each department is considered an internal customer to other departments", "the plant has customer feedback on quality and delivery measurements", "a formal customer service system is implemented", and "taking customers' complaints seriously".

The second dimension of interest to this study is "TQM human resource practices", which represent the so-called soft side of TQM. According to TQM philosophy, people are the most valuable resource within the company. Most researchers (e.g., Morita and Flynn, 1997; Wilkinson *et al.*, 1992; Bou-Llusar *et al.*, 2005) argue that a more comprehensive quality management programme requires skilled and knowledgeable personnel to implement it effectively. Therefore, several employee-focus practices such as empowerment, teamwork, employee involvement and participation, work attitudes, shared vision and adequate training and education were always cited as prerequisites for any successful quality management programme (Flynn *et al.*, 1995; Brah *et al.*, 2000; Evans and Dean, 2000, Agus, 2004). Yusof and Aspinwall (2000) showed empirically that employee involvement in quality programmes was significantly linked to the success of these programmes in small and medium enterprises. Brah *et al.* (2000) reported similar empirical evidence from the service sector of Singapore. In the current study, four statements were selected to operationalise the "TQM human resource practices" concept. These included "forming teams to solve problems and develop teamwork spirit", "shared vision between management and employees", "employee participation programmes", and "employee training and learning programmes".

In the last section of the questionnaire, nine daily common quality practices were included as potential indicators of the third quality management dimension, namely "Core quality practices". Most of these practices were widely used in several empirical studies (Pooley and Welsh, 1994; Flynn *et al.*, 1995; Martinez-Lorente *et al.*, 1998; Sun, 2000; Bamford and Greatbanks, 2005). These consolidated items used in this study were: "process improvement programmes", "continuous improvement", "benchmarking practices and performance", "the use of statistical process control", "data-driven decisions", "the existence of accurate input(s) quality measurements", "the existence of accurate process quality measurements", "the existence of accurate final product(s) quality measurements", and "using computer in quality control". The Appendix illustrates the three selected dimensions and the corresponding concepts for each.

In developing measures for a plant quality practices, perceptual questions were used. Since the use of manufacturing practices is not a dichotomous (use, do not use) variable, as was empirically documented by Morita and Flynn (1997) and Yong and Wilkinson (2001), questions about the level of implementation of quality practices were used. The answer to each of the quality practices questions was measured on a five-point Likert scale, with 5 representing "fully implemented" and 1 representing "rarely implemented".

Different firm and plant size measures, such as annual revenue; total investments; and number of employees, are usually used in several operations management empirical studies. Although respondents in such studies were asked to provide information about the three measurements, most of them were very reluctant to reveal any information about sales and investments. In addition, size, in terms of employment, of only a number of large plants was known in advance of defining the sample. This is due to inaccurate and outdated employment records in most small plants. This is especially true in the refractors industry. In order to encourage respondents to provide employment data, the employment size question was in an interval form. Based on the experience of PAFI classification, three employment size brackets were defined in the questionnaire: small (35 employees or fewer), medium (from 36 to 70 employees), and large (71 employees or higher). Each plant manager was asked to classify his plant as small, medium or large according to these intervals. Based on the responses, the sizes of the plants for the sample were distributed as follows: 37.1 per cent small; 30.6 medium; 32.3 per cent large.

Statistical analysis

As shown above, three different multi-item scales are used to operationalise quality management practices in this study. Therefore, all scale variables were tested for internal consistency and reliability before they were used for further analysis. In addition, confirmatory factor analysis was used to test the construct validity for each of the three scales.

Because of the fact that ordinal scales are used in measuring the level of implementation of different quality practices and because of the relatively low sample size in the current study, selecting the appropriate statistical techniques for comparing group means is considered very crucial. Most of the available parametric inferential statistics depends on certain assumptions (Danial, 1990). Of interest, both student's t and F tests in the analysis of variance assume that samples have been drawn from normally distributed populations with equal variance. Therefore, testing the collected data for the satisfaction of these two assumptions was carried out using Kolmogorov-Smirnov and Levene's tests respectively.

