

Exploring total quality management applications under uncertainty: A research agenda for the shipping industry

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Abstract The present study explores total quality management (TQM) implementation in shipping companies by identifying the TQM practices adopted by them as well as the respective TQM management results. Determining the relationships among TQM factors and results, especially under the moderating effect of market or environmental uncertainty, is also an aim of this study. Evidence is drawn using data from 87 major shipping companies based in Piraeus/Greece, and exploratory factor analyses are carried out to extract five TQM practices and four TQM results latent factors. The TQM factors that significantly influence quality management results are further determined through multiple linear regression analyses. Results reveal a set of strategic choices focusing not only on the strict implementation of ISM rules and procedures, but also toward a continuous change in management and leadership culture aiming to achieve better results. Finally when uncertain environments are experienced or perceived, a shift toward a more agile management approach is a prerequisite for success. This article describes a reliable and valid TQM model applied in the shipping service sector and a way for shipping companies to improve their business performance.

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Introduction

The importance of quality in selecting transport services or modes has been emphasized by Eng-Larsson and Kohn (2012) in general, and in maritime



transport in particular by Thai (2008) who further supports that quality means not only safe, reliable, efficient transport services but also socially responsible behavior and environmental protection concerns. The International Maritime Organization (IMO) has since long recognized both the significance of a commonly applied safety and environmental policy, and the necessity for adapting the existing international instruments (the ISO 9001 Quality Management System and ISO 14001 Environmental Management System) in the maritime environment. In 1993, IMO introduced its ISM Code (International Safety Management Code) as a standard to ensure safety; prevent human injury or loss of life; and avoid damage to environment and property. Like the ISO 9001 QMS, the ISM Code is based on general principles and objectives that promote sound management and operating practices within the industry as a whole (Pun *et al.*, 2003).

However globalization and economic cyclicity have brought about a number of forces, causing transformations in many service sectors such as shipping and ports (Pun *et al.*, 2003). Environmental uncertainty, or the *inability to predict accurately the outcomes of a decision* (Duncan, 1972), is certainly one of the consequences of globalization, causing notable concern within the maritime sector. This uncertainty calls all players, shippers, carriers, port operators and the respective companies that interface with them to be proactive rather than reactive, more competitive than simply profitable (Paixao and Marlow, 2003) and more adaptive than simply well trained so to finally become more agile (Sherehiy *et al.*, 2007).

This required 'agility' could be achieved by companies that not only offer products or services within any quality standard but also adopt new management strategies and deliver total service offerings (Paixao and Marlow, 2003). This holistic quality view necessitates a broader view of management and, within it, of managing for quality and increased customer/stakeholder value (Conti, 2013). It further mandates organizations and stakeholders to improve their strategic initiatives so to better serve customers with higher quality products or services (Araujo and Sampaio, 2014).

It may therefore be essential for quality managers facing an unstable environment not only to continue with systems that may have worked with in the past but also to develop quality-based integrated management systems that fit the new business era (Antony, 2013). Total quality management (TQM), which has proved its universal applicability irrespective of sector (Dahlgaard-Park *et al.*, 2013) or country (Boateng-Okrah and Fening, 2012), has been brought forward as an excellent and solid choice. Today, TQM has increasingly been accepted and implemented by many firms largely because of the benefits associated with it (Mensah *et al.*, 2012) especially on creating competitive advantage (Zairi, 2013) and thus making TQM the most striking



differentiator between world-class and non-world class firms (Khanna and Gupta, 2014).

Although many research studies have thoroughly examined TQM and its issues globally, there is not unanimous scholarly support on which are the TQM factors that bring about superior results (Calvo-Mora *et al*, 2014) and which is their impact on performance (Mensah *et al*, 2012; Boulter *et al*, 2013). Similarly, Lam *et al* (2012), state that little TQM research has been conducted so far on the services sector, resulting in a deficiency in the literature with regard to the linkages of TQM on market performance, service quality or financial performance (Boulter *et al*, 2013; Calvo-Mora *et al*, 2014) especially in Europe. Finally, little research attention has been given to studying quality management in the service sector in general (Yapa, 2012); few papers too have looked into a specific service sectors (Alonso-Almeida *et al*, 2013; Talib *et al*, 2013; Tari *et al*, 2013); and also few have examined the broader area of quality in commercial maritime transport services (Durvasula *et al*, 1999; Thai, 2007; Thai, 2008; Pantouvakis, 2014). Finally only one study examines the relationships between quality management practices and organizational performance in the shipping industry (Cheng and Choy, 2013).

