



## An empirical assessment of ISM Code effectiveness on performance: the role of ISO certification

Angelos Pantouvakis & Maria Karakasnaki

To cite this article: Angelos Pantouvakis & Maria Karakasnaki (2016) An empirical assessment of ISM Code effectiveness on performance: the role of ISO certification, Maritime Policy & Management, 43:7, 874-886, DOI: [10.1080/03088839.2016.1169451](https://doi.org/10.1080/03088839.2016.1169451)

To link to this article: <http://dx.doi.org/10.1080/03088839.2016.1169451>



Published online: 08 Apr 2016.



Submit your article to this journal [↗](#)



Article views: 66



View related articles [↗](#)



View Crossmark data [↗](#)

# An empirical assessment of ISM Code effectiveness on performance: the role of ISO certification

Angelos Pantouvakis<sup>a</sup> and Maria Karakasnakis<sup>b</sup>

<sup>a</sup>Department of Maritime studies, University of Piraeus, Piraeus, Greece; <sup>b</sup>Department of Maritime studies, University of Piraeus, Piraeus, Greece

## ABSTRACT

Although the introduction of the International Safety Management (ISM) Code aimed at increasing the safety standards in the maritime industry, several studies conducted so far argue for its inability to successfully fulfill its goals. The purpose of the current study is to evaluate the ISM Code effectiveness by drawing analogy from similar applications of ISO 9001 effectiveness in service companies. It also aims to determine its impact on firm performance and differentiate between ISO and non-ISO-certified shipping companies. Findings indicate that ISM Code effectiveness consists of two dimensions, namely continuous improvement and customer satisfaction focus, and the significance of its contribution on improving company performance is revealed, especially in the case of ISO-certified shipping companies. Moreover, the continuous improvement dimension was found to affect performance at a greater extent.

## KEYWORDS

ISM Code; effectiveness; performance; ISO standards

## 1. Introduction

Over the past years, maritime safety-related considerations have received a great deal of attention both from an academic as well as practitioner perspective. Also, they still remain important topics of interest in the maritime community and are the ultimate concerns of all maritime stakeholders (Karahalios, Yang, and Wang 2015; Schröder-Hinrichs et al. 2013). Thus, there is a growing body of literature that recognizes the importance of cultivating a safety philosophy and implementing well-designed measures and plans that promote the existence of safety management systems in the shipping industry. In this regard, the International Safety Management (ISM) Code plays an important role in the maintenance of high safety standards as it refers to the establishment of good management practices directed towards safety and pollution prevention.

Although the proper implementation of the ISM Code is a major area of interest within the field of maritime discipline, the ability of shipping companies to effectively respond to the Code's mandatory requirements has gained considerable critical attention. Recent evidence suggests that the introduction of the ISM Code has improved the safety levels in the maritime industry and has contributed to the reduction of shipping accidents, mainly caused by the human factor (Tzannatos and Kokotos 2009; Tzannatos 2010). However, this notion has been challenged by other studies, which demonstrate that the Code's actual implementation by the shipping companies does not reflect its character and purpose and thus question its true effectiveness (Bhattacharya 2012).

However, the effectiveness of other quality management systems, such as International Organization for Standardization (ISO) 9001 standards, has been well documented in the relevant

literature (Psomas, Pantouvakis, and Kafetzopoulos 2013). Although ISO 9000 certification constitutes a voluntary procedure contrary to the ISM Code which is mandatory for all shipping companies, both present many conceptual and structural similarities (Chen 2000; Pun, Yam, and Lewis 2003) and are based on general principles and objectives aimed at promoting sound management practices. Specifically, both ISO standards and the ISM Code have been explicitly designed to encourage a structural, formalized, systematic, and process-oriented management of companies' operations. This can be achieved through emphasizing the provision of clear requirements, specifications, and guidelines for process documentation, encouraging a formal and hierarchic organizational structure, constantly executing strict controls and formal means of coordination, complying with a large number of mandatory rules, reporting nonconformities and promoting continuous improvement initiatives.

In the literature stream, research studies that deal with ISM Code effectiveness are generally scarce, have mostly placed an emphasis on accident patterns investigations (Kokotos and Linardatos 2011) and have been based on qualitative case studies (Lappalainen, Kuronen, and Tapaninen 2014). Taking into account the recommendations for more research attention on the Code's effectiveness issues (Bhattacharya 2012), the current study first aims to examine the ISM Code effectiveness and the dimensions that may best describe it in an analogy to the ISO 9001 effectiveness as examined in the quality management literature and successfully applied in the case of service companies (Psomas, Pantouvakis, and Kafetzopoulos 2013), by drawing evidence from a sample of 163 shipping companies located in Greece.

Moreover, this study also intends to determine the extent to which ISM Code effectiveness can explain shipping company performance which is described as in ISO case by its operational (Marín and Ruiz-Olalla 2011), financial (Sharma 2005), or service quality (Psomas, Pantouvakis, and Kafetzopoulos 2013) outcomes.

Finally, this work differentiates ISM shipping companies between those that are ISO and non-ISO certified in an attempt to further exploit differences in shipping companies' performance (Wu and Chen 2012) as it is widely supported that companies that are ISO certified perform better than their non-ISO counterparts.

The remaining part of the paper proceeds as follows: the next section presents a literature review on the ISM Code and ISO 9000 series standards. The data collection process is described in the third section, while the data collected are analyzed in the results and discussion section. Finally, the paper's conclusions and implications are summarized in the last section.

