Measuring Success Factors of Quality Management in the Shipping Industry

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Abstract

It is generally accepted that quality management is considered a valuable competitive factor for firms that confers them competitive advantages and enables them to achieve superior performance. Although there have been numerous studies examining general quality management practices and implementation, industry-specific studies on quality management practices and factors that influence their success in the shipping industry are rather few. This study seeks to identify the factors that are critical to successful quality management, and attempts to develop a reliable, empirically-tested, and rigorously-validated measurement instrument for quality management, for the shipping industry. We conducted a large-scale survey of shipping industry executives and applied a rigorous research methodology to treat the survey data. We identified four success factors of quality management, which are *top management commitment and participation*, *quality information and performance measurement*, *employee training and empowerment*, and *customer focus*, and developed a functional instrument to measure quality management in the shipping industry. This paper contributes to research by identifying the success factors of quality management, and provides managerial insights on the successful management of quality, in the shipping industry.

Keywords: Success factors, quality management, shipping industry

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Introduction

Global competition is increasingly severe as more countries are embracing the free market model and opening up their borders for investments and trading (Lee, 2002). To stay competitive, a company's fundamental business strategy must focus on seeking strategic advantages through enhancing its business excellence and performance. Quality management provides an effective approach to carry out this fundamental business strategy. As pointed out by Temtime (2003), quality management has become an indispensable and a globally pervasive strategic force in today's turbulent and dynamic business world, and the increasing intensity of global competition has made quality management a prerequisite for business survival. It is generally agreed that companies that pursue sound quality management practices will become more competitive due to business excellence and enhanced performance (Lee, 2002).

Shipping, a traditional industry, remains the most important mode of transportation in international trade. Seen or unseen, a substantial percentage of the world's trade is carried on merchant ships, and someone, somewhere has to have the skills to sail, service, design and build replacements for the global trading merchant ships that are afloat in the world (Grey, 2003). Despite being nearly invisible, the shipping industry is bigger than most people have ever thought of. As such, nobody can deny the enormous value that shipping has helped to add to the global market (Stopford, 2004). The success and survival of the shipping industry is critically important for international trade and global economic growth, given that the role played by the shipping industry has no immediate or direct substitute. Like other industries, the shipping industry is confronted with traditional and new challenges, which prompt shipping companies to seek improvement through quality

management in the performance of their core processes and services in order to stay competitive.

Although there have been numerous studies examining the elements that constitute quality management, the factors that are critical to the success of quality management implementation (e.g., Black and Porter, 1996; Powell, 1995; Saraph et al., 1989; Yosuf and Aspinwall, 1999), and the relationship between quality management practices and organizational performance (e.g., Hendricks and Singhal, 1997; Ittner and Larcker, 1996; Lemak et al., 1997), studies on quality management in the logistics industry are few in number (Lai et al., 2004), and relatively limited research has been devoted to studying factors that influence the success of quality management in the shipping industry. This study seeks to fill this research gap by identifying the factors that are critical to successful quality management in the shipping industry. We also attempt to develop a reliable, empirically-tested, and rigorously-validated measurement instrument for quality management in the context of the shipping industry.

This study is organized as follows. In the next section we review the relevant literature on quality management in the shipping industry. In the third section we discuss the identification of the success factors of quality management in the shipping industry and detail the development of their measurement scales. We describe and justify the research methodology, followed by analysis and discussion of the empirical results in the fourth section. In the fifth section we discuss the research findings and their theoretical and managerial implications, and we conclude the study in the final section.