Normality and homogeneity of variance test results, as reported in Table II, indicate that the average scores of most quality-practice constructs are normally distributed. Similarly, Levene's test results did not support the rejection of the null hypothesis that the variances of the two industry groups are equal for three of the constructs. Also, the homogeneity of variances of the three size groups was confirmed for all quality-practice variables. Based on these results, the two independent sample t-test was used to compare quality practices of the two manufacturing sectors. Similarly, the analysis of variance (ANOVA) k-independent samples test was selected to test for the difference in quality practices across the three plant-size groups.

Results and discussion

The principal component analysis with varimax rotation was used to extract factors using a minimum scale factor loading of 0.50 as criterion. On the other hand, Cronbach's standardised alpha was selected to measure each construct reliability level with a minimum value of 0.60 (Nunnally, 1978). Reliability is the degree to which measures are free from errors and thus yield consistent results (Brah *et al.*, 2000). It is a measure of internal consistency based on the average inter-item correlation and is the most commonly used reliability test in survey research. Validity and reliability results of the three quality-practice dimensions used in the study are reported in Tables III-V.

The principal component analysis results, as reported in Tables III and IV, confirmed the unidimensionality of the measurement statements that were included for both "Customer focus" and "TQM human resource practices" scales respectively. The five statements of "customer focus" were loaded on one factor with an initial

	Kolmogorov-Smirov's for test results		Levene's test for different industry groups		Levene's test different size groups	
Quality practices	K-S Z	Significance	Levene st.	Significance	Levene st.	Significance
Customer focus	0.878	0.424	1.524	0.226	1.555	0.217
TQM human resources	0.860	0.451	1.775	0.179	2.098	0.153
Process quality	1.157	0.137	7.599	0.001	0.007	0.934
Quality measures	1.857	0.002	0.515	0.600	3.362	0.072

Table II. Normality and homogeneity of variance tests

	Factor analysis results	Internal consistency results		
Variables	One factor	Item mean	Item SD	Alpha if item deleted
Customer needs are thoroughly analysed	0.665	4.022	0.7450	0.6746
Internal customer consideration	0.633	3.174	1.4500	0.6977
Feedback about customer satisfaction	0.609	4.109	0.9244	0.6821
Customer service system	0.751	3.544	1.1674	0.6418
Taking customer complaints seriously	0.790	3.717	1.1674	0.6000

Notes: Cumulative explained variance = 48.020; The standardised Cronbach alpha of the construct = 0.7086; Initial eigenvalue = 2.401

Table III. Factor analysis and internal consistency test results of the "customer focus" variables

	Factor analysis results		Internal consistency results	
Variables	One factor	Item mean	Item SD	Alpha if item deleted
Teamwork for solving problems	0.789	4.2545	0.7750	0.7970
Shared vision	0.869	4.1818	0.8626	0.7454
Employees' participation programmes	0.790	2.8727	1.2027	0.7583
Employees' training programmes	0.795	3.3455	1.1741	0.7507

Notes: Cumulative explained variance = 65.854; The standardised Cronbach alpha of the construct = 0.8125; Initial eigenvalue = 2.634

Table IV. Factor analysis and internal consistency test results of the "TQM human resources practices" variables

Variables	Factor analysis results: Factor one	Factor analysis results: Factor two	Internal consistency results: Item mean	Internal consistency results: Item SD	Internal consistency results: Alpha if item deleted
Process improvement programmes	0.653		4.111	0.6635	0.7588
Data-driven decisions	0.779		3.926	0.9081	0.7371
Continuous improvement	0.677		4.148	0.7373	0.7685
Benchmarking	0.754		3.444	1.2539	0.7198
SPC use	0.746		3.889	1.1103	0.7052
Using computer in QC	0.579		2.241	1.4133	0.7865
Input quality measurements		0.918	4.000	0.9723	0.9262
Process quality measurements		0.951	3.946	0.9802	0.8814
Final product quality measurement		0.920	4.018	0.9242	0.9127

Table V.
Factor analysis and internal consistency test results of the"core quality practices" variables

Notes: Cronbach alpha of the two factors = 0.7803, 0.9362; Cumulative explained variance = 65.854; Initial eigenvalue = 2.634; principal component analysis and varimax rotation were used; The given names of the two factors are "process quality" and "quality measurements accuracy" respectively