## 2. Background

### 2.1 ISM Code

The ISM Code constitutes an international standard for the safe management and operations of ships and for pollution prevention (IMO 2010). According to the International Maritime Organization (IMO), the explicit objectives of the ISM Code are *to ensure safety at sea, prevention of human injuries or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property* (IMO 2010). Since its entry into force in 1998, the ISM Code provides a global legal framework and is comprised of different aspects, all aiming at promoting a broad and integrated safety management philosophy in the shipping industry (Batalden and Sydnes 2014). Moreover, the Code forced shipping companies to redesign their management systems as well as their daily practices in order to achieve compliance with its mandatory requirements and fulfill its objectives. Although mandatory, the ISM Code gives shipping companies the flexibility to develop their own policies and safety procedures (Bhattacharya 2012), which highlights the Code's self-regulating character.

Generally, the ISM Code consists of two parts, the first of which (Part A) deals with implementation issues, whereas Part B covers various aspects of certification and verification

procedures. The Part A states the safety management objectives that any shipping company must follow and includes, among other things, functional requirements for the implementation and maintenance of a safety management system, the establishment of a safety and environmental policy, and the responsibilities of the company, the designated person(s) and the master. Moreover, it stresses the importance of the proper documentation, report, and analysis of emergency situations, nonconformities, accidents, and hazardous occurrences. According to Part A, a shipping company must also ensure that the ship and technical equipment are maintained in conformity with the relevant regulations. The Part B of the ISM Code concerns certification and verification issues, such as the issuance of the (interim) Document of Compliance and the (interim) Safety Management Certificate, as well as it provides specific forms of these documents.

## **2.2 ISO 9000 series standards**

Like the ISM Code which only concerns the context of maritime industry, ISO 9000 series are generic standards that can be applied both in manufacturing (Kammoun and Aouni 2013) and services organizations (Psomas, Pantouvakis, and Kafetzopoulos 2013) and determine the basic requirements that an organization must fulfill in order to develop a quality management system. ISO 9000 standards provide guidelines for the proper systemization and formalization of companies' processes and emphasize the importance of documenting such procedures (Tari, Molina-Azorin, and Heras 2012). In this way, the ability of an organization to consistently provide products and services, which lead to increased customer satisfaction and meet applicable statutory and regulatory requirements, becomes evident (ISO 2009). According to the ISO, the general quality management principles underlying the ISO 9000 series are customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision-making, and mutually beneficial supplier relationships (ISO 2012).

Generally, firms seek ISO certification driven by both internal and external motives (Kammoun and Aouni 2013). Internal related factors deal with quality, operational, or competitiveness related issues (Kim, Kumar, and Kumar 2011), as well as efficiency and systemization improvements or internal control aspects (Heras-Saizarbitoria, Casadesús, and Marimón 2011). On the other hand, external driving forces of certification mainly rely upon strengthening a company's image (Mak 2011) and the relationship with its suppliers (Kammoun and Aouni 2013) or responding to external pressures, such as customers' requests (Bevilacqua et al. 2013). The above-mentioned types of motivations can have a different impact on the performance outcomes of ISO adoption and implementation (Prajogo 2011). Actually, firms seeking ISO certification based on internal motives tend to present enhanced corporate results (Sampaio, Saraiva, and Rodrigues 2011). Nevertheless, irrespective of a company's incentives in pursuing certification, the implementation of ISO standards has positive effects on operational performance (Marin and Ruiz-Olalla 2011), has innovation consequences (Mangiarotti and Riillo 2014), leads to process improvements (Melão and Guia 2013) and employee motivation (Kammoun and Aouni 2013), or can enhance customers' purchase intentions (Wu and Jang 2013).

## **2.3 ISM Code effectiveness**

Although the enforcement of the ISM Code has led to a decrease of human-induced shipping accidents (Tzannatos and Kokotos 2009; Tzannatos 2010), its true effectiveness is rather debatable (Akhtar and Bouwer Utne 2015). This was corroborated by Bhattacharya (2012), who argued that the different perceptions between shore-based managers and seafarers regarding the Code's objectives undermined its intended purpose. He concluded, among other things, that the failure of the ISM Code was caused by the fact that seafarers did not

take part in managing workplace health and safety conditions, since their working conditions were far from perfect and their relationships with managers were characterized by low trust. Moreover, Batalden and Sydnese (2014) analyzed a number of casualties and maritime incidents and concluded, for example, that the absence of effective establishment of procedures, plans or checklists (Clause 7 of the ISM Code) was rather evident in the case of very serious accidents.

Acknowledging the shortfalls of the ISM Code, some authors have attempted to determine the specific factors that can lead to the successful implementation of the Code and to evaluate its intended purpose. In this vein, Tunidau and Thai (2010) demonstrated that the application of quality management principles to the existing safety management systems could lead to the successful implementation of the ISM Code in shipping companies in some Pacific Islands states. Specifically, they confirmed that the continuous improvement principle, embedded in the quality management systems, should be an integral part of a shipping company's safety philosophy during its onboard and ashore daily operations. Moreover, they highlighted the importance of senior management commitment and employee involvement as, among others, critical success factors of ISM Code implementation. Lappalainen, Kuronen, and Tapaninen (2014) attempted to evaluate the effectiveness of the ISM Code based on certain qualitative criteria for an effective maritime safety policy, and verified the Code's successful application in the Finnish shipping industry, commenting that specific tools fostering continuous improvement should be utilized. In an earlier study, Celik (2009) stressed the need for designing an integrated quality and safety management system for shipping operations through the joint implementation of the ISM Code and ISO 9001:2000 standards in order to upgrade the safety and reliability levels of shipping operations and consequently strengthen the reputation of shipping companies.

