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WORLD MARITIME UNIVERSITY

Malmö, Sweden

**TO IMPROVE QUALITY OF MANAGING SAFETY
IN CHINESE MARITIME SAFETY
ADMINISTRATION**

By

LI ZHIQING

China

A dissertation submitted to the World Maritime University in partial
fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

in

MARITIME ADMINISTRATION AND ENVIRONMENTAL PROTECTION

2000

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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ABSTRACT

Title of Dissertation: **To Improve Quality of Managing Safety in CMSA**

Degree: **MSc**

The dissertation is a study of the common principles and practices for successful safety management in the world shipping industry, which forms the foundation of improving the safety quality administration in CMSA.

A brief look is taken at the primary functions of maritime safety administration in general and the author's personal views of the inter-relationship between safety and quality.

The successful practices of applying quality strategy in maritime safety management are investigated.

The background of the Chinese maritime industry is reviewed and the maritime safety policy and the current maritime safety situation are explored, with a view to ascertaining the strengths and the weaknesses for further improvement.

Many efforts were made to analyze the reasons for improving the quality of managing safety with the aim to show the imminent needs in the future development of CMSA.

A substantial part of the dissertation consist of the suggestions for improvement in CMSA, which are generated from the TQM theory, the successful maritime safety management practices and risk control methodology considering the Chinese characteristics and the current situation in CMSA.

Managing safety needs a supportive atmosphere of the top level management's truthful commitment, the total involvement from all the levels, and qualified, well-trained and motivated people.

To improve the quality of managing safety can only be achieved within a system.

Risks should be treated with the scientific methodology both reactively and proactively.

The exchange of experiences, testing of ideas and sharing of views on the national level and international level will also be one of the cornerstones of our work in the future.

Key words: China, Maritime, Administration, Safety, Quality and Management.

TABLE OF CONTENTS

| | | |
|-----------------------|---|-----------|
| Declaration | | ii |
| Acknowledgements | | iii |
| Abstract | | iv |
| Table of Contents | | v |
| List of Tables | | viii |
| List of Figures | | viii |
| List of Abbreviations | | viii |
| Chapter 1 | Introduction | 1 |
| Chapter 2 | The introductory framework of MSA | 4 |
| | Definition of “ administration” | 4 |
| | The functions of MSA | 5 |
| | National economy and maritime safety | 7 |
| | Link between MSA and quality | 8 |
| Chapter 3 | What is safety quality management | 10 |
| | What is quality | 10 |
| | Quality management in public administration | 11 |
| | What contributed to safety improvement | 11 |
| | Modern management system’s approach to safety | 12 |
| Chapter 4 | Challenges faced by CMSA today | 15 |
| | Managing organization | 15 |
| | Government reformation | 15 |
| | Challenges from the industry | 16 |
| | – The nature of maritime sectors | 16 |
| | – Environmental protection and economic development | 16 |
| | – Marine transport has many error- inducing factors | 17 |
| | – Viewing “Safety” | 17 |
| | – Addressing human element | 18 |
| | – The culture of safety | 19 |
| Chapter 5 | The successful systematic quality approaches applied in marine safety management | 21 |
| | ISO9002 | 21 |
| | SEP | 23 |
| | ISM code | 23 |
| | FSA | 24 |
| | ISMA Code | 27 |

| | | |
|------------------|--|-----------|
| | QSQC | 30 |
| | PTP | 31 |
| | SAFETY CASE | 33 |
| | STCW Convention | 36 |
| | Some safety reporting systems | 39 |
| Chapter 6 | Analysis the current situation of CMSA | 41 |
| | Chinese characteristics | 41 |
| | – China is a developing country with a very big population. | 41 |
| | – Superior natural condition for developing water transport. | 41 |
| | – China is a socialist country | 42 |
| | Transport and national economy | 42 |
| | Safety production policy | 44 |
| | CMSA | 45 |
| | Current maritime safety situation in China | 48 |
| | Weaknesses of CMSA | 49 |
| Chapter 7 | The reasons for improvement | 51 |
| | State's responsibility | 51 |
| | Flag State Self-Assessment Form of IMO | 53 |
| | PSC | 54 |
| | Lessons learned from disasters | 55 |
| | International trends of safety management | 57 |
| | Safety culture | 58 |
| | The benefits of implementing MSQA system in CMSA | 61 |
| | The advantage of setting improvement as a goal | 62 |
| | Sharing information within the community | 63 |
| Chapter 8 | Suggestions for improvement (I) | |
| | — <i>Develop a supportive atmosphere for safety culture</i> | 66 |
| | Understanding quality | 66 |
| | Top management commitment | 68 |
| | Total involvement | 69 |
| | Competent staff | 71 |
| | Motivation | 73 |
| | Understanding the causes of accidents/incidents | 74 |
| | Understanding environmental protection policy | 77 |
| Chapter 9 | Suggestions for improvement (II) | |
| | — <i>Set up MSQA System in CMSA</i> | 78 |
| | Policy formulation | 78 |
| | Organizing | 79 |
| | Planning for safety | 80 |
| | Implementation | 81 |
| | Measuring performance | 82 |
| | Reviewing lessons learned | 86 |
| | Focusing on continuous improvement | 87 |

| | | |
|-------------------|--|------------|
| Chapter 10 | Suggestions for improvement (III) | |
| | — <i>Application of risk control methodology in CMSA</i> | 90 |
| | Hazards identification | 91 |
| | Assessing risk | 91 |
| | Risk Control | 93 |
| Chapter 11 | Suggestions for improvement (IV) | |
| | — <i>Promotion communication both inside and out side CMSA</i> | 95 |
| | Information input into the Administration | 95 |
| | Information flows within the Administration | 96 |
| | Flows of information from the Administration | 97 |
| | The methods to improve communication within the Administration | 98 |
| | Set up Chinese Maritime Safety Information System | 100 |
| Chapter 12 | Final thoughts | 103 |
| References | | 105 |

LISTS OF TABLES AND FIGURES AND LIST OF ABBREVIATIONS

LIST OF TABLES

| | | |
|----------------|---|----|
| Table 1 | ISO 9002 requirements | 22 |
| Table 2 | Six functional requirements of ISM code | 25 |
| Table 3 | A comparison of the various safety and quality codes | 29 |
| Table 4 | Task and Scientific Terms of Typical Safety Case | 35 |
| Table 5 | The statistics of 1996 – 1998 Chinese flag vessel detention | 54 |

LIST OF FIGURES

| | | |
|------------------|---|----|
| Figure 1 | Principal Claim cause - frequency | 19 |
| Figure 2 | Graphical presentation of risk regions | 27 |
| Figure 3 | Key elements of the safety case concept | 35 |
| Figure 4 | The organizational structure of CMSA(headquarter) | 46 |
| Figure 5 | Public comments in environmental pollution | 70 |
| Figure 6 | Anticipation of future environmental condition | 70 |
| Figure 7 | Dr. W.Heinrich's "Accident Distribution Model" | 75 |
| Figure 8 | A Sample of Accident Cause Ranges | 76 |
| Figure 9 | TQS flow process | 78 |
| Figure 10 | A framework for setting performance standards | 84 |

LIST OF ABBREVAITIONS

| | |
|-------------|---|
| CMSA | Chinese Maritime Safety Administration |
| MSA | Maritime Safety Administration |
| FSA | Formal Safety Assessment |
| ISMA | International Ship Managers' Association |
| PSC | Port State Control |
| QSS | Quality Standard System |
| ISM | International Safety Management |
| SEP | Safety & Environment Protection |
| MSQA | Maritime Safety Quality Administration |
| QAT | Quality Action Team |
| PTP | Prevention Through People |
| QSCS | Quality System Certification Scheme |

Chapter One

Introduction

Quality and safety are words that are flashing towards us from every article on a shipping theme. Substandard ships, substandard operation, substandard Flag States, substandard Port States and substandard classification societies have been recurring issues on the agenda.

Both authorities and the public in general are concerned with the increasing impact of technology on our common environment. Certain accidents have triggered increased public pressure and an accelerated political activities which have resulted in laws and requirements with impacts which are not totally foreseeable.

The shipping catastrophe review over the last 20 years shows a clearly increasing trend. The tragic accidents of the “Herald of Free Enterprise” and the Scandinavian Star” have initiated work within IMO, resulting in IMO resolution A.647(16): Guidelines on Management for the Safe Operation of Ships and for Pollution Prevention, and also the succeeding resolution A.680(17). The accident of the “Exxon Valdez” with severe oil pollution in sensitive waters, has certainly contributed to and accelerated the formulation of the American Oil Pollution Act (OPA 90).

Historically, the marine industry has used prescriptive rules and regulations for treating safety.

Since investigations of maritime casualties show roughly that 80% of all accidents are caused by substandard acts and 20% by substandard conditions, and knowing that 80% of all accidents are related to human acts, either direct or indirect, it is clear that the highest potential for improvement is on the human side, and that the development of a positive safety culture is the only way to improve the safety standards. If a

change of approach is to be adopted, the major hurdles to be overcome will need to be identified, and possible solutions suggested.

Furthermore, quality management principles have been used by the land based industry for quite some time. Quality management had become an important tool for improving the way organizations function in the 1990s, both in the industry and in the private and public service sectors. It was not until recently that these ideas got foothold within the shipping industry.

The ISM Code, with its requirement for shipowners to have in place a Safety Management System, aims to increase safety consciousness in the operation of ships. FSA on the other hand aims to improve the regulatory regime in IMO. The two initiatives are complementary, and both will help reduce risks at sea.

“If governments do not work well — economies won’t work well” Juhani Turunen, the Finnish Permanent Under-Secretary of State said. Increasing globalization will mean growing interdependency. International events and actors will increasingly influence issues that have traditionally been domestic.

Organizations, which manage marine safety successfully, display a number of common characteristics. They have their safety and environmental risks under control and can demonstrate a progressive improvement in their safety records.

From CMSA’s point of view, many reasons show that

- The traditional regulatory regime in CMSA are facing challenges;
- The quality of managing safety in CMSA has to be improved;
- The way to improve the quality of managing safety in CMSA should be based on finding a breakthrough in developing the service functions in CMSA and in promoting safety culture in the Chinese maritime industry.

CMSA, as the competent maritime safety authority in China, has three issues to confront:

1. What does CMSA need to do to enable the safety management regime in CMSA to cater to the rapidly changing situation in the safety management arena?
2. How can the industry be encouraged to be safety conscious?
3. How can the administrative regime become comprehensive and proportional to the risks faced by the industry?

China is at present carrying out a government reform, which involves all the public sectors. So does the CMSA. The reform in CMSA is under planning in conformity with clear political guidelines and strong political support.

The above situations provide the CMSA an unprecedented opportunity to initiate a substantial change in the way of managing safety. The future reform should be done not only for the sake of central government directives, but also for the citizens and for business. It is important that their views are reflected in this reform and the future work of CMSA must genuinely respond to their expectations.

In order to be able to serve the citizens and the economy in the best possible way in the future, we have to address the fundamental questions what CMSA does and what it does not do have to be addressed. CMSA must concentrate on doing the most essential and the most important tasks in doing the right things at the right time.

Chapter Two

The introductory framework of MSA

Definition of “ administration”

“Administration” can be broadly interpreted as the management of organization” (Vanchiswar, 1996). The reason for this lies in the fact that administration is generally viewed in the context of public, or in an even more narrow sense – State administration. State administration is in effect the management of government business. At this point, the expression (“administration”) is subject to management and governing, i.e. performing with authority. The source of the authority is the law concerned.

Administration is treated as the foundation of the organized society of today. A very common theory assumes that all types of organizations are to be managed in the same way, i.e. the management can be applied universally, if various types of organization are considered. However, not only many common features but also many differences can be observed.

According to Weber, the basic bureaucracy is legal power. This marks the ideally typical model of bureaucracy. Its features are: clear regulation of competencies, obligation to perform, command and obedience, the admissibility of coercive means, the principle of hierarchy and instance, firm controls and supervision rules. Furthermore, the right to appeal and complain, and the mandatory recording of all processes must also be mentioned in this context. In terms of personnel, the bureaucracy model is characterized by the necessary functional qualification of the employees, fixed salary, full time employment, a calculated chance of promotion, impartiality in performance of duty and the principle of official secrecy. All in all, these features are generally valid. They can ultimately be found in every bureaucratic

administration or hierarchical order, whether in the economy, administration or other institutions.

The functions of MSA

Public administration, i.e. goals and normative framework of the organization acts according to the State goals and norms.

The role of the state has developed far beyond the basic activities of external defense and internal law and order, to an interventionist and active planning role. The original role can be seen as negative, in that it was primarily concerned with stopping other people doing things that were primarily concerned with stopping other people doing things that were inconvenient to society; the modern role is more positive – actually providing for society a large range of goods and services in and out of the marketplace.

---- Glen Plant

The Maritime Administration of a country is an integral part of its overall public administration. “The expression ‘Maritime Administration’ means the administration of essential matters pertaining to the maritime sector in any country and calls for specialized knowledge and skills of a high order.” (Vanchiswar, 1996).

Since the expression “ Maritime Administration” is a generic, the concept of its nature and extent can vary depending upon whether a) the Ministry responsible for maritime matters itself, is being viewed as the Maritime Administration, or b) a sub-formation under the said Ministry is to be the Maritime Administration.

The aforesaid Ministry is responsible for maritime legislation and for implementation of government policy in the ultimate, and for overall co-ordination, as well as for relevant action in harmony with the ministries responsible for inter alia trade, economy and planning. It has to be appreciated that there is a very important need for a specialized sub-formation (i.e. support formation) manned by knowledgeable and competent officials to assist the Ministry to:

- formulate the proposed maritime policy,
- draft the legislation,
- implement the formulated policy and legislation,
- discharge its national and international obligation, and

- promote maritime development.

Such a formation needs to encompass or ensure coverage of the following:

- the obligatory functions of the MSA, and
- the voluntary, although it is important functions related to the promotion of maritime development.

Every maritime country, whether developed or developing, needs to have a MSA as an essential part of the maritime administration. The MSA is the specialized executive arm of a maritime government to implement or enforce the regulatory and allied functions embodied in the national maritime legislation, especially those pertaining to registration of ships, maritime safety, marine personnel, maritime casualty investigations and protection of the marine environment.

According to P S Vanchiswar, the roles and functions of a MSA would tend to fall into the following four categories:

- Advisory function

Policy making especially in its final stage is expected to be a political function of government. The policy process itself has three aspects, i.e. formation, implementation and evaluation. As regards the “formation” the advisory functions of MSA would be as knowledgeable, specialized formation in form of suggestion/drafting of such formation for consideration and approval at the political level. In most cases the above would need to be supplemented by discussions and verbal clarifications by the top officials of MSA.

- Administrative function

Maritime Safety Administration as part of the overall Public Administration of a Government has to discharge its administrative functions as any other

administrative units of the government, following the administrative and financial rules and procedures and to ensure implementation of policies and carry out the mandated specialized functions.

- Regulatory function

Maritime Safety Administration is not only part of the Public Administration of a government but also the specialized executive arm of the government regarding maritime matters. As a specialized executive arm of a maritime government, regulatory and allied functions embodied in the national maritime legislation have to be implemented and enforced.

- Developmental / promotional function

Besides the above-mentioned functions, the developmental functions contribute directly to maritime development. They can take the forms of participation in the process of formulating the policy of the government with regard to maritime safety development, e.g. promotion of safety culture, and deciding upon the activities to be undertaken in connection with such development.

Based on the above categorization, the management of MSA can be broadly divided into administration and service, whether they are delivered together or separately. In other words, the administration of CMSA has its administrative side and its service side.

The relationship between an integrated national economy and maritime safety and environmental protection policy

The government's attitude towards shipping can sometimes play an important role in the development of a country's maritime industry. Such an attitude is generally expressed through various measures taken by authorities, which can be called the

national maritime policy. As maritime policy can be understood as an integral part of the overall economic policy of a country, it embraces regulatory, financial and fiscal measures to be employed by authorities in relation to the country's maritime transport sector.

As about 90 percent of the world international trade in volume is sea-borne, and the percentage is even higher in some maritime countries (Ma,1999), nobody can deny the important role of maritime transport to a country. Maritime policy is of great importance to the development of shipping and related activities and the national economy at large.

Maritime policy of a country is a system that consists of a number of specific policy measures in connection with different areas including maritime safety and environmental protection policy. These policies should be consistent and interrelated.

If maritime safety policy is an integral part of the country's general economic policy, this policy should then be formulated based on the following two understandings:

- What is the role of MSA in the development of a country? This has been discussed in the above section.
- What measures are really needed to be taken for the general interest of the maritime sector and of the national economy? That will be exploited in the following discussions.

Link between MSA and quality

Governments have created a vast array of institutions designed to exercise collective control and influence over the societies and economies for which they have been given responsibility.

It remains crucial for governments, and the individuals who constitute them, to continue their search for innovative mechanisms for making government work better

and to serve society better. The effort must be carried on even on the face of “ill structured” or “intractable” problems, and often in the service of a mass public that neither recognizes nor appreciates the efforts involved. Contemporary public servants are neither martyrs nor saints, but they are individuals charged with continuously making collective decisions and to enforce precious decisions on behalf of the public interest. The leaders of a government are also in charge of reforming and improving the internal performance of their organizations.

Understanding administrative reforms requires understanding the traditional modal of governance that is the backdrop against which attempts at reforming must be viewed.

The roles of MSA are not only viewed as kind of authority, but as kind of service as well. The effectiveness and efficiency of “measures taken” in its work are meaningful to the policy of national economy and social stability. Today countries recognize more and more that sound economic development must be environmentally sustainable and be concerned with how to do this, whereby MSA can always find the incentives to improve the quality of its administration.

Moreover, to avoid wasting efforts and resources and to get goal results, emphasizing quality of the work of MSA will promote close cooperation among all parties involved within the framework of clear general criteria and concentration on priority issues.

