Performance Criteria for the International Safety Management (ISM) Code

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ABSTRACT

There is an obvious need to conduct research and to gather and analyze data that could provide a sound, scientific, and objective evaluation of the ISM Code. The first step in organizing such a research effort is the identification of performance criteria. In this connection, the proposed paper poses and attempts to answer the following questions: What performance criteria are appropriate for assessing the ISM Code's effectiveness? How can "effectiveness" be defined and measured? The paper reviews past and ongoing ISM research, IMO documents, and relevant scientific literature to identify what analytical tools and indicators could be applied in evaluating the ISM Code. An argument is made that the application of a synthesis approach in the research, i.e., a combined qualitative-quantitative methodology, would provide the most comprehensive picture of the Code's effectiveness. The study concludes by proposing two sets of performance criteria – under the categories "output" and "outcome" – suitable for the assessment of the ISM Code.

1. Introduction

The first three years of the first phase of ISM Code implementation have elicited mixed reviews and conflicting verdicts – success ("The ISM Code's beneficial impact"), failure ("ISM: the bulb that failed to bloom"), and skepticism ("The ISM Code – is it working?") – have been heralded in the shipping news. Such assessments, however, seem to be largely based on oral testimony and anecdotal evidence. There is an obvious need to conduct research and to gather and analyze data that could provide sound, scientific, and objective evaluations of the Code. One of the first steps in such a research effort is identifying appropriate performance criteria, i.e., indicators that provide specific measures of safety and reveal how well the Code and its different components are doing in meeting its objectives (Osborne and Gaebler, 1992). Osborne and Gaebler (1992) give four good reasons why the performance of regulatory regimes such as the ISM Code should be measured and assessed:

- What gets measured gets done
- If you don't measure results, you can't tell success from failure
- If you can't see success, you can't learn from it
- If you can't recognize failure, you can't correct it

The objective of this paper is to offer criteria that might be applied in a research project evaluating the effectiveness of the ISM Code. It will pose and attempt to answer the following questions: How can the Code's "success" or "effectiveness" be defined? How can it be measured? What are some of the criteria appropriate for assessing its effectiveness? The study will commence by reviewing IMO meeting documents as well as past and current research on the ISM Code. The purpose of the review would be to identify what standards, explicit or implicit, have been or may be applied in evaluating the Code. The paper will also survey literature in the fields of policy analysis and safety science to identify analytical tools and frameworks that could be relevant in a scientific assessment of the ISM Code. With the reviewed literature as reference, the paper will then define effectiveness and propose a set of performance criteria.

2. Completed and ongoing ISM research

Albeit very small, there is a body of research focusing on the ISM Code. One study (Hahne et al., 2000) carried out by classification society Germanischer Lloyd analyzed survey forms filled out by 382 shipping companies. The forms contained answers to questions regarding the company's organizational structure and field of operations, safety organization / safety policy, qualification of personnel, and experience with implementation of ISM. The data gathered was not used to directly evaluate the effectiveness of the Code. It was used instead to evaluate the shipping industry's attitude towards ISM and its readiness to implement the Code. Together with the survey data, Germanischer Lloyd used the ISM certification process as a mechanism to identify what safety problems found aboard ship posed a hindrance to the attainment of the Code's objectives. One of the study's central findings was the existence of widespread resistance among industry personnel against "imposing" a safety culture aboard ship and against the introduction of what was perceived as yet another regulatory and documentary burden. The data also confirmed that the shipping sector as a whole was not ready for the ISM Code. Nevertheless, the German study is

relevant to this paper in that it identifies factors that help determine the attitudes and perceptions shore- and ship-based personnel have of ISM and safety in general.
Another study (Hemquist, 2000) was conducted by the Swedish (P & I) Club. Using insurance claims activity as a criterion for evaluating the Code's effectiveness, the Swedish study indicated that "vigorous application of the ISM Code can significantly reduce claims exposure."
One on-going study (Anderson, 2001) intends to "consider the perceived conflict between the requirements under the ISM Code to produce... reports as a part of its SMS (safety management system)... on the one hand, and, on the other hand, the consequential production of potentially self incriminating evidence which could be used against those who produced that evidence: the ships master, or other seafarer... and the ship operator who will stand exposed to civil or criminal liabilities." Anderson's study focuses on the willingness of seafarers to submit reports of deficiency and non-compliance and how readily shore management acts upon such reports. Since this system of reporting is a novel concept in shipping and is the key to the SMS's self-perfecting mechanism, the level of activity in this area would also reflect upon the effective operation of the ISM Code.