Bearing in mind the above considerations, and in line with Pun *et al* (2003) who suggest studying the integration of safety management systems in the shipping industry with quality, environment and other related management systems, and Cheng and Choy (2013) who advocate for the need to study the moderation effect of capital intensity and national culture on quality results, the present study focuses on examining the TQM implementation in an uncertain shipping business environment. Given that total quality culture varies from one company to another and from one industry to another (Harrington *et al*, 2012), especially in an uncertain environment, the purpose of this study is twofold: first is to analyze and explore the TQM practices that ISM certified shipping companies implement in practice, as well as the quality management results they derive. Second is to test the possible moderating effect on those practices and subsequent results the uncertain environment poses. Greek shipping companies appear to be a very interesting case for analysis, because of several structural traits that they appear to have (Koufopoulos *et al*, 2010) as well as the dominant position of Greek shipping worldwide.

The rest of the article is structured as follows: In the first part, the literature review and the research hypotheses are presented. In the next part of the article, the methodology of a research study carried out on Greek shipping companies is described. This is followed by data analysis and the respective results. In the next part, the results are discussed and the final conclusions and practical implications are drawn. Finally, the limitations of the study and future research recommendations are presented.



Literature Review and Research Hypotheses

Definition of TQM

Just like quality, TQM is a very nebulous concept that is arduous to precisely define. Many researchers and organizations have devised various definitions, some significantly different in terms of the underlying concepts (Mensah *et al.*, 2012). The International Academy of the American Society for Quality defines TQM as the management approach of an organization centered on quality, based on the participation of all of its members and aiming at long-term success through customer satisfaction and benefits to all members of the organization and to society (Harrington *et al.*, 2012).

TQM practices

TQM practices are interdependent elements (integral parts) of the TQM framework (Tari, 2005) and they comprise the ‘soft’ side of TQM, while the ‘hard’ side comprises the quality management tools and techniques (for example, control charts, Pareto chart, scatter diagram and so on). Various studies have been conducted to determine the precise nature of successful TQM practices (Boulter *et al.*, 2013) as well as their connection to management theory (Boateng-Okrah and Fening, 2012). A thorough understanding of these factors will increase the probability of TQM success by predicting and avoiding barriers during TQM implementation (Mosadeghrad, 2014).

Voon *et al.* (2014) has decomposed TQM practices in 10 components for quality advancement: total employee involvement, continuous improvement, continuous training, teamwork, empowerment, top management commitment and support, democratic management style, customer satisfaction focus and culture whereas Karimi *et al.* (2014) identified a predictor set of TQM practices in service companies including leadership, strategic planning, customer and market focus, measurement, analysis, knowledge management, human resource focus and process management.

In the same vein but differently conceived Talib *et al.* (2013), examining the TQM practices in Indian service companies, observed another set of dimensions including top-management commitment, customer focus, training and education, continuous improvement and innovation, supplier management, employee involvement, information and analysis, process management, quality systems, benchmarking, quality culture, human resource management, strategic planning, employee encouragement, teamwork, communication and product and service design. Lam *et al.* (2012), on their study in Malaysian service industry, described six dimensions of TQM namely top management leadership, strategic



planning, process management, information and analysis, customer focus and human resource management.

In the transport sector Singh and Sushil (2013) have identified 11 variables as TQM enablers for successful implementation in domestic Indian airline industry, namely top management commitment, communication, benchmarking, employee involvement, training and education, teamwork, continuous improvement, quality culture, customer involvement, improved service quality and process improvement.