Chapter Three

What is safety quality management

What is quality

Quality is often used to signify ‘excellence’ of a product or service. Within half a century, the concept of quality has evolved in a remarkable way:

- conformity to a specification

In some engineering companies the word may be used to indicate that a piece of metal conforms to certain physical dimension characteristics and often set down in the form of a particularly ‘tight’ specification.

- Meeting the requirements

Quality then has been opened up to meet the customer requirements, and this has been expressed in many ways by other authors:

*“Quality should be aimed at the needs of the consumer, present and future”
– Deming.*

“Fitness for purpose or use” – Judan.

“The totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs” – BS8402, 1995

“The total composite product and service characteristics of marketing engineering, manufacture and maintenance through which the product and service in use will meet the expectation by the Customer” – Feigenbaum.

“Conformance to requirements” – Crosby.

The quality of an organization’s products, services and other outputs is determined by the satisfaction of the customers who use them and results from the effectiveness and efficiency of the processes that create and support them.

Quality improvement: Action taken throughout the organization to increase the effectiveness and efficiency of activities and processes to provide added benefits to both organizations and its customers.

Quality improvement is achieved by improving processes. Every activity or item of work in an organization comprises one or more processes. Quality improvement is a continuous activity, aiming for higher process effectiveness and efficiency. Quality improvement efforts should be directed towards constantly seeking opportunities for improvement, rather than waiting for a problem to reveal opportunities.

Quality management in public administration

By adopting quality management strategies, business and industry have learned to work smarter and to gain a competitive edge in the new global economy. The principles of quality management, used in the private industry, are creating a quiet revolution in the public sector. Government is under constant pressure to deliver more services with fewer resources and to improve quality of service in cost-effective ways.

Recently, quality management has been even more and more widely introduced into public sectors like government departments, schools, hospitals, and police forces. to achieve effective citizen/client-focused service or product delivery and to discover the power of continuous improvement. Organizations everywhere are becoming more and more aware of the high cost of poor quality.

What contributed to safety improvement?

The National Safety Council of USA reported that:

Between 1912 and 1984, accidental work-related deaths per 100,000 inhabitants decreased by 76 percent, from 21 to 5. In 1912, an estimated 18,000 to 21,000 workers' lives were lost. In 1984, in a work force, which had more than doubled in size... only 11,500 work-related deaths were

reported.” This quite satisfying result can be attributed to measures taken in the areas of safety technology, education and law.

Accident prevention is, therefore, above all a demand to which not only the State, and especially appointed agencies, but also the individuals must subordinate themselves. Thus, in the past years in China:

- Many laws dealing with the improvement of occupational safety have been made, like in all industrialized countries;
- Research institutes have been founded and research programmes have been conducted;
- Offices for the inspection of factories and workshops have been established;
- Work on the safe construction of machines and equipment has made progress;
- Campaigns have been started in factories as well as in public;
- Attempts have been made to make employees receptive to safety-related affairs.

Modern management system’s approach to safety?

According to Terje Staalstrom, it is the application of special, technical and managerial skills to systematic (planned, disciplined, organized) forward—looking (before-the –fact) identification and control of hazards throughout the lifecycle of a process, project, program or activity. Not an after– the–fact philosophy of accident prevention, “do-fail–fix-do” approach.

A definition of “**safety**” was proposed by Kuo (1990), as follows:

*“ **Safety** is a perceived quality that determines to what extent the management, engineering and operation of a system is free of danger to life, property and the environment.”*

It is because safety involves all these factors that the subject has to be dealt with in a systemic way.

There have been many successful safety & quality management approaches set up including:

- Safety case
- International Ship Managers' Association (ISMA)
- Euro Norm, British Standards Institute International Standards Organization. (EN.BS.ISO 9000 series)
- Risk Profiling
- Formal Safety Assessments
- Investment in People (IIP)
- Prevention Through People (PTP), United State Merchant Marine Academy.

Furthermore, many most advanced management concepts were introduced into the safety management system, such as:

- Participative Management,
- Quality Circles, and
- Total Quality Management

Quality is not free, but it pays back. Costs related to safety and environment protection or quality of shipping can be divided into two parts:

- The appraisal and preventive cost

Such cost may include the expenditure related to design review, special training, audits, quality planning, prevention equipment and activities, quality measures and qualification, test and inspection equipment and activities,

- The failure cost or the losses

These include losses of lives or property, damage to the environment, loss of business of shipping companies; the losses may also be spread to the extent which are out of the control of a single company.

If there is no quality investment in appraisal and preventive measures, the failure cost will be higher in one way or another.

The application of a quality management system (or safety quality administration system) in MSA as a whole is an approach to improve the effectiveness and the efficiency of the activities. It is a method for ridding people's lives of wasted efforts; it is essentially a way of organizing and involving the whole organization with the collaborations and participation of all relevant parties, which have in common the processes of improvement. The methods and techniques can be applied throughout the Administration and the whole maritime community.

Chapter Four

Challenges faced by CMSA today

Managing organization

Complex systems are not static. They are subject to dynamic development in order to safeguard their own existence; systems constantly reproduce themselves.

The development of an organization does not result primarily from this social differentiation. However, the behavior of elements in this progress considerably determines how the system fits in with its environment. The reference is the constantly changing difference between a system and its environment.

Constant adaptation through observation and constant redevelopment can ultimately be regarded as the only possibility for social systems to master the complexity of their environment.

Government reformation

During the 1990s, new projects to reform public administration were initiated in China. This reform program involved the ministerial level of public administration and all subordinate offices. Within this framework, the functions of public administration, the organizational structures and operations were examined and appropriate measures taken. The individual goals are as follows:

- Reassessment of the functions and management structure of public administration by concentration on central functions
- Increase in the productivity of public administrations with regard to the effectiveness and efficiency of fulfilling functions
- Cost reductions and establishment of a system of cost/ performance ratios

- Less burden on the management through concentration on the real tasks of management and development of instruments to support a result-oriented management of administration
- Achievement of balanced division of labor for the employees of public administration
- Increased citizen-orientation of the administration
- Increased citizen-orientation of the administration through reinforcement of the service functions.

Challenges from the industry

Shipping has always been international whereby a mixture of inputs from various country origins is found in a single shipping activity. However, not only this tradition has been largely generalized in virtually all economic sectors. In shipping itself, new development has been observed. Flag, capital, accounting, crew, management and operation, marketing, are all being formulated and piece-by-piece being globalized to an even greater extent. CMSA is facing more and more challenges from the current situations of the world maritime industry as:

– The nature of maritime sectors

The effect of the maritime sector has never been restricted within the national boundaries and it is even more internationalized nowadays. It becomes more and more apparent as a result of the current process of integration of the national economic system, i.e. globalization, safety and environmental problems are achieving in a way of being solved at global level. The role of international organizations, like IMO, ILO, OECD, ITF, WTO and regional ones, such as EU and all the PSC MOUs are constantly increasing. This of course may and does modify the nature of national policies whether actively or passively. This trend is most likely to continue in the future.

– The conflict between environmental protection and economic development

The economics of shipping continue to put extreme pressure on vessel operations to minimize costs as one way of achieving an acceptable return. Despite the benefits obtained from the use of modern technology, the economies of scale derived from vessel size and optimum utilization and the reduced crew numbers, it is increasingly difficult to achieve an acceptable return on capital in the shipping industry.

Ports around the world are facing increased pressure for development of newer, larger and more efficient facilities to accommodate increased waterborne trade carried by larger and larger vessels, which posed more and more potential risks to the environment. Today countries have recognized that sound economic development must be environmentally sustainable. The urgent need to safeguard the environment for future generations emphasizes the need not only to discuss the problems, but also to find strategies and effective measures to solve them.

– **Marine transport has many error- inducing factors**

- Immense diversity and complexity,
- New technologies yield increased output rather than increased safety,
- Centralized shipboard authority,
- Commercial and operational pressures,
- Courts designed to fix blame rather than avoid accidents,
- Increasing traffic density, shrinking staff numbers and aging fleet.

– **Viewing “Safety”**

The marine industry has traditionally been very conservative. This is not surprising because ships have evolved over many centuries on the basis of experience gained in practice. It should also be borne in mind that shipping is dependent on world trade and is adversely affected by fluctuations in the economy. There is a general reluctance by shipowners and operators to commit funds to anything that could be seen as an “expense”. Safety is perceived to be an “extra-cost” item, and it needs to be demonstrated to the shipowner that this is

worthy of being done. Very few ship operators will opt for anything beyond the minimum safety standards. (Kuo, 1998)

Everyone has some safety-related experience and lessons learned, and therefore some appreciation of what he or she thinks safety is all about. Fortunately, nobody is expecting to gain all the valuable experiences and the sound appreciation of safety from disaster and losses suffered. So winning support for alternative ideas is therefore an even more demanding task for them.

– **Addressing human elements**

The regulatory process has been overwhelmingly reactive. Each time the industry has suffered another costly mishap, the regulatory process has responded, mostly in a political way, and mostly aimed at reaffirming the safety inspection or redesigning the vessel so as to make it more difficult for the humans to recreate the last mishap.

Some of the big marine mishaps have occurred to relatively new vessel rather than the substandard rust buckets everybody all disdains. And some have occurred to owners that one would clearly place in the safety conscious end of the spectrum and to crews that have been well trained and well qualified by long experience. The regulatory process has not reduced the likelihood of an otherwise competent individual to make an error in judgement at a critical point in time. Any new approach to safety needs to address this anomaly: What is missing when a competent individual in a safety conscious organization, aboard a fully compliant vessel, makes a major error in judgement?

According to UK P&I Club, although claims resulting from human error are decreasing slowly in absolute terms, their relative importance is increasing in a climate where ship failure is significantly reducing (see Figure 1). Three out of every five major claims are directly related to human errors. In particular, shore

person error is identified as a continuing major problem. Crew error continues to cause 45% of all personal injury claims.

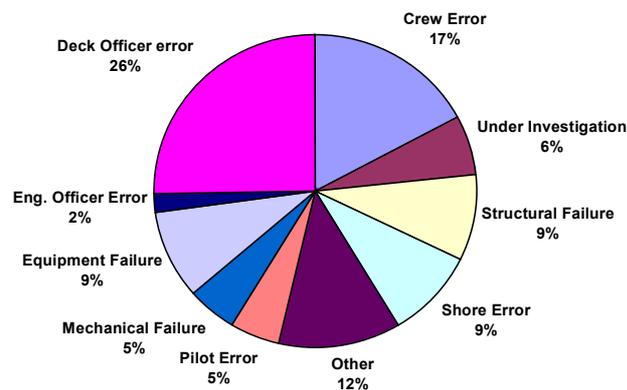


Figure 1 **Principal Claim Cause – Frequency**

(Source UK P&I Club)

– **The culture of safety**

Culture norms have a significant impact on an organization’s ability to change. Many behavior patterns are held in common by most types of organizations and are deeply ingrained, e.g. do not ever disagree with the boss; do not give the boss any bad news; do not share information with co-workers. Some are almost instinctive and can act as real barriers to change in any organization, even in some shipping companies that have begun quality improvement efforts. (Cohen & Brand, 1993)

In the past, the safety of shipping and other maritime activities have been treated by what is called the prescriptive approach, with mainly technical requirements that are easy to be applied and verified, whereby the authorities draw up rules and regulations and the users obey them without questioning. Safety at sea mainly depends on the design characteristics of the ship, operational aspects and competence of the crew, which should be integrated by safe management of the company covering all activities both on board and ashore.

IMO deals mainly with ship design and equipment, and only in recent years, recognizing the fundamental role played by the human element, did it start devoting more and more attention to the other aspects, which are also to be regarded as essential components of an indivisible system. The revised STCW Convention and the ISM Code are two main instruments recently developed by the IMO to tackle human element issues. Also the Formal Safety Assessment (FSA) could be another important tool for taking the human element fully into account in the IMO rule-making process. It is a rational and systematic approach for assessing the risks associated with shipping activities and for evaluating the cost and benefits of IMO's options for reducing the risks.

As a result, to avoid wasting efforts and get good results, the safety production should be carried out through close cooperation among all parties involved within the framework of clear general criteria and concentration on priority issues.

Chapter Five

The successful systematic quality approaches applied in marine safety management

As a matter of fact, quality is not a strange term in the marine safety management arena. Using quality the approach to improve safety standards has been introduced into the marine safety management by many organizations since quite a period of time ago. Also, the application was developed from using some general applied quality safety standards to setting up some particular marine sectors dedicated quality safety standards. The following is going to give a general review of the successful safety quality management systems or approaches widely used within the marine community.

ISO9002

The ISO 9002 Standard, used world-wide to certify quality systems, defines quality assurance. The citation ISO 9002 is now found in the company literature of a vast range of businesses and enterprises both within the marine industry as well as others.

It is a part of the International Standard for Quality: ISO 9000 series. Quality system registration demonstrates that the client can be confident that the registered company maintains a system that assures the best practices in quality, avoids errors and improves its performance.

It is the tried and tested quality standard used by many manufacturing and service industries worldwide. ISO 9002 needs to be interpreted from the ship operations viewpoint to make it “shipping friendly”.

ISO 9002 contains 17 paragraphs. (see Table 1) All these provisions, implemented by the company, form the quality management system.

Table 1 **ISO 9002 REQUIREMENTS**

| |
|--|
| <ol style="list-style-type: none">1. Management responsibility2. Quality system3. Contract review4. Document & date control5. Purchasing6. Control of Customer supplied product7. Product identification supplied product8. Process control9. Inspection & testing10. Control of inspection measuring & test equipment11. Inspection & test status12. Control of non-conforming product13. Corrective & preventive action14. Handling, storage, packaging, preservation & delivery15. Control of quality audit16. Training17. Statistical techniques |
|--|

ISO 9002 focuses mainly on four points:

- Management commitment and responsibility
- Contract review
- Production process control
- Methods of inspection and prevention of quality deficiencies.

ISO 9002 is neither a law nor a set of rules. It is a voluntary way for companies to improve and demonstrate the quality of their management. But it is more than that: the basic intention of this standard is to provide a client with adequate assurance that the expected service will meet his requirements.

This standard applied in the maritime industry represents a guide to assist management and executives in introducing a quality and safety management system. It offers a way to define quality, safety and environmental protection objectives; and to focus and direct the resulting system towards concrete goals.

SEP

Prior to the adoption of the ISM Code as a regulatory requirement several classification societies launched their own version of safety code covering virtually the same aspects of safety, pollution and environment. Most of them were not widely adopted and DNV's SEP Rules are maybe the only rules that are still mentioned to any great extent.

SEP is blend of ISO 9002 and IMO Resolution A.647(17), prepared by Class. The continued use of SEP is most common and widely used by Scandinavian shipowners and shipmanagers. But it is likely that its use will diminish as operators choose to confine themselves to a safety management system based on the ISM.

ISM Code

In each of the major contributory accidents mentioned in the previous section, the software received the major part of the criticism in the various report findings. The ship/shore management interface was identified as a serious weakness and, consequently, the focus of the operation requiring the most attention.

Chronologically the first major disaster in recent times influencing the development of systems designed to improve the management interface was the *Herald of Free Enterprise*. The Sheen Report highlighted major deficiencies in the overall management of the vessel as well as specific criticisms of particular practices affecting the safety of the operation.

The IMO responded to the safety management aspects of the inquiry by adopting a resolution (A741 (18)) to approve and recommend “IMO Guidelines for the Management of Safe Ship Operation and Pollution Prevention”. These guidelines have progressed from voluntary adoption to the International Safety Management Code, which became mandatory by the direct reference of SOLAS Chapter 9.

“The cornerstone of good safety management is commitment from the top”. In matters of safety and pollution prevention it is the commitment, competence and motivation of individuals at all levels that determines the results.

The code does not give any specific requirements about the structure of the SMS Manual, but expresses in broad terms which can be used as general principles and objectives so that it can have a widespread application and different levels of knowledge and awareness of the items outlined. The core of the Code is the Chapter 1.4 “Six functional requirements” (see Table 2)

FSA

The term FSA originated about seven year ago, when the Marine Safety Agency took forward one of the principal conclusions of Lord Carver’s report on safety aspects of ship design and technology. This was that a more scientific approach to ship safety should be adopted, based on the assessment and control of risks, together with a move towards performance rather than prescriptive standards where possible. As what Secretary General of IMO, Mr. William O’Neil said, “the main response to the Exxon Valdez tanker disaster was to make double hulls mandatory for all oil tankers, even though the accident was the result of a navigational error and double hulls would probably not have prevented the oil escaping in any case.”

Furthermore, since 60 percent of accidents are caused directly, and a further 30 percent indirectly, by human actions, decisions, errors and violations, the prescriptive approach has serious limitations as a safety assessment tool.

Table 2 **SIX FUNCTIONAL REQUIREMENTS OF ISM CODE**

| Basic Functional Requirements | Elaboration Chapters |
|---|-----------------------------|
| 1.4 Every Company should develop, implement and maintain a safety management system (SMS) which includes the following functional requirement: | Ch. 11 |
| .1 A safety and environment-protection policy; | Ch. 2/Ch.1.2 |
| .2 Instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flags state legislation; | Ch. 6.7, and 10 |
| .3 Defined levels of authority and lines of communication between, and amongst, shore and shipboard personnel; | Ch. 3 and 5 |
| .4 Procedures for reporting accidents and non-conformities with the provisions of this Code; | Ch. 9 |
| .5 Procedures to prepare for and respond to emergency situations; and | Ch. 8 |
| .6 Procedures for internal audits and management reviews. | Ch. 12 |

The motivation of the approach proposed by the UK in response to the Carver report was to “improve” the formulation of prescriptive rules and regulations, and it was formally presented to IMO in May 1993. This approach, which was termed “Formal Safety Assessment” (FSA), has been accepted and endorsed by IMO. Thus, FSA is a tool which is intended to be used for assessing and managing risks in a cost effective way, not for individual ships, but for ships in general as part of the rule making process. The individual steps involved in this approach will now be given using the exact wordings adopted in the submission.

