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NEW RESEARCH

Safety management system registration in the shipping industry

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Abstract *Shipping is perhaps the most internationally recognized of all the world's great industries – and one of the most dangerous. It has always been accepted that the best way of improving safety at sea is by developing international regulations that are followed by most shipping nations. Since 1993, the International Maritime Organization (IMO) has adopted the International Safety Management (ISM) Code as a minimum statutory requirement for ship operating companies to establish, implement and maintain their safety management systems (SMS). This paper compares the ISM Code with the requirements of the ISO 9001:2000 quality management system and the OHSAS 18001:1999 Occupational Health and Safety Standards. It reviews the SMS registration process and discusses the problems and difficulties commonly faced by ship operating companies in the process. A 15-step implementation strategy for SMS registration is presented. The model provides ship operating companies with a practical reference to manage the SMS registration in compliance with the statutory requirements of the IMO.*

Introduction

In recent years, the quality, health and safety requirements in many countries have been more stringent than was the case previously. Pressures from communities have led to the enactment of various safety legislations and safety standards in different countries and regions for different industries (Krause, 1993; Manuele, 1993; Pun and Hui, 2002). Wilkinson and Dale (1998) argue that different international and national safety standards provide guidance to help organizations develop their safety management systems (SMS) with respect to varied business needs and requirements. Following a number of very serious accidents that occurred during the late 1980s, which were manifestly caused by human error, with management faults also identified as contributing factors,



the International Maritime Organization (IMO) adopted a resolution at its 16th Assembly in October 1989, the guidelines of which concerned management for the safe operation of ships and for pollution prevention. The purpose of this was to provide those responsible for the operation of ships, with a framework for the proper development, implementation and assessment of safety and pollution prevention management in accordance with good practice (IMO, 2001). Based on general principles and objectives, the guidelines promoted evolution of sound management and operating practices within the industry as a whole. After some experience in the use of the guidelines, in 1993 IMO adopted the International Management Code for the Safe Operation of Ships and for Pollution Prevention (in short, the ISM Code). In 1998, the ISM Code became mandatory under the International Convention for the Safety of Life at Sea (SOLAS). The code applied for SMS registration in ship operating companies and vessels including all tankers, passenger ships, bulk carriers and other cargo ships in 162 member states of IMO (IMO, 2001, 2002).

The ISM Code entered into force on the first day of July 1998 for passenger ships, including passenger high-speed crafts, oil tankers, chemical tankers, gas carriers, bulk carriers and cargo high-speed crafts of 500 gross tonnage and above. The Code also applies to other cargo ships and mobile offshore drilling units of 500 gross tonnage and above not later than July 2002 (IMO, 2002). The Member States of IMO need to reinforce the SMS registration schedules as set for ship operating companies and vessels by the IMO (Yeung, 1997). At the time, many companies had neither good experience nor knowledge of the ISM Code. In preparing for the SMS registration, they faced a lot of implementation problems and difficulties. This paper discusses these problems and difficulties drawing on the experiences of ship operating companies that have successfully obtained the SMS registration in Hong Kong and Singapore. It examines the determinants of SMS implementation, and presents a 15-step implementation strategy for SMS registration using the ISM Code. This paper uses some technical terms in facilitating the discussion, with a list of the abbreviations presented in the Appendix.

Safety management standards and the ISM Code

According to Osborne and Zairi (1997), a SMS is composed of standards, procedures and monitoring arrangements that aims at promoting the health and safety of people at work and protecting the public from work related accidents. The main function of SMS is to define the scope of work, analyze hazards, develop and implement controls, and improve feedback systems (Davis, 1997). International and regional standard organizations have been setting a trend towards the establishment of a set of safety standards for various disciplines (Takala and Obadia, 1997; Waring, 1996). The International Organization for Standardization (ISO) has member organizations that have their own proposed standards. European Committee for Standardization (CEN)

is a regional standards organization that has members encompassing all the national European standards bodies. For instance, British Standards Institution (BSI) published BS 8800 – an occupational health and safety management standard in 1996 (BSI, 1996). Standard Australia (SAA) published a standard for health and safety in its present form, AS 1470, which is similar to BS 8800 but more prescriptive. Association Française de Normalization (ANFOR) has also developed standards to manage occupational health and safety. Waring (1996) argues that ISO has been working with other national standard bodies worldwide to harmonize their works and standards. In response to increasing demands for a recognizable health and SMS standard, BSI has published a new Occupational Health and Safety Assessment Series (i.e. OHSAS 18001) specification with guidance for self-assessment and compliance requirements for certification purposes in 1999 (BSI, 1999). The specification standard is mainly compatible with the ISO 9001 (ISO, 2000) (quality) and ISO 14001 (ISO, 1996) (environmental) management systems standards, in order to facilitate the integration of quality, environmental and occupational health and SMSs in organizations (BSI, 1999).