Based on the recent study of Psomas, Pantouvakis, and Kafetzopoulos (2013) on ISO 9001 effectiveness, this study attempts to differentiate itself from similar studies in the literature, which generally focus on analyzing accident numbers (Kokotos and Linardatos 2011) or follow case study approaches conducted in a single context (Bhattacharya 2012), and investigates ISM Code effectiveness through the use of the principles underlying ISO 9001 effectiveness in service companies.

The three dimensions of continuous improvement, customer satisfaction focus, and prevention of nonconformities, which comprise ISO 9001 effectiveness in service companies (Psomas, Pantouvakis, and Kafetzopoulos 2013) form a comparable basis for evaluating ISM Code effectiveness, as both ISO 9000 series standards and the ISM Code consist of many principles which share a common, underlying philosophy (Pun, Yam, and Lewis 2003) and present many conceptual similarities since they verify the existence of an implemented quality system (Chen 2000). Both standards clearly highlight the importance of taking a systematic approach to management, streamlining all the companies' operations, rigidly applying formal rules, implementing strict documentation procedures, and executing frequent controls. Moreover, the commitment of top management and the principle of continuous improvement are emphasized in both standards. Both ISO standards and the ISM Code define the responsibilities and authorities of qualified personnel and stress the need for efficient communication among the company's members and for provision of adequate resources when requested. All in all, they build up systems that are fixed, adherent to routine operations, and controls and advance formal management operations. In view of all that has been mentioned so far, one may suppose that the measurement instruments that have been successfully used for evaluating ISO effectiveness in the context of service companies (Psomas, Pantouvakis, and Kafetzopoulos 2013) can be equivalently applied in the context of shipping companies in order to assess ISM Code effective implementation. Thus, the first research question is:

**Research question 1: Can ISM Code effectiveness be described by the three principles underlying ISO 9001 effectiveness (continuous improvement, customer satisfaction focus and prevention of nonconformities)?**

## **2.4 Company performance**

Traditionally, companies utilized certain financial measures, such as profit or revenue growth, in order to evaluate their performance. However, the complex business environment, in which modern organizations operate has forced them to use multiple financial and nonfinancial indicators, which better and more properly measure firm performance achievements and reflect both stakeholders' and shareholders' interests (Panayides 2003). Thus, a great deal of previous research has focused on the use of various economic and noneconomic data to appropriately assess the performance of shipping companies (Jenssen and Randy 2006; Österman and Rose 2014). For example, Lirn, Lin, and Shang (2014) measured container shipping companies' performance both from an environmental as well as financial perspective, while Lun et al. (2014) differentiated between short-term (e.g. profit, sales volume) and long-term (e.g. customer satisfaction) economic and environmental performance of the shipping industry. Yang, Marlow, and Lu (2009) identified three categories of liner companies' performance, namely innovativeness, financial, and customer service performance, whereas Lai et al. (2013) operationalized the performance construct as comprising financial and service-related measurement items.

In the quality management literature, it has been demonstrated that implementing certain quality standards, like ISO 9000 series, can have important performance implications, such as a positive influence on the company's operational and business performance (Psomas and Fotopoulos 2009). Specifically, ISO certification has been linked with financial performance improvements (Sharma 2005), whereas Marín and Ruiz-Olalla (2011) concluded that there is a positive relationship between ISO 9000:2000 certification and quality and operative results. Pantouvakis and Dimas (2010) indicated that ISO 9000 certification exerts a positive influence on port financial efficiency, either in terms of profit or revenue. In a more recent study, Psomas, Pantouvakis, and Kafetzopoulos (2013) proved that the service quality and operational performances are directly and significantly influenced by ISO 9001 effectiveness in service companies.

Apart from assessing the impact of ISO certification on performance using certain economic and noneconomic criteria, much of the current literature pays particular attention to whether firms passing ISO certification display better performance results when compared to their non-certified peers. Generally, it seems that ISO and non-ISO-certified manufacturing and service companies exhibit significant differences in their financial and nonfinancial performances (Wu and Chen 2012, 2011), since Marín and Ruiz-Olalla (2011) proved that quality-certified companies present better quality and operative results than noncertified companies.

Bearing the above-mentioned studies in mind, this study also investigates the relationship between ISM Code effectiveness and shipping company performance and attempts to differentiate between ISO and non-ISO-certified shipping companies. The second and third research questions are therefore:

**Research question 2: Does ISM Code effectiveness explain well shipping company performance?**

**Research question 3: Is the ISM Code effectiveness–performance relationship moderated by ISO certification or in other words do ISO-certified shipping companies perform differently than their non-ISO-certified competitors?**

### 3. Methods

#### 3.1 Questionnaire development

A structured questionnaire consisting of three parts to measure ISM Code effectiveness and adapted from relevant work on ISO 9001 effectiveness measurement by Psomas, Pantouvakis, and Kafetzopoulos (2013) was used. The first part was based on three axes, namely continuous improvement, customer satisfaction focus, and prevention of nonconformities and comprised 14 items. All items were measured on a seven-point Likert-type scale (1 = strongly disagree, 7 = strongly agree). The items to measure performance were also adapted from the study of Psomas, Pantouvakis, and Kafetzopoulos (2013). Following the results of a pre-pilot study of 10 managers in shipping companies, four items were finally utilized in order to assess company performance. Two of the items reflected the service quality performance and two items were used to assess the company's financial performance. Performance measurement items were measured on a subjective scale following contentions evident in the literature on their use (Panayides 2003). For each item, company performance was assessed using a seven-point Likert-type scale (1 = minimum level, 7 = maximum level). Finally, the last part of the questionnaire included questions on the demographic profile of the shipping companies.