Step 1: Identification of Hazards

In this step, the hazards associated with a given type of ship, e.g., a tanker, will be identified using various techniques such as HAZOP.

Step 2: Assessment of the Risks Associated with These Hazards

The risk levels of the hazards identified in Step 1 will now be assessed in order to establish which of them require attention.

Step 3: Ways of Managing the Identified Risks

It is unclear what is meant by the title of this step, because it was the “hazards” that were identified, see Step 1, while the “risk” (risk levels) were assessed, see Step 2. More recently, the wording has been altered to “ Suggest options for managing the identified risks”, but even this alteration does not clarify the usage of the terms “hazard” and “risk”. At the same time the proposers have no doubt in their minds that a number of methods should be used for dealing with the hazards identified and needing attention.

Step 4: Cost/Befit Assessment of Identified Options

It is implied in this step that a number of options will be produced as a result of Step 3, and these will be assessed using criteria associated with cost and benefit. The output will be a list of options and ratings.

Step 5: Final Selection of Option

This step will begin with a list of options and how they rate with respect to cost/benefit criteria. The prescribing authorities will then choose the option that best meets their requirements and use it to improve their relevant prescriptive rules and regulations.

The introduction of FSA into IMO shows its significance in terms of the formation of prescriptive safety rules and regulations of IMO that:

- The limitations of using prescriptive rules and regulations are highlighted;
- “Hazard Identification” and “Risk Assessment” were applied;
- The role of Human Factors in dealing with safety was addressed;
- Cost/Befit analysis as a basis for selecting a given option was used.

The aim of safety measures at sea should be to reduce risks. The matrix in figure 2 illustrates the risk level, which is the combination of the probability and the severity. Clearly, the top right hand part of the matrix, where the risk level is very high, is intolerable, which means catastrophes happening so often that they can not accepted.

Conversely, there is a region of negligible risk in the lower left part of the matrix: spending time and money trying to reduce risks which are already negligible is wasteful. In the middle is what is called the ALARP region, (see Figure 2) where efforts should be made to reduce the risks to **As Low As Reasonably Practical**, bearing in mind the costs and difficulties involved in doing so.

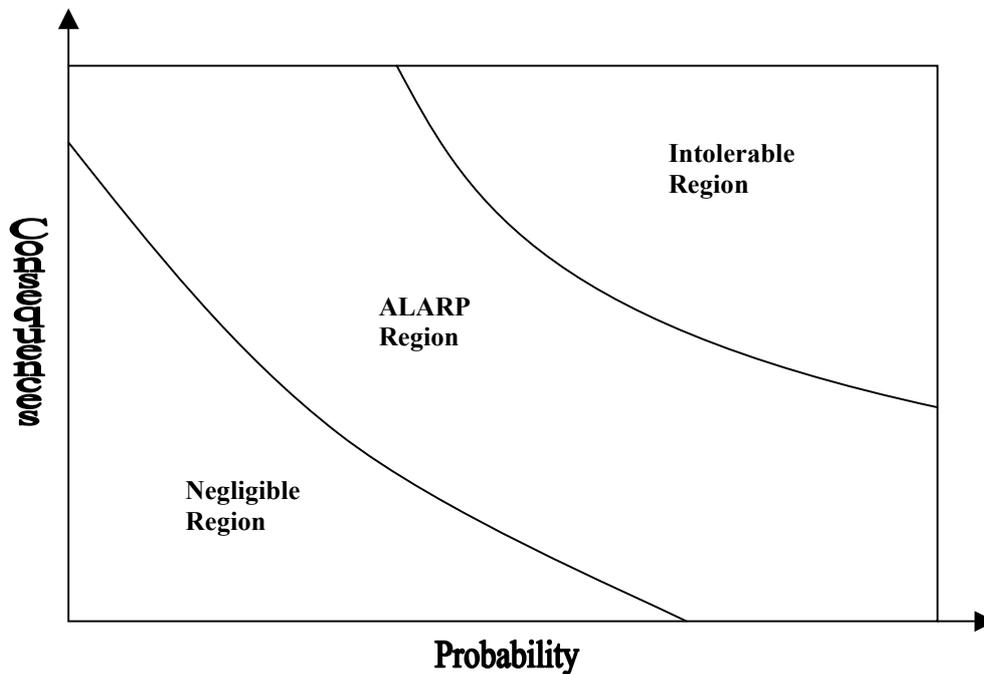


Figure 2 *Graphical presentation of risk regions*

ISMA Code

The ISMA Code is a detailed and comprehensive quality code written specifically for ship management (and, latterly, crew management) companies including safety and environmental protection requirements. The ISMA Code incorporates the basic principles of ISO 9002 and IMO Resolution A.741(18).

The ISMA produced a code in 1992 designed to cover all the major aspects of ship management that could reasonably be required in order that a company could call itself a shipmanager. It also established a minimum level of the service required.

The ISMA Code committee took as its starting point the ISO 9002 model for quality assurance and attempted to interpret the standard in a way that would be general for all ship managers, thus avoiding many of the traps found in the bare interpretation of ISO 9002. It also took into account other requirements such as the IMO guidelines, Resolution A741(18) that later became the ISM Code, the “oil major” requirements and the functions of insurance and accounting. In addition to the basic needs, the code also attempted to outline the minimum expectations that a client might have of a ship manager. These were outlined as the ethics expected of an ISMA member.

ISMA Code remains an excellent starting point for anybody contemplating quality assurance since it interprets the outline requirements of ISO 9002, ISM, oil company and charterers requirements in a consistent form so that achievement of the ISMA standards demonstrate quality to a known base line. The interpretation is in a language understood by the industry with respect to the level of quality expected.

The scope of the accreditation is defined in the code itself and does not require to be checked as for example the ISO 9002.

The body formed to carry out the accreditation consists of four major classification societies and ensures that audits are performed consistently and to a homogeneous standard. A comparison of the various safety and quality codes is shown in the Table- 3.

Table 3 *A comparison of the various safety and quality codes*

| Procedure | ISMA | ISM (IMO) | ISO 9002 |
|--|-------|--------------|-------------|
| Business ethics/policies | • | • | • |
| Organization | • | • | • |
| Personnel | • | • | • |
| Contingency planning | • | • | • |
| Operational Capability | • | • | • |
| Maintenance/Maintenance standard | • | • | • |
| Corrective action | • | • | • |
| Records | • | • | • |
| Document control | • | • | • |
| Internal quality audits | • | • | • |
| Safety | • | • | |
| Environmental protection | • | • | |
| Technical support | • | • | |
| Cert. And compliance rules/regs | • | • | |
| Cargo handling and cargo care | • | • | |
| Communication procedures | • | • | |
| Auditing body | • | • | |
| Cost efficiency/purchasing/contracting | • | | • |
| Contract review | • | | • |
| Management review | • | | • |
| Quality system | • | | • |
| Drug and alcohol policy | • | | |
| Insurance | • | | |
| Accounting | • | | |
| | 24/24 | 17/24 | 14/24 |

(Source: Ship Management, p 164)

QSCS

More than 100 governments have authorized classification societies, in view of their expertise and the world availability of a highly qualified surveying staff, to implement the statutory regulations of the conventions and related codes and resolutions, either wholly or in part, and to issue statutory certificates on their behalf. However, it is important to note that delegating administrations still retain their responsibilities and obligations under the conventions, that they have ratified.

Delegating Administrations must have some means of monitoring the organization, to which they have delegated, to ensure that the work is being adequately and satisfactorily performed. It therefore follows that each delegated organization should have a satisfactory quality system such that it may demonstrate, to all concerned, the quality of its services. In this respect, IACS has set up a QSCS implemented by the IACS Quality Secretary. The Quality Secretary is responsible to the IACS Council via the IACS Quality Committee. The quality system requirements of IACS have been based upon the applicable requirements of ISO 9001(1994) adopted and applied as stated in ISO 9004 and other applicable standards such as IMO Resolution A.739(18).

IACS' QSCS is an arrangement of organizational structure, responsibilities and procedures to verify and certify the conformity of a classification society's internal quality system to the requirements of IACS QSCS.

As implied by the definition, the main objectives of QSCS are to verify that

- A Society has developed its own internal quality system;
- The system of the Society is in conformity with the requirements laid down by IACS including the "Code of Ethics" and IACS procedural requirements;
- The system of the Society is in operation as described in relevant documents from that Society.

Within the QSCS the following functions (services) are performed:

- Review and evaluation of the system documentation,
- Audit of system implementation,
- Certification,
- Maintenance of certification by annual and renewal audits,
- Maintenance of documented evidence, and
- Consideration of appeals.

Additionally however, in order to conform with efficient application of a Quality System in practice, the IACS QSCS incorporates a requirement for vertical audit. This is carried out on a sample basis in various areas of work selected by the IACS Quality Secretary, and goes beyond the ISO requirements. Each member Society has been audited by an IACS audit team led by the Quality Secretary, on the basis of which the IACS Quality system Certificate of Conformity has been issued.

PTP

From its beginning, the U.S. Coast Guard and industry have worked closely together to ensure that both the government and industry needs are met. A PTP Quality Action Team (QAT) was chartered by the Coast Guard in 1994 to "develop a long-term strategy to rebalance the safety equation by refocusing prevention efforts on casualties caused by human error." The PTPQAT was composed of representatives from the Office of Marine Safety, Security, and Environmental Protection (currently G-M), in partnership with personnel from the Office of Navigation, Safety and Waterways Services (currently G-O) and they completed a comprehensive Prevention Through People Study. The QAT found that about 80% of all accidents have their root cause in the human element.

PTP is an approach to marine safety and environmental protection that systematically addresses the root cause of most accidents - the human element. It recognizes that the

major portion of these problems come from organizational errors and promotes a cultural change to develop a "do it right" mindset.

PTP was developed as a systematic risk based approach to safety management. This systematic approach looks at the entire picture, taking into account all information that is involved in the system. It ensures that all aspects of ship design, construction, management and operations are addressed, including the ship's operating environment.

The system components for PTP are: management, work environment, behavior of people and appropriate technology. These are all based on a solid foundation of rules, regulations and standards. This systematic approach requires a constant balance of the interaction among these four components. The foundation also includes non-governmental organizations, which play an important role in supporting the pillars. Examples include the direct contributions of class societies, standard bodies and port authorities, as well as indirect contributions from insurers. When those who make up the foundation act in concert, operators are provided with an even base upon which better operators can compete evenly. Marginal operators are forced either to improve or are driven out of business.

The organizational management pillar sets the stage for safe operations. It embodies the corporate culture that promotes safe and environmentally sound operations. A company's goals of no oil or chemical spills and injury-free operations, as well as its expectation of full compliance with all safety and environmental standards, demonstrate the corporate safety culture. Management's commitments to safety and ethics affect performance and influence the safety outcomes.

The Coast Guard has developed PTP partnerships with some organizations for the purpose of furthering development of PTP in the industry. These partnerships show how PTP can be applied successfully within the different segments of the marine

industry. Up to the end of 1998, they have signed partnership agreement with the following:

- American Waterways Operators (AWO), signed September 1995.
- Passenger Vessel Association (PVA), signed January 1996.
- American Petroleum Institute (API) & The Chamber of Shipping America, signed October 1996. (Chamber of Shipping America was formerly United States Chamber of Shipping.)
- International Council of Cruise Lines (ICCL), signed March 1997.
- International Association of Independent Tanker Owners (INTERTANKO), signed April 1998.
- Spill Control Association of America (SCAA) & Association of Petroleum Industry Cooperative Managers (APICOM), signed July 1998.
- Baltic International Maritime Council (BIMCO), signed September 1998.

(Source: <http://www.uscg.mil>)

SAFETY CASE

In other industries, the risk based approach is typically applied by means of a so-called “safety case”. The safety case is a document which establishes, for a particular installation, that operations are acceptably safe. It does this by means of an objective and quantified assessment of risk and consideration of risk management options.

The concept of the “safety case” has been derived from the application of the principles of systems engineering for dealing with the safety of systems or installations for which little or no previous operational experience exists. In such a situation it would be logical to seek answers systematically to a number of questions about the system or installation. The five relevant ones can be stated as follows:

Question 1: What aspects of this System can go wrong?

This is an obvious first question because no system can be designed, built or operated exactly as intended, but by identifying what might go wrong we shall be able to give attention to that aspect in good time.

Question 2: What are the chances and effects of them going wrong?

Once an aspect that could go wrong is identified, it is important to establish the chances of this actually happening and how serious it would be. Clearly, if the consequences are very serious but the chances of occurrence are extremely low, it is a matter of limited concern. Likewise, if the chances of occurrence are very high but the consequences are trivial, it is also a matter of limited concern. However, if the chances of occurrences are high and the consequences are very serious, then the matter calls for attention.

Question 3: How could these chances and effects be reduced?

Once the importance of failure of a particular aspect is determined, attention should be given to reducing its effects, or the chance of its occurrence, or both.

Question 4: What should be done if an accident does occur?

No matter how well a system is designed, constructed or operated, it is always possible for something to go wrong, because it would be impossible to eliminate or cater for all eventualities. It is therefore essential to be prepared and to have contingency plans.

Question 5: How can the system be managed to ensure Safety?

The answers obtained to the first four questions will provide a lot of information about the safety of the system, the aspects that can go wrong, and how serious it would be. This information is interesting in itself but is of no practical significance unless there is a method for managing and controlling the risk levels of specific hazards to stay under tolerable levels.

Table 4 summarizes the five questions and the tasks that need to be done in order to answer them, together with the relevant scientific terminology.

Table 4 Task and Scientific Terms of Typical Safety Case

| No. | Question | Task and Scientific Terms |
|-----|-----------------------------------|--|
| 1. | What aspects can go wrong? | Identify hazards systematically (Hazard Identification) |
| 2. | What are the chances and effects? | Assess the risk levels of the hazards (Risk Assessment) |
| 3. | How can they be reduced? | Reduce risk levels of selected hazards (Risk reduction) |
| 4. | What to do if an accident occurs? | Be prepared to respond to emergencies (Emergency Preparedness) |
| 5. | How can safety be managed? | Manage and control risk levels of hazards (safety Management System) |

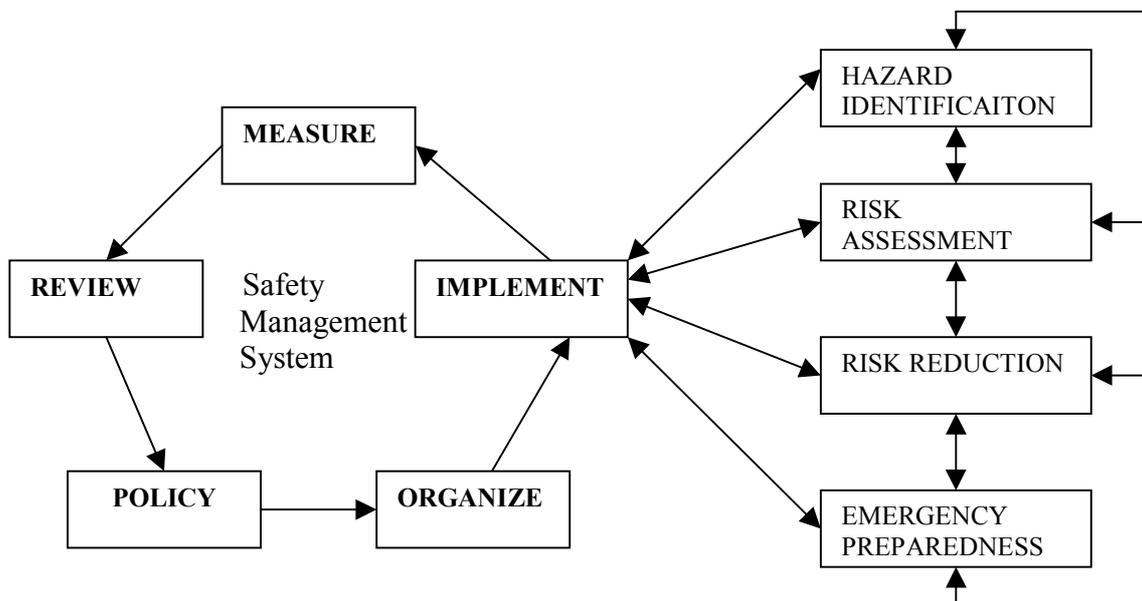


Figure 3 Key elements of the safety case
(source: *Managing Ship Safety*, p35)

Figure 3 illustrates pictorially the relationship of the different elements of the safety case concept expressed in the scientific terminology.

It can be seen from Figure 3 that the central element is the Safety Management System, which has five components, as follows:

- Policy formation.
- Organize resources and the communication of information.
- Implement the agreed policies and actions.
- Measure that the required standards are being met.
- Review performance and make relevant refinements.

The other four elements of the concept are:

- Hazard identification: Identify the likely hazards of the system. For a ship, typical examples would include collision and fire.
- Risk Assessment: Evaluate the risk level of each hazard in order to determine whether it is in the intolerable, tolerable or negligible region.
- Risk Reduction: Reduce the hazards with an intolerable risk level and, if it can be done cost-effectively, lower also the hazards with a tolerable risk level.
- Emergency Preparedness: Prepare for emergencies that could occur in the event of a potential hazard becoming a reality, even when all precautions against it have been taken. (Kuo, 1998)

STCW Convention

The STCW Convention, adopted by IMO in 1978, defines standards for training, certification and watchkeeping for seafarers.

This Convention, which was revised in 1995, reinforces the criteria for eligibility of seafarers, and requires proof of the effectiveness of measures introduced to satisfy the intentions of the Convention.

According to requirements of STCW95 Regulation I/8, each party should ensure that all training, assessment of competence, certification, endorsement and revalidation activities carried out by non-governmental agencies or entities under its authority are continuously monitored through a QSS to ensure achievement of defined objectives, including those concerning the qualifications and experience of instructors and assessors.