Eigenvalue of 2.401 and sizable loadings (> 0.609) on the factor. Together they were able to explain 48.02 per cent of the variance of the related construct. Furthermore, with a Cronbach's standardised alpha of 0.7086, this construct was considered reliable. Accordingly, the construct internal consistency was confirmed and its individual items were combined and treated as single entity. These individual items were "Customer needs", "Internal customer consideration", "Customer feedback", "Customer service", and "Customer complaint system". Most of these concepts and subsystems are related to the "customer and market focus" criterion of the MBNQA and were identified in several empirical studies (Anderson *et al.*, 1995; Flynn *et al.*, 1995; Sun, 2000; Yong and Wilkinson, 2001; Huarng and Chen, 2002; Sousa, 2003; Douglas and Fredendall, 2004; Fuents-Fuents *et al.*, 2004; Lau *et al.*, 2004; Agus, 2004; Seth and Tripathi, 2005).

Similarly, all of the "TQM human resource practices" statements were significantly loaded (> 0.789) on one factor with only one exception. "Employee suggestions system" was deleted because of the low level of loading (< 0.50) on the factor. The loaded items, however, explained about 65.854 per cent of the variance with a relatively high reliability level of 0.8125. As a single entity, the combined score of this construct includes "Teamwork", "Shared vision", "Employee participation", and "Employee training". These practices are frequently stressed in most TQM literature and empirical studies.

On the contrary, and as shown in Table V, the unidimensionality of the "Core quality practices" suggested scale was not confirmed and only nine of its eleven statements were loaded on two separate factors. Neither "the existence of accurate customer satisfaction measurements" nor "using computer in quality control" was loaded on any of these two factors. Therefore, both statements were deleted. Based on the nature of the loaded concepts, the first construct was called "Process quality" while the second was named "Quality measures accuracy". Most of the individual items of the "Process quality" construct are parts of the process management dimension that were used by Flynn *et al.* (1995), Sun (2000), Yong and Wilkinson (2001), Huarng and Chen (2002) and Sousa (2003). This includes "Process

improvement", "Data-driven management", "Continuous improvement", "Benchmarking", and "Statistical process control", and "Using computer in quality control". With a reliability level of 0.7803, the internal consistency was also verified for this newly developed construct in the Kuwaiti environment.

On the other hand, the second emerged construct, "Quality measures accuracy", is related mainly to the existence of accurate measures for the quality level of inputs, processes, and outputs at the plant level. All suggested individual related items were highly loaded (> 0.918) with only "Accurate customer-satisfaction measures" as an exception. Because of its very low loading level (< 0.50), this item was deleted from the scale. However, the reliability level of the "Quality measures accuracy" construct, after deleting this item, was considerably high (0.9362), hence its internal consistency was confirmed.

According to these scale verification results, each of the four quality-practice groups was treated as a different construct. Hence, the mean value of the items measuring a particular construct was taken as the value of that construct for a given respondent.

Quality management practices in Kuwait industries

The mean and standard deviation values for each of the four constructs and their associated individual items in the two industrial sectors, along with the *t*-test results, are reported in Table VI.