Literature Review

Not long ago, the terms “quality” and “transportation services” seldom appeared in the

same sentence, nor was “quality” mentioned in the shipping sector. Purchasers of materials and parts have been actively pursuing quality management throughout the supply base, but buyers of transportation services and the industry that serves them, i.e., the shipping industry, have been less enthusiastic about quality. Minahan (1998) stated that it is fair to say that service industries, like the shipping industry, have been slower to get on the quality bandwagon than production companies, mainly because: (1) it is more difficult to measure a service defect than a defective part or material, (2) service industries have more of a hurdle in terms of creating a quality culture, (3) quality management and ISO have primarily been focused on measuring material and part problems using very specific metrics, while services require more subjective measures, (4) quality systems are initially designed for the manufacturing environment, and one has to use a lot of creativity to convert those standards and relate them to the service environment, (5) logistics quality lacks clarity about measurements and suffers from a lack of information systems to support such measurements, and (6) to make matters worse, shippers have been slow to agree on the exact meaning of quality for transportation services. Despite these hurdles, many transportation providers, including shipping companies, have increasingly been taking a proactive role in managing and improving quality in their businesses. Various transportation service providers have had quality measurement and improvement programmes in place for more than a decade.

Lai et al. (2004) stated that a number of factors are seen to account for an increase in the adoption of quality management systems in the logistics industry, which include a rise in quality awareness, an increase in customer pressure, and a need to install a mechanism to improve work processes. In recent years, intensified competition, rising

performance expectations of shippers, who are the core customers of the shipping industry, and increased regulations for the industry have all prompted shipping companies to widen the scope and increase the quality level of their services. Recognizing the positive impact of quality management programmes on their businesses, three-fourths of the 165 respondent firms (which were members of the Australian Purchasing and Materials Management Association) to the survey conducted by Millen et al. (1998) indicated that they had implemented quality programmes, and 60% of the firms that had not done so were planning to implement such programmes in the following three years. The increasing trend towards implementing quality programmes in the logistics industry has led the shipping industry to follow suit. As a result, shipping companies have been making progressive efforts to design and implement comprehensive quality assessment and improvement strategies or programmes with a view to improving performance, competitiveness, and customer satisfaction (Minahan, 1998; Wisner, 1999).

While previous research has addressed different aspects of transportation service quality, we devote this study to identifying the factors that are critical to successful quality management, and developing a reliable, empirically-tested, and rigorously-validated measurement instrument for quality management, for the shipping industry. To meet the study's objectives, we first develop a preliminary set of success factors of quality management and their measurements in the shipping industry. They are the most common and core factors of success of quality management that have substantially been adopted in existing survey-based quality management studies, and that have been empirically developed, tested, and validated.

Success Factors of Quality Management in the Shipping Industry

Following the approach adopted by Escrig-Tena (2003) and Kaynak (2003), we first conducted an extensive review of the literature with the aim of identifying the success factors pertinent to general quality management, and their measuring indicators. In a synthesis of survey-based quality management research published between 1989 and 2000, Sila and Ebrahimpour (2002) found 76 studies that used factor analysis to identify 25 most commonly extracted factors for quality management practices. The factors receiving the largest coverage in the studies surveyed include customer focus and satisfaction, employee training, leadership and top management commitment, teamwork, employee involvement, continuous improvement and innovation, and quality information and performance measurement.

Based on an analysis of the empirical studies conducted by Ahire et al. (1996), Andersen et al. (1995), Black and Porter (1996), Flynn et al. (1994), Powell (1995), and Saraph et al. (1989), Kaynak (2003) summarized the most popular perspectives on quality management practices, which are management leadership, employee relations, quality data and reporting, supplier quality management, product/service design, and process management.

Making reference to the measurements embedded in the European Foundation for Quality Management Model and based on an extensive review of the literature, Claver et al. (2003) developed a set of critical quality management factors, which comprise leadership, quality planning, training, specialized training, supplier management, process management, and continuous improvement.

From the transportation sector's perspective, Wisner (1999) conducted a survey of practitioners of the industry and found that the respondents (67.5% were carriers)

perceived that continuous quality improvement, obtaining customer feedback, top management commitment, finding root causes of quality problems, employing quality measurements, empowering employees to solve problems, quality training, setting quality goals and standards, decentralizing the responsibility for quality, and fostering mutual respect between management and employees, are the most important quality programme elements for the transport industry.