3. IMO documents

IMO meeting documents were reviewed from as early as the 54th session (1987) of the Maritime Safety Committee (MSC) to determine what concerns influenced the framers to give the ISM Code the structure it has taken. Unfortunately, the review revealed a lack of detail in documented background information on the formulation process. This corroborates the difficulties referred to by Stenmark (2000), who headed a number of Swedish delegations to IMO and who mentioned in his study that the "preparatory work on the Code took place in working groups that, though officially constituted, employed unconventional work methods." Stenmark added that "minutes were not recorded... The meeting reports produced within IMO's different committees and subcommittees, where the Code was formulated, are summaries and reflect only decisions and contains proposals and drafts for whichever text may be under review at the moment." Nevertheless, there are at least two IMO documents that provide some indication of the Code's framers' expectations. One is an earlier version of the Code, the Guidelines on Management for Safe Ship Operation and Pollution Prevention (IMO, 1988), which had the purpose of providing "elements that can be used to gauge safety management and to develop and implement safety management." According to the document, the objectives of the guidelines were "to ensure safety, prevent human injury or loss of life, damage to the environment, particularly marine pollution, and damage to property." The other document, a submission by the Nordic maritime administrations (IMO, 1991), contains recommendations for revising the 1988 guidelines. According to the Nordic countries, the objectives of safety and environmental protection management should be the promotion of safe practices in ship operation, safe working conditions aboard ship, and the capability to handle whatever emergencies may still occur. They also offer the following criteria to determine whether the above objectives have been met: compliance with mandatory rules and regulations; observation of applicable codes, guides, and standards worked out by IMO, administrations, class societies, and industry organizations; and identification of risks not covered by the above sources and establishment of adequate safeguards (IMO, 1991). Though broad and general, the two documents give at least an indication of the Code's framers' expectations.
Examining the ISM Code itself gives us the same broad results. The Code states that its purpose is to provide an international standard for the safe management and operation of ships and for pollution prevention (IMO, 1993). Its objectives are "to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment, and to property." Section 12.2 of the ISM Code also requires the shipping company to "periodically evaluate the efficiency" of the SMS. In keeping with the general language of the Code, no detailed guidelines or standards are provided for this periodic evaluation of the SMS's efficiency. The Code only mandates that the review of the SMS be conducted "in accordance with procedures established by the (shipping) company." This is made clearer in Resolution A.788(19) which contains implementation guidelines to the ISM Code. Section 2.1.3 of the guidelines recommends administrations "not to use criteria in the form of prescriptive requirements as these may result in companies implementing solutions prepared by others. This may then result in difficulty for a company to develop the solutions which best suit that particular company, that particular operation or that specific ship" (IMO, 1995). In assessing an SMS's compliance with the Code's requirements, section 2.1.4 of the guidelines further recommends that administrations "ensure that these assessments are based on determining the effectiveness of the SMS in meeting specified objectives, rather than conformity with detailed requirements." In specifying objectives, companies are meant to consider the ability of the SMS to meet the following general safety management objectives (an improved version of the Nordic submission):

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

There is one more objective worth adding to the above list that is found in the introductory paragraphs of A.788, i.e., that "the application of the ISM Code should support and encourage the development of a safety culture in shipping." As far as a review of IMO documents go, the above summarize the maritime sector's expectations of the ISM Code. However, because the Code is designed to be non-prescriptive the challenge for this exercise is to translate these broad objectives, in addition to those that have been applied in the body of ISM research, into criteria that lend themselves to analysis and evaluation. There are at least two research disciplines that could provide us with analytical tools and concepts that could help us in developing these criteria – policy analysis and safety science. We shall look to policy analysis for analytical framework while we look at safety science literature to see how safety and safety policy is evaluated in other industries.