The criterion of the QSS further requires that:

- Within the QSS the education and training objectives and related standards of competence to be achieved are clearly defined and the levels of knowledge, understanding and skills appropriate to the examinations and assessments required under the Convention are identified.
- The field of application of the quality standards must cover the administration of the certification system, all training courses and programmes, examinations and assessments and the qualifications and experience required of instructors and assessors, having regard to the policies, systems, controls and internal quality assurance reviews established to ensure achievement of the defined objectives.
- An independent evaluation of the knowledge, understanding, skills and competence acquisition and assessment activities, and of the administration of the certification system, are conducted at intervals of not more than five years in order to verify that:

1. all internal management control and monitoring measures and follow-up actions comply with planned arrangements and documented procedures and are effective in ensuring achievement of the defined objectives;
2. the results of each independent evaluation are documented and brought to the attention of those responsible for the area evaluated; and
3. timely action is taken to correct deficiencies.

Apart from general provisions of QSS, the minimum compulsory standards for the qualification and certification of the skills of seafarers are covered, namely,

- Requirements for masters and seafarers
- Requirements for engine room crew
- Requirements for radio operators
- Specific requirements concerning certain types of ships
- Requirements concerning safety, emergencies, medical care and conditions of survival at sea
- Conditions for maintaining certification of seafarers during the transitional period provided for in the Convention
- Requirements to be respected for surveillance at sea in order to ensure the safety of those on board during a voyage.

Every company must be able to prove that the seafarers on board its ships possess the skills needed to perform the functions assigned to them. They also have to set up a training programme, to maintain and even develop such skills.

The regulatory nature of the STCW Convention means that there is no way the maritime transport companies can avoid it. All these provisions concern maritime administration, training bodies and companies.

Some safety reporting systems

1. ***The Human Factors Group Marine Safety Reporting System (MSRS)*** – The MSRS was developed for the maritime industry based upon the ASRS and was initiated in the fall of 1995. The data entry form is simple to complete. Although there are no statutory protections or incentives for reporting, over 300 reports have been received to date. Limited reporting of the results has been accomplished.
2. ***The Nautical Institute International Marine Accident Reporting Scheme (MARS)*** –This scheme is also an anonymous reporting system but collects reports of accidents (<http://www.nautinst.org/marineac.html>). The information on the accident and analyzed casual factors are carefully reported in highly readable accounts that are popular reading in journals and magazines.
3. ***Canadian Transportation Safety Board (SECURITAS)*** –The SECURITAS system is run by the National Transportation Safety Board of Canada. The system focuses on collection unsafe procedures and practices from each of the different modes of transportation. Information leading to identifying the reporter's identity is not released. Occurrence reports are developed and published based on the reported information and the use of other information to verify the incident/accident situation. Reports are made available on their Internet site(<http://bsttsb.gc.ca>).
4. ***The National/International Maritime Safety Incident Reporting System (NMSIRS)***
The system is currently in its formative stage and is being driven by an industry/labor-based working group under the society of Naval Architects and Marine Engineer's organization umbrella. This initiative is jointly facilitated by the U.S. Maritime Administration and US Coast Guard. (BIMCO Bulletin 1998 November)
5. ***Maine Accident Investigation Branch UK (MAIB) Confidential Hazardous Incident Reporting Programme (CHIRP)*** –This system is a relatively new development in collecting maritime incident data. It is currently at the same

initial stage as NMSIRS in its development process. The MAIB has expressed an interest in coordinating efforts to develop a common maritime safety incident reporting system. MAIB currently produces a periodic “ Safety Digest” that covers lessons learned from marine accident reports.

Chapter Six

Analysis of the current situation of CMSA

Chinese characteristics

As mentioned in Chapter 2, shipping is an industry of international nature. The functions and structure of maritime administrations in various countries do have something in common. They are following similar rules, therefore they can share some experiences gained in this field with each other, whether in a developed or a developing country. On the other hand, it should be born in mind that each Maritime Administration is situated in a specific country, i.e. while China is applying the experience of other maritime countries, her own history, customs and geographical features have to be taken into consideration.

– China is a developing country with a very big population

Recently, the population in China has reached 1.3 billion. About half of the Chinese mainland population live within the coastal area and they generate 53% of the gross national output, in so far as agriculture and industry are concerned.

– China has a vast area of land and sea area and superior natural condition for developing water transport

China's mainland coastline extends to 18,000 km. It has a sea area of 3.38 mn km² and covers 10 provinces, autonomous regions and municipalities. There are also some 6,500 islands with an additional coastline of 14,000 km. The majority of China's coastline is ice free throughout most of the year.

There are more than 1,500 rivers with valleys greater than 1,000 km and more than 900 lakes with valleys of varying size. All of them make an excellent medium for water- borne transportation. Among the rivers there are for example Changjing, Zhujiang and Heilongjiang . In combination with the Beijing- Hangzhou Grand

Canal and other small rivers, there is a good inland waterway network. (SHEN, 1999).

Since 90 percents of import and export cargoes in China are carried by sea, the importance of optimizing shipping has been confirmed.

– **China is a socialist country**

After the founding of the new China, the government carried out a policy of centralization. Since 1979 a new general policy has been adopted; this is a policy of reform, open-door and invigorating the economy. Now, the structure of the government in China is still carrying out the process of reform in order to be in line with the general policy.

Transport and national economy

Experience shows that transport development is essential and instrumental to economic and social growth, especially in a developing country like China. Transport facilities form an integral part of a nation's infrastructure and are basically indispensable and service-oriented. A sophisticated transportation system must push forward social and economic growth, otherwise it will only impede it, resulting in a waste of resources and a downgrading of economic benefits. With a comprehensive and well-developed transportation network, the country can accelerate the exchange of commodities, become port-oriented, be a part of the world economy and have ability to attain a stable economic growth for the nation.

In 1999, Chinese water transport volume was close to 1.2 billion tons; the rotation volume of goods reached 2126.3 billion ton/km, with the respective increases of 165 percent and 465 percent since 1978. The proportion of water transportation to China's total transportation services increased by 144.4 percent, constituting 52.8 percent means of the whole transportation. The freight volume of foreign trade accounted for 84 percent of the increase.

Authoritative sources say that China's water transportation used to be regarded as a bottleneck hindering the development of the national economy. Now the water transport market has gained rapid developments thanks to the effort in breaking down the barriers between trades , between departments or regions, and to encourage diversified economic sectors to jointly develop water transport services.

For these reasons, the Chinese State Council gives priority to state economic planning in such a way that transport must go ahead of the other industries and it can assume its responsibility of expediting, national economic development.

It is the MOC which is viewed as the Maritime Administration in China. and, its major functions and responsibilities include the following:

- To formulate development strategies, principles, policies and regulations of the country's waterway transportation according to the demands of national economic and social developments and to supervise the enforcement thereof;
- To organize the drawing up of development planning for the national waterway transport and make the long- and medium-term and annual plans;
- To be responsible for the administration of the waterway transport industry and transport organizations;
- To regulate and control the transport of goods and materials which are important to the national economy and people's livelihood or emergency use;
- With joint efforts of other departments concerned, to foster and regulate national transportation market and transport infrastructure construction market; to set up and gradually improve the information and service system; to guide the transport industry to develop in a coordinated way with rational structure.

As a subdivision of the Maritime Administration, the policy of MSA will no doubt be in line with the above, whereby the developmental / promotional functions of MSA

are indicated. In another words, one part of MSA's functions should be to guide the maritime industry to develop in a coordinated way with rational structure, to foster national maritime market and to promote the national economic and social development.

The safety production policy

The Central Committee of the Communist Party of China and the State Council have always attached great importance to safety in the production. The Chinese President, Jinag Zemin emphasized the importance of understanding the relations between the safety and production, safety and efficiency, and safety and development. The vice-premier of the Chinese State Council, Wu Bangguo, stressed that safety needs to be integrated with production and efficiency. It is of vital importance to balance safety with production, economic growth and people's livelihood. It is also linked to the country's reform, development and stability and has a significant bearing on the sound performance of the national economy.

The safety policy made by the State Council includes, inter alia,

- Production safety should become top priority. The "safety first" principle should be underscored, while preventive measures should be enhanced, especially in enterprises which are undergoing organizational reform and restructuring;
- Leading officials at all levels should respect safety in production;
- A safety education in production should be launched in all departments and areas.
- A responsible system must be instituted in all production units and further implemented.
- Work safety weak points should be supervised and improved;
- The causes of accidents should be found and lessons drawn. Measures shall be taken to prevent possible hidden dangers causes of major accidents;

The development of the transport industry has always been guided by the principles of "Safety First and Prevention Essential". The Ministry has paid great importance to

safety in transportation, especially in the maritime sector. “With around 260, 000 ships in China, forming a huge transportation system, each department must view safety as the most important thing” Minister of the MOC, Huang Zhendong, stressed.

Apart from setting up rules and regulations like the” Maritime Traffic Safety Law”, establishing appropriate departments, such as “ Harbor Superintendency Administration” and allocating high level professional personal for safety supervision, there are regular meetings in the Ministry and its subordinate departments.

Furthermore, following the requirement of the Ministry, each shipping company in China has a specified department looking after the safety of operation in their respective company and keeping close contacts with the regional Harbor Superintendency Administration.

CMSA

As a result of reorganization of the Ministry in 1998, the CMSA became a relatively independent governmental body, although it is still under the leadership of the Ministry. It remains as a non-profit making organization, but has its own budget and income. It has a united supervising system from the center government to local with united policy and regulations, united development plans and united supervision administration. The new Administration maintains all functions of policy-making and setting up the rules and regulations of general nature. To enhance the position of the new Administration, one of the deputy minister is appointed to be the director of this Administration concurrently. (The structure diagram of CMSA can be found in Figure 4)

Main functions:

- Developing the draft laws and regulations for water-borne traffic safety and preventing marine pollution in accordance with the national needs and the international conventions, of which China is a contracting party;

The organization structure of CMSA (headquarter)

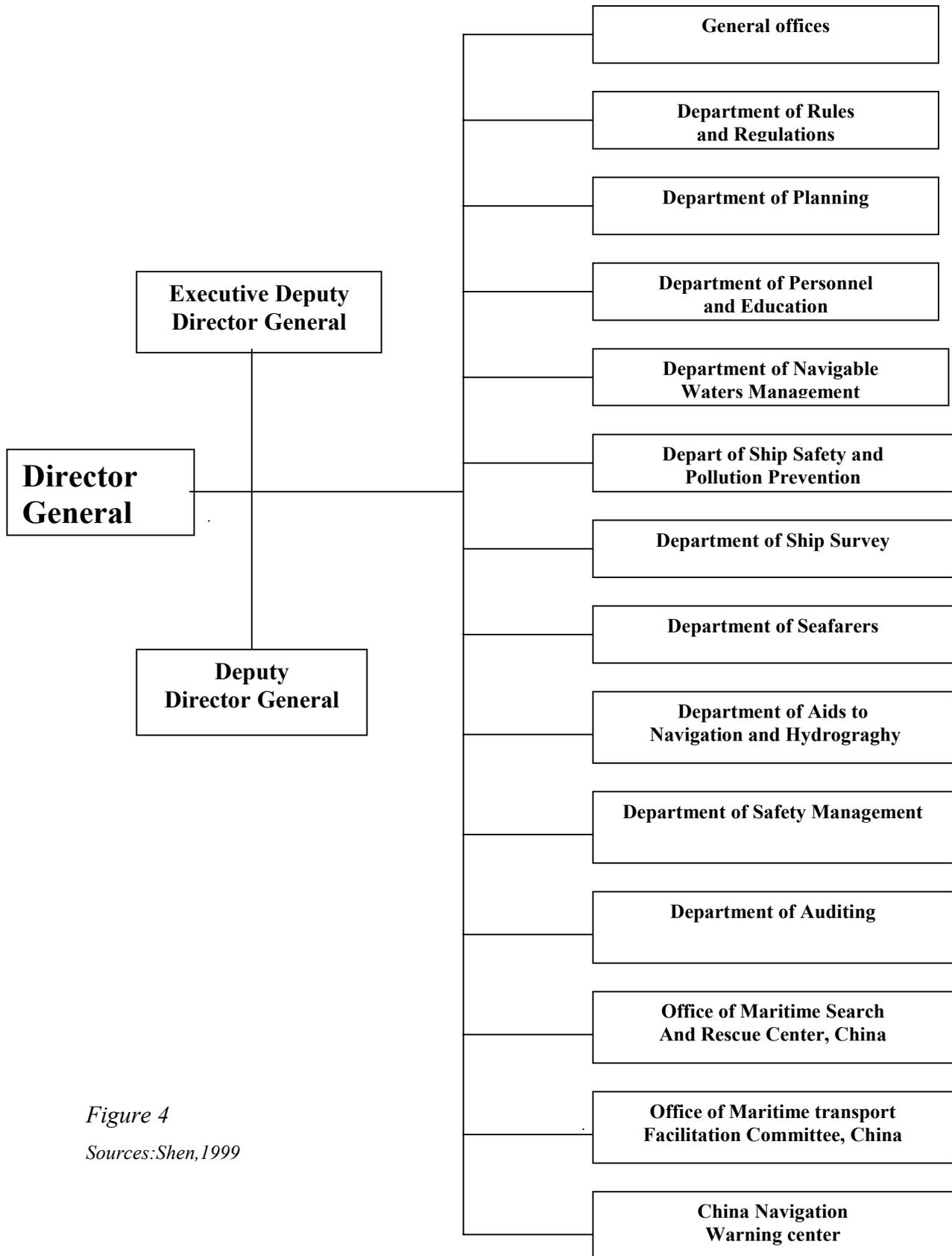


Figure 4

Sources: Shen, 1999

- Supervising the implementation of the said international conventions, national laws and regulations;
- Registering vessels and approving the ownership and rights of vessels flying the flag of the People's Republic of China;
- Auditing and supervising the qualification of ship survey agencies, pilotage agencies, seafarer manning companies and the qualification and quality systems of training institutes of seafarers and pilots;
- Guiding and controlling the ship owners and operators in implementing the relevant laws, regulations and international conventions;
- Supervising the manning of the vessel in accordance with the safety standards, examining marine officers, pilots, crew members and issuing appropriate certificates;
- Approving the application of foreign vessels entering the ports and carrying out foreign vessels entry and departure documentation inspection;
- Supervising the compulsory piloting of foreign vessels;
- Supervising, inspecting and checking the technical, navigational and loading conditions of vessels;
- Maintaining water-borne traffic order, carrying out traffic control in important waters, administrating the salvage of shipwrecks and sunken objects, ordering the mandatory removal of shipwrecks or object obstructing the navigation;
- Approving the construction of surface and underwater projects and the towage of large units;
- Organizing search and rescue at sea;
- Approving and eliminating the areas closed for navigation, promulgating navigation warnings;
- Controlling the use of the shorelines of harbors, supervising the maintenance of the water depths of navigational channels and aids for navigation;

- Conducting investigations and treating the traffic and pollution accidents caused by ships and offshore installations and taking disciplinary actions against ships, offshore installations or persons concerned.
- Setting up general rules and regulations for ship survey.

Current maritime safety and environmental protection situation in China

According to the figure from Chinese water transportation management seminar held in Guangzhou in Mar 16-18, 2000, China had more than 260,000 commercial ships at the end of 1999. The infrastructures of Inland River transportation have been notably improved. The number of ports is 1200, among which 130 of them are open to the foreign ships, and the number of the berths is 330,000. The berths of coastal ports has been increased by 12 times since 1987, among which 734 are 10,000-ton (deadweight)-class deep-water berth.

China currently has 1299 coastal shipping companies and 4467 inland companies. There are more than 300 ocean-going shipping companies, 1,900 vessels totally, and the overall transportation capacity is 3,600 deadweight tonnage (Among them, 2015 tonnage are under the flag of open registry). There are 200 passenger shipping companies.

In 1999, the cargo throughput of the major coastal and inland ports are 1.45 billion tons, among which 0.426 billion tons are from foreign trade. The passenger throughput of the major coastal and inland ports is 98.29 million. The international container throughput of China is 17.33 million TEU, also increasing with an annual growing rate of 30%.

On the other hand, according to MOC, among the 260,000 ships, 79% of the bulk carriers and 83% of the oil tankers are more than 20 years olds. The irrational

proportions are causing serious unfair competition among the shipping companies, which lead to restrictions in the healthy development of the market of the industry.

In 1999, 769 passengers died in ship or boat accidents -- a 26.9 per cent increase since 1998. Two hundred forty-nine boats sank, causing direct losses of 251 million yuan (US\$30 million). These losses are 13.5 per cent higher than those recorded in 1998.

A total of 29,000 tons of oil leaked out in 53 serious accidents from 1973 to 1999. Statistics show that during 1965 to 1997, a total of 4.14 million tons of oil leaked out around the world. Between 1976 and 1996, there were 2,242 ship oil spill accidents in China's coastal areas, and since 1994 serious oil spills have increased by five to seven cases annually, the Ministry of Communications statistics indicate. In 1983, "Oriental Embassy", 1990 "Maya 8" and 1999 "Min Ran Gong 2" oil pollution accidents all caused several millions of US dollars in direct economic losses.

Weaknesses of CMSA

In addition to the serious safety and environment situation, CMSA itself still has many distinguished weaknesses, which are worthy of being highlighted.

- Lack of the strategic research in CMSA.

The shipping industry is undergoing changes in terms of new technology, safety culture and economy globalization. CMSA will no doubt be affected even though it used to be more domestic. The government reformation has provided the best base and the chance of a long-term development; however, it is still a great challenge to the whole CMSA. To be capable of meeting the changes, the long term developing strategic research is far less than enough.

- The maritime safety legislation is processed more slowly than the need for current development.

Many importation national laws, e.g. “Merchant Ship Law”, has been prepared for many years, but have still not come into being. Much work remains to be done for the revision and modification of the current law.

- Inability to carrying out sufficient and efficient Search and Rescue.

The “11.24 Sea Disaster” of Da Shun has shown that there are many things to be improved in the national SAR system.

- The risk control techniques need to be improved

Accidents are happening again and again although many safety countermeasures have been introduced. The full range of the root causes were not full analyzed. Some potential threats and contributing factors were not taken into consideration.