Following Zhang et al. (2000), and based on the above critical reviews of important quality management practices, we present in Table 1 comparisons of the most common and core success factors of general quality management that are reliable, empirically-tested, and validated. From the comparisons, we identify eight success factors of quality management for this study, which include leadership, training, employee relations, process management, quality data and reporting, supplier quality management, continuous improvement, and customer focus. Based on this initial set of quality success factors for this study, we further identify 60 measurement indicators that underpin the eight success factors, which are presented in Table 2.

Content Validity

We develop a survey instrument based on the identified success factors and their measurement indicators. Before conducting surveys using the instrument, we tested its content validity, i.e., the measurement indicators adequately cover the success factors of quality management pertinent to the shipping industry (Kerlinger, 1978). We consider two critical issues of content validity. First, the measurement indicators adequately cover all relevant dimensions of quality management. Second, the proposed survey instrument as a whole is well understood and worded, and is able to collect the data for the purposes of this

study. We assessed content validity by using a panel of experts, comprising two independent experts - an academic with research expertise in quality management and an experienced shipping executive - for a preliminary assessment, and subsequently a larger panel of experts, comprising all senior industry practitioners, for a detailed assessment, to judge how well the survey instrument meets the common questionnaire design standards (Malhotra and Grover, 1998) and the expected requirements in terms of its coverage and the degree to which its statements are unambiguously worded (Rao et al. 1999).

Based on the feedback from the experts, we modified the proposed survey instrument in order to (1) improve its contents, ease of understanding, and texts, (2) eliminate ambiguity, (3) delete duplicated and unnecessary measurement indicators as appropriate in the case of the shipping industry - as a result, the number of measurement indicators was reduced from 60 to 39 items, and (4) obtain all the experts' agreement that the instrument possesses content validity. With reference to the modified survey instrument, we developed the survey questionnaire that includes the remaining 39 measurement indicators.

Data Collection

This organizational-level study is based on empirical data collected through a questionnaire survey administered to shipping industry executives. We invited respondents to participate in our survey by randomly sampling shipowner members of the world's two major international maritime associations, namely the Baltic and International Maritime Council (BIMCO), and the International Association of Independent Tanker Owners (INTERTANKO). We mailed 1,028 survey packages to 803 owner members of BIMCO, 152 owner members of INTERTANKO, and 73 joint owner members of both BIMCO and

INTERTANKO. Fourteen survey packages were returned due to wrong addresses or incorrect contact details in the databases of BIMCO and INTERTANKO. As a result, 1,014 survey packages, which made up the sample for this study, were received by the targeted respondents. In the end, 166 responses were returned, of which four declined to respond and one return was incomplete. In other words, a total of 161 usable returns were obtained for analysis, yielding an effective response rate of 15.88%.

Respondent Profiles

The demographic data and salient profiles of the valid respondents were analyzed and summarized. 71.4% of the respondents had been in business for more than 20 years, while 9.9% of the respondents had a company history of over 100 years. In terms of revenues, 81.4% and 20% of the respondents recorded annual revenues of over US$5 million and over US$100 million, respectively. 67.7% of the respondents had been awarded quality certificates, out of which 37.3% had received two or more quality certificates. The majority of the respondents (92.5%) had implemented a certain degree of quality management practices; however only 9.3% of the respondents had adopted quality award criteria to assess and evaluate their quality management implementation. 59.6% of the respondents stated that their customers require them to implement a certain degree of quality assurance measures and/or improvement programmes. As a result, 68.4% of the respondents received very great or great support from their shareholders and/or top management to implement quality management. 68.2% of the respondents reported that they had implemented quality management, and 78.0% of those with no implementation of quality management planned to do so in the near future. Only 7% of the respondents (or 22.0% of those without implementing quality management) had neither implemented

quality management nor had any plan to do so.

Non-response Bias

To test for potential non-response bias, we performed a series of *t*-tests of the mean values of the responses to a sample of the measurements of success factors of quality management between the early respondents group and the late respondents group, i.e., those who responded on or before and after a cutoff date, respectively (Malhotra and Grover, 1998; Oppenheim, 1996). The test result indicated that the mean values between the two groups did not differ significantly, suggesting that non-response bias did not seem to be a problem in this study.