#### 3.2 Sample

The questionnaire was distributed to 700 shipping companies located in Greece (almost the whole population) and responses were collected from safety and quality managers. Finally, 163 usable responses were obtained. 53.7% of responding companies have less than 100 employees (shore based and crew), 15.4% from 101 to 200, 13% from 201 to 500, and 17.9% more than 500 employees. The 64.8% of the companies under consideration have less than 8 vessels in their fleet, 7.4% have between 13 and 20, 14.8% from 21 to 35, and 13% employ more than 35 vessels. Finally, 45.4% of the responding shipping companies are ISO 9000 and/ or ISO 14001 certified.

#### 3.3 Data analysis

Exploratory and confirmatory factor analyses were performed to extract the latent factors of ISM Code effectiveness and to confirm the one-dimensional structure of performance. The impact of ISM Code effectiveness on the performance was determined through regression analysis. Regression analyses were also employed in order to examine the above mentioned relationship in the cases of ISO and non-ISO-certified shipping companies.

## 4. Results and discussion

### 4.1 Factor analysis of ISM Code effectiveness

In order to reveal the underlying dimensions of ISM Code effectiveness, exploratory factor analysis (EFA) was first applied on its 14 items using the method of Principal Component Analysis (PCA) to yield the factors and a varimax rotation to improve the interpretation. After the deletion of 3 items that present cross loading behavior the 11 remaining items collapsed in two distinct factors with an eigenvalue greater than one, which explain the 63.310% of the total variance (Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy = 0.868). Table 1 shows that all the factor loadings are >0.60. Factor loadings >0.50 are generally considered necessary for practical significance (Hair et al. 2006). Moreover, loadings of >0.45 are considered statistically significant for sample sizes of around 150 (Hair et al. 2006). Moreover, in order to validate the EFA results and to confirm and generalize the two-dimensional structure of ISM Code

**Table 1.** Exploratory factor analysis of ISM Code effectiveness.

<i>KMO measure of sampling adequacy = 0.868</i> <i>Total variance explained = 63.310%</i>	Factor 1 continuous improvement	Factor 2—customer satisfaction focus
The company continuously collects information for processes and service improvement	0.831	
The company achieves measured-explicit quality goals	0.824	
The company applies an effective plan for continuous quality improvement	0.797	
The company continuously monitors and improves its processes, procedures, and services	0.785	
The company develops and supports an organizational structure supporting continuous improvement	0.750	
Services always conform to specifications according to internal audits	0.640	
Employees continuously improve their work	0.614	
The company focuses on customer requirements		0.824
The company assures that its services meet customer requirements		0.788
Customer complaints constitute a major company priority		0.767
The company's activities increase the level of customer satisfaction		0.529

effectiveness (Hair et al. 2006), confirmatory factor analysis (CFA) was further employed using the maximum likelihood estimation and an acceptable fit was revealed with Chi squared/ DF = 2.978, GFI = 0.884, CFI = 0.917, NFI = 0.881).

The EFA results in Table 1 reveal that the ISM Code effectiveness is described by two factors, namely 'continuous improvement' and 'customer satisfaction focus' (Research question 1), contrary to the initial structure of ISO 9001 effectiveness, which is comprised of three distinct dimensions. It is obvious that in the case of shipping companies and after the EFA, the 'Prevention of nonconformities' dimension does not appear to be a constituent part of ISM Code effectiveness. However, this result needs to be interpreted with caution, since it is not implied that the importance of this specific dimension is unacknowledged, but may be attributed to the fact that the implementation of the ISM Code by all shipping companies is mandatory, contrary to the voluntary character of ISO adoption.

The specific design and implementation of procedures as well as the establishment of measures, which ensure that nonconformities to rules are investigated and analyzed by the company and the relevant classification societies, constitute a specific clause of the ISM Code that any shipping company must follow. Moreover, the intended purposes of control execution and implementation of corrective actions are to verify that a shipping company is at any time ready to respond to emergency situations and hazards as well as to prevent their recurrence (Clauses 8 and 9 of the ISM Code). The 'Prevention of nonconformities' dimension of ISO 9001 effectiveness in service companies was replaced by the above-mentioned mandatory specificities of the ISM Code. Moreover, the correlation analysis of the summations of the three initial (before the EFA), examined dimensions showed a very high and significant correlation (0.705) (Table 2) between the concepts of 'continuous improvement' and 'Prevention of nonconformities'. Following these justifications, the reason why the latter was wiped out by the former becomes clear.

**Table 2.** Correlations of the summations of the three initial (before the EFA) dimensions of ISM Code effectiveness.

	Continuous improvement	Customer satisfaction focus	Prevention of nonconformities
<b>Continuous improvement</b>	1	0.534	0.705
<i>Sig.</i>		0.000	0.000
<b>Customer satisfaction focus</b>	0.534	1	0.560
<i>Sig.</i>	0.000		0.000
<b>Prevention of nonconformities</b>	0.705	0.560	1
<i>Sig.</i>	0.000	0.000	

The two extracted factors describe explicitly the principles of continuous improvement and customer satisfaction focus and represent the effective implementation of the ISM Code by the shipping companies. The collection of quality, processes, and service improvement information, the development of the company's organizational structure and the application of effective plans are directed toward fostering a continuous improvement philosophy. Moreover, focusing on customer requirements, successfully responding to their specific demands, and executing all the company's activities with the ultimate goal of enhancing customer satisfaction characterize the ISM Code effectiveness.