In the maritime sector Thai (2008), studying a sample of shipping companies, port operators and freight forwarders/logistics service providers in Vietnam, found that service quality in maritime transport is a six-dimensional construct consisting of resources, outcomes, process, management, image and social responsibility, whereas Pantouvakis (2014) has examined the link between Service Quality and Market orientation with a diverse sample of 399 shipping corporations. Cheng and Choy (2007) identified four factors that are critical to successful quality management in shipping companies' namely top management commitment and participation, quality information and performance measurement, employee training and empowerment, and customer focus.

Despite observed variations, all TQM studies coincide in emphasizing customer focus, employee involvement and management, employee knowledge and processes followed as the primary attributes of successful TQM practices. Hence, based on the above review of the literature and the lack of a unanimous approach on which the dimensions or practices of TQM are the following research question is formulated and examined through this study:

Research Question 1: *What is the underlying structure (latent constructs/factors) of the TQM practices implemented by shipping companies?*

TQM results

TQM is widely considered as a powerful management tool for enterprises to improve products and services, performance and business results, job satisfaction and employee loyalty (Wisniewska and Szczepanska, 2014). The TQM also greatly assists companies to obtain significant benefits including both increased financial and non-financial outcomes, such as Quality and operational excellence (Dahlgard *et al*, 2013; Calvo-Mora *et al*, 2014). Mensah *et al* (2012), further commenting on TQM results noted, in line with Boulter *et al* (2013), that TQM significantly influences organizational performance which can be then categorized into four main groups: financial and market performance, organizational effectiveness, customer satisfaction and conformity to rules.



Especially for service companies, some recent attempts to identify and categorize possible TQM benefits include Karimi's *et al* (2014) work who delineate results including product and service outcomes, customer-focused outcomes, financial and market outcomes, human resource outcomes, organizational effectiveness outcomes, leadership and social responsibility outcomes. In a similar course Yunis *et al* (2013) based on service companies operating in the United States, Mexico, Korea and China, support that the TQM results concern product and service quality, effective and efficient process design, reduction in the waste of resources and higher productivity. The findings of Talib *et al* (2013) in Indian service companies reveal that TQM practices are highly and significantly correlated with quality performance. Finally Cheng and Choy (2013), based on an extensive literature review, identified financial performance, marketing performance, employee performance and operational performance as the key organizational performance measures in shipping.

Following the above the following research questions are formulated:

Research Question 2: *What is the underlying structure (latent constructs/factors) of the quality management results achieved by the shipping companies?*

Research Question 3: *Which TQM practices have the greatest impact on achieving quality management results in shipping companies?*

Uncertain environment

The problem of how organizations can successfully understand and deal with unpredictable, fast changing and dynamic environments has been a prevailing topic in academia for many decades, with many diverting proposals and suggestions. Nevertheless what environmental uncertainty is allows many definitions because *uncertainty is a widely used but not universally defined term* (Downey and Slocum, 1975). However a common definition usually employed describes and links *uncertainty to the inability to predict accurately what the outcomes of a decision might be* (Duncan, 1972; Downey and Slocum, 1975).

According to researchers, environmental uncertainty influences the organization not only as whole but also individual aspects of it (Huber *et al*, 1975; Kreiser and Marino, 2002). Furthermore, the identification and treatment of uncertainty depends primarily on how it is *subjectively perceived and judged by the decision makers* (Downey and Slocum, 1975; López-Gamero *et al*, 2009; Koufopoulos *et al*, 2010) in the firm's environment (Priem *et al*, 2002), and not on robust and objective criteria. Managers and decision-makers trace and experience different types of uncertainty, either in the macro environment,



or from competitors and the market they operate in, or finally from the level of technology that is required for successful operation (Jabnoun *et al*, 2003). Every executive then assigns varying importance to different types of uncertainty based on asymmetries of information, the degree that a change affects the organization or the decision-making process followed (Milliken, 1987).

Especially shipping companies, which operate in a very dynamic and unpredictable environment should continually trace, perceive, understand, adapt and respond to this uncertainty in order to survive (Tovar and Wall, 2012). Exploring thus decision-makers' opinion on the influence of uncertainty on quality management practices and results is highly recommended in the relevant literature (Walker *et al*, 2013) and seems of great importance to practitioners and academics alike.