Purification of Items (Measurement Indicators)

The measurement items needed to be purified before a factor analysis was conducted on them. When factor analysis is conducted before purification, it produces many more dimensions than can be conceptually identified, confounding the interpretation of the factor analysis (Churchill, 1979). We adopted two criteria to purify (eliminate) items before conducting a factor analysis. First, items for a given success factor exhibiting a corrected item-total correlation (i.e., the correlation of each item with the sum of all other items) less than 0.50 are usually candidates for elimination (Hair et al., 1998; Koufteros, 1998; Malhotra and Grover, 1998; Robinson et al., 1991; Torkzadeh and Dhillon, 2002). Second, items are also eliminated using internal consistency reliabilities. The reliability of the items comprising each success factor is examined using Cronbach's alpha (α), and items are eliminated if the reliability of the remaining items is at least 0.90, or items are retained for further analysis if the reliability of the remaining items is less than 0.90

(Torkzadeh and Dhillon, 2002).

The corrected item-total correlation eliminated eight measurement indicators, i.e., V29, V44, V45, V46, V47, V48, V53, and V54, out of the original 39 measurement indicators. All the eliminated measurement indicators had a corrected item-total correlation below 0.50. Thus 31 measurement indicators were retained for the reliability test. The reliability test further eliminated one measurement indicator (V26). As a result, 30 measurement indicators for success factors of quality management were retained for the subsequent factor analysis.

Kaiser-Meyer-Olkin (KMO) Measure and Bartlett's Test

Before conducting factor analysis, we performed two tests to check the possible presence of multicollinearity or correlation among the items and the appropriateness of factor analysis. KMO quantifies the degree of intercorrelations among the variables and the appropriateness of factor analysis (Norusis, 1999) with a value above 0.50 for either the entire matrix or an individual variable indicating appropriateness (Hair et al., 1998). Bartlett's test of sphericity tests for the presence of correlations among the variables, which provides the probability that the correlation matrix has significant correlation among at least some of the variables (Hair et al., 1998; Norusis, 1999).

The KMO values, which were all greater than the 0.50 threshold value, and the results of the Barlett's test, which were all significant beyond the 0.000 level for the success factors of quality management, suggest that the correlation matrix is not an identity matrix and that the intercorrelation matrix contains enough common variance to make factor analysis of the 30 retained measurement indicators worth pursuing (Hair et al., 1998; Torkzadeh and Dhillon, 2002).

Exploratory Factor Analysis (EFA)

We performed an EFA of the retained items using the principal component analysis as the extraction method and the varimax criterion as the rotation method of the retained items to assess the unidimensionality of the retained items and, where appropriate, eliminate items that are not factorially pure (Weiss, 1970). The main objective of using the EFA is to summarize the identified (retained) items into a new and smaller set of uncorrelated dimensions (i.e., success factors of quality management) with a minimum loss of information (Ngai et al., 2004). The unidimensionality of each success factor is assessed by examining the factor loadings. Items with factor loadings greater than 0.50 on the factor that they are hypothesized to load on are considered adequate indicators for that factor (Hair et al., 1998). In addition, the use of imprecise and ambiguous terms to label the factors should be avoided (Bagozzi, 1981). The items in each category are assumed to be measures of the same factor. Items that are not factorially pure and/or cross-load on multiple factors are deleted. We used 0.4 as the cutoff value to delete items that cross-load on multiple factor(s) (Ngai et al., 2004).

After extracting the factors by the EFA and appropriately labeling them, we conducted a reliability assessment by calculating the Cronbach's α for the extracted factor model in order to ensure that the items comprising each success factor are highly reliable and internally consistent (Hair et al., 1998). If the calculated Cronbach's α is greater than the critical point of 0.70 (Nunnally, 1978), the proposed success factor is said to be highly reliable and internally consistent.