The International Maritime Organization recognized the importance of the existing international instruments as the most important means of preventing maritime casualties and pollution of the sea and included sections on management and the importance of a safety and environmental policy (IMO, 2002). In 1993, it adopted the ISM Code as a standard to ensure safety, to prevent human injury or loss of life, and to avoid damage to the environment, in particular, the marine environment, and to property. Like ISO 9001 for the quality management systems and OHSAS 18001 for the occupational health and SMSs, the ISM Code is based on general principles and objectives that promote the evolution of sound management and operating practices within the industry as a whole. It has 13 elements (see Table I) and provides guidance for ship operating companies to (IMO, 2001, 2002; Nautical Institute, 2001):

- assure safe practices in ship operation and a safe working environment;
- establish safeguards against all identified risks; and
- improve continuously the safety management skills of personnel ashore and aboard, including preparing for emergencies related both to safety and environmental protection.

ISO 9001 stresses the ability of an organization to perform and produce goods and services in accordance with the contract requirements with customers (ISO, 2000), whereas OHSAS 18001 looks into the compliance of legislations and company performance in the areas of occupational health and safety (BSI, 1999). The ISM Code works in a similar way to the ISO 9001 and OHSAS 18001 series of standards, but focuses on assuring the safety management practices in ship operations to make ships safer and the ocean cleaner. The ISM Code contains many internal and external elements that are comparable to both

Clause references	The ISM Code elements ^a	ISO 9001:2000 clauses ^b	OHSAS 18001: 1999 clauses ^c	Safety management systems
1	General	4 + 5.1 + 5.5 + 5.6	4.1 + 4.3	707 <hr/> Table I. Elements of the ISM Code versus the clauses of ISO 9001 and OHSAS 18001
2	Safety and environmental protection policy	5.1 +5.4 +5.5.1	4.2	
3	Company responsibilities and authority	5.6.2	4.4.1 + 4.6	
4	Designated person(s)	5.6.3	4.4.1	
5	Master's responsibilities and authority	5.6.2	4.4.1 + 4.6	
6	Resources and personnel	6.1 + 6.2.2	4.4.6	
7	Development of plans for shipboard operations	6.5 + 7.1 + 7.5 + 8.2	4.3 + 4.3.1	
8	Emergency preparedness	4	4.3.1	
9	Reports and analysis of non-conformities, accidents and hazardous occurrences	8.1 + 8.3 + 8.5	4.5.2	
10	Maintenance of ship and equipment	7.1 + 7.5.2 +7.6	4.5.1 + 4.5.2	
11	Documentation	5.6.6 + 5.6.7	4.4.4 + 4.4.5	
12	Company verification, review and evaluation	8.1 + 8.2	4.5.4	
13	Certification, verification and control	8.1 + 8.2	4.5.4	

Sources: Abstracted from ^a IMO (2001), ^b ISO (2000) and ^c BSI (1999)

standards. For instance, they stress the needs for and purpose of management review that ensures continuing suitability and effectiveness of the organization through reviewing of the corporate policies, objectives and targets. The compliance requirements in document control and recording for the ISM Code are similar to those of both standards. They also impose strict auditing requirements that monitor the extent to which corporate policy and objectives are being met. Table II contrasts macro-level comparison of the ISM Code, ISO 9001 and OHSAS 18001.