Considering the above a fourth research question is here formulated as follows:

Research Question 4: *Do the usual total quality management practices and results change when environmental uncertainty is apparent in shipping or in other words does uncertainty moderates the TQM practices-TQM results link?*

Methodology

Questionnaire development

On the basis of the above-mentioned research questions, a research project was carried out among Greek shipping companies. The data collection method used was that of a structured questionnaire, developed by the authors and based on relevant works already tested in other sectors of the economy (Psomas and Fotopoulos, 2009; Fotopoulos and Psomas, 2010) as well as in shipping (Cheng and Choy, 2007, 2013).

Uncertainty was measured based on the uncertainty measurement considerations of Jabnoun *et al* (2003) and Priem *et al* (2002) asking for the opinions of only the senior executives of the firms in sample. This way their answers produce comparable results as perceptions of uncertainty vary, following a manager's level within the organisation (Ireland *et al*, 1987). Initially several sets of uncertainty questions including macro-environmental concerns, competitors' uncertainty (new competitors, competitors' behavior and relative power, intensity of competition, customer needs and expectations and so on), market uncertainty (supply and demand dynamics of the market, investment climate and so on) and other political and societal changes (special interest groups and



relevant professional bodies, legal constraints, imposed regulations and so on) were put forward for consideration to a holdout sample of executives. After a pilot study with a group of eight senior managers, competitors' uncertainty has been proven to be the most essential and immediate predictor and influencer of decision-makers' choices. This set of questions is therefore kept as a surrogate for all uncertainty measurement, as competitors' actions seem to include all other environmental concerns. It has been further decided to sum-up all questions included in competitors' set and produce a continuum corresponding to an environment without intense competition on one side to an extremely rival and competitive one on the other side. Questions include: *'We are often aware of competitors' strategic movements (for example, Mergers, acquisitions, listings, strategic co-operations and so on)'; 'Our market is dominated by few strong players'; 'Strong and sometimes below the belt competition is not rare in shipping'; 'Every service differentiation we can offer can be easily imitated by competitors'.*

Respondents were asked to indicate the degree of agreement or disagreement with these statements using a 7-point Likert scale, where 1 represented 'strongly disagree' and 7 represented 'strongly agree'.

Sample

The questionnaire was distributed only to shipping companies' senior managers, responsible for safety and quality issues, and identified under permission from a commercial database where all Greek shipping companies and their major staff members are listed. A cover letter was included in the mailing, explaining the purpose of the study, along with the questionnaire and a return envelope addressed to one of the authors. Participants were assured of total confidentiality and anonymity. Finally, a sample of 87 questionnaires from the entire population of Greek shipping companies operating through Piraeus port was collected representing almost the 14 per cent of them. Thirty-eight per cent of the companies employed less than 100 employees in all maritime and supporting operations; 16 per cent from 101 to 200; 20 per cent from 201 to 500; and the rest 26 per cent more than 500 employees. The 54 per cent of the companies under consideration have had less than 8 vessels in their fleet; 8 per cent were between 13 and 20; 17 per cent from 20 to 35; and 19 per cent employed more than 35 vessels of all types. Shipping companies in the sample included almost all those listed in the various stock exchanges together with other non-listed companies.

Data analysis

Exploratory factor analysis (EFA) was applied to refine the latent constructs/factors of the TQM practices and the respective results, and to assess the



measurement model reliability and validity. The relationships between the latent constructs/factors of the TQM practices and the respective results were examined through multiple linear regression analyses (Table 1).

Q1

Discussion

EFA results

In order to test the factorial structures of both TQM practices and results exploratory factor analyses (EFA) have been executed with varimax rotation. All multi-factor loading variables have been deleted so as to achieve the best explanation of the phenomenon under study (Tables 2 and 3). Five distinct factors for practices – namely ‘top management commitment to quality’, ‘process management improvement’, ‘employee quality management’, ‘customer focus’ and ‘employee knowledge and education’ – and four for results – namely ‘customer satisfaction’, ‘financial and market performance’, ‘service quality performance’, ‘conformity to rules’ – have been produced, with Kaiser–Meyer–Olkin (KMO) measures over 0.8, supporting thus the good fit of the factorial structure. Furthermore, all factor loadings exceeded the 0.6 limit, indicating that the explained variance – as expressed by the squared factor loading – by every factor is satisfactory (Hair *et al*, 2005) for sample sizes around 100 cases. Cronbach’s α coefficients verified the reliability of all factors and construct, convergent and discriminant validities have been tested and verified (Factor loadings > 0.6 , AVE > 0.50 , AVE $> \text{Corr}^2$).