After four iterations of the EFA, 14 measurement indicators were eliminated and the remaining 16 measurement indicators were organized under four factors. In other

words, the EFA produced a four-factor model with 16 measurement indicators for success factors of quality management, whereby all the factor loadings met the threshold value of 0.50 or above and all the eigenvalues were greater than 1, which explains 72.209% of the variance. The final EFA results are presented in Table 3.

We then interpreted the results of the EFA by assigning labels to the extracted factors. In view of the nature and semantics of the measurement indicator descriptions for the respective factors, it is theoretically acceptable to group them under the same success factors and label them accordingly:

- Factor 1: Top Management Commitment and Participation (MCP) with six measurement indicators comprising V22, V23, V24, C25, V27, and V28;
- Factor 2: Quality Information and Performance Measurement (QIM) with four measurement indicators comprising V40, V41, V42, and V43;
- Factor 3: Employee Training and Empowerment (ETE) with four measurement indicators comprising V30, V31, V32, and V35;
- Factor 4: Customer Focus (CUF) with two measurement indicators comprising V55 and V56;

As for the reliability assessment of the factor model extracted by the EFA, the results in Table 3 show that the values of the respective factors and the overall Cronbach's α's for the four success factors of quality management were all above the recommended critical point of 0.70 (Nunnally, 1978). There is clear evidence that the factor model extracted by the EFA is highly reliable and internally consistent.

Construct Validity

Having confirmed that the extracted factors are unidimensional and meet the necessary

levels of reliability, we conducted a final assessment of the validity of the constructs, which addresses the issues of convergent, discriminant, and content validity (Hair et al., 1998), in order to assess the extent to which a measure or a set of measures correctly and accurately represents what it is supposed to, i.e., the degree to which it is free from any systematic or non-random error (Carmines and Zeller, 1979). Convergent validity assesses the degree to which two measures of the same construct are correlated (Hair et al., 1998). If the *t*-value of the measurement scale is greater than |2| or |2.576|, it is considered as significant at the 0.05 and 0.01 levels, respectively, which indicates that the scale is measuring its intended concept (Koufteros, 1998). Discriminant validity is the degree to which two conceptually similar constructs are distinct (Hair et al., 1998). We tested discriminant validity by comparing the Average Variance Extracted (AVE) of a construct with its squared correlations with other constructs (Koufteros, 1998). Discriminant validity is established if the AVE of a construct is substantially higher than the squared correlations between this construct and all other constructs (Koufteros, 1998). Regarding content validity, we assessed the degree of correspondence between the items selected to constitute a summated scale and its conceptual definitions (Hair et al., 1998) by conducting interviews with a panel of experts, comprising one academic and three senior executives from international shipping companies, to judge and assess how well the measurement instrument meets the standards (Emory and Cooper, 1991).

As for the results of convergent validity, the *t*-values of all the items in all the success factors were higher than 2 or 2.576, which are significant at the 0.05 and 0.01 levels, respectively, indicating that the items are measuring the intended success factors. In addition, the results show that all the success factors possess discriminant validity. Finally,

content validity reveals that the retained measurement indicators in the respective success factors are confirmed to be adequately covering all the relevant dimensions of quality management in the shipping industry. Overall, the results support the construct validity of the retained measurement indicators for the four success factors of quality management

Based on the results of the EFA, reliability assessment, and tests of construct validity as described above, we have developed a reliable, empirically-tested, and rigorously-validated instrument to measure the success factors of quality management in the shipping industry.

Discussion

With reference to the success factors of quality management, the results of this study are in general in agreement with those reported in previous studies. Though the measurement indicators for success factors of quality management may be classified in a different way and/or the measurement constructs may be labeled in a different manner, the most important success factors of quality management in the shipping industry as identified by this study are: top management commitment and participation, employee training and empowerment, quality information and performance measurement, and customer focus. Recently, Lau et al. (2004) stated that it is conventional wisdom that firms implementing quality management place a special emphasis on leadership, and strongly focus on human resources, information and analysis, and customers and markets.