- Information Technology is not full utilized

Most of the regional administrations can not access the Internet, and some on the spot stations have no computers.

- The qualification of the staff is still in poor condition

According to the statistic of 1999, in the whole CMSA system, 46% of the staff are workers. The proportion of the staff, who are equivalent or under High School education is 54%. Further 44% of the whole CMSA staff are working with internal service.

Chapter Seven

The reasons for improvement

What exists today is a maze of disconnected regulatory regimes built up over the past 40-50 years, all developed on the premises that it is possible to regulated every aspect of safety in the industry. The burden on shipowners has at times been overwhelming.

It may be surprising to hear that for the most part, this approach has been successful. There has been a steady long-term improvement in safety in the Chinese industry. No matter what perspective is considered, there is a sustained reduction in marine losses especially over the past 15 years.

As the pressure is imposed by the development of global economy and technology, the maritime industry has been one of the most affected industries, suffering from the environmental changes. The new technology applied in shipping is causing more kinds of potential risks either to human lives, properties or to the environment; more risks are causing more international and national regulations; more regulations, which are raising the safety standards, and therefore are leading to more sub-standard ships. As a result more and more PSC memorandums were set up for the reason that some flag States repeatedly failed to carry out their responsibilities. All these changes should be taken into consideration by CMSA if it is going to adapt to the changing environment and be qualified.

State's responsibility

Casualties to ships on the sea involving loss of life or environmental pollution, attract great publicity, particularly in the flag State and IMO. One of IMO's targets is to ensure the consistent and effective implementation of IMO instruments globally and in compliance with the requirements.

International conventions have been developed which clearly define the responsibility of flag State. The flag States have the primary responsibility to have an adequate and effective system to exercise control over ships entitled to fly their flag, and to ensure that the ships comply with relevant international rules and regulations.

On the other hand, when a foreign flag ship enters the territorial waters of China, as a Port State, China has the duty to protect lives, property of the citizens and the environment.

In relation to the chain of responsibility, it was agreed that the primary responsibility for quality shipping lays with the owner or operator of the ship. The first line of defense rests with the flag State, with a goal defined in the FSI sub-committee as “to have a fleet with a good safety record and which causes minimal damage to the marine environment”. The second line of defense rests with the Port State, the 'quality (external) auditor'.

The Quality Shipping Seminar held in Singapore on 24-25 March 2000 suggested that there was a need for a new international instrument that would lay down the minimum requirements and obligations of a flag State. Those who did not fulfill these minimum requirements could be black listed by others in the industry such as the class societies. Port States could also consider more inspections or even ban ships under blacklisted flag States from their ports and consider fewer inspections for quality ships.

In shipping companies, safety concern has to be affected by commercial interests, so it is not always the case that a shipping company can put one hundred percents of its efforts on the safety issues. Sometimes, to reach the so-called “zero risks” within a single company is unaffordable or wasteful.

There is no doubt that although most of the Chinese shipping companies under the phrase I of the ISM Code have got their DOCs and SMCs in time, their understanding of the real meaning of the ISM Code is far from perfect for the constraints of time and the dramatic culture change. It can be imagined that there are some poorly managed companies that were forced to gear with an inefficient SMS for survival. The big additional cost without so much eminent output in the first several years could become suicidal. As mentioned before, maritime transport is a peculiarly error-inducing system, and many of the root causes are beyond the control of individual organizations. Therefore, to achieve safety culture needs the efforts of the whole Chinese maritime industry, and CMSA should of course take the leading position to do so. However, all in all self-knowledge of CMSA is the first step.

Flag State Self-Assessment Form of IMO

IMO 21st session recently adopted a Resolution A.881 (21) Self-assessment of flag State performance. The form is intended to establish a uniform set of internal and external criteria which can be used by flag States on a voluntary basis to obtain a clear picture of how well their maritime administrations are functioning and to make their own assessment of their performance as flag States.

The form covers issues such as asking whether the administration has the necessary laws, infrastructure and human resources in place to implement and enforce international maritime safety and pollution prevention instruments.

The development, acceptance and adoption of such internal and external criteria listed in the self-assessment form is used for the self-assessment of the ability, capacity and performance of flag States, furthermore to

- ensure that flag States comply with relevant international rules and regulations.
- reaffirm that flag States have the primary responsibility to have in place an adequate and effective system to exercise control over ships entitled to fly their flag and

- ensure the consistent and effective implementation of IMO instruments for global compliance with the requirements.

The form includes:

- *General obligations of flag States,*
- *Internal criteria for assessment of flag State performance (legal framework and enforcement),*
- *Responsibility of recognized organizations acting on behalf of the Administration,*
- *Casualty and incident investigation, and*
- *External criteria for the assessment of flag State Performance*

It is supposed to urge member governments, in their efforts to improve safety of life at sea and to protect the marine environment, to carry out, at regular intervals at their discretion, a self-assessment of their capabilities and performance in giving full and complete effect to the various instruments to which they are Party.

PSC

– Statistics of Port State Control Detention (see Table 5)

Table 5 The statistics of 1996 – 1998 Chinese flag vessel detention

| Region | 1998 Chinese Flag vessel Detention Ratio (%) | 1996-1998 Chinese Flag vessel Detention Ratio (%) | 1998 Detention Ratio (%) | 1996-1998 Detention Ratio (%) |
|-----------|--|---|--------------------------|-------------------------------|
| Paris-MOU | 9.73 | 11.8 | 14.31 | 15.27 |
| Tokyo-MOU | 6.83 | 9.94 | 7.29 | 6.49 |
| USCG | 2.63 | 6.15 | 4.73 | 6.00 |

(Source: website of each)

Despite its imperfection and various criticisms of the PSC inspection and the subsequent port State intervention, the PSC system has been applied universally and more or less uniformly within various PSC regions without regard to the flag ship is

flying. The statistics on flag State detention as a percentage of ship inspections published annually by the various PSC Secretariats are an objective and fairly accurate indication on the performance of a flag State and the quality of its fleet of ships in general.

– Enhanced international co-operation in PSC

Effective regional agreements, common criteria for inspections; harmonized inspection and detention procedures; internationally approved qualification of PSCO; internationally agreed code of conduct; transparency by increased information within regions and inter-regionally, all of these pose real challenges, however, it gives a good opportunity for all the States concerned in improving the quality of PSC and the conduct of the PSCO.

Learn lessons from disasters

Is it possible for the industry to learn lessons and get benefits from an accident, even though the ship was lost? Answers: yes, whenever an accident occurs, there are lessons which can be learned.

The existing maritime safety regime is comprehensive in which recordkeeping and documentation play key roles. There is actually a lot of information in circulation but shipping is a conservative industry and, traditionally, there has been a tendency for organizations to restrict the availability of information they hold to outside parties. Greater transparency of relevant ship information will put all the parties bearing a responsibility for safe shipping under equal threat of exposure for sub-standard practices, thus reinforcing the need to make a commitment to quality. Too often in the past, ship casualties have not been subject to proper investigations and opportunities to learn valuable lessons and to disseminate this information widely to the benefit of the entire industry have been lost.

However, even nowadays in the discussions over the Erika accident, there is still a tendency in some countries to pin the fault automatically on the seafarers before acknowledging the full range of causes by thorough investigation.

The value of effective, efficient accident and incident investigation is growing daily in the maritime industry. In the author's personal view a need to gain knowledge for the purpose of prevention has not been properly recognized in the Chinese maritime industry. For too long the performance of investigation has been *ad hoc* with insufficient planning and preparation. Consequently, the results achieved have been less than desired. There is a need for professionally trained investigators and planned management of the entire investigation process.

Investigation is a critical element of safety and risk control. Without complete reporting of accident losses and comprehensive investigation of these losses, the administrator has no knowledge of the extent and the nature of conditions, which downgrade the efficiency of shipping companies' business and threaten the human life and environment.

As Raymond Kuhlman (1977) said,

Lacking such knowledge, the situation can be likened to the proverbial house built upon the sand. The daily winds and rains of the business climate erode the foundation of the house of business grain by grain. The effect is rarely noticed and the magnitude of the potential impact not perceived until the loss of one final small grain results in the fatal collapse of the house of business.

Disaster after disaster has revealed the same pattern of incompetence, lack of foresight and irresponsibility. Safety systems and procedures have not been updated to cover changes in technology and operating conditions. The employees, who implement them, have not been adequately trained. Communications between top management and front-line employees have been poor. Directors find they can defend themselves against legal action by claiming that this or that was 'not my job'

– even when they had clearly failed in their responsibility to make it someone's job – or that no one had told them what was going on.

The underlying theme is that the most important lesson to be learnt from the disasters is that many organizations lack the leadership, structure and environment that encourage people to learn from mistakes.

Risk has become an important part of other high impact industries. Beginning some 25 years ago with the nuclear industry, the systematic assessment of risk and risk reduction measures have since become a common technique to reduce incidents and losses within the oil and chemical industries. And it is gaining acceptance as a part of the safety culture in other industries as well. Within the marine industry, in the author's point of view risk analysis techniques, similar to the formal safety case approach, should become a part of the new Safety Culture in China.

International trends of safety management

Management practices for the 21st century have to be based on supernational regulations and agreed objectives. The obligations of protecting the environment of the oceans are shared by all countries on the same basis.

The environment acknowledges no frontiers and for many environment pollutants, the protection must be tackled on a global basis if the improvements necessary for sustainable development are to be attained. The urgent need to safeguard the environment for future generations emphasizes the need not only to discuss the problems, but also to find strategies and actions to solve them so effective measures must be taken.

Implementing the ISM Code is far more than shifting the responsibility of inspection from the Administration to the shipping companies themselves. Improvement of the

quality of the safety administration in CMSA requires a comprehensive approach, which must first be recognized and then implemented.

From CMSA's viewpoint, a world trend for maritime industries in achieving proactive ways to deal with safety management. It is not only limited to the shipping companies, but also spread to IMO, Classification Societies, training institutes and some MSA of leading maritime countries.

Looking around the world, the questions to ask is, “ If a shipowner has made a commitment to safety quality assurance, what justification could we have if we were not performing on a level that were internationally recognized as being at least similar to the personnel in shipping companies?”

This tendency towards change and development can –in a theoretical, yet practically relevant way – be understood with the help of a recent form of systems theory (Luhmann 1985, 1988). This theory allows changes to be analyzed in a theoretical framework. This form of consideration can also be applied to administrations, provided they are regarded as a system theory or part of a system. The system – oriented perspective also makes it possible to address the issue from extremely varied initial conditions –e.g. the relevant specific features in varied countries. A significant advantage of the newer systems theory is the fact that it starts out from contingent structures. Thus, it is possible to take specific conditions and aspects into account.

Safety culture

Through the years, safety regulations have essentially concentrated on improving the vessel in the mistaken belief that a better ship would be harder for humans to lead into misfortune. The fact is no matter what is done to the ship, the human element in the safety equation will win. Any new approach to marine safety must tackle the

challenge of improving the human performance on vessels. There are many conventional facets to these problems such as recruiting, training, qualification, and retention. But there are also many less understood human factors such as motivation, boredom, fatigue, present moment thinking, and ergonomics.

The new approach to safety, in order to qualify as a ‘Safety Culture’, must be a part of all thoughts and actions. It must become an inherent part of everyday operations. It must become one of the guiding principles of how we conduct everyday work. To get to that point will take considerable time and consistent effort. Creating a plan, turning it into a new regulation and declaring an implementation date will not be enough.

Safety activities at all levels are essential, not only to fulfil legal obligations, for consultation, but also to achieve effective risk control. In a safety culture regime, successful shipping companies are not satisfied with mere legal compliance so they actively encourage and support safety representatives in their roles.

Those Chinese shipping companies, which under the phase I of the ISM Code got their DOCs in time, as what the author understands, just represented the first step in the “Long March of Safety Culture”. Some of the following attitudes, which still existed in some Chinese shipping companies, did hinder the further improvement of safety culture in China:

- Some managers honestly did not think they had a safety management problem, they had no definitive measures of safety management, and that gave them a false sense of security.
- Some managers faced so many problems that they did not have time for another one. They did not see safety management relating at all to their other worries.
- It never occurred to some managers that safety management could be used as a strategy for improvement.

- Some honestly thought they had solved their problems because they had assigned responsibility to the safety department.

The ISM Code's Preamble states that “ the cornerstone of good management is commitment from the top. In matters of safety and pollution prevention it is the commitment, competence and motivation of all individuals at all levels that determines the result”.

The IMO Resolution A.788 (19) «*Guidelines on Implementation of the ISM Code by Administration*» emphasizes that the ISM Code should support and encourage the development of a *Safety Culture* in ship operations, putting further emphasis on human properties as *commitment, values and beliefs*.

The Administrations' introduction of a safety culture in ship operations, is voicing that the required standard for safety can not be obtained simply by the “ compliance culture”, which in fact has dominated most countries' regime so far.

In IMO Resolution A. 900(21) “Objective of the organization in the 2000s”, the Assembly decided to direct the Committees, under the co-ordination of the Council, *among others*:

- 1) *To take measures to implement the proactive policy agreed in the 1990s more actively than in the past;*
- 2) *To focus their attention on:*
 - *Shifting emphasis onto people;*
 - *Ensure the effective uniform implementation of existing IMO standards and regulations relating to maritime safety and environmental protection;*
 - *Developing a safety culture and environmental conscience in all activities undertaken by the Organization.*

As the competent authority, which is responsible for the safety matters in the shipping industry, CMSA should no doubt set up its own safety culture within the Administration at first and before encouraging the shipping companies to do the same, whereby the safety output can be exposed to the whole shipping industry.

IMO Resolution A .788 states that: “Administrations are recommended to limit the development of criteria in the form of prescriptive management systems solutions”. An interpretation of the further wordings is that it is only the “company itself” that should develop “the solutions which best suit that particular company, that particular operation or that specific ship”. Furthermore, according to Chapter 2.1.4, “Administrations are recommended to ensure that these assessments are based on determining the effectiveness of the SMS in meeting specified objectives, rather than conformity with detailed requirements.”

As the changes from inspection regime to safety culture, the function in focus of CMSA should shift from an administrative regulatory function to a developmental/promotional function to some extent.

The benefits of implementing a safety and quality system in CMSA

Managing safety is a complicated task. The quality of managing safety can only be achieved within a system. Successful developing and implementing an appropriate safety and quality system in CMSA should finally expect to experience a reduction in accidents, which may cause harm to people, damage to the environment, property/cargo or the ship.

By implementing the system in CMSA, present policies and procedures will be refined and added to improve and streamline the process and become of more value. Management and employees will become more comfortable in the application of systems that have proved to be of value. Confidence will be gained and experience will be put to good use. As better training procedures and good working environment

start to produce more motivated, knowledgeable and safer conscious employees in CMSA, the enthusiasm and experience gained will be passed onto juniors.

Experience from within the shipping industry has shown that the shipping companies in China may further benefit in terms of:

- An improvement in *Safety Consciousness and Safety Management Skills* of personnel,
- The establishment of a *Safety Culture* that encourages continuous improvement in safety and environmental protection,
- *Greater confidence* for their services,
- Improvement of the *Administration Morale*,
- a **reduction in accident frequency and/or severity** with a concomitant reduction in financial penalties or losses for national fleets, and
- more effective *allocation of resources* for the provision of training and equipment

There is also evidence to suggest that, over a period of time, commercial benefits of her national fleets may also generate from the general benefits, including:

- *Costs savings* as a result of improved efficiency
(Minimization of disruptions to the operation of vessels)
- *Favorable insurance premiums* relative to the market
- The *reduction of exposure to claims* in the event of a major disaster

The advantage of setting improvement as a goal

The major advantage of improvement as a goal is that it forces the management to an understanding of CMSA's real work and its current level of performance. It also requires the Administration to understand the capacity of its systems. Goals cannot be set in a vacuum and must be derived from such a meaningful understanding of the Administration's work.

A focus on improvement allows for small progress in the process; Employees achieve the goals that they can “see” that management rewards, small improvements or a simple reversal in negative trends.

Finally, the emphasis on improvement can help prevent declining performance, which often occurs when the Administration focuses on a big “victory” and neglects its “base” supporting that type of win. It is the power to push the Administration towards excellence.

Sharing information within the community

There is lack of sharing of relevant casualty information, reliability information, and available information. The shipping industry has historically been very poor in this important function. The aircraft industry was forced by its regulators to share casualty information, perhaps for obvious reasons. However, on the basis of that they also share reliability and availability information, which has provided huge benefits to the safety of aircrafts. How many shipowners have suffered, for example, premature failure of a medium speed gearbox or turbocharger without knowing of the same problems encountered by others?

To provide early and detailed information about casualties, which have resulted in losses or constructive total losses, have also raised a need for information to be available and to be shared. In the Airline Industry this is known as ‘near misses’. More detailed and earlier information would make this analysis easier and more meaningful.

The view was shared by INTERCARGO, the bulk carrier owners’ association, which urged the shipping industry to share information gained from accident investigations. Its latest casualty report shows 19 ships lost, 87 seafarers lost their lives on bulk carriers during 1998. More than half of the ships were 25 years or older; only one was under 20. A quarter of the accidents may be related to structural failure; the vast

majority of accidents leading to loss are to problems common to all types of ships. The figure for 1990-1998 was 731 lives and 131 ships lost.

Canadian investigators were talking metal samples from the bulker Alcor, which ran aground and cracked into two in the St Lawrence River. They say the circumstances of the accident are “disturbingly similar” to those of the Flare which broke in two parts and sank in 1998.

When looking for causes, therefore, it would be useful to study not just the total loss figures but also other serious casualties, which did not lead to a vessel’s loss. INTERCARGO wants the findings of others, such as flag states and owners in this area to be generally available. “ In such cases lessons would be easier to learn than from the reaming of vessel lying on the ocean floor.” (*“Call to share information on accidents” in “THE SEA” Issue 143*)

Recently, five main comprehensive subsidiary companies of China COSCO Corporation were reconstructed into four specialized companies, which deal with container ships, bulk carriers, general cargo ships and tankers respectively. On the one hand, COSCO was going to reduce the internal competition within the Corporation and increase its economic scale. On the other hand, they understood that even within different safety systems of the same Corporation, they still found that there were many obstacles in collecting the safety lessons and spreading them to the different companies effectively and efficiently.