Quality practices	Food ($n = 32$) Mean	SD	Refractors ($n = 32$) Mean	SD	Entire sample ($n = 64$) Mean	SD	Independent-sample *t*-test results *t*	Significance
Customer focus	*3.65*	*0.787*	*3.67*	*0.666*	*3.66*	*0.722*	*− 0.111*	*0.912*
Customer needs	3.93	0.716	4.23	0.669	4.08	0.702	−1.548	0.105
Customer feedback	3.93	1.252	4.00	0.943	3.96	1.101	−0.234	0.816
Customer complaints	3.77	1.175	3.36	1.293	3.60	1.230	1.202	0.235
Customer service	3.45	0.961	3.45	1.101	3.45	1.011	−0.010	0.992
Internal customer	3.20	1.448	3.27	1.388	3.23	1.407	−0.182	0.856
Human resources	*3.61*	*0.744*	*3.72*	*0.987*	*3.67*	*0.870*	*− 0.503*	*0.617*
Teamwork	4.27	0.785	4.26	0.773	4.26	0.773	0.043	0.960
Shared vision	4.13	0.860	4.19	0.833	4.16	0.840	−0.278	0.782
Training programmes	3.20	0.961	3.44	1.423	3.32	1.198	−0.767	0.447
Participation	2.73	1.143	3.00	1.277	2.86	1.206	−0.839	0.405
Process quality	*3.57*	*0.742*	*3.60*	*0.838*	*3.59*	*0.786*	*− 0.146*	*0.882*
Continuous improvement	4.10	0.662	4.14	0.790	4.12	0.720	−0.200	0.842
Process improvement	4.07	0.692	4.13	0.619	4.10	0.651	−0..371	0.712
Data-driven decisions	3.93	1.048	3.83	0.711	3.88	0.892	0.452	0.653
SPC use	3.67	1.155	4.03	0.983	3.85	1.078	−1.333	0.188
Benchmarking	3.33	1.184	3.39	1.383	3.36	1.278	−0.163	0.871
Using computer	2.07	1.363	2.50	1.530	2.27	1.446	−1.112	0.710
Quality measures	*3.93*	*0.994*	*4.03*	*0.901*	*3.98*	*0.898*	*− 0.412*	*0.682*
Input quality	3.89	1.175	4.07	0.716	3.98	0.971	−0.675	0.502
Process quality	3.93	1.067	3.96	0.881	3.97	0.971	−0.128	0.899
Final product quality	3.97	0.944	4.07	0.917	4.02	0.924	−0.436	0.665

Note: Construct results are in italics

Table VI.
Quality practices in the two industries (mean, SD and the independent sample *t*-test results)

A close look at the implementation level of the individual items shows that, in general, seven practices of the surveyed 18 items were frequently implemented in the Kuwaiti industry, with a mean score of ($\geq$ 4.0). This includes "forming teams to solve problems and develop teamwork" (4.26), "shared vision between management and employees" (4.16), "continuous improvement" (4.12), "process improvement programmes" (4.10), "customer needs and requirements are thoroughly analysed" (4.08), and " The existence of accurate final product(s) quality measurements " (4.02). Moreover, all of the four quality-practice groups scored above average implementation level ($>$ 3.59) in the entire sample. These results, which are also true in the two industrial sectors, could be a preliminary indication of the Kuwaiti manufacturers' awareness of the major role quality management practices can play in achieving sustainable competitiveness for their plants. The least used quality management practices in the two industrial sectors were "Employee participation programmes" (2.86) and "Using computer in quality control" (2.27).

When comparing the overall implementation level of the four quality management constructs, the reported mean values in Table VI indicate that "Quality measures accuracy" was the most used group of practices, with a mean value of 3.98 on a five-point scale. Within this group, the frequent use of accurate quality measures for production inputs (mean value of 3.98), production process (mean value of 3.97), and for final products (mean value of 4.02) seems to be very essential for Kuwaiti manufacturers in the two industries.

On the other hand, "Process quality" practices scored second with only a moderate level of implementation (3.59). This result is also true for the two manufacturing sectors. A close investigation of the consolidated items of this construct provides an explanation for this observation. Mainly, this relatively moderate value score is due to the very low implementation level of "computer use in quality control" as shown in Table VI. Using computer in quality control scored only (2.27) for the entire sample and (2.07) and (2.50) in the food and refractors sectors respectively. This very limited usage is partially justified for a newly developing industry that utilises cheap and low-skilled expatriate labour in most of its operations. Within this process quality practices, "continuous improvement", "process improvement programmes" and "data-driven decisions" represent the top three highly implemented practices with mean scores of 4.12, 4.10, and 3.88 respectively for the overall sample.

As for the level of implementation of the "Customer focus" concept, the first two items, namely "customer needs and requirements are thoroughly analysed" and "having frequent feedback from customer on quality and delivery", were reported to be the most common practice for the entire sample with mean values of (4.08) and (3.96) respectively. The same phenomena were documented in the food industry where the same two items scored (3.93). In the refractor sector, the reported scores of these two highly implemented items were even slightly higher, (4.23) and (4.00) respectively. The fierce competitive Kuwaiti market forces the adoption of the customer-driven organisation principle as a competitive strategy. Unfortunately, the reported data seem to indicate the narrow definition of a "customer" in the Kuwaiti industry. As reported in Table VI, the concept of "internal customer" was the least implemented concept within the "Customer focus" construct. The reported mean scores for the entire sample and the two industrial sectors of the "internal customer" practices were (3.20), (3.27), and (3.23) respectively.