Top Management Commitment and Participation

Baidoun (2004) pointed out that this success factor is in tandem with all previous studies and the existing literature (e.g., Ahire et al., 1996; Black and Porter, 1996; Da Silva Fonas

et al., 2002; Flynn, et al., 1994; Ho, 1995; Oakland, 1996; Prajogo and Sohal, 2004; Rao et al., 1999; Saraph et al., 1989; Tamimi, 1998; Thiagarajan et al., 2001; Zairi et al., 1994; Zhang et al., 2000), and with all major quality awards (e.g., the Malcolm Baldrige National Quality Award; the European Quality Award; and the Deming's Prize). He remarked that there is unanimity in opinion amongst all quality gurus and every author of quality management on the importance of top management commitment and participation as an essential quality management element. In addition, most research has revealed that the major problem of quality management implementation is a lack of top management commitment and participation, which leads to its eventual failure (Al-Zamany et al., 2002; Amar and Zain, 2002; Choi and Behling, 1997; Coeloh et al., 2004; Dahlgaard et al., 1994; Dayton, 2003; Ljungström and Klefsjö, 2002; Prajogo and Sohal, 2004b; Radovilski et al., 1996; Rao et al., 2004; Salegna and Fazel, 2000; Tamimi and Sebastianelli, 1998; Tatikonda and Tatikonda, 1996). Our findings confirm that top management commitment and participation is a significant success factor of quality management in the shipping industry.

Employee Training and Empowerment

Mehta (1999) considered people as the foundation of quality management, while Da Silva Fonas et al. (2002) stated that human resources are one of the strongest contributing factors of companies implementing quality management. Escrig-Tena (2003) also pointed out that employee-related quality management practices are all related to operation, quality and financial results. Ugboro and Obeng (2000) reported that employment training and empowerment are crucial elements of a successful quality management programme. In short, employee training and empowerment is viewed as a key ongoing process in support

of organizational growth and advancement (Kassicieh and Yourstone, 1998).

Quality Information and Performance Measurement

The timeliness of providing quality data for performance measurement is crucial to identifying quality problems and providing information on areas of possible improvement (Choi, 1995; Ho et al., 1999; Lockamy, 1998). Williams et al. (2004) stated that there is increasing demand for improved measures of quality performance, which are considered as the technical part of quality management implementation (Evans and Lindsay, 1999), by quality companies, which highlights the importance of quality information and performance measurement. Lai et al. (2004) included measurement of performance based on goals in their proposed ten-step approach towards implementing quality management in the logistics industry. Jun et al. (2004) posited that erroneous measures or no measures to track the progress of quality performance are one of the major reasons for the failure of quality management efforts in many companies (Ljungström and Klefsjö, 2002; Tamimi and Sebastianelli, 1998; Tatikonda and Tatikonda, 1996).

Customer Focus

Prior studies (e.g., Banker et al., 1996; Schlesinger and Heskett, 1991) have found that increased market competition has led many firms to emphasize customer focus in order to enhance customer satisfaction and to gain a competitive edge. Chong and Rundus (2004) held that the greater the degree of market competition, the more positive the relationship between the quality management practice of customer focus and organizational performance is. They further suggested that the most important quality management practice is customer focus, which denotes that the primary goal of any organization is the

delivery of goods/services to the full satisfaction of its customers. Horngren et al. (2003) also pointed out that a strong emphasis on customer focus should lead to both market expansion and gain in market share (Fornell, 1992; Zeithaml et al., 1993), and, ultimately, in improved organizational performance (Chong and Rundus, 2004).

Conclusions

From a theoretical perspective, this industry-specific study identified four important success factors of quality management in the shipping industry, which are consistent with the frequently cited success factors of quality management in firms implementing quality management in other industries. More importantly, we developed a reliable, empirically-tested, and rigorously-validated instrument to measure the success factors of quality management in the shipping industry. These success factors, which have not been identified in the literature on quality management in the shipping industry, can be adopted in future quality management research in the shipping industry. Overall, this study contributes to the literature by expanding the knowledge-base of the global quality improvement movement and by deepening the understanding of the factors that influence the success of quality management in the industry-specific literature.