Results provided support and explanation to our first and second research questions (Research Questions 1 and 2) regarding the structure of TQM practices and results.

The impact of TQM practices on TQM results

On the basis of the TQM practices and results dimensions previously revealed, a set of multiple regression analyses has been performed. The regression analyses have used the summated scales of all the respective measured items for each independent and dependent variables (latent factors) as is commonly used in the literature. Three sets of regression analyses have been produced; the first examines the overall impact of TQM practices on results, whereas the other two distinguish between stable and unstable environments within which the firms’ decision makers feel they operate. All tests for linearity, homoscedasticity, independence and normality were carried out and found not to violate any set limits (Hair *et al*, 2005).

**Table 1:** Impacts of TQM practices on results

TQM practices					Adj. R ²	TQM results	Factor ^a
Top management	Process management	Employee quality management	Customer focus	Employee knowledge and education			
b = 0.338**	b = 0.285*	b = 0.123	b = 0.038	b = 0.362**	0.343	Customer satisfaction	Overall
b = 0.204	b = 0.473*	b = 0.055	b = 0.089	b = 0.330	0.207		Stable
b = 0.401**	b = 0.175	b = 0.138	b = 0.113	b = 0.386**	0.381	Service quality	Unstable
b = -0.053	b = 0.205*	b = 0.184*	b = -0.061	b = 0.183*	0.116		Overall
b = -0.270	b = 0.076	b = 0.456**	b = -0.213	b = 0.056	0.227	Stable	
b = 0.161	b = 0.191	b = 0.053	b = -0.041	b = 0.238	0.037	Unstable	
b = 0.333**	b = 0.252*	b = 0.283**	b = 0.223**	b = 0.051	0.307	Financial performance	Overall
b = 0.259	b = 0.293**	b = 0.193	b = 0.359**	b = -0.008	0.259		Stable
b = 0.237	b = 0.314**	b = 0.287*	b = -0.259	b = 0.115	0.349	Unstable	
b = -0.071	b = -0.294**	b = 0.122	b = -0.003	b = -0.160	0.132	Conformity	Overall
b = -0.237	b = -0.128	b = -0.101	b = 0.028	b = -0.172	-0.051		Stable
b = 0.070	b = -0.425	b = 0.181	b = -0.004	b = -0.186	0.149		Unstable

^aOverall, Stable and Unstable refer to the level of environmental uncertainty.

Bold values marked with * indicate significant values at the .10 level.

Bold values marked with ** indicate significant values at the .05 level.

Table 2: Exploratory factor analysis of the TQM practices in shipping companies

Measured variables	Factor loadings				
	F1 ^a	F2 ^a	F3 ^a	F4 ^a	F5 ^a
Top management actively participates in quality improvement efforts	0.768	—	—	—	—
Top management sets the quality issues on the agenda of the managers' meetings	0.724	—	—	—	—
Top management supports the quality improvement efforts by providing resources	0.693	—	—	—	—
The quality policy is taken into consideration in strategic planning	0.668	—	—	—	—
The company sets quality objectives for managers and employees	0.638	—	—	—	—
Top management gives the authority to employees to manage quality problems	0.617	—	—	—	—
Process and product non-conformities are detected through internal audits	—	0.812	—	—	—
The critical processes are determined-evaluated	—	0.782	—	—	—
Specific organizational structure has been formulated to support quality improvement	—	0.748	—	—	—
Quality data is taken into consideration from managers in the planning and control process	—	0.697	—	—	—
Educational programs are evaluated	—	0.627	—	—	—
The employees are educated in quality management and problem solving techniques	—	0.562	—	—	—
Mistakes are precluded in the process design	—	0.660	—	—	—
Employees are motivated to improve their performance	—	—	0.801	—	—
Employees who improve quality are awarded	—	—	0.757	—	—
Employees are evaluated	—	—	0.713	—	—
Employees take initiatives	—	—	0.703	—	—
Employees participate in the decision-making process and in setting quality objectives	—	—	0.600	—	—
The quality policy and objectives are communicated throughout the company	—	—	—	0.723	—
Customers are encouraged to submit complaints and proposals for quality improvement	—	—	—	0.592	—
The quality policy is taken into consideration in strategic planning	—	—	—	0.570	—
The company's managers/employees are in close contact with customers	—	—	—	—	0.819
The employees have knowledge and know-how	—	—	—	—	0.639
Educational subjects are absorbed by employees	—	—	—	—	0.552