In a similar manner, the "TQM human resource practices" construct was reported to have almost the same level of implementation as the "Customer focus" concept. Although human resource practices scored a relatively above average implementation level for the entire sample (3.67), only "forming teams to solve problems and develop teamwork" and "shared vision between management and employees" scored a high usage level. Most notably, the concept of teamwork scored the highest implementation level with a mean value of (4.26). In contradiction to this result, respondents reported a relatively low "participation process" with mean scores of (2.73), (3.00), and (2.86) in the overall sample and in the two sectors respectively. One explanation is that forming teams in Kuwaiti plants does not include employees in most cases. It includes only executives and supervisors. This might be due again to differences in nationality, language, and culture between top managers and executives on the other hand and production workers on the other.

When comparing the two industrial sectors, the results show that the ranks of the mean scores of the four quality-practices groups are almost identical. While "Quality measures accuracy" group of practices were reported to have the highest implementation level, "Process quality" group of practices was the least used in both sectors. On the other hand, the ranks of "Customer focus" and "TQM human resource practices" in the two sectors were slightly different. Refractors industry exhibits slightly higher implementation level for the four quality-practices dimensions. However, the *t*-test results, as shown in Table VI, do not confirm any significant differences between the two industrial sectors. Therefore, *H1* was not rejected ($p < 0.05$). In Kuwait, type of industry has no significant effect on the level of implementation of any of the investigated quality practices groups or individual items. This result seems to be consistent with the conclusion that was reached by Lai and Cheng (2003) in Hong Kong. In particular, they found that a significant contrast exists between public utilities/service industries and manufacturing/construction industries. However, they did not report any significance differences among various manufacturing groups.

Plant size and quality practices

As for the implementation level of quality management practices in the three size groups, Table VII reports the composite mean scores for the four constructs and for each of their associated individual statements. It includes also the ANOVA test results.

The initial investigation of the composite mean values shows that the extent of implementation of the four constructs has been greater with large and medium plants while the adoption by small plants has been relatively low. This conclusion is almost true for each of the 18 individual quality management practices considered in the study. In addition, the use of "quality measures" scored the highest implementation level of all quality-practice constructs across the three size groups.

When comparing the different size groups, the significance values of the ANOVA test statistics for "customer focus" ($p < 0.010$) and "process quality" ($p < 0.001$) practices in Table VII supported the rejection of the hypothesis that level of adoption of these two constructs are equal across different sizes. Thus, *H2* was rejected for these two constructs. Plant size, in terms of number of employees, is a determinant of the level of implementation of "Customer focus" and "Process quality" practices in the Kuwaiti manufacturing units.

Quality practices	Small ($n = 23$) Mean	SD	Medium ($n = 19$) Mean	SD	Large ($n = 20$) Mean	SD	ANOVA test results F	Significance
Customer focus	*3.31*	*0.667*	*3.81*	*0.789*	*3.94*	*0.581*	*4.962*	*0.010* *
Customer needs	3.95	0.805	4.18	0.636	4.21	0.631	0.800	0.455
Customer feedback	3.89	1.05	4.18	1.185	3.95	1.050	0.331	0.720
Customer complaints	2.89	1.231	3.88	1.269	4.13	0.885	5.636	0.006**
Customer service	3.06	1.110	3.71	0.985	3.63	0.885	2.192	0.123
Internal customer	2.73	1.486	3.25	1.571	3.80	1.060	3.171	0.050
Human resources	*3.50*	*0.883*	*3.58*	*1.003*	*3.93*	*0.612*	*1.561*	*0.219*
Teamwork	4.14	0.774	4.23	0.903	4.45	0.605	0.912	0.408
Shared vision	4.09	0.811	4.06	1.088	4.35	0.587	0.709	0.496
Training programmes	2.90	1.412	3.29	1.213	3.80	0.761	3.019	0.057
Participation	2.42	1.216	3.06	1.211	3.15	1.137	2.133	0.128
Process quality	*3.16*	*0.580*	*3.63*	*1.024*	*4.03*	*0.453*	*7.721*	*0.001* **
Continuous improvement	3.95	0.759	4.24	0.752	4.25	0.639	1.088	0.344
Process improvement	3.82	0.589	4.29	0.686	4.30	0.571	4.223	0.020*
Data-driven decisions	3.45	0.945	3.88	0.993	4.35	0.489	5.872	0.005**
SPC use	3.27	1.077	3.88	1.111	4.50	0.688	8.320	0.001*
Benchmarking	2.64	1.498	3.47	1.125	4.05	0.686	7.800	0.001*
Using computer	1.17	1.283	2.35	1.482	2.70	1.542	2.586	0.085
Quality measures	*3.68*	*0.774*	*4.13*	*1.066*	*4.13*	*0.847*	*1.556*	*0.220*
Input quality	3.68	0.885	4.12	1.167	4.15	0.875	1.347	0.269
Process quality	3.63	0.895	4.12	1.111	4.10	0.912	1.513	0.230
Final product quality	3.74	0.806	4.18	1.047	4.15	0.933	1.345	0.270