From a managerial perspective, the findings of this study are useful to quality management practitioners in the shipping industry, because by recognizing the success factors of quality management, shipping executives are better able to devise their own quality management programmes that are unique (which are heterogeneous and cannot be substituted) against their competitors, in order to achieve better performance and to sustain competitive advantages. In short, the results of this study offer practical hints to shipping management on the most profitable areas to focus their attention to in practising quality

management in their firms.

Although our findings may have broadened the understanding of the success factors of quality management in the context of the shipping, our study is not immune from several limitations, which we will leave as potential topics for future research.

First, our sample was drawn from owner members of BIMCO and INTERTANKO. Future research should replicate our study by analyzing and focusing on various sectors of the shipping industry, to evaluate and compare the results of sectoral differences, and how sectoral differences would affect the mix of success factors of quality management. In addition, the use of a larger sample should yield higher levels of reliability and validity of the measurement instrument. Second, this study only collected cross-sectional data that measure respondents' perceptions at a point in time, which do not capture the continuous transformations of respondents' perceptions that might affect the results. A longitudinal study is desirable for future research. Finally, our study is exploratory in nature and so there is a lack of theories to underpin the research results. It is natural to theorize based on some established management theories, e.g., the resource-based theory, that the success of quality management will lead to improvement in organizational performance. Thus, additional research should be undertaken to examine the possible link between the success factors of quality management uncovered in this study and measures of organizational performance in shipping firms. Such research results will not only shed light on the relationship between quality management and organizational performance, but also help further validate our findings by establishing the success factors' criterion-based validity.

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Table 1: Success Factors of Quality Management Identified from the Literature

This study	Sila and Ebrahimpour (2002)	Kaynak (2003)	Claver et al. (2003)	Wisner (1999)
Leadership	Leadership and top management commitment	Management leadership	Leadership	Top management commitment
Training	Employee training		Training / Specialized training	Quality training / Empowering employees to solve problems
Employee relations	Employee involvement / Teamwork	Employee relations		Decentralizing responsibility for quality / Fostering mutual respect between management and employees
Process management		Process management / Product and service design	Process management	
Quality data and reporting	Quality information and performance measurement	Quality data and reporting	Quality planning	Employing quality measurement / Finding root causes of quality problems / Setting quality goals and standards
Supplier quality management		Supplier management	Supplier management	
Continuous improvement	Continuous improvement and innovation		Continuous improvement	Continuous quality improvement
Customer Focus	Customer Focus and satisfaction			Obtaining customer feedback

Table 2: Initial 60 Measurement Indicators for Success Factors of Quality Management

Leadership (adopted from Kaynak, 2003)	
V1.	Extent to which the top management (responsible for organizational profit and loss) assumes responsibility for quality performance.
V2.	Acceptance of responsibility for quality by top management within the organization.
V3.	Degree to which top management is evaluated for quality performance.
V4.	Extent to which the top management supports long-term quality improvement process.
V5.	Degree of participation by top management in the quality improvement process.
V6.	Extent to which the top management has objectives for quality performance.
V7.	Specificity of quality goals within the organization.
V8.	Comprehensiveness of the goal-setting process for quality within the organization.
V9.	Extent to which quality goals and policy are understood within the organization.
V10.	Importance attached to quality by top management in relation to cost and schedule objectives.
V11.	Amount of review of quality issues in top management meetings.
V12.	Degree to which the top management considers quality improvement as a way to increase profits.
V13.	Degree of comprehensiveness of the quality plan within the organization.
Training (adopted from Claver et al., 2003)	
V14.	Managers and supervisors declare that all employees are trained to help them understand how and why the organization performs.
V15.	Most employees understand the basic processes used to create the services.
V16.	Higher management has developed an environment helping towards on-the-job-training.
V17.	Managers and supervisors participate in specialist training.
Employee relations (adopted from Kaynak, 2003)	
V18.	Extent to which employee involvement type programs are implemented in the organization.
V19.	Effectiveness of employee involvement type programs in the organization.
V20.	Extent to which employees are held responsible for error-free output.
V21.	Amount of feedback provided to employees on their quality performance.
V22.	Degree of participation in quality decisions by the employees.