4. Policy analysis

Policy analysis is an "applied discipline or field" of political science "concerned with the evaluation of public policy." It has its origins in the 1960s when, during the US presidency of Lyndon Johnson, "social-scientific policy research and evaluation were widely celebrated as the proper basis for decision making in public policy" (Fischer, 1995). Perhaps the biggest debate in the discipline today is the relative preponderance of quantitative methods – such as, *inter alia*, microeconomics, econometrics, decision analysis, and statistics – in policy analysis. One classic example of the application of quantitative analysis in safety policy is Viscusi's 1979 study of the impact of occupational safety and health regulation. The study looked at the impact of the early years of the implementation of the Occupational Safety and Health Act of 1970 in the US by analyzing "pooled time series and cross section data on industry health and safety investments and injury rates for the 1972-1975 period" (Viscusi, 1979). The econometric analysis showed no significant effect of OSHA on workplace safety, mainly because the financial incentives were weak. A follow-up study was conducted in 1986 using an expanded series of data from 1973 to 1983 (Viscusi, 1979). Although the follow-up study showed an improved positive effect compared with the earlier one, the data was still inconclusive on the issue of OSHA's overall effectiveness and relevance to worker safety. Another quantitative study, "Direct and indirect effects of regulation: a new look at OSHA's impact," was completed by Bartel and Thomas (1985) by developing and testing "a three-equation model of workplace injuries, industrial noncompliance with OSHA safety standards, and OSHA enforcement." Like Viscusi, Bartel and Thomas did not find their empirical data conclusive. Nevertheless, their study concluded that OSHA had commendable, if indirect, effects on safety.

At the same time, there seems to be a rising tide against an exclusively empirical approach in policy analysis. There is, as it were, more than meets the statistical eye. Yanow (2000) sees the debate as being between analysts who believe "that it is not only necessary but also actually possible, to make objective, value-free assessments of a policy from a point external to it" (the positivist, empirical, or quantitative school) and those who believe that it is impossible "to stand outside of the policy issue being studied, free of its values and meanings and of the analyst's own values, beliefs, and feelings" (the interpretative, naturalistic, or qualitative school). Fischer emphasizes, however, that it is not a question of choosing one approach to the exclusion of the other. The quantitative approaches still play an important role in policy analysis but only as long they are applied "within the normative frameworks that give its empirical data meaning" (Fischer, 1995), in a methodology John (1998) prefers to call the "synthesis approach."

Baldwin and Cave (1999), Viscusi et al. (1996), Weimer and Vining (1999) offer introductions to the subject of policy analysis while Yanow (2000), Fischer (1995), and John (1998) offer methodologies that combine the qualitative and quantitative approaches.

5. Safety science

Safety Science is a multidisciplinary field of research into the science and technology of human safety. "It extends from safety of people at work to other spheres, such as transport, leisure and home, as well as every other field of man's hazardous activities." It covers, *inter alia*, the "physics and engineering of safety; its social, policy and organizational aspects; the management of risks; the effectiveness of control techniques for safety; standardization, legislation, inspection, insurance, (and) costing aspects" (Elsevier Science, 2001).

Kjellén et al. (1997) studied the economic effects of implementing a precursor to the ISM Code known as internal control (IC). In force in Norway since 1992, IC is a key regulatory strategy designed to ensure that companies comply with the country's safety, health and environment (SHE) legislation. It operates within Norwegian industry in very much the same way as the ISM Code does in international shipping. Kjellén et al. compared retroactive data covering ten years at an aluminum plant and calculated how much of the expenses incurred in implementing IC was offset by benefits in Q-SHE (quality, safety, health, environment). The study also determined IC's effect on Q-SHE related losses. The reported LTI-rate (number of lost-time injuries per 1 million hours of work) was used as the

central criterion for measuring the safety program's Q-SHE effects. Kjellén et al. found that a significant reduction in the plant's operational (variable) expenditures was accomplished in parallel with significant improvements in Q-SHE related results.

Mitchison and Papadakis (1999) conducted a study on safety management systems under the European Union's Seveso II Directive (96/82/EC) which is the Union's equivalent of the ISM Code for certain establishments holding hazardous substances. Like ISM, the central feature of Seveso II is the implementation of a safety management system or SMS. Mitchison's and Papadakis' conclusions and guidance on SMS assessments are relevant to this study in that they conclude that the SMS under Seveso II is no different from those in other industries. Most SMS guidance are, as a rule, very general in nature and give emphasis to flexibility in structure and details. Mitchison and Papadakis (1999) warn against the adoption of an industry-wide safety performance rating system on the grounds that "the results will not in general be comparable across different establishments, and because the desire to perform well in the rating may prevail over the real objective, which is to improve overall safety... We remain sceptical as to the usefulness of rating systems based on simple and uniform formulae."