According to the French ship classification society, there are significant procedural and economic advantages in establishing a program with the objective of dual certification, though the scope of application of the ISO 9001 standard is wider than the ISM Code (Bureau Veritas, 1994). The two disciplines are complementary with their coverage of quality and safety. Morriss (1995) adopts 22 system criteria of the International Ship Managers' Association (ISMA) to examine the similarities of various standards including the ISO 9001 series and the ISM Code (see Table III). It is shown that the requirements of both are mainly compatible to most of the Association's criteria and with each other. In fact, many companies have trained their internal safety auditors using their quality audits personnel, resources and

Table II.
A macro-level comparison of the ISM Code, ISO 9001 and OHSAS 18001

Dimensions	ISM Code ^a	ISO 9001 Standard ^b	OHSAS 18001 Standard ^c
Purposes	Provide guidance for ship operating companies to make ship safer and the ocean cleaner. Mandatory for all tankers, passenger ships, bulk carriers and cargo ships. Third-party registration	Effectively documenting the quality system elements to be implemented or in place needed to ensure an ability to perform. Voluntary registration by an accredited third party	Assist organizations to develop an OHS management system to protect employees and others whose health and safety may be affected by the organization's activities
Emphasis	Statutory requirement to establish a SMS for safe operation and management	Validate supplier ability and capability to perform according to contract	Establish occupational health and SMS to link with other management systems standard and sustainable development.
Eligibility	Ship operating companies, the ship owner or any person, such as the manager or bareboat charter, who has assumed responsibility for operating the ship	This is generic and independent of any specific industry or economic sector. It is applicable to all types and sizes of organizations	Organizations of all sizes and regardless of the nature of their activities
Participants	Ship operating companies need to certify their safety performance in accordance with the ISM Code. A document of compliance and/or a safety management certificate will be issued	Organizations wish to develop their quality systems and to meet the vendor requirement as specified in contracts, especially those wishing to have trades with EC countries and the USA	Organizations wishing to develop an OHS management system based on the guidance of HS (G) 65 or/and ISO 14001. Organizations may include companies, divisions operations and facilities
Evaluation	Document reviews, company audits and shipboard audits will be performed. It contains 13 basic elements to evaluate the safety performance	Specification for design, development, production, installation and servicing. It contains eight principal areas that include management responsibility, resource management, process management, measurement, analysis and improvement	Does not lay down specific OHS performance criteria. Six elements (initial status review, OHS policy, planning, implementation and operation, checking and corrective action and management review) are required
Orientation	Heavy on compliance with statutory requirement. Share common management system principles with the ISO 9001 and OHSAS 18001	Process plus management and administration. Stress quality assurance initiatives, conformity, performance measurement and continuous improvement	Share common management system principles with the ISO 9001 and ISO 14001
Mechanics	Select certification agency, commission company/on-site audits and obtain certification	Select registration/certification agency, submit a quality manual, conduct external audits and obtain certification	Contains guidance and recommendations, perform self-assessment and for certification purpose

Sources: Based on ^a IMO (2001), ^b ISO (2000) and ^c BSI (1999)

The ISMA's 22 criteria	ISM Code	ISO 9001	Safety management systems
Business ethics	✓	✓	709 <hr/> Table III. Compatibility of the ISM Code and ISO 9001 to the ISMA's 22 criteria
Organization	✓	✓	
Personnel	✓	✓	
Safety	✓	○	
Environmental protection	✓	○	
Contingency planning	✓	✓	
Operational capability	✓	✓	
Cost efficiency/purchasing/contracting	○	✓	
Maintenance/maintenance standard	✓	✓	
Technical support	✓	✓	
Insurance	○	○	
Accounting	○	○	
Certificate and compliance-rules/regulation	✓	○	
Cargo handling and cargo care	○	○	
Communication procedures	✓	○	
Management agreement	○	✓	
Records	✓	✓	
Auditing body	✓	○	
Quality system	○	✓	
Document control	✓	✓	
Internal quality audits	✓	✓	
Drug and alcohol policy	○	○	

Notes: ✓ = Compliance criteria; ○ = not required or not applicable
Source: Based on Morriss (1995)

facilities. Acquiring skills and techniques in both quality and SMS audits was the foundation training for IMO auditors. During the early days for conducting both company and shipboard audits, the IMO auditors need to have quality audit experiences in conjunction with the ISO 9001 quality management system (Yeung, 1997).