Table VII.
Quality practices by plant size (mean, SD, and the *F*-test results)

Notes: Construct results are in italics; small (35 employees or fewer), medium (36 to 70 employees), and large (more than 70 employees); * $p < 0.05$, ** $p < 0.01$

A close investigation of the individual practices of these two constructs provides a better understanding of these reported significant differences at the construct level. For instance, concerning the "Customer focus" group of practices, it is safe to conclude that plants with different sizes differ significantly ($p < 0.010$) only in handling customer complaints. While both large- and medium-size plants scored significantly higher (4.12, and 3.88 respectively) in "Taking customer complaints seriously", the adoption of this concept by small plants was less than average (2.89). On the other hand, the significant differences among the three size-groups in the level of use of "Process quality" practices is due to their differences in implementing five of the six individual practices in this group. This includes process improvement ($p < 0.020$), data-driven decisions ($p < 0.005$), SPC use ($p < 0.001$), benchmarking ($p < 0.005$) and using computer in QC ($p < 0.027$).

In contrast, the implementation level of "TQM human resources management" and "Quality measures" do not differ significantly ($p < 0.219$ and $p < 0.220$ respectively) among the three size groups. Accordingly, *H2* was not rejected for these two constructs. Small, medium, and large Kuwaiti plants were alike in their usage of "TQM human resources management" and "Quality measure" practices. The utilising of teams for solving problems, securing a shared quality vision between management and employees, initiating employees' participation programmes, then encouraging employees' training programmes were ranked in this order within the human

resource practices in all groups. Similarly, the three groups were identical in the ranks of the level of use of accurate quality measures. The use of accurate quality measures for final products, material inputs and process quality were ranked first, second and third by large, medium and small plants in Kuwait.

For a better understanding of the reported significant differences between the three size groups, all multiple comparisons among means seem to be very essential. Rejecting the overall hypothesis of equal implementation level by the analysis of variance does not indicate that every group mean differs significantly from every other group mean. The *Post-Hoc* Scheffe multiple comparison test was utilised to test this proposition. Like the analysis of variance, the Scheffe procedure is quite insensitive to departure from normality and homogeneity of the variances (Roscoe, 1969). Table VIII presents the results of all pair wise comparisons between the three size groups.

Table VIII shows that large plants scored significantly higher than small plants in terms of their level of use of both "Customer focus" and "Process quality" criteria. On the other hand, the differences between large and medium plants and between medium and small plants are both insignificant. With their higher implementation level of the concept of customer focus in their operations, Kuwaiti large plants outperformed significantly ($p < 0.016$) the adoption of the same concept in small plants by a mean difference of 0.4948. Similarly, they scored a remarkable mean difference of 0.8689 higher than small plants in their adoption of process quality practices.