There are a number of safety science studies that adopted a particular safety criterion in order to identify a sampling of industrial plants that could be investigated for attributes that result in greater occupational safety. Cohen at al. (1975) was a questionnaire study "in which safety program practices of matched pairs of low and high accident rate plants were compared to determine factors that might account for the difference in safety performance." Smith et al. (1977), a companion study to the above, conducted on-site surveys "of a sample of 7 pairs of the questionnaire respondents in order to expand on the results of Cohen et al.." The findings confirmed the results of the questionnaire study and identified additional factors "in safety program practices that could account for plant safety performance." Simonds and Shafai-Sahrai (1977) used work injury frequency rates as their criterion for studying eleven pairs of industrial firms and identified ten positive factors that could be related to higher safety levels.

In his study, Hurst (1997) shows that findings from research activity could form the basis for developing practical tools to assess safety management and safety attitudes. In particular, Hurst describes how research work commissioned by the Health and Safety Laboratory (UK) were crucial to the development of STATAS (Structured Audit Technique for the Assessment of Safety Management Systems) and PRIMA (Process Risk Management Audit), analytical tools that have been employed for the assessment of management arrangements, risk control systems, safety management performance, safety attitudes, and safety culture.

6. Performance criteria for the ISM Code

After a broad sweep of some of the relevant literature, this study will now consolidate the information reviewed within the context of the ISM Code and translate them into criteria for assessing the Code's performance. Before moving on, it might be relevant to review Mitchison's and Papadakis' skepticism as to the usefulness of industry-wide safety performance rating systems. Mitchison and Papadakis actually qualified this viewpoint by conceding that such a rating system may be useful in evaluating changes. This was borne out by the industry-wide studies of Cohen et al., Smith et al., and Simonds and Shafai-Sahrai. This present study does not intend to propose performance criteria for an industry ratings system or to identify specified objectives for the ISM certification process. Rather, the criteria to be proposed in this paper are intended to be applied in evaluating the performance of the ISM Code as a regulatory framework. The rate of change in accident frequency in a given year relative to previous years, to take an example, could be one such indicator. In addition, while the Mitchison and Papadakis study is mathematical and theoretical, the authors themselves argue that a purely quantitative approach is inappropriate in evaluating an SMS. A qualitative system such as the SMS must also be evaluated qualitatively.

6.1 Effectiveness

One of the questions posed in the introduction to this paper was "How is 'effectiveness' defined?" Baldwin and Cave (1999) define effective regulation as one that addresses "the issue of whether desired results are actually achieved (irrespective of costs)." They contrast this with "efficiency" which takes into consideration the ratio of benefit to the cost to government of implementation and enforcement of regulations.

Viscusi (1979), on the other hand, draws a link between effectiveness and cost, not to government but to the industry being regulated. After comprehensive econometric calculations, he concludes in his study that the "conceptual analysis indicated that the effectiveness of job hazard regulations hinges critically on the economic incentives created." Adapted to the ISM Code, effectiveness could depend on the willingness of ship owners to run the risk of expensive delays due to ISM-related detentions or other activities.

According to Sagen, the effectiveness of the ISM Code does not hinge upon the compliance by shipping companies with mandatory instruments (a key objective of the Code) because this is already taken for granted through the issuance of statutory certificates. Instead, the true measure of the ISM Code's success is how effective enforcement is by administrations (Sagen, 1999).

The common thread between these three definitions is that effectiveness is measured by the positive results resulting from the enforcement of the regulatory regime. For purposes of this study, effectiveness is given the meaning from Baldwin and Cave, i.e., the state of the achievement of the desired results. To ask whether the ISM Code is effective is to ask whether it actually achieves the desired results it was designed to achieve, i.e., safer ships and cleaner seas. This leads us to the next question: "How can the Code's 'effectiveness' be measured?"