If this is the case in such big a shipping company, it is obvious what the situations look like in the smaller shipping companies. Even if they have a sophisticated documented SMS, how can they get the expertise to do risk research and accumulate the amount of practical safety experience on their own within short period? Not surprisingly, some small shipping companies (particularly the single ship company), after running the SMS for one or two years, very rarely had hazard records and their

accident report records were empty. In the author's personal understanding, by no means are they all free of any potential risks. The reason might be that there are so many either public or private safety-related institutes and agencies functioning as the safety information systems set up in the leading maritime countries, as mentioned in chapter four. What they have been doing is to collect safety input either on the national basis or on the international basis, to process it by their dedicated expertise groups and to distribute their safety output to all their members or clients.

In this regard for the time being at least, as China does not have so many of these kinds of private organizations and it is not easy to approach latter because of the constraints of language, communication or economic conditions.

How can the Chinese shipping industry at large be persuaded to begin sharing information and reap the same important benefits already enjoyed by other industries?

In the author's point of view, it should be CMSA's responsibility to take measures to convince the Chinese shipowners and shipowners' associations that a significant benefit from the sharing of information will far outweigh their cost to participate.

Based on the above understandings, the author further explains the last function mentioned in Chapter 2 (Developmental / promotional function) as follows:

CMSA should be committed to provide the best services for shipping industries to achieve safety in a more effective, efficient and economical way with their possible resources available, and also to “sharpen their competitive edges” against the fast changing world maritime industry. It is the most suitable part of the roles for Maritime Safety Administration which justifies the proud name of “Public Servant”.

Chapter Eight

Suggestions for improvement (I)

- Develop a supportive atmosphere for safety culture

The culture of an organization can be thought of as a shared set of informal beliefs and values that make up the ground rules for what is expected from employees and what employees can expect from an organization.

The influence of an organization's culture covers all aspects of work activities, affecting individual and group behavior, job design and the planning and execution of the work.

CMSA is expected to provide professional responsible, efficient and productive value-added services which meet or exceed the clients' expectation and facilitate an evolution towards excellence.

Understanding quality

As mentioned before, within half a century, the concept of quality has evolved in a remarkable way: from the narrow sense of conformity to a specification. It has opened up to the horizon of appropriate client needs, further up to fit for purpose.

However, before talking about providing quality service to clients of CMSA, it must be apprehended who are supposed to be the clients of CMSA and what are they expecting CMSA to do?

- The government

CMSA is carrying out the duties which are delegated from the central government according to the law. As public administrations are concerned with the

implementation of policies determined politically, and administrators are accountable and responsible to their political masters, their decisions must reflect this responsibility. “Good departmental civil servants should try to prevent the Minister having to make decision on low-level matters,... (Plant, 1998)

For this purpose what CMSA is really expected to do is to promote the national sustainable economic development and safeguard the social stability.

– The shipping companies and the seafarers

Shipping is an enormous investment. Any loss originated from ships to humans, property, third party or environment will cause disastrous results. Therefore, to protect Chinese shipping companies, the people and the environment against risks will be CMSA’s work of top priority.

– The public

Safety and environment-friendly transportation are two basic concerns of the people. Public administration is often evaluated by its ability to operate in a manner so as to maximize and integrate the public interest, vis-à-vis private business is evaluated on the basis of profit maximization. The public, who are in a sense the “clients” of the CMSA’s services, indicate, where they are able, critical views via their political representatives or through the media. All public administration takes place against a background of public criticism. (See Figure 5 and Figure 6)

The quality issue could be raised within a single accident with all the clients impaired at the same time. For instance, the 11.24 sea disaster of “Da Shun” happened in Bo Hai Sea in China in 1999 caused:

- about 300 losses of lives,
- Yan Da passenger shipping company, which “Da Shun” belonged to, was suspended,

- For quite a long period, the passenger shipping transportation of the whole country suffered a bad recession. It is said that some lines had ever had “zero” passenger in some particular voyages, and
- President Jiang and Premier Wu’s concerns.
- The Minister of MOC Huang Zhengdong commanded search and rescue on his own for several accidents that happened after the 11.24 disaster.

Therefore the quality issues of CMSA are not merely needed to be raised for a limited period after a disaster. The administration needs somebody (or a department or a committee) to oversee quality on a daily basis, i.e., to check if everything the Administration is doing is the most effective and efficient way to meet the client’s expectation.

Top management commitment

Most employees try to do a good job; most try to do what they perceive management wants them to do. They gain their perception directly from what their leaders say and indirectly from what they do: the way they spend their time, the topic that capture their attention and the action they reward.

Employees gain their perception from informal occasions as well as from formal official statements. If the top management talks about quality but does not lead the way, the troops will perceive that they, too, should pay lip-service to quality.

If the management’s approach to quality is tentative or ambiguous, it will be reflected in the Administration’s behavior: people will go through the action of hanging the banners and will mouth the words, but they will conduct their work as usual.

Understanding quality is one thing; making a firm commitment is another.

Top management's first responsibility is to establish a quality policy and to infuse this policy in the organization. Another important top management responsibility area should be to establish a quality assurance function, to support the organization's quality effort, to oversee the construction of a quality system, and to review the quality system periodically and make required improvements.

... In fact, to our knowledge, every successful quality revolution has included the participation of upper management. We know of NO EXCEPTIONS.

--- Dr, J.M. Juran

Total involvement

Participation, commitment and involvement in safety activities at all levels is essential. Not only to fulfil legal obligations, but also to achieve effective risk control, and finally to benefit the clients.

Pooling knowledge and experience are key aspects of risk control. Participation complements control in that it encourages the "ownership" of safety policies by employees at all levels.

Employees at all levels should also be involved in groups concerned with setting performance standards, devising operational systems, procedures and instructions for the control of risks and with monitoring and auditing activities. The involvement of senior technical employees and others in writing systems and procedures is particularly important. Reference to their intimate knowledge of how work is done is essential if procedures are to be relevant, accepted and written in a form which can be applied in practice. Such arrangements secure the effective participation of employees in safety policy formulation and development. In some cases *ad hoc* problem solving teams, brought together from a regional Administration, can help

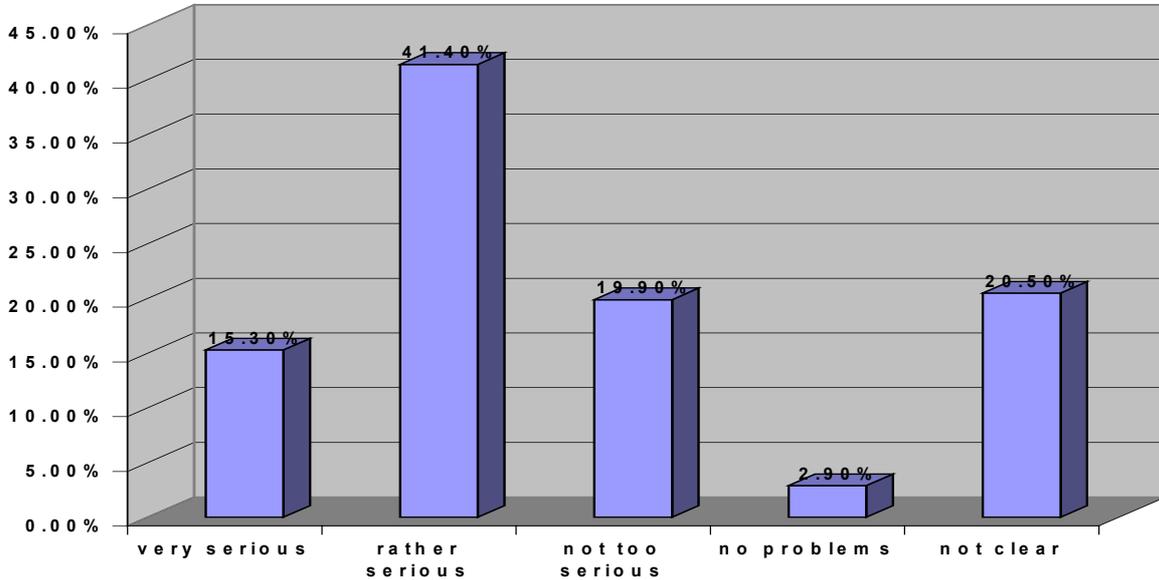


Figure 5 Public comments in environmental pollution

(Source: China Daily, Hong Kong edition, Dec 2, 1999)

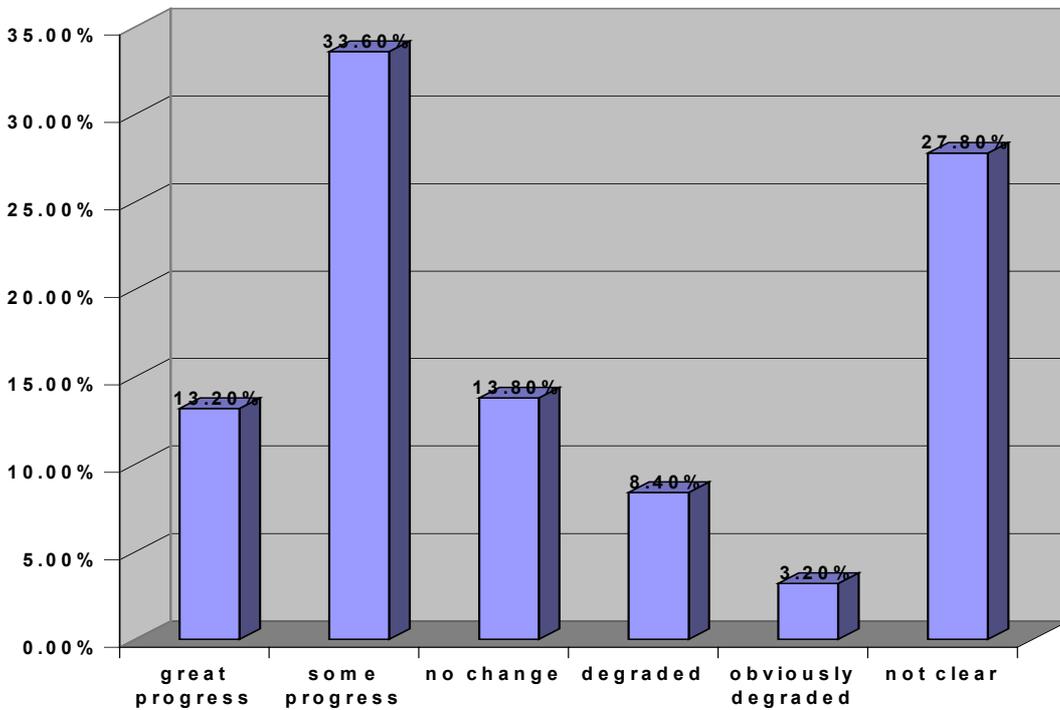


Figure 6 Anticipation of future environmental conditions

(Source: China daily Hong Kong edition, Dec 2, 1999)

some specific problems, including issues which may have arisen from a disaster, an accident or an incident.

Other approaches to promote involvement may include the use of hazard report books, suggestion schemes or safety circles (similar to quality circles), where safety problems are identified and solved. These can also help in developing enthusiasm and enable useful expertise and knowledge to be drawn upon.

A safety quality system need to have life breathed into it and be willing to become successful. The difference between a “bad” system and a good system is that, in a “good” system, quality is lived and breathed; not just “indoctrinated” but every employee is made to feel part of the system and become a contributor.

Competent Staff

All administrations face the difficult task of attracting and keeping competent technical and administrative staff. This will continue to be a major challenge particularly in developing countries.

The objective of ensuring the competence of employees should always be to maximize their contribution to the MSQA system either individually or in groups. Working in compliance with performance standards and participating in initiatives such as hazard spotting, problem solving and improving standards all help to develop competence and to contribute to better safety administration.

The competent personnel should be properly qualified, trained, experienced and skilled.

In the updating of China personnel policies born from the planned economy, State Councilor Wang Zhangyu made it clear that the central government considers “the

adjustment of personnel as a long term strategy to back up the sustainable and rapid development of China's economy".

Arrangements need to be made to ensure the competence of all employees (including department leaders). All employees need to be able to work in a safe manner, department leaders need to be aware of relevant legislation and how to manage safety effectively. It may also be necessary to examine the abilities of contractors' staff where they work close to, or in collaboration with, direct employees.

Arrangements made might include:

- ensuring competence through recruitment, selection, placement, transfer and training and the provision of adequate specialist advice.
- recruitment and promotion procedures which ensure that employees (including those at all levels of management), have the necessary physical and mental abilities for their jobs, or can acquire these through training and experience. systems to identify health and safety training needs arising from recruitment, changes in staff, analysis and working practices; the need to maintain or enhance competence by refresher training, also for the contractor's employees;
- systems to provide the information, instruction, training and supporting communications effort needed to meet these needs;
- getting supervised on-the-job experience;
- arrangements to ensure competent cover for staff absences, particularly for staff with critical safety responsibilities.

Education, training and experience make important contributions to the achievement of competence. Proper supervision of these at all level helps to ensure the development and maintenance of competence and is particularly necessary for those new to a job or undergoing training.

Whatever levels of competence are achieved by department leaders and employees, safety advice will sometimes be needed. Advice can be obtained from outside national or international consultant organizations. Although successful organizations often employ or set up their own in-house safety adviser team.

Motivation

In the market view, the principle problem with traditional bureaucracies is that they do not provide sufficient incentive for individuals working within them to perform their jobs as efficiently as they might. Given the dearth of motivation, individuals will usually attempt to maximize other qualities in their jobs. One such might be “on the job leisure”, resulting in the familiar image of the slothful, indolent bureaucrat.

The problems existing in the traditional system could be:

- No motivation in youngs
- Age means more than quality and performance
- Once a leader, always leader.

A critical and difficult task for CMSA in attempting to implement safety quality administration is to alter the incentive structure to reward improvement. It is important to provide a reward, even if the pay off will occur in months or years later. Not only should reward those who respond to emergencies be rewarded, but also those who build and maintain or improve systems that reduce or eliminate emergencies.

It is also important to foster and use the employee's suggestions to encourage frequent experimentation to improve work processes. Successful experiments are not the only ones that should be rewarded; 1experiments even if they fail should be rewarded, if they provide important insights about work processes.

CMSA has successfully carried out rearranging the incentive system by adopting a series of the new paradigms about work and management.

It is recognized that providing material rewards to top performers and successful work teams is sometimes difficult in a government. However, even public organizations have a variety of resources to deploy as incentives: choice assignments, better office space, public recognition or even simply expressions of gratitude. Rewards like these, along with promotions and raises, are all opportunities to applaud improved performance and high-quality work analysis.

The recruitment of personnel and the further education and training of employees are important foundation for successful motivation management.

Understanding the causes of accidents/incidents

Most people think that the ONE SERIOUS ACCIDENT—causing disaster and loss of life, suddenly appears as being struck by lightning. This is not the case. (Sagen, 1999)

The safety pioneer Dr. H.W.Heinrich found that for every serious accident there are 30 warnings by minor accidents and up to 300 warnings by near missing. The message is that all those pre-warnings must be taken seriously as each of them could lead to a serious accident next time if the conditions were slightly different, and act by preventive actions to avoid re-occurrence. He called this system “The Accident Distribution Ratio” (see Figure 7), which looks like a triangle:

Though the maritime community captures information on marine casualties, situations that involve unsafe occurrences, e.g., near-accidents (near-misses) and hazardous situations involving vessels, their crews, and/or passengers and cargo often go undetected. Because there are few actual marine accidents, the near-miss report data will represent a potential gold mine of safety information because,

- They have huge amount,

- They are free, which means they are not based on any tough losses and damages,
- They are valuable for understanding risk levels.

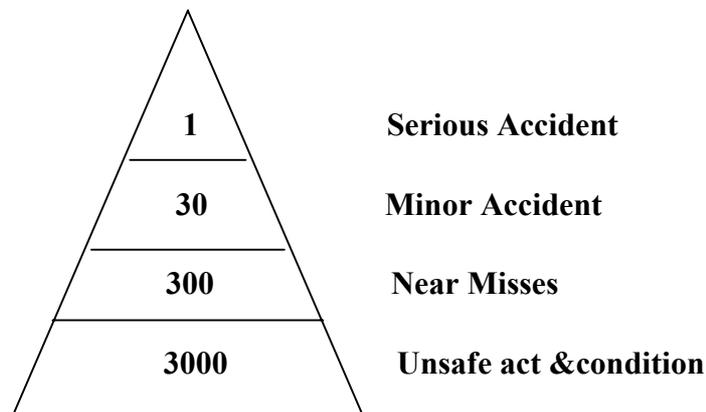


Figure 7 *Dr. W. Heinrich's "Accident Distribution Model"*

On the other hand, the rather small number of accidents can be representing a huge amount of the losses and damages, e.g.

Bill for Exxon Valdez Spill

\$27m on seabirds

\$18m on otters

\$300m to fishermen

cost of :

employment of 11,000 people on clean-up

training of 18,000 people

use of 80 aircraft, 1,400 vessel, 560 skimmers two dry docks

floating hotels

use of 2.5 times the fuel that was spilled

30,000 tonnes of equipment

600.000 pairs of gloves

30,000 hard hats

775,000 feet of anchor chain

500,000 feet of boom

specialist teams from around the world

TOTAL = \$2.5bn

Traditionally in China, when accidents happen there is a tendency to find an explanation from the contributory cause and the immediate cause spectrum (see Figure 8). The organizational causes or the upgraded causes, at least some key factors, were always missed to be taken into consideration in the accident investigation. Using systematic methods to analyze the full range of the causes of marine accidents is the most effective and efficient way to prevent similar mishaps happening in the future.