The SMS registration process with IMO

The requirements of registration

The ISM Code establishes safety management objectives and requires a SMS to be established by the “company” that is defined as the ship operating company and/or owner or any person (such as the manager or bareboat charter) who has assumed responsibility for operating the ship. The company is required to establish and implement a policy and system for achieving these objectives. This includes providing the necessary resources and shore-based support. According to the Japanese ship classification society, a company typically goes through five stages for the SMS registration under the IMO (Nippon Kaiji Kyokai, 1996):

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- (1) to apply for a flag state government or a classification society;
- (2) review the safety management manual;
- (3) conduct a preliminary evaluation;
- (4) perform an on-site or company audit; and
- (5) complete a registration.

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The SMS registration with respect to the ISM Code is a statutory requirement. The government of the flag states (i.e. countries whose flag a ship flies) administer the SMS registration and endorse the issue of SMS certifications. In accordance with the regulation 1/6 of the 1974 SOLAS Convention and regulation 4 of Annex-I and regulation 10 of Annex-II of MARPOL 73/78, the flag state governments may entrust some recognized organizations to carry out the certification (Anderson, 1998; IMO, 2001; Yeung, 1997). The IMO delegated the 11 classification societies of International Association of Classification Societies (IACS) as the certification agencies or bodies for conducting SMS audits in accordance with the ISM Code.

The procedures required by the Code should be documented and compiled in a safety management manual, a copy of which should be kept on board. Every company is expected "to designate a person or persons ashore having direct access to the highest level of management" (IMO, 2001, 2002). A company is required to establish, implement and maintain its SMS for at least three months before the registration audit can commence. In some cases, any company may select more than one certification agency if it manages vessels of different nationality ship owners simultaneously. If the registration is successful, the certification agency will recommend the company to the Safety Management Register (SMR) with a Document of Compliance (DOC), and in other cases, issue a Safety Management Certificate (SMC) to individual shipboards or vessels (IMO, 2001, 2002).

Auditing procedures of registration

With respect to the issue of a DOC, the auditing procedures cover a document review and a company audit (CA). The document review ensures that the safety management manual and relevant documentation comply with the requirements of the ISM Code. This is preceded by company visit(s) to verify the effective functioning of the SMS and assignment of responsibilities, to discuss any deficiencies that may have arisen from the review, and to plan for the subsequent auditing activities. The purposes of CA are to examine the objective evidence that includes records from the internal audits performed by the company, ashore and on board. The SMS should be in operation for at least three months and on board at least one ship of each type operated by the company. This is to examine the correctness of the statutory and classification records presented for at least one ship of each type to which the DOC applies (IMO, 2001; Yeung, 1997). Similarly, the auditing procedures for issuing a SMC

go through a document examination and a shipboard audit (SA). The validity and relevance of the DOC should be examined for a specified type of ship. Other provisions, such as, maintenance of class with the classification society and maintenance of valid statutory certificates, should be complied with. The purposes of SA are to assure that the system on board has been in operation for at least three months. The objective evidence includes records from the internal audits performed by the company (IMO, 2001; Yeung, 1997). Both CA and SA are official terms used by the certification agencies (Nippon Kaiji Kyokai, 2002).

Registration audits and follow-ups

For any ISM Code registration audits, a lead auditor representing his/her certification agency would prepare an auditing program by mutual consent with the applicant. In general, an auditor team consists of two to four auditors. The auditing agenda should be completed in three days or less for a company; however, this may be extended or shortened on a case-by-case basis and may be split depending on actual circumstances. The auditing program includes an opening meeting, an interim meeting if necessary, execution of auditing activities and a closing meeting. At the closing meeting, the auditor team will present the findings and judgment on the severity of any non-conformances of the company. An auditor's report must be produced and four possible outcomes of recommendations would be made upon the completion of the program. These outcomes are:

- (1) SMS registration in accordance with the ISM Code is recommended.
- (2) Minor non-conformances are found and corrective actions are taken to the consideration of auditor team. In such case, registration is recommended on condition that the agreed corrective actions are completed within the time period as specified by the auditor team.
- (3) A satisfactory partial audit of the identified problem area(s) is required before registration can be recommended.
- (4) Non-conformances are serious and widespread. In such a case, the system is subject to another full audit at a future date before registration will be considered.

A company successfully completing its registration audit is eligible to apply for the SMR with DOC and/or SMC. It is entitled to use the certification agency's logo for publicity purposes. The initial audit for registration is five years. In order to assure that the company can effectively implement and maintain the system, the certification agency will conduct a follow-up audit annually and conduct a renewal audit every five years. The annual audits stress particularly the performance of the internal system, whereas the renewal audits are to revisit the whole system in accordance with the ISM Code.