6.2 Dichotomy

To facilitate identification of performance criteria within a combined qualitative-quantitative framework, it would be useful to adopt the policy analysis concept of output and outcome. In the field of policy analysis, outputs are alternatively referred to as "policies" while outcomes may also be referred to as "goals." The dichotomy between output and outcome is a device employed in policy analysis that enables the researcher "to find out if policy intentions turn into reality, and when policies are successes or failures. The procedure allows the researcher to ask some pertinent questions about the effectiveness of the policy process" (John, 1998). Weimer and Vining (1999) offer this succinct distinction between the two concepts: "goals are the values we seek to promote and policies are the alternatives and strategies for promoting them." Examples of outputs/policies in the context of the ISM Code are the regime of port State control inspections and the system of SMC (safety management certificate) and DOC (document of compliance) certification. Examples of outcomes/goals are the promotion of ship safety, protection of the marine environment, and the development of a safety culture in shipping.

The designation of an item as either output or outcome is not necessarily set in stone in every case. Goals, perhaps reworded, occasionally become policies at another level as new goals are set. In other words, the divisions are not necessarily always clear-cut. Weimer and Vining (1999) advise that one should "start by formulating goals as abstractly as possible and policy alternatives as concretely as possible." The dichotomy also reminds researchers of the complementary nature of the quantitative (concrete policy alternatives) and qualitative (abstract and normative goals) methodologies.

6.3 Proposed criteria

The following objectives that were identified in the review of IMO documents will be used to form the basis for developing criteria for evaluating the ISM Code's performance:

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

The task now is to identify performance criteria under the headings "output" and "outcome" as defined above.

6.3.1 Output

If output can be defined as the set of alternatives and strategies for promoting the safety values we seek to promote, then the performance criteria to be proposed under this heading will relate to activities that ensure that the ISM Code is in place as a safety regulatory framework. Following are the proposed criteria:

- *Port State control detentions related to ISM deficiencies or non-conformities.* The Secretary-General of IMO has directed the collection of "information on, for example, any significant drop, or otherwise, in the number of detention of ISM-certificated ships together with any information or action taken by port State control authorities in respect of ISM Code deficiencies" (IMO, 2001).
- *ISM-related spot inspections requiring demonstration.* Under the ISM Code, the maritime administration is expected to carry out controls to ensure that the SMS is functioning. An inspection that involves requiring ship's crew to demonstrate competence is normally a sign that there is reason to believe that the SMS might not be functioning properly. A high number of spot inspections could be linked to a lower level of safety.
- *Re-inspections related to ISM deficiencies or non-conformities.* A high number of re-inspections reflects on the number of inspections that led to deficiencies being noted for rectification. The data could be compared over time to see if there is a down- or upward trend, particularly involving major non-conformities.
- *Reporting of ISM deficiencies and non-compliance by shipboard staff.* The main criterion employed in the on-going study by Anderson. The willingness and actual use of this important mechanism gives an indication that the Code is functioning as it should.
- *Annual review and interim surveys results.* Non-compliance and deficiencies detected by auditors during annual reviews and interim surveys, particularly those categorized under major non-compliance, could be compared over time.

The above indicators or criteria could be observed by comparing a series of data over time to not only to gather absolute values but also to detect the rate of change, a technique used regularly in safety science. Quantitative criteria are highly desirable "because they facilitate more precise ex ante comparisons of effects" (Weimer and Vining, 1999), yet they need to be tempered by normative analysis.

6.3.2 Outcome

If goal/outcome can be defined as the set of safety values we seek to promote, then the performance criteria to be proposed under this heading will relate to measures that indicate whether the ISM Code is producing its intended results. Following are some proposed criteria:

- *Accident rate* and *injury frequency*. Cohen, et al. (1975) employed accident rate as the criterion in their study while Simonds & Shafai-Sahrai (1977) considered injury frequency. An effective ISM Code should result in a downward trend in accident rates and injury frequency not only in terms of personal injuries to seafarers but of vessels involved in marine casualties. It is worthy to note that accident and injury rates are commonly employed in safety science but does not seem to have been used in an evaluation of the ISM Code.
- *Mortality rate*. Nielsen (2000) estimates that 2,595 seafarers die every year while serving at sea. Observing the number of accidental deaths at sea over a period of time will give an indication of the Code's