#### 4.2 Shipping company performance

In order to confirm the one-dimensional structure of company performance, EFA was run again and the results are shown in Table 3. One factor was yielded with an eigenvalue greater than one, which explains the 58.291% of the total variance (KMO measure of sampling adequacy = 0.707), thus representing an aggregate measure of shipping company performance.

As shown in Table 3, the first two items outline the company's service quality performance, whereas the last two items describe two different aspects of financial performance. Taken together, all items can be used as a composite measure in order to assess a company's overall performance.

#### 4.3 The impact of ISM Code effectiveness on company performance

Regression analysis was used to examine the impact of ISM Code effectiveness on the performance of shipping companies. The regression analysis is based on the factor scores of the independent and dependent variables as extracted by EFA and rotated by varimax assuring thus absence of any multicollinearity effects between the two independent variables (tolerance = 1, VIF = 1). The dependent variable is company performance, while the two extracted factors of ISM Code effectiveness, namely 'continuous improvement' and 'customer satisfaction focus', were used as independent variables. Significant correlations were revealed between 'continuous improvement' and performance (0.405) and 'Customer satisfaction focus' and performance (0.259), while the regression results are shown in Table 4.

According to the results, the regression is statistically significant ( $p$ -value = 0.000 and Adj.  $R^2$  = 0.222). The value of Adj.  $R^2$  is deemed satisfactory for social sciences (Balabanis et al. 2001) and is in line with similar results in the quality management literature. For example, Psomas, Pantouvakis, and Kafetzopoulos (2013) confirmed that operational performance is directly

**Table 3.** Exploratory factor analysis of performance.

	Factor 1— performance
<i>KMO measure of sampling adequacy = 0.707 total variance explained = 58.291%</i>	
The service quality of the company compared with its major competitors	0.829
The reliability of the services provided (the maintenance of the quality characteristics in a long period of time)	0.807
The company's net profit compared with its major competitors	0.740
The company's revenues increase during the last three years	0.667

**Table 4.** Regression analysis results.

Dependent variable: performance		
	<i>b</i>	<i>Sig.</i>
<i>Adj. R<sup>2</sup> = 0.222</i>		
<i>F-value = 24.079</i>		
<i>p-Value = 0.000</i>		
Continuous improvement	0.405	0.000
Customer satisfaction focus	0.259	0.000

affected by ISO effectiveness with an Adj.  $R^2 = 0.297$ . Estimating the regression model, the results show that 'performance' is directly and positively affected by 'continuous improvement' ( $p$ -value = 0.000 and  $b = 0.405$ ) and 'customer satisfaction focus' ( $p$ -value = 0.000 and  $b = 0.259$ ). The results demonstrate that a shipping company's performance can be directly improved by increasing ISM Code effectiveness (Research question 2). Second, the absolute values of the  $b$  coefficients indicate that the aspect of 'continuous improvement' plays the most decisive role in enhancing a shipping company's performance.

#### 4.3.1 ISO versus non-ISO-certified shipping companies

In order to investigate potential moderating differences in the ISM Code effectiveness–performance relationship between ISO and non-ISO-certified shipping companies (Research question 3) two different subsamples were employed. The first contains all ISO-certified companies, whereas the second includes only those that are not ISO certified. It is again noted that all shipping companies are ISM certified by the relevant regulatory authorities. Two separate regression analyses were run for every subsample. Tables 5 and 6 display the correlations and the dependent and independent variables, as well as the summary regression statistics for ISO and non-ISO-certified shipping companies, respectively.

Table 6 is quite revealing in several ways. As far as the ISO-certified shipping companies are concerned, the regression analysis resulted in a high value of Adj.  $R^2$  (0.420), demonstrating thus the high explanatory ability of the examined model. The values of the  $b$  coefficients show that ISM Code effectiveness contributes positively and significantly to performance increases, and that this can be achieved by focusing mainly on the 'continuous improvement' and to a lesser degree on the 'customer satisfaction focus' dimension. Interestingly, if we now turn on examining the analysis results of non-ISO-certified companies, it can be seen that a very low value of Adj.  $R^2$  (0.052) was reported, indicating a weak or nonexistent explanatory power of ISM Code effectiveness to company performance.

This may be appointed to a number of reasons. The first reason may be problems connected with the questionnaire itself, or the data collection. However, the results from reliability analysis confirm that the data stand as collected and lead us to reject this assumption. The second reason may be owed to the possibility of existence of a nonlinear relationship between the two dimensions of ISM Code

**Table 5.** Correlations.

ISO-certified shipping companies		Performance
	Continuous improvement <sup>a</sup>	0.614
	Sig.	0.000
	Customer satisfaction focus <sup>a</sup>	0.260
	Sig.	0.025
Non-ISO-certified shipping companies		
	Continuous improvement <sup>a</sup>	0.194
	Sig.	0.068
	Customer satisfaction focus <sup>a</sup>	0.174
	Sig.	0.102

<sup>a</sup>Correlation between 'continuous improvement' and 'customer satisfaction focus' equals by construction (varimax rotation) to zero and therefore has not been included in the table