Problems and difficulties with SMS registration

Recently, many studies have been undertaken to investigate the development of safety management strategies and practices (see, for example, Weinstein, 1996; Ansari, 1997; Yeung, 1997; Else, 1998; Ross, 1998; Pun and Hui, 2002). Some safety literature also addresses the factors and difficulties or problems that may affect the establishment, implementation and maintenance of SMSs (see, for example, Osborne and Zairi, 1997; Takala and Obadia, 1997; Anderson (1998), Back and Woolfson, 1999). Although many adherents openly praise the benefits from SMS registration, others have identified significant costs and implementation obstacles. Critics have suggested, for instance, that SMS entails excessive retraining costs, consumes inordinate amounts of management time, increases paperwork and formality, demands unrealistic employee commitment levels, and emphasizes process over results. Reasons for friction or failure to implement a SMS may include a mismatch of organizational culture, inadequate training, a lack of management leadership, financial commitments, and cooperation (Back and Woolfson, 1999; Osborne and Zairi, 1997). Drawing on the experiences from SMS-certified companies in Hong Kong and Singapore (Yeung, 1997), the most difficult problems associated with the registration are:

- *Resistance to change* – many shore-based staff and crews are resistant to change while introducing any new procedures and instructions in accordance with the ISM Code.
- *Lack of human resources* – preparing safety management manuals and writing procedures require human effort and time that are beyond the capability of current staff.
- *Insufficient knowledge of procedures* – the requirements of ISM Code are new to many managers, port and ship captains, and engineering superintendents.
- *Lack of inter-departmental communication* – conflicts always occur among departments, especially the operation department and the technical department.
- *Level of education* – many ship operating companies employ lower educated crews from developing countries. This reduces operating costs but also creates a lot of problems with poor communications.
- *Frequent staff turnover* – most crews are recruited on a contract basis (normally in six to 12 months). This adds to the difficulties of introducing change or any new policies and practices on board.
- *Time pressure to obtain registration* – many ship operating companies rush to complete SMS registration in nine to 12 months time. This imposes enormous pressure on the management and staff involved to achieve it.

An implementation strategy for SMS registration

Having regard for the difficulties and problems identified, there has been a pressing need to help ship managers smooth out the SMS registration and meet the statutory requirements of the IMS Code. Many practitioners and researchers have suggested different strategies, models and frameworks to implement the safety management practices. Some of them are adopting a generic approach while others are company or industry specific to a particular environment or application. For example, Ansari (1997) suggests some company-specific safety strategies for Boeing, whereas Else (1998) stresses the strategic necessity of health and safety to sharpen a company's competitive edge. Yeung (1997) proposes a stepwise implementation approach that is based on ISO 9000 standards to enhance safe operations of ships and environmental protection. Pun and Hui (2002) examine the synergy of safety and quality dimensions and came up with an implementation model of safety-focused quality management.

A digest of the literature relating to SMS and the experiences of the SMS-certified companies helps build a practical model for facilitating the registration process. The authors have proposed a 15-step implementation strategy for SMS registration in accordance with the ISM Code. However, two basic prerequisites are assumed. The first is that the ship managers are well versed in the needs and requirements of their business. The second is that they are reasonably aware of the statutory requirements of the ISM Code. A schematic presentation of the strategy model is given in Figure 1. The sequence of individual steps may be altered with respect to different companies needs and business natures. These steps are elaborated below.

Step 1. Commit to changes and improvements

Top management is the main driver of SMS efforts throughout the implementation process (Pun and Hui, 2002). Management leadership and commitment can bring about corporate-wide safety initiatives and management practices in compliance with the statutory requirements of the IMS Code. Having a clear corporate vision and mission for SMS registration is essential, so that people can understand management's commitment and expectation. The management should nurture a safety culture, develop the objectives, goals and policy, define clearly the safety responsibilities, and delegate authorities and assign resources to where appropriate for the preparation and the execution of changes and improvements across the whole organization (Cooper, 1997).