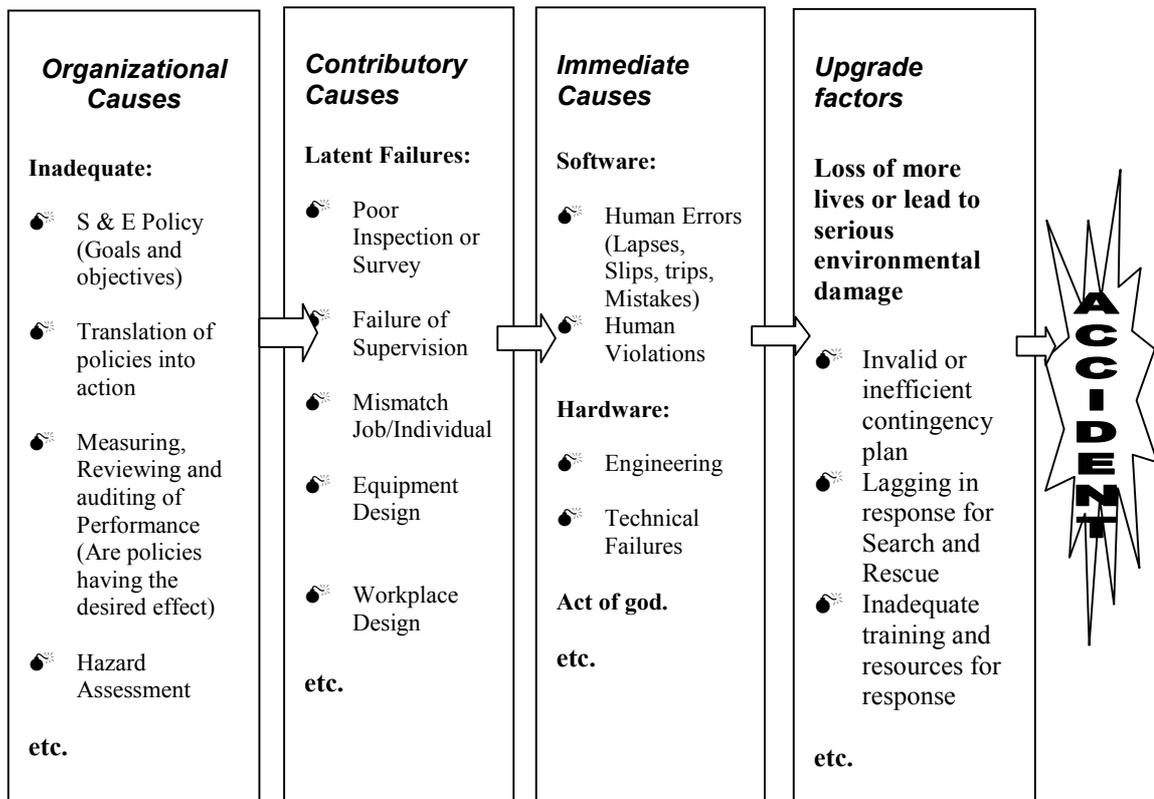


Figure 8 A Sample of Accident Cause Ranges

Understanding environmental protection policy

The right to development does have certain limitations in as much as it can not be asserted at the expense of the community or even at the expense of neighboring States whose prospects may be jeopardized. For example, a state can not in the name of development proceed to applications of nuclear energy in such a way as to harm the environment and imperil human life whether in the immediate neighborhood or in the surrounding region.

Sustainable development, a key issue through the entire work, was defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (UN, Agenda 21) The concept of sustainable development is commonly identified as the key to understanding the relationships between environment and development. It calls a sense of responsibility with respect to the actions that extend to the consequences in every part of the world, and to future generations.

A preventive environmental policy should aim at avoiding or slowing down the accumulation of environmental damage. As a support measure, the enhancement of environmental awareness and the promotion of knowledge of the environmental damage and its causes should be aimed at.

An ecological economic policy ought to provide for the environment – relevant aspects; the goals of traditional economic policy should be redefined.

Chapter Nine

Suggestions for improvement (II)

— Set up MSQA System in CMSA

The principles of quality assurance have already been used in the Chinese traditional safety administration. The purpose of this chapter is not to dwell on the whole framework of the MSQA system, but to highlight some key points of the flow process (see Figure9) based on Total Quality System principles.

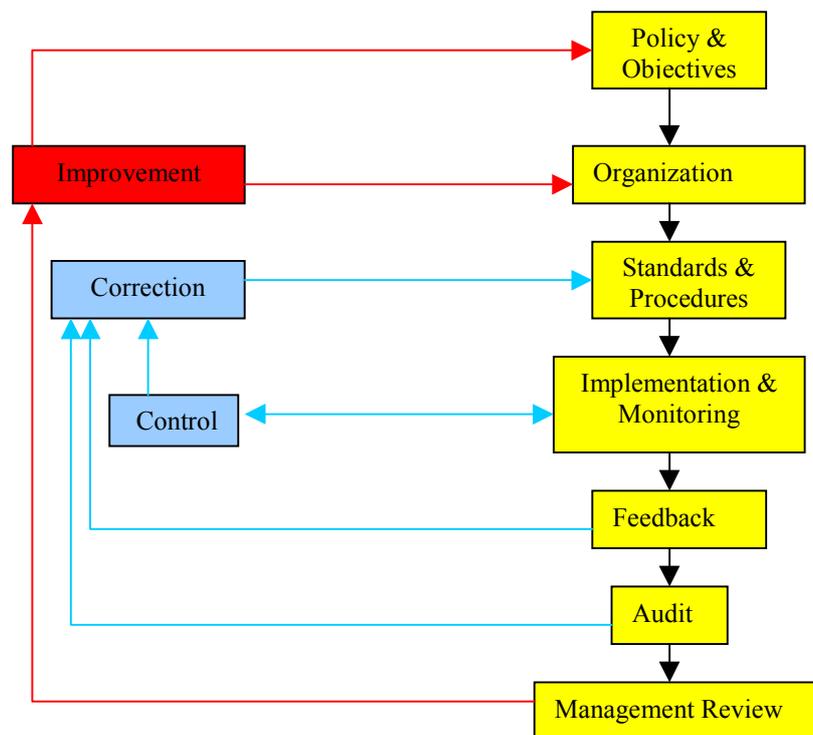


Figure 9 TQS flow process

Policy formulation

Every organization has a set of policies to guide the performance of the staff so its overall objectives can be achieved in the most effective way.

Maritime Safety Administrations which are successful in achieving high standards of safety have safety policies which contribute to their safety administration, while meeting their responsibilities to the people and the environment in a way which fulfils both the spirit and the letter of the law. In this way they satisfy the safety expectation of the government, their employees, shipping industries and society at large. Their safety policies influence all their activities and decisions, including those dealing with the selection of resources and information, the design and operation of working systems, the design and delivery of administration and services, and the control and disposal of waste.

Like almost any other quality management system, it needs to be driven from the top down and built from the bottom up.

The policies of MSQA should place special emphasis on the following:

- Generating a culture that enable everyone to have a strong commitment to the organization and help to control risk levels.
- Involving staff in formulating policies and setting targets to be achieved.
- Recognizing the role of human resources and looking after the well-being of all staff.
- Making the work interesting and stimulating by reducing monotony and, where possible, introducing flexibility.
- Creating an atmosphere that encourages discussion of safety issues both formally and informally.
- Supporting positive initiatives aimed at continuous improvement.

Organizing

All the activities in the MSQA system should be organized in such a way that the safety policies can be implemented.

The MSQA System has to establish the responsibilities of individuals with regard to safety matters, and to ensure that there are effective mechanisms for communication information, promoting co-operation and ensuring that people with relevant capabilities are available to do certain tasks. Particular emphasis should be placed on the following:

- Allocating responsibilities on safety matters to members of staff throughout the Administration from the most senior to the most junior.
- Ensuring that individuals recognize that they are accountable for their specific safety responsibility.
- Devising a communication mechanism so that information can be effectively transmitted in, and received from, any direction, and setting up safety committees to discuss safety matters.
- Providing training to staff or recruiting qualified personnel so that appropriated capabilities are available to do the various safety related tasks.
- Having schemes for recognizing and rewarding the achievement of targets.
- Devising and adopting performance procedures and instructions for each task that incorporate practicable safety factors, and giving attention to international or national standards and their implementation.
- Ensuring appropriate working groups and providing supervision.

Planning for safety

Planning required for establishing and maintaining an effective system of safety quality management is essential for the effective implementation of safety policies. Adequate control can only be achieved by coordinated action of all members of the Administration.

The aim of planning for safety is to identify the inputs necessary to achieve effective risk control. The process includes:

- Identifying objectives which support the aim, and setting targets for their achievement within a specific period;

- Establishing performance standards for measuring and assessing the inputs needed to:
 - Develop, maintain and improve an organizational culture which supports the control of risks; and
 - Maintain direct control over the risks generated by the maritime activities.

Implementation

The management of an organization has to co-ordinate the actions of all the members so that its policies and objectives can be achieved in the context of MSQA System.

The particular tasks that need to be fulfilled include the following:

- Ensuring that performance standards are achieved through the correct application of information technology to follow the internationally accepted standards. The details of the documented performance standards should reflect the degree of the risks.
- Performing analyses in order to establish the risk level of identified hazards and seeking solutions for their reduction and management.
- Seeking ways of reducing hazards to tolerable risk levels using the ALARP principle.
- Establishing priorities for the provision and maintenance of control measures by the use of risk assessment techniques, giving priority to high-risk areas and adopting temporary control measures to minimize risks where satisfactory control cannot be achieved immediately.
- Being well-prepared for the possibility of any emergency.
- Introducing suitable controlling mechanisms to prevent deviation from established safety limits.
- Carrying out regular training and updating related training documentation.
- Introducing appropriate procedures in the supervision of contractors/sub-contractors.

Measuring performance

Safety performance in the Administration, which manages safety successfully, is measured against pre-determined standards. This reveals when and where action is needed to improve performance.

Failures of control are assessed through reactive monitoring which requires thorough investigation of any accidents or incidents. In both active and reactive monitoring the objectives should be not only to determine the immediate causes of sub-standard performance but also, more importantly, to identify the underlying causes and the implications for the design and operation of the MSQA System.

Figure 10 gives a conceptual framework for identifying key areas of setting performance standards.

It requires the MSQA System to focus on the following:

- Devising criteria for measuring performance in the “steady state” including routine and non-routine activities.
- Establishing, operating and maintaining active systems that will enable performance to be measured objectively.
- Using achievement of objectives and specified standards, e.g. as references for monitoring purposes.
- Planning changes from the “steady state”, arising from any change in procedures, people or information.
- Preparing for foreseeable emergencies, such as fire, injuries, accidents or the failure of control equipment.
- Giving special attention to activities with high risk levels by monitoring these in greater depth and more frequently.
- Introducing proactive monitoring systems which will collect and analyze safety-related information with special attention to incidents which had the potential for an actual accident, i.e. “near misses”.

- Devising a reporting mechanism for collecting data to enable immediate and underlying causes of accidents to be identified. (*see Chapter 11*)

A FRAMEWORK FOR SETTING PERFORMANCE STANDARDS

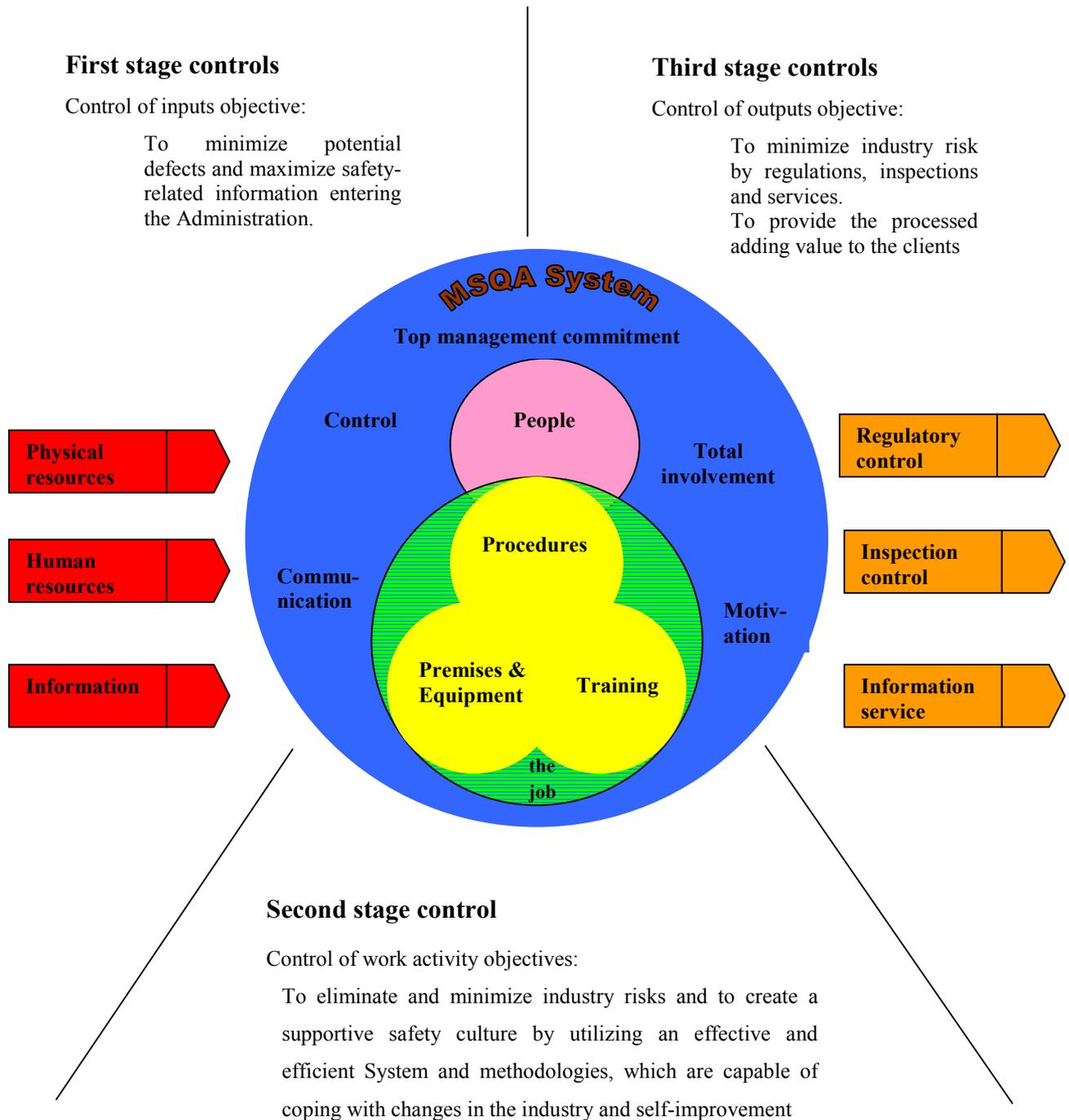


Figure 10 outlines a conceptual framework for identifying key areas for which performance standards are necessary to establish control and for measuring performance in CMSA.

➤ **At the input stage (the left-hand side of the diagram)**

Physical resources include:

- The design, selection, purchase and construction of workplaces;
- The design, selection, purchase and installation of specialized equipment for:
 - search and rescue,
 - 24 hours watch-keeping
 - safety navigation and pollution surveillance
 - ship inspection
 - accident investigation
 - combating pollution
- the design, selection and purchase of:
 - Information technology facilities
 - (reliable)communication devices
 - (24 hours a day 7 days a week ready in use) transportation means

Human resources include:

- the recruitment and selection of all employees;
- the selection of contracting organizations

Information include:

- Information relating directly to safety, such as standards, guidance and aspects of the law;
- Other technical and management information relating to risk control and the development of a positive safety culture;
- Raw data relating to safety, such as from disasters, hazardous occurrences and damages collected from clients (suppliers); and

➤ **At the second stage (the middle part of the diagram)**

The five elements involved in creating a positive safety culture are:

Top management commitment, control, communication, motivation and total involvement;

Premises and equipment – include the place of work, facilities for all the Administration main functions, logistics and information technology facilities.

Procedures – include the design of jobs and work procedures and all aspects of the way the work is done;

People – include the placement of employees, their competence and their physical fitness for the job.

➤ **At the output stage (the right hand side of the diagram)**

Regulatory control – includes laws, rules, regulations, standards and circulars;

Inspection control – includes routine inspection, seasonal concentrated inspection campaign (CIC) and specific concentrated inspection campaign;

Information service – includes making seminars, lectures, guidelines, newsletters and consultations, communicating research results and other kinds of safety information.

Reviewing lessons learned

Learning from all relevant experiences and applying the lessons learned will be important elements in an effective MSQA System. Key aspects include how the Administration's policies, procedures, controls and standards have been implemented. By auditing and analyzing performance the lessons learned can be fed back into the system for its enhancement. In this way the MSQA System loop can be closed.

Aspects that require special attention include the following:

- The introduction of auditing by competent (well-trained and experienced) personnel who are not connected with the immediate area of the activity concerned.
- Examining the total range of MSAQ activities, e.g. policy, organization, implementation and measurement.
- Reviewing performance with a view to taking appropriate action to remedy deficiencies.
- Identifying who is to be responsible for implementing the remedial action, and planning schedules.
- Establishing appropriate frequencies of review at the different levels of the Administration.
- Developing “benchmarks” of performance for comparison within different regional Administrations or with international organizations

When an organization develops its safety management systems there will be less emphasis on the mechanics of achieving results. Effective monitoring, reviewing and auditing procedures should automatically feed back into improvement and development. The need to maintain the systems, to provide motivation and to promote improvements by setting further objectives will, however, always be present.

Focusing on continuous improvement

The aim of CMSA's work is not just to keep the day to day work running but also to make a continuous improvement in terms of managing safety efficiently.