Conclusions and recommendations

The current study provided four reliable and valid multi-item constructs for measuring quality management practices in the developing Kuwaiti industry. These constructs were "Customer focus" (five items), "TQM human resource practices" (four items), "Process quality" (six items) and "Quality measures accuracy" (three items). These constructs were, therefore, used to report the survey results of quality practices of different-sized plants in two different manufacturing sectors: food processing and refractors. The food processing and refractors sectors were chosen because they represent two extremes with regard to their managerial practices; the former for its relatively sophisticated management practices and the latter for its traditional management practices. Thus, a significant variability in quality management practices between the two industries was already expected. The findings, however, did not support this argument. No significant difference between the two sectors in terms of their quality management practices was detected. The implementation of quality practices seems to be essential across all manufacturing sectors in the highly

	Difference between small and large		Difference between medium and large		Difference between small and medium	
	Mean difference	Significance	Mean difference	Significance	Mean difference	Significance
Customer focus	−0.6262	0.016*	−0.1314	0.835	−0.4948	0.077
Process quality	−0.8689	0.001**	−0.3987	0.231	−0.4703	0.121

Notes: Small (35 employees or fewer), medium (36 to 70 employees), and large (more than 70 employees); * $p < 0.05$, ** $p < 0.01$

Table VIII.
Post hoc multiple comparisons between different size groups (Scheffe's test results)

competitive Kuwaiti environment. Under such environment, the implementation of customer-focus concept, TQM human resource practices, continuous process improvement, and having accurate quality measures seems to be basic requirements for any plant to be an order-qualifier. Quality practices in Kuwait are not an industry-related issue. This is due to the very competitive Kuwaiti market, which is almost open to all international producers.

As for plant size effect, the study revealed that size is a determinant of the implementation level of all quality practices that are related to customer focus and process quality TQM criteria. Kuwaiti large and medium plants tend to exhibit a higher implementation level of these constructs than their smaller counterparts. However, multiple comparisons showed that only large plants scored statistically higher than small plants in putting customer focus and process quality practices in actual implementation. These results support the findings of Lee and Oakes (1995), Haksever (1996), Elmati and Kathawala (1999), Yong and Wilkinson (2001), and Zhao *et al.* (2004). They argue that there are fundamental differences between large and small firms that may significantly affect a small firm's ability to implement a successful quality management system. This research seems to support this argument. The availability of more financial resources, visionary and knowledgeable leadership, highly skilled and competent workforce and well-established operation systems are some of these features in the relatively large Kuwaiti manufacturing plants.

The findings of this research suggest several managerial implications for Kuwaiti manufacturers and governmental decision makers. The continuous enhancement of quality management implementation in all manufacturing units seems very essential. This is especially true in the globalisation era. In addition, PAFI should provide help and support to small and mid-sized plants to enhance their ability to implement effective quality management system. Encouraging the firms to seek ISO 9000 certification, apply for local and regional quality awards and certificates, and to attend local and international quality management workshops represent some possible actions in this direction.

Because of the exploratory nature of this research, further empirical studies are required to investigate other quality management directions in the Kuwaiti environment, by adding more dimensions and elements of quality management. This might further enhance the reliability levels of the recommended scales. Using different plant size measures, such as total investment and/or total sales rather than number of employees, represent other dimensions for exploring the effect of plant size on quality practices. In addition, formulating a multivariate model for predicting the level of implementation using joint distribution of the quality management constructs as a dependent variable and several independent variables, such as quality strategy and business environment, as predictors represent another suggested avenue of research.

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Appendix. Questionnaire

Quality practices used in the questionnaire

On a scale from 1 to 5, please indicate the level of implementation of each of the following quality-practices concepts in your plant.

Customer focus

(1) Customer needs and requirements are thoroughly analysed.

(2) Each department is considered an internal customer to other departments.

(3) The plant has customer feedback on quality and delivery measurements.

(4) A formal customer service system.

(5) Taking customer complaints seriously.

TQM human resource practices

(1) Forming teams to solve problems and develop teamwork.

(2) Shared vision between management and employees.

(3) Employee participation programmes using computer in quality control.

(4) Employee training programmes.

(5) Employee suggestions system.

Core quality practices

(1) Process improvement programmes.
(2) Data-driven decisions.
(3) Continuous improvement.
(4) Benchmarking practices and performance.
(5) Supplier partnership programmes.
(6) The use of statistical process control.
(7) The existence of accurate input(s) quality measurements.
(8) The existence of accurate process quality measurements.
(9) The existence of accurate final product(s) quality measurements.
(10) The existence of accurate customer satisfaction measurements.
(11) Using computer in quality control.

Level of implementation: (1) rarely implemented; (2) slightly implemented; (3) average implementation; (4) frequently implemented; (5) fully implemented.

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