**Table 6.** ISO versus non-ISO-certified shipping companies—regression results.

Dependent variable: performance				
	ISO certified		Non-ISO certified	
	Adj. $R^2 = 0.420$		Adj. $R^2 = 0.052$	
	$F$ -value = 27.382		$F$ -value = 3.401	
	$p$ -Value = 0.000		$p$ -Value = 0.038	
	$b$	Sig.	$b$	Sig.
Continuous improvement	0.607	0.000	0.208	0.049
Customer satisfaction focus	0.242	0.008	0.189	n.s

effectiveness and company performance. Following this, additional statistical analyses were carried out, but no nonlinear (e.g. logarithmic, quadratic, exponential) relationship was revealed. Overall, the regression results in [Tables 4](#) and [6](#) indicate that the ISM Code effectiveness explains performance well when examining the total sample of shipping companies as well as the ISO-certified companies, but not the uncertified firms.

The above findings can be interpreted in various ways. ISO standards certification and implementation constitute voluntary procedures that a shipping company has the discretion to follow in order to establish the existence of a sound quality management system. On the other hand, the ISM Code requires all shipping companies to fulfill certain regulatory requirements and implement strict safety policies, emphasizing thus its mandatory character. It seems that those shipping companies which have chosen to be engaged in maintaining and supporting the implementation of a quality management system based on ISO 9000 or 14001 standards have also managed to internalize more efficiently all the obligatory specifications of the Code into their daily operations. Through quality certification, they have reaped all the benefits associated with the implementation of ISO quality standards and have shifted their management philosophy from simply adopting process-oriented safety approaches towards a broader and more effective safety management system supporting continuous improvement and creating a culture which targets customer satisfaction. Thus, they have accomplished higher levels of effective implementation of the ISM Code, which subsequently leads to performance gains.

On the other hand, the ISM Code effectiveness–performance relationship in the case of non-ISO-certified shipping companies was not revealed. A likely explanation is that these companies have adopted a more mechanistic and routine-driven way of action viewing the implementation of the ISM Code merely as an obligatory burden imposed to them. Hence, it may be that they have been unable to ensure correct application of process management techniques or have experienced a failure on behalf of the shore based personnel and crew to properly implement the companies' safety management systems in practice, contrary to the quality-certified companies in which the ISO accreditation has resulted in continuously improving all company's procedures and effectively serving the customer. Moreover, the majority of the companies, which are not certified according to ISO standards, belong to the smaller size categories, a fact that further strengthens our argument on the ineffectiveness of the Code to yield desired performance results. The average number of employees (including shore based staff and ship crew) of non-ISO-certified companies is 122, while ISO-certified companies employ on average 238 people. Moreover, the average fleet of uncertified companies is comprised of 8 vessels, whereas ISO-certified companies employ on average 20 vessels in their fleet ([Table 7](#)). It is possible that smaller, uncertified shipping companies are not able to systematize their daily operations according to the Code's objectives and do not manage to exhibit performance increases though the

**Table 7.** Demographics.

	ISO-certified shipping companies ( <i>n</i> = 74)	Non-ISO-certified shipping companies ( <i>n</i> = 89)
<b>Number of employees</b>		
0–20	4	25
21–40	10	12
41–80	10	13
81–100	7	6
101–200	9	16
201–500	13	9
>500	21	8
<b>Number of ships</b>		
1–3	6	31
4–7	12	32
8–12	13	12
13–20	8	4
21–35	18	6
>35	17	4

Code's effective implementation. This finding echoes other studies in the quality management literature, which claim that larger companies achieve greater benefits from ISO 9000 in terms of performance than smaller companies (Feng, Terziovski, and Samson 2007).

## 5. Conclusion

Since its regulatory enforcement, the implementation of the ISM Code by the shipping companies has received increased academic attention, focusing mainly on the evaluation of the Code's contribution towards enhancing safety awareness in the shipping industry or minimizing maritime accident occurrences. However, over the past years, few research studies have attempted to assess the Code's true effectiveness, whereas none of them tried to examine its link with performance results. From a scholarly perspective, the present study contributes to the existing body of literature by investigating the ISM Code effectiveness and by exploring its effects on shipping company performance. However, it takes a different approach from similar studies, regarding the conceptualization of the Code's effectiveness. Following the principles underlying ISO 9001 effectiveness in service companies, the present study concludes that the ISM Code effectiveness is composed of two different dimensions, namely 'continuous improvement' and 'customer satisfaction focus', whereas a shipping company's performance can be described by one factor, including both service quality and financial performance indicators. Moreover, according to the study findings, by achieving higher levels of the Code's effectiveness, company performance is directly improved. Also, the 'continuous improvement' dimension was found to account more for the attainment of better performance results when compared to the 'customer satisfaction focus' factor. When comparing the ISO versus non-ISO-certified shipping companies, it was revealed that the ISM Code effectiveness–performance relationship was only evident and strong in the former case. Future research should therefore concentrate on examining this relationship casewise in the context of non-ISO-certified companies or based on additional quality management concepts, such as total quality management. From a managerial perspective, shipping companies should continuously strive for achieving the maximum level of ISM Code effectiveness. Through encouraging the development of a continuous improvement philosophy and actively focusing on satisfying their customers, the Code's effectiveness is assured and performance gains are realized. It is interesting to note that shipping companies should concentrate their efforts not only on simply applying the Code's functional requirements, but also towards pursuing its effective implementation.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## References