^aF1 = Top management commitment, F2 = Process management improvement, F3 = Employee quality management, F4 = Customer focus, F5 = Employee knowledge and education.





Table 3: Exploratory factor analysis of shipping companies’ performance indicators

Measured variables	Factor loadings			
	R1 ^a	R2 ^a	R3 ^a	R4 ^a
The reliability of the services provided (the maintenance of quality characteristics in a long period of time)	0.856	—	—	—
Customer retention and loyalty	0.849	—	—	—
Customer satisfaction from after sales services	0.808	—	—	—
Customer satisfaction from products	0.801	—	—	—
Providing services on time	0.773	—	—	—
The company’s effectiveness	0.723	—	—	—
Employee satisfaction	—	0.687	—	—
The predominance of the company’s services in relation to the services of its major competitors	—	0.670	—	—
The conformance of the services to customer specifications	—	0.665	—	—
The company’s profitability	—	—	0.845	—
The company’s net profit	—	—	0.845	—
The company’s sales increase	—	—	0.843	—
The company’s cash flow from operations	—	—	0.820	—
The company’s financial indexes	—	—	0.794	—
The average increase of market share during the last 3 years	—	—	0.739	—
The company’s penetration/access in domestic and foreign markets	—	—	0.599	—
The percentage of the non-acceptable – non-conforming services	—	—	—	0.847
Unreasonable employee absence	—	—	—	0.823
Employee alteration rate	—	—	—	0.777
Customer complaints	—	—	—	0.641

^aR1 = Customer satisfaction, R2 = Service quality performance, R3 = Financial and market performance, R4 = Conformity to rules.

The regression of TQM practices on each TQM result produces significant outcomes albeit of varying importance. The results show that ‘customer satisfaction’ and ‘financial and market performance’ are well explained by TQM practices, giving Adj R² over 0.3, which is considered acceptable in social sciences (Hair *et al*, 2005; Psomas and Fotopoulos, 2010) and cannot be compared with relevant studies in shipping as Cheng and Choy’s (2013) work does not provide AdjR² results. On the other hand, ‘operational performance’ and ‘service quality’ give significant results in the area of AdjR² = 0.12 that are marginally acceptable in interpreting and explaining the constructs. A set of different TQM practices are evident and produce significant results in every case; when examining, for example, the ‘customer satisfaction’ result, ‘top management’, ‘process improvement’ and ‘employee knowledge’ have been found as those contributing more. Besides, estimates reveal that ‘process management improvement’, a factor that is greatly linked to ISM processes and applications, significantly affects ‘service quality’ and ‘conformity to rules’. Finally the regression analysis supports that for getting better financial results as an outcome almost all input variables (except ‘employee knowledge’ practice which is insignificant) should be involved (Table 1).



The moderating effects of uncertainty

As 'conformity to rules' and 'service quality' are marginally explainable, we focus on 'customer satisfaction' and 'financial' outcomes to exploit possible moderating effects of uncertainty. We have summated (as previously explained) all four dimensions of competitor's uncertainty and we construct a continuum taking values from 1 to 28 dichotomized by the median at a 'stable' and an 'unstable' status as they have been valued by senior managers in every shipping firm in the sample. By then selecting the cases responding to every categorization (stable, unstable) we regress again practices on results to search for possible changes.