In essence, what MSQA System is supposed to do is not only to formalize and document the way safety is managed and our services are delivered, But more important, it has sharpened the focus on the way the things are done. It is vital for the management to know how well they are doing, to measure what is being done and to set up ways of signaling areas for improvement. This is the focus of the management system.

Amongst Deming's 14 Points for Management one is to improve constantly and forever the system of production and services. Similarly, Tom Peters, the author of In Search of Excellence identifies quality improvement as a never-ending journey.

The principles of continuous improvement are based on the empowerment of all the employees of the Administration so that they can contribute to improving the safety skills or service provided to the clients. It is not supposed to follow any set of rules imposed by an external party; it is up to the Administration itself to decide on the policies and objectives to be adhered to.

The highlights of quality improvement, compared with quality assurance, are:

- Organization adapted constantly to suit situations, ideas and goals,
- Progress plans, to which the company is committed annually,
- Efforts concentrated on the quest for excellence in all parts of the Administration,
- Use of group working methods, to encourage the exchange of ideas and foster active participation,
- Creation of an environment that will enhance motivation, enabling every member of the administration to take part in the programme commensurate with his potential.

The MSQA System safety policies, which focus on continuous improvement, can contribute to management performance of CMSA by:

- Preserving and developing human and physical resources;
- Minimizing the financial losses which arises from avoidable unplanned events;
- Recognizing that accidents and incidents result from failings in management control and not just the fault of individual employees;
- The need for the leaders to develop appropriate organizational structures and a culture which supports risk control and secures the full participation of all members of the organization;
- The need to resource and plan policy implementation adequately;
- Ensuring a systematic approach to the identification of risks and the allocation of resources to control them;
- The need to scrutinize and review performance so as to learn from experience;
- Recognizing the connection between quality and safety and environmental protection.
- Supporting quality initiatives aimed at continuous improvement.

The impact on CMSA is firstly to ensure that the management adopts a strategic overview of quality. The approach must focus on developing the prevention mentality. It is easy to underestimate the effort that is required to change attitudes and approaches. Many people will need to undergo a complete change of “mind-set” to unscramble their intuition, which rushes into the detection/inspection mode to solve quality problems; “we have a quality problem, we’d better checking every letter, take two samples out of each sack, check every widget twice”, etc.

The correct mind set may be achieved by looking at the kinds of barriers which exist in key areas. Staff will need to be trained and shown how to reallocate their time and energy to search for causes of problems and to correct the causes, not the symptoms, hopefully once and for all. This will require of management a positive, thrusting

initiative to promote the “right first time” approach to work situations. Through quality improvement teams, which will need to be set up, these actions will naturally reduce the inspection-rejection syndrome.

Everyone, from top management to the youngest and newest entrants in the organization has a part to play, and one of the principal aims is to ensure that quality becomes everyone’s concern.

This voluntary approach relies on the convictions of people, but it also requires a shared vision of the future by the whole management team heading the campaign.

Chapter Ten

Suggestions for improvement (III)

—Application of risk control methodology in CMSA

All activities involve a risk. The only way to eliminate risk thoroughly is not to do something. However, that is not the way expected to be choose. What has to be done is to manage the risk and ensure that threats are minimized to acceptable levels and that the befits outweigh the risks.

A risk is the probability of something going wrong. Risk control is a means of increasing the chances of successful action in the face of uncertainty by improving available information.

In the context of safety Administration of CMSA now, the measures to implement risk control are geared at three levels:

Pre-risk: Safety Inspection

During –risk: Emergency Response

Post-risk: Accident Investigation

It is still a kind of after– the–fact philosophy of accident prevention, “do-fail–fix-do” approach. However, to the successful Administration, improvement is about seeking out potential problems (or improvement opportunities), and not about waiting for a failure, to identify an area for improvement.

The basis of conducting risk control methodology is that, on the one hand, any failure, which occurs in one system, will have a inclination to recur in another similar system for the same reason. On the other hand, although two particular systems may appear to be completely different, if they possess the same or similar component parts or procedures, they will both be open to a common mode of failure.

In the evolution of approach to Safety and Loss prevention it is clear that there has been an increasing move towards risk management as opposed to more technical (/specialized) solutions. (Trbojevic, 1999)

The risk control process provides a structured approach to hazard identification. The CMSA should assess the risk and the development of risk controls to prevent hazard releases, or mitigate the consequences of such release.

Hazards identification

Hazards identification - identifying hazards which are the potential causes of harm;.

Seeking out and identifying hazards is an essential first step in risk control. In relation to the activity of interest, every effort should be made to identify as many hazards as possible in a pre-assigned period of time. The list should include rare hazards as well as those which are frequent. The generated list can then be used to set up a database of hazards associated with the various activities and systems. This database will be useful in the preparation of future cases. Adequate information is necessary and references should be made to relevant sources such as:

- Investigation of accidents and incidents,
- Information collected from the shipping industry,
- The personal knowledge and experiences of departmental leaders and employees,
- Accident and incident data from the administration, from IMO or other organization,
- Expert advice and opinion.

Assessing risk

Assessing risk - analyzing the risk which may arise from hazards;

Assessing risk is necessary in identifying their relative importance and to obtain information about their extent and nature. This will help in deciding on methods of control. Knowledge of both areas is necessary in order to identify where to place the major effort in prevention and control, and in order to make decisions on the adequacy of control measures.

Determining the relative importance of risks involves deciding on the severity of the hazard and the likelihood of occurrence. There is no general formula for rating risks in relative importance but a number of techniques have been developed to assist in decision making.

RISK = Hazard Severity X Likelihood of Occurrence

For example:

The effect of a hazard may be rated:

- 3 – MAJOR
- 2 – SERIOUS
- 1– SLIGHT

The Likelihood of harm may be rated:

- 3 - HIGH
- 2 – MEDIUM
- 1-LOW

As a result of assessing the above results, it can be seen that hazards are distributed throughout the intolerable, tolerable and negligible risk regions. It is, of course, essential to reduce those in the intolerable region to the tolerable region, but it may not be cost effective to move any from the tolerable to the negligible region. Bearing in mind that hazards are bound to be in any system, activity or project, it would be useful to establish a number of fundamental guidelines for risk reduction.

Evaluating risk will demand a thorough knowledge of all activities and working practices and again the knowledge of the employees and seniors involved will prove valuable. Evaluating risk should be carried out by competent people, and professionals' advice may be necessary in some cases, especially in the choices of appropriate techniques and the interpretation of results.

However, it is very difficult to obtain reliable statistics because accidents lead to changes in the way an activity is carried out and thus alter the bases of the data. It has to be recognized that it is difficult to convert practical experience into usable mathematical relations. Qualitative methods should not be dismissed because they do give valuable insight into the “importance” of a given hazard.

Risk control

Risk control - deciding on suitable measures to eliminate or control risk;

All final decisions about risk control must take into account the relevant requirements which establish minimum levels of risk prevention or control.

The design of all measures should take account of the human factor aspects.

Many requirements are, however, qualified by the words, ‘so far as is reasonably practicable’, or ‘so far as is practicable’. Other duties require the use of ‘best practicable means’.

Priorities must be established for the provision and maintenance of control measures by the use of risk analysis techniques, giving priority to high risk areas. Furthermore, adopting temporary control measures to minimize risks where satisfactory control cannot be achieved immediately is necessary.

The practical implementation of control measures is assisted by their good design. The full implementation of adequate control measures may take time, and at each stage where full controls cannot be achieved, adequate steps should be taken in the interim to minimize the risks. Control measures should be recorded as a means of ensuring their consistent implementation.

Maintaining risk control measures requires adequate review, maintenance and monitoring procedures to secure continued operation. This will include review procedures to examine risk evaluation and control measures in the light of changes and technological developments. The type of maintenance, its frequency and depth will reflect the extent and nature of the risk revealed by the risk evaluation process. The balance of resources devoted to the various control measures will also reflect the relative importance of the risks.

Chapter Eleven

Suggestions for improvement (IV)

— Promote communication both inside
and outside CMSA

According to system theory, organizations can be thought of as open systems that interact in various ways with their external environments (Beer, 1980)

Organizations, which try to change the quality culture, operate systems, procedures or control methods without effective, honest, two-way communication, will experience the frustration of being a “cloned” type of organization which can function but inspires no confidence in being able to survive the changing environment in which it lives.

A high level of communication between and within the different levels in the organization, and also outside the Administration and outside of the Chinese maritime industry can cast a strong focus on safety and help the Administration to learn and improve safety efficiently.

Effective communication is essential. This involves information coming into CMSA, flowing within the Administration organization and going out from the Administration.

Information input to CMSA

An important function of controlling is to report and interpret the findings. Due to factors such as the dynamics of competition, rapid technological development and shorter product life cycles. Good sources of safety related information coming into the Administration is very important for the development of a safety policy, management system and performance of CMSA. Such information is particularly

necessary for those responsible for policy making, planning, setting performance standards, measuring, auditing and reviewing performance.

To fulfil the functions mentioned above CMSA has to:

- Maintain an adequate information system in relevant laws (national or international) and on guidance and developments in general and safety management practice;
- Be able to interpret the law and understand how it applies to the organization;
- Keep close cooperation with all parties involved within the framework risk control;
- Set clear general criteria for information input and concentrate on priority issues;
- Provide authoritative and independent advice to directors in an effective manner on establishing and keeping up-to-date organizational standards and risk control methods relating to both “hardware” (such as equipment) and “software” (such as procedures, system and people).

Information flows within CMSA

Effective internal communication is essential if the safety policy is to be understood and consistently implemented. Systems are also needed to communicate key information such as:

- The meaning and purpose of the policy;
- The vision, values and beliefs which underlie it;
- The commitment of senior management to its implementation;
- Plans, standard procedures and systems related to implementation and performance measurement;
- Factual information which will help securing the involvement and commitment of work people (including relevant information from outside services);
- Comments and ideas for improvement from individuals and groups;
- Reports on performance.

A comprehensive system is made up of a variety of formal and informal means of communication, which together ensure an adequate flow of information up, down and across the organization.

For example, the function of “safety inspector” in the sense suggested may not be the sole activity of an inspection. Inspectors at various levels can also assist in the framing and revision of legislation; undertake investigations, surveys and research; participation of advisory literature; sit in various kinds of technical committees, deliver lectures, and participate in conferences at home and overseas although the main day-to-day activity of the majority of inspectors is the inspection of ships. In other words, aside from the main responsibility, everybody or every department in CMSA should bear another responsibility to communicate his safety experience to the other related parties.

Flows of information from CMSA

Safety information needs to be communicated outside the Administration. That is what the system is designed for. The processed output safety information, which is supposed to be provided to the industry, should point out the way to key interventions that could reduce the number of future casualties and thus save lives and property, reduce injuries, mitigate damage to the environment, and reduce operational and response costs for the maritime industry.

In such cases openness is important and the information given needs to be relevant and to be presented in a form which can be readily understood. Professional advice can be sought on how to best present information so that it can be understood by the audience to whom it is meant.

Maintaining means of communication in the time of emergency is also important and special contingency arrangements may be necessary.

The suggested methods to improve communication within the Administration

- *Team Briefing* – increases commitment, explaining why something has to be done is important and reduces of misunderstandings. It must be face to face, within 4 – 15 team members, given by relevant departmental leaders/team leaders, regular (monthly at most), relevant. Important information should be passed within 48 hours. The contents normally consist of the four aspects:

1. Progress
2. Policy
3. People
4. Points for action

*Not for consultation and problem solving

*Not to be used as a talking shop or for complaints

- *Consultations*

Consultation, which could be set up in terms of ‘Joint Participation Group’ or ‘the Administration Advisory Board’, can be used to

1. improve the quality of decisions;
2. utilize the knowledge and ingenuity of those affected;
3. Improve industrial relations; and
4. understand each others points of view.
5. assess and monitor quality of communication achievements

*Leader should be senior manager of unit.

*Consult at work group level.

*Train people together for this task – break down barriers.

– *Quality Circles*

Quality Circles are voluntary, temporary teams that use Deming's methods to improve work processes. They choose a problem or process to improve, then measure the results, analyze data, pinpoint underlying causes, design and implement solutions, check the results, refine their solutions, and try again. People are discussing what they want to discuss and implement the necessary changes. Management is not involved directly.

The success depends on:

- Quality of schemes co-ordinator and his/her commitment.
- Training of co-ordinator and circle members.
- Willingness and commitment of management to make scheme work.

Advantages:

- Supervisors develop leader skills
- Tightening of procedures and discipline
- Improved communication, morale and performance

– *Suggestion Scheme:*

Advantages:

- People know that their thinking power is being utilized.
- Helps to create a cost conscious labor force which will co-operate rather than resist change.
- It can pinpoint talented people
- Tells the Administration the current climate of opinion
- Improves Safety Productivity

– *The other effective means may include:*

- Management Bulletin – Distributed at short notice to departmental leader/senior officers when a change has occurred.

- Walk the job – Chat and above all listen to employees.
- Questionnaires – How is the communication system working?
- Attitude Survey – Anonymous, outside the working place.
- Check Efficiency – Trace the communication of two recent important decisions to employees.
- Notice Boards
- Newsletter

Setting up a Chinese Maritime Safety Information System

Aiming at improving communication between the CMSA and the outside stakeholders, the author suggests that a Chinese Maritime Safety Information System be set up, which is proposed to be supported by the ship owner/operator, unions, Class Society, mariner and academia, P&I and as well as involving the international partners of the maritime community at large.

In order to guarantee the voluntary participation and cultivate safety conscience, the system had better be non-regulatory in nature. Confidentiality should be provided and the reporting party should be released from liability prosecution. The focus of the system will be to develop a voluntary non-attribution maritime safety trend, forecast, and lesson-learned reporting system.

Apart from the safety information gained from the accidents reported and investigated according to the national law and international conventions, as we talked, the main part of the safety information, from which lessons should be learned is from non-accidental cases. Under the safety culture regime it provides a good chance to exploit the safety “treasure”.

Therefore, besides the reactive safety information input, the safety information system is also intended to capture causal information and lessons-learned on maritime near-miss events, which, however, maybe for some corrective action in the

chain of events, did not result in the occurrence of an accident. Such near-miss events might indicate collision situations, near pollution events, and related precursor events, e.g., crew fatigue, equipment maintenance/failure, communication failure, policy and procedural issues. The safety reporting system will allow the maritime community to identify system vulnerabilities and weaknesses well before failure or accidents occur.

The analysis of this data will promise to point the way to key interventions that could reduce the number of future casualties and thus save lives and property, reduce injuries, mitigate damage to the environment, and reduce operational and response costs for both the private and public segments of the maritime community and the general public.

The system will function in a way that, e.g. the mariner has a near collision or has come across a safety issue that he/she feels is important enough to advise others about in the marine community. The mariner and /or company completes a report form (electronic or paper version) that is designed to capture the information in the form of a narrative and also facilitate its recording for statistical study purposes. This report is then forwarded to the Data Center of the system. The Data Center validates, re-identifies and enters the information into a database, which analyzes and distributes the information in a useful form (e.g., safety alerts, trend analysis, safety forecasts of issues loom just over the horizon, lessons-learned) back out to the maritime community and general public.

Key elements of the system

1. Voluntary, confidential reporting, and liability protections for participants,
2. Incentives for reporting, publicity, and marketing,
3. Database and form design,
4. “Data Center” analysis and reporting,
5. Well connected with the individual SMS of shipping companies, and

6. System design and planning.

Its value will be shown from the prevention of just one catastrophic event involving a large loss of life and/or damage to the marine environment or the reduction in search and rescue operations, marine accidents and oil spill recovery responses, cargo claims, insurance premiums, and seaman and employee injury claims.

Moreover, the free flow of safety information and intensified safety information will spread out the cost of safety investment and improve the productivity of safety output for the benefit of the whole industry.

Chapter Twelve

Final Thoughts

Managing organizations is a complex act. It requires a thorough understanding of the dynamic relationships within the socio-technical system (the internal environment) and the relationship to the external environment, with which the system is in constant interaction.

Responsible Administrations should see their efforts resulting in friendlier, less punitive safety regimes. A realistic expectation should be that the implementation of high standards is rewarded by reduced external inspection. The biggest rewards, however, will be the savings in operational costs, improved performance, and better relations with clients which is commensurate with responsible management.

The improvement toward a safety culture in the Chinese shipping industry can not be advanced if the CMSA is not required to change.

Gaining the substantial support and commitment of top management and also the person commitment and involvement from every level of management is not easy and is one of the major reasons for the failure of a TQM programme (Lesley& Malcolm). It generally gets easier as the programme develops and the benefit of success begins to be realized.

The improvement must encompass all the people involved in safety and environmental protection, including regulatory bodies and all the stakeholders.

The improvement must be envisioned and realized through a continuous improving process, dedicated actions, minute-by-minute, and day-by-day, which will truly create a safety culture in the maritime shipping industry.

To establish a true safety culture in the Chinese maritime industry, it must start with realistic expectations, the people involved have to be patient and persistent in the implementation, target the human elements in the safety equation and above all be intolerant of the substandard in the industry.

However, absolute safety in any transportation system is unattainable. Any safety level adopted is always a compromise based on the technology available, operational efficiency cost effectiveness, reliability in the marine environment and social and political safety expectations in the society concerned. The safety standards of CMSA should be a compromise but represent the highest practicable standards of the days. CMSA should ensure that the safety standards would receive virtual global acceptance within a reasonably short time.

Furthermore, CMSA has to recognize that reforming public administration is never unproblematic and it is never possible to achieve change overnight. The implementation of the safety quality concept in CMSA is rather difficult at present. This mainly results from the poor reception of controlling due to the still very marked existence of traditional concepts. To totally implementing safety and quality management, CMSA must be persistent to take the long and stony way.

Finally, since promoting a new regime for safety culture is a very broad topic, the practical planning and implementation will be a systematic task, which needs the involvement of expertise from all relevant areas. The work, which the author has done, will not claim to be a systematic analysis and thorough conclusion. What the author can only be supposed to reach is to explore some points, which could be valuable for the future development of CMSA.

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