V23. Extent to which building quality awareness among employees is ongoing.

V24. Extent to which employees are recognized for superior quality performance.

V25. Effectiveness of supervisors in solving problems / issues.

Process management (adopted from Claver et al., 2003)

V26. Continuous control and improvement of key processes.

V27. Preventing faulty services is a strong practice.

V28. The processes used include quality measures.

V29. The employees involved in different processes know how to evaluate them.

Quality data and reporting (adopted from Kaynak, 2003)

V30. Availability of cost of quality data in the organization.

V31. Availability of quality data

V32. Timeliness of the quality data.

V33. Extent of quality data collected by the service support areas of the organization.

V34. Extent to which quality data are used as tools to manage quality.

V35. Extent to which quality data are available to managers, supervisors and employees.

V36. Extent to which quality data are used to evaluate supervisor and managerial performance.

V37. Extent to which quality data, control charts, etc., are displayed at employee work stations.

Supplier quality management (adopted from Kaynak, 2003)

V38. Extent to which suppliers are selected based on quality rather than price or schedule.

V39. Thoroughness of the supplier rating system.

V40. Reliance on reasonably few dependable suppliers.

V41. Amount of education of supplier by the organization.

V42. Technical assistance provided to suppliers.

V43. Involvement of the supplier in the service development process.

V44. Extent to which longer term relationships are offered to suppliers.

V45. Clarity of specifications provided to suppliers.

V46. Responsibility assumed by purchasing department for the quality of incoming products / services.

V47. Extent to which suppliers have programs to assure quality of their products / services.

Continuous improvement (adopted from Claver et al., 2003)

V48. Program aimed at finding time and cost losses in all internal processes.

V49. The organization reinforces continuous study and improvement of its services.

V50. Use of specific organizational structure (quality committee, work teams) to support quality improvement.

V51. Identification of areas for improvement.

V52. Information management aimed at supporting quality management (analysis of data regarding business performance, cost and financial aspects in order to support the development of improvement priorities).

Customer focus (adopted from Claver et al., 2003 with additional items from Rao et al., 1999)

V53. Increased personal contacts between the organization and customers.

V54. Customers' requirements are used as the basis for quality.

V55. Extent to which the organization is totally committed to creating satisfied customers.

V56. Extent to which the organization's goals exceed customers' expectations.

V57. Extent to which executives demonstrate with their actions that customer satisfaction is important.

V58. Extent to which employees know which attributes of the services the organization's customer value.

V59. Extent to which customers' complaints are resolved.

V60. Extent to which employees are encouraged to satisfy customers.

Table 3: Results of the Exploratory Factor Analysis*

	Factor (Success Factors for Quality Management)			
	1	2	3	4
Factor 1 – Top Management Commitment and Participation (MCP)				
V22	0.763			
V23	0.764			
V24	0.865			
V25	0.818			
V27	0.744			
V28	0.718			
Factor 2 – Quality Information and Performance Measurement (QIM)				
V40		0.652		
V41		0.751		
V42		0.851		
V43		0.803		
Factor 3 – Employee Training and Empowerment (ETE)				
V30			0.702	
V31			0.863	
V32			0.792	
V35			0.579	
Factor 4 – Customer Focus (CUF)				
V55				0.816
V56				0.847
Mean (scale)	12.614	9.046	8.890	4.149
Standard deviation	4.0656	2.760	2.590	1.355
Eigenvalue	7.510	1.651	1.365	1.027
% of variance	46.940	10.321	8.532	6.417
Cumulative % of variance explained	46.940	57.260	65.792	72.209
Cronbach's α	0.921	0.855	0.806	0.810
Overall Cronbach's α :	0.913			

* Results obtained after four iterations of the EFA.
Only indicators with factor loadings greater than 0.50 and without cross-loading on multiple factors with factor loadings of greater than 0.40 are reported.