- Akhtar, M. J., and I. Bouwer Utne. 2015. "Common Patterns in Aggregated Accident Analysis Charts from Human Fatigue-Related Groundings and Collisions at Sea." *Maritime Policy & Management* 42 (2): 186–206. doi:10.1080/03088839.2014.926032.
- Balabanis, G., A. Diamantopoulos, R. D. Mueller, and T. C. Melewar. 2001. "The Impact of Nationalism, Patriotism and Internationalism on Consumer Ethnocentric Tendencies." *Journal of International Business Studies* 32 (1): 157–175. doi:10.1057/palgrave.jibs.8490943.
- Batalden, B.-M., and A. K. Sydnes. 2014. "Maritime Safety and the ISM Code: A Study of Investigated Casualties and Incidents." *WMU Journal of Maritime Affairs* 13 (1): 3–25. doi:10.1007/s13437-013-0051-8.
- Bevilacqua, M., F. Emanuele Ciarapica, G. Giacchetta, and B. Marchetti. 2013. "An Empirical Study of ISO 9000 on the Supply Chain of a Company Leader in the Heating Sector." *International Journal of Quality & Reliability Management* 30 (8): 897–916. doi:10.1108/IJQRM-Feb-2012-0024.
- Bhattacharya, S. 2012. "The Effectiveness of the ISM Code: A Qualitative Enquiry." *Marine Policy* 36 (2): 528–535. doi:10.1016/j.marpol.2011.09.004.

- Celik, M. 2009. "Designing of Integrated Quality and Safety Management System (IQSMS) for Shipping Operations." *Safety Science* 47 (5): 569–577. doi:10.1016/j.ssci.2008.07.002.
- Chen, L. 2000. "Legal and Practical Consequences of Not Complying with ISM Code." *Maritime Policy & Management* 27 (3): 219–230. doi:10.1080/030888300411077.
- Feng, M., M. Terziovski, and D. Samson. 2007. "Relationship of ISO 9001: 2000 Quality System Certification with Operational and Business Performance: A Survey in Australia and New Zealand-Based Manufacturing and Service Companies." *Journal of Manufacturing Technology Management* 19 (1): 22–37. doi:10.1108/17410380810843435.
- Hair, J. F., W. C. Black, B. J. Babin, R. E. Anderson, and R. L. Tatham. 2006. *Multivariate Data Analysis*. 6th ed. Upper Saddle River, NJ: Pearson Prentice Hall.
- Heras-Saizarbitoria, I., M. Casadesús, and F. Marimón. 2011. "The Impact of ISO 9001 Standard and the EFQM Model: The View of the Assessors." *Total Quality Management & Business Excellence* 22 (2): 197–218. doi:10.1080/14783363.2010.532330.
- IMO (International Maritime Organization). 2010. *ISM Code, International Safety Management Code and Guidelines on Implementation of the ISM Code*. London: IMO Publishing.
- ISO (International Organization for Standardization). 2009. *Selection and Use of the ISO 9000 Family of Standards*. Geneva, Switzerland: International Organization for Standardization.
- ISO (International Organization for Standardization). 2012. *Quality Management Principles*. Geneva, Switzerland: International Organization for Standardization.
- Jenssen, J. I., and T. Randy. 2006. "The Performance Effect of Innovation in Shipping Companies." *Maritime Policy & Management* 33 (4): 327–343. doi:10.1080/03088830600895485.
- Kammoun, R., and B. Aouni. 2013. "ISO 9000 Adoption in Tunisia: Experiences of Certified Companies." *Total Quality Management & Business Excellence* 24 (3–4): 259–274. doi:10.1080/14783363.2012.669548.
- Karahalios, H., Z. L. Yang, and J. Wang. 2015. "A Risk Appraisal System regarding the Implementation of Maritime Regulations by A Ship Operator." *Maritime Policy & Management* 42 (4): 389–413.
- Kim, D.-Y., V. Kumar, and U. Kumar. 2011. "A Performance Realization Framework for Implementing ISO 9000." *International Journal of Quality & Reliability Management* 28 (4): 383–404. doi:10.1108/02656711111121807.
- Kokotos, D. X., and D. S. Linardatos. 2011. "An Application of Data Mining Tools for the Study of Shipping Safety in Restricted Waters." *Safety Science* 49 (2): 192–197. doi:10.1016/j.ssci.2010.07.015.
- Lai, K. H., C. W. Y. Wong, Y. H. V. Lun, and T. C. E. Cheng. 2013. "Shipping Design for Compliance and the Performance Contingencies for Shipping Firms." *Transportation Research Part E: Logistics and Transportation Review* 55: 74–83. doi:10.1016/j.tre.2013.03.004.
- Lappalainen, F. J., J. Kuronen, and U. Tapaninen. 2014. "Evaluation of the ISM Code in the Finnish Shipping Companies." *Journal of Maritime Research: JMR* 9 (1): 23–32.
- Lirn, T.-C., H.-W. Lin, and K.-C. Shang. 2014. "Green Shipping Management Capability and Firm Performance in the Container Shipping Industry." *Maritime Policy & Management* 41 (2): 159–175. doi:10.1080/03088839.2013.819132.
- Lun, Y. V., K. H. Lai, C. W. Y. Wong, and T. C. E. Cheng. 2014. "Green Shipping Practices and Firm Performance." *Maritime Policy & Management* 41 (2): 134–148. doi:10.1080/03088839.2013.819133.
- Mak, B. L. 2011. "ISO Certification in the Tour Operator Sector." *International Journal of Contemporary Hospitality Management* 23 (1): 115–130. doi:10.1108/09596111111101706.
- Mangiarotti, G., and C. A. Riillo. 2014. "Standards and Innovation in Manufacturing and Services: The Case of ISO 9000." *International Journal of Quality & Reliability Management* 31 (4): 435–454. doi:10.1108/IJQRM-06-2012-0077.
- Marin, L. M., and M. C. Ruiz-Olalla. 2011. "ISO 9000: 2000 Certification and Business Results." *International Journal of Quality & Reliability Management* 28 (6): 649–661. doi:10.1108/02656711111141201.
- Melão, N. F., and S. M. Guia. 2013. "Exploring the Impacts of ISO 9001 on Small-And Medium-Sized Social Service Institutions: A Multiple Case Study." *Total Quality Management & Business Excellence*. doi:10.1080/14783363.2013.822193.
- Österman, C., and L. Rose. 2014. "Assessing Financial Impact of Maritime Ergonomics on Company Level: A Case Study." *Maritime Policy & Management*. doi:10.1080/03088839.2014.904946.
- Panayides, P. M. 2003. "Competitive Strategies and Organizational Performance in Ship Management." *Maritime Policy & Management* 30 (2): 123–140. doi:10.1080/0308883032000084850.
- Pantouvakis, A., and A. Dimas. 2010. "Does ISO 9000 Series Certification Matter for the Financial Performance of Ports? Some Preliminary Findings from Europe." *Maritime Policy & Management* 37 (5): 505–522. doi:10.1080/03088839.2010.503714.
- Prajogo, D. I. 2011. "The Roles of Firms' Motives in Affecting the Outcomes of ISO 9000 Adoption." *International Journal of Operations & Production Management* 31 (1): 78–100. doi:10.1108/01443571111098753.
- Psomas, E. L., and C. V. Fotopoulos. 2009. "A Meta Analysis of ISO 9001: 2000 Research-Findings and Future Research Proposals." *International Journal of Quality and Service Sciences* 1 (2): 128–144. doi:10.1108/17566690910971418.