Step 2. Establish a safety management panel

The management needs to establish a safety management panel (SMP) or steering committee for overseeing the SMS registration. Its main tasks are to convert the vision and mission statements into a set of objectives, assess the corporate strengths and weaknesses, and monitor the cross-functional project

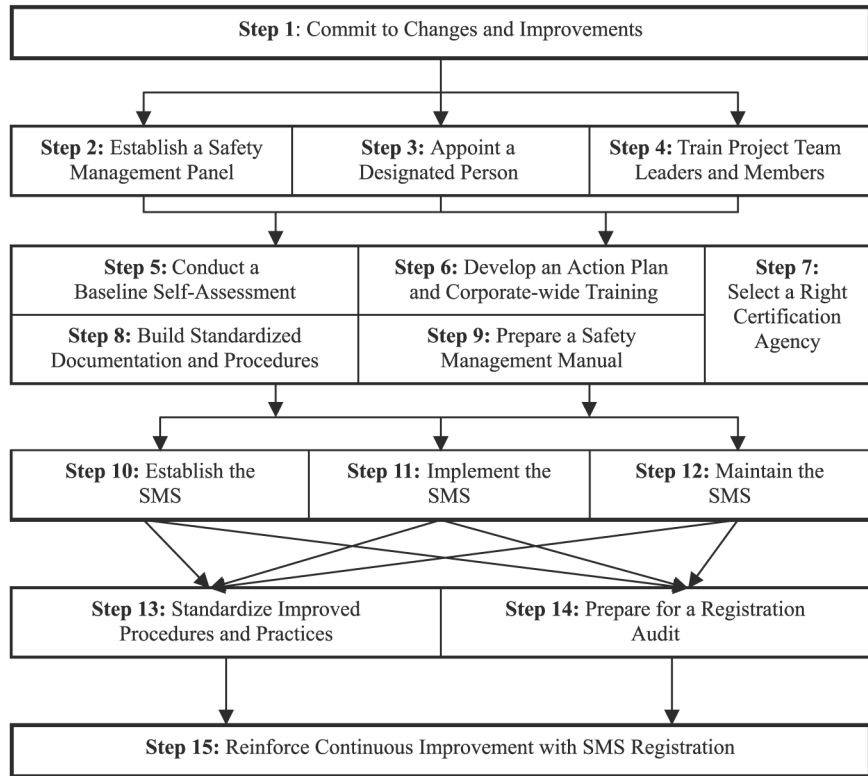


Figure 1.
A 15-step
implementation strategy
for SMS registration

teams of an organization. The SMP may be divided into groups having different responsibilities, such as assistance in forming a documentation team, procedure writing, people training, preparation of a safety management manual and conduct of baseline self-assessments. The SMP should be prepared to seek external advice and assistance if needed for any unsolved matters while using the ISM Code. Many classification societies and consulting companies also provide services to help their clients with the implementation of SMS.

Step 3. Appoint a designated person

The management should appoint a designated person (DP) or persons ashore to assure the safe operation of each ship and to provide a link between the company and those on board. The DP has direct access to the highest level of management, and irrespective of other responsibilities, should have defined authority for assuring that a SMS is established, implemented and maintained in accordance with the ISM Code (IMO, 2001, 2002). The DP performs similar roles as that of the management representative in ISO 9001 and OHSAS 18001, and has the responsibilities for reporting on the performance of the SMS to the management for review and as a basis for improvement.

Step 4. Train project team leaders and members

Key personnel of SMS implementation include the SMP members, the DP, project team leaders and members. They should receive proper training on the ISM Code, related standards (e.g. ISO 9001, OHSAS 18001 and ISO 14001) and internal audits so that they can acquire the knowledge, skills and techniques necessary for implementing SMS. Thus, management should provide the training facilities and resources, and arrange both internal and external training opportunities for these personnel as far as possible to facilitate the implementation of the SMS. For instance, the company should support the leadership training and trainers programs, and delegate employees to attend the ISM Code and related seminars conducted by some classification societies.

Step 5. Conduct a baseline self-assessment

Prior to the implementation of the ISM Code, the SMP should conduct a baseline self-assessment on how well the current system meets the requirements of the Code. This helps the company define the critical processes and determine the training requirements, the resource allocation and the time required for registration. Besides, the self-assessment results also help identify both strategic and limiting factors that may affect the establishment, implementation and maintenance of the SMS.