In general, when managers aim to achieve increased 'customer satisfaction' in unstable shipping environments their firms should place greater importance on 'employee knowledge and education' and on 'quality practices of top management'. Hence constant learning of new skills allow employees to work simultaneously in many tasks and to assume multiple roles, following top management's willingness to adapt and change. When stable operating environments are perceived, 'customer satisfaction' is accomplished through 'process management improvement' or by rigidly applying standard formal rules and procedures such as ISO or ISM within the organization (Psomas and Fotopoulos, 2010).

On the other hand, when unstable competitor environments are present, organizations adopt a less formal, less hierarchical and less mechanistic way of action that concentrates mainly on a higher degree of flexibility and on a higher level of well trained employee cooperation, rather than on simply focusing on processes and standards.

The study of moderating effects further indicates that in order to reap financial benefits companies should focus mainly on the correct application of process management techniques and hence the important role of ISM and ISO standards is here apparent. However, in business environments characterized by stability and predictability, companies should further concentrate their efforts not only on 'process management' improvement activities but also on developing sound customer focused practices in order to achieve high financial performance. This system promotes a high degree of centralization and targets at satisfying already known customer needs with the ultimate goal of gaining significant financial results. On the other hand, organizations operating at unstable environments should adopt more flexible and innovative ways of managing daily operations. In such circumstances, the importance of well-documented processes and formal organizational structure is also highlighted in order to consolidate a company's financial position. But the shift of interest points now to the crucial role of employees in affecting the economic outcomes of an organization.



The study results demonstrate that employees who are motivated to improve their performance and have a participative role in the decision-making process of setting the quality objectives can determine the performance outcomes of their organizations, in cases where the timely adaptation to external changes becomes crucial for a company's survival. It is in such uncertain settings, where employee attributes can offer a sustainable competitive advantage.

Conclusions

The results of this study are prominent for several reasons. First, because it is the first time that *clearly* the TQM concept has been studied in the shipping sector. This article suggests that TQM practices are – or should be – implemented in the shipping sector and that service practitioners should emphasize TQM as a feasible change management tool to achieve a greater degree of market orientation, improved service quality and better performance within their organizations. These practices may be described as ‘top management commitment’, ‘process management improvement’, ‘employee quality management’, ‘customer focus’ and ‘employee knowledge and education’. Moreover, four reliable and valid latent factors were revealed regarding the results achieved through implementing the TQM practices. These are ‘customer satisfaction’, ‘financial performance’, ‘service quality performance’ and ‘conformity to rules’. This outcome provides some initial insight into our two first research questions dealing with the structure of the TQM practices and results followed in shipping.

Second, the set of regression equations we have developed provide evidence of different sets of strategic choices that a firm may follow to achieve certain results. Depending on the result mainly pursued by the shipping companies under consideration, different focus on certain practices should be allotted as not all the TQM practices' factors have a significant impact on results. In line with Calvo-Mora *et al* (2014) this work adheres that for the shipping organizations to be capable to improve their key results it is necessary to orientate their quality management systems not solely on processes but also toward leadership and management of human resources, a culture of quality, learning, continuous improvement, policy and strategy and the management of tangible and intangible resources.

Finally, this work addresses the moderating role of uncertainty to shipping firms' strategic choices by bringing forward a set of different approaches for best company results by practicing senior managers, to distinguish sources and levels of uncertainty for their firms. Clearly, the cognitive answers of the senior executives are in support of a ‘silent’ agile approach that shipping firms follow when they feel the danger of an unstable environment. This agile approach calls



for a shift from a mechanistic, hierarchic structure of the today's shipping firms to a more organic approach that supports knowledge and continuous learning of employees and allows management to be more adaptive to scan, understand and monitor changes. Every employee should take part in this 'culture of change' toward identifying opportunities, determine new technologies, express ideas, adopt new methods of service production and serve the customer.

This silent agile movement and the relevant implications of TQM practices in shipping should be further investigated and not faded out within the general benefits from applying a rather old-fashioned quality standard like the ISM Code.

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