- Psomas, E. L., A. Pantouvakis, and D. P. Kafetzopoulos. 2013. "The Impact of ISO 9001 Effectiveness on the Performance of Service Companies." *Managing Service Quality* 23 (2): 149–164. doi:10.1108/09604521311303426.
- Pun, K. F., R. C. M. Yam, and W. G. Lewis. 2003. "Safety Management System Registration in the Shipping Industry." *International Journal of Quality & Reliability Management* 20 (6): 704–721. doi:10.1108/02656710310482140.
- Sampaio, P., P. Saraiva, and G. A. Rodrigues. 2011. "The Economic Impact of Quality Management Systems in Portuguese Certified Companies: Empirical Evidence." *International Journal of Quality & Reliability Management* 28 (9): 929–950. doi:10.1108/02656711111172522.
- Schröder-Hinrichs, J.-U., E. Hollnagel, M. Baldauf, S. Hofmann, and A. Kataria. 2013. "Maritime Human Factors and IMO Policy." *Maritime Policy & Management* 40 (3): 243–260. doi:10.1080/03088839.2013.782974.
- Sharma, D. S. 2005. "The Association between ISO 9000 Certification and Financial Performance." *The International Journal of Accounting* 40: 151–172. doi:10.1016/j.intacc.2005.01.011.
- Tari, J. J., J. F. Molina-Azorín, and I. Heras. 2012. "Benefits of the ISO 9001 and ISO 14001 Standards: A Literature Review." *Journal of Industrial Engineering and Management* 5 (2): 297–322. doi:10.3926/jiem.488.
- Tunidau, J., and V. V. Thai. 2010. "Critical Factors for Successful Implementation of the ISM Code in Some Pacific Islands States." *WMU Journal of Maritime Affairs* 9 (1): 63–80. doi:10.1007/BF03195166.
- Tzannatos, E. 2010. "Human Element and Accidents in Greek Shipping." *Journal of Navigation* 63 (1): 119–127. doi:10.1017/S0373463309990312.
- Tzannatos, E., and D. Kokotos. 2009. "Analysis of Accidents in Greek Shipping during the Pre- and Post-ISM Period." *Marine Policy* 33 (4): 679–684. doi:10.1016/j.marpol.2009.01.006.
- Wu, S.-I., and J.-H. Chen. 2011. "Comparison between Manufacturing Companies that are ISO Certified and Those that are Not Certified Using Performance Measurement Model." *Total Quality Management & Business Excellence* 22 (8): 869–890. doi:10.1080/14783363.2011.593860.
- Wu, S.-I., and J.-H. Chen. 2012. "The Performance Evaluation and Comparison Based on Enterprises Passed or Not Passed with ISO Accreditation: An Application of BSC and ABC Methods." *International Journal of Quality & Reliability Management* 29 (3): 295–319. doi:10.1108/02656711211216153.
- Wu, S.-I., and J.-Y. Jang. 2013. "The Performance of ISO Certification Based on Consumer Perspective: A Case Study of A Travel Agency." *Total Quality Management & Business Excellence* 24 (3–4): 496–518. doi:10.1080/14783363.2011.560704.
- Yang, -C.-C., P. B. Marlow, and C.-S. Lu. 2009. "Knowledge Management Enablers in Liner Shipping." *Transportation Research Part E: Logistics and Transportation Review* 45: 893–903. doi:10.1016/j.tre.2009.05.003.