Step 6. Develop an action plan and corporate-wide training

In order to ensure a smooth registration process, a management representative should be nominated and a detailed action plan of tasks and schedules should be prepared. The plan should incorporate the company's safety management policy and the ISM Code requirements into individual tasks and activities. It should define clear scope and requirements of tasks, allocate them to assigned individuals, and ensure that these individuals understand their roles. Management should foster cultural change and encourage people involvement and teamwork. The provision of corporate-wide training and education of practical skills, methods and techniques should be initiated at this stage. Top and middle management (e.g. the managers, engineering superintendents, port and ship captains) must coordinate and facilitate the implementation of the SMS. Front-line personnel (e.g. crews and labours) should also become aware of the safety management concepts, their responsibilities and the importance of their commitment.

Step 7. Select a right certification agency

The management needs to select a right certification agency or body to apply for the SMS registration. There are four basic criteria for selecting the agency, including its competency, experience, compatibility, and the costs and time scale (Munro-Faure *et al.*, 1993). Reputation of the agency is another dominant criterion. The registration certified by a reputed agency may provide confidence to the government, the company, the ship owners, the ship charters

and the customers. For the application of SMC for individual vessels, the selection of a certification agency should also take account of the nationality of ship owners. For instance, it may be more appropriate to consider Nippon Kaiji Kyokai (i.e. Class NK) for Japanese ships or Det Norske Veritas classification (i.e. Class DNV) for Norwegian ships as the certification agency respectively.

Step 8. Build standardized documentation and procedures

In order to standardize the procedures for effective documentation control, the SMP should form a documentation team comprising managers responsible for individual departments, engineering superintendents and ship captains. The task of the team is to prepare three major tiers of documents, including the safety management manual, the procedures and instructions, management records and other documents needed for proper establishment, implementation and maintenance of the SMS.

Step 9. Prepare a safety management manual

According to the ISM Code, a safety management manual should be prepared or compiled. The SMP needs to decide on the types of manual systems for the company and delegate tasks to the DP and other key personnel (such as managers, superintendents, port and ship captains) involved in the manual preparation. This may be in the form of two separate manuals, one for the company and the other for the shipboard; or a combined manual for the entire system. The contents of the manual(s) should include:

- a title page and revision history;
- a safety management policy;
- the scope of the safety management manual;
- a company profile;
- the management organizational chart;
- a statement of personnel responsibilities of managers, superintendents, port captains;
- a brief explanation of individual elements of the ISM Code; and
- a catalogue of all associated safety management procedures.

The SMP should also approve the safety management manual, the procedures and instructions.

Step 10. Establish the SMS

The SMP should clearly define the authorities and responsibilities of departments and personnel in accordance the ISM Code. Corporate considerations in finance, markets and legal aspects should also be incorporated into the system. The SMP must examine the new or revised procedures and instructions before they are finalized with or without the

assistance of outside consultants. These procedures and instructions should be written in the common language(s), normally in English and/or a local language. Document control, such as the approval, distribution, receipt, re-issue and retrieving, should follow the standardized procedures in step 8.

Step 11. Implement the SMS

The SMP needs to ensure that the new and revised procedures and work instructions of the system are put into practice and everyone ashore and on board strictly adheres to them. The DP and other key personnel should monitor the situation, prevent or take prompt corrective actions if necessary for any deviations due to misinterpretations and misunderstanding. Besides, the SMP should collect and record the objective evidence for assuring proper SMS implementation and performance improvements in accordance with the ISM Code.

Step 12. Maintain the SMS

Regular internal audits can help evaluate the improvement efforts and maintain the effectiveness of the SMS. The DP has the responsibility to coordinate the conduct of internal audits that are effective means for recognizing, and hence are able to correct deficiencies in the system (Munro-Faure *et al.*, 1993). ISO recently introduced the ISO 19011 standard as a new guideline for unifying/harmonizing ISO 9000 and ISO 14000 International Standards for auditing (ISO, 2002). This standard provides practical guidance to auditors including those who audit internally the SMS within their own organizations. All non-conformities (NC) found or identified should be recorded in the internal audit reports. The DP should endorse the findings in the reports and redirect them to the relevant department managers and/or personnel responsible for the NC and corrective actions.

Step 13. Standardize improved procedures and practices

Upon receiving the internal audit reports, the department managers and the people involved (e.g. engineering superintendents, port and ship captains, project leaders and members) should take corrective action on the NC within an agreed period of time. They must investigate the root causes of errors, fix the errors, eliminate them and prevent re-occurrence. The DP should evaluate the results of any corrective action, make improvements, and report on the performance to the SMP and top management. All improved procedures and practices in the system should be documented and standardized for use in the company. Proper reward systems or methods should be reinforced to recognize teams or individuals for performance improvement. This can facilitate company-wide safety efforts and encourage total employee involvement.

Step 14. Prepare for a registration audit

After establishing the system for at least three months, if the SMP and DP agree at the system performance meeting on the requirements of the ISM Code, they can recommend to top management to apply for a registration audit to the selected certification agency (see step 7). The SMP and DP should assure the safety management manual and other supporting documents are readily available for the agency's preview before the audit commences. They would then coordinate the pre-audit visit (if any) to the company and the registration audit made by an auditor team of the agency. Other personnel involved should also be prepared to respond to any queries from auditors, and provide possible support to facilitate the whole auditing process from opening via execution to closing. If NC are found, the DP should take the corrective actions and assure that the work is done within the agreed time period.

Step 15. Reinforce continuous improvement with SMS registration

On receiving the agency's recommendations, the SMP and DP should work closely with other's personnel involved in the preparation of the SMR and plan for the use of the certification agency's logo of DOC and/or SMC for publicity purposes. The management should review the SMS at defined intervals sufficient to ensure its continuing suitability and effectiveness in satisfying the requirements of the ISM Code and the company's stated safety policy and objectives. The SMP and DP should coordinate the internal audits, maintain the safety records consistently, and reinforce the safety management practices for the annual follow-up audits and the renewal audits every five years. Moreover, maintaining the safety culture with committed management and efficient management reviews would ensure that organizations stay ahead with continuous performance improvements.

Conclusion

Many practitioners and researchers advocate that achieving safety performance can help organizations foster their competitive edge (see, for example, Ansari, 1997; Ross, 1998; Pun and Hui, 2002). This is attributable to the minimization of financial loss, compliance with legislation, effective allocation of safety responsibilities, and promotion of community goodwill. The IMO adopted the ISM Code as a minimum statutory requirement for SMS registration in the shipping industry. At present, many ship operating companies are in different stages of their SMS registration. This paper reviews the registration process and discusses the problems and difficulties faced by ship operating companies during the process. The 15-step implementation strategy serves as a practical reference for organizations to establish their SMS for the SMR. The strategy model provides a process-oriented approach for helping ship operating companies to go through the registration process in

accordance with the ISM Code. This also assists them in maintaining the SMS and reinforces continuous improvement in safety performance.

Nevertheless, full implementation of a working SMS can only partially be achieved if the ship operating companies do not use the ISM Code as it was intended. The implementation strategy must be reviewed consistently with respect to their needs and the changing business requirements. Management leadership and commitment, people involvement and attitudes towards safety are the determinants of safety management practices. Ongoing development, implementation and maintenance of the SMS should be in accordance with the ISM Code. Meanwhile, there has also been a strategic movement to incorporating quality and environmental management standards into the SMS (Osborne and Zairi, 1997; Pun and Hui, 2002). Further research using comparative studies and case studies is suggested to investigate the detailed processes and the determinants of the SMS registration in the shipping industry across different countries and the integration issues of SMS with quality, environment and other related management system standards.

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Appendix. A list of abbreviations used

ANFOR	Association Francise de Normalization
BSI	British Standards Institution
CA	Company audit
CEN	European Committee for Standardization
DOC	Document of Compliance
DP	Designated person
Flag state	The state of the flag that the vessel flies (in IMO conventions, the flag state is sometimes referred to as the "administration")
IACS	International Association of Classification Societies
IMO	International Maritime Organization

ISM	International Safety Management
ISM Code	The International Management Code for the Safe Operation of Ships and Pollution Prevention, or in short, the International Safety Management Code
ISMA	International Ship Managers' Association
ISO	International Organization for Standardization
MARPOL	The International Convention for the Prevention of Pollution from Ships
NC	Non-conformities
OHS	Occupational Health and Safety
OHSAS	The Occupational Health and Safety Assessment Series
SA	Shipboard audit
SAA	Standard Australia
SMC	Safety Management Certificate
SMP	Safety management panel
SMR	Safety Management Register
SMS	Safety management system
SOLAS	International Convention for the Safety of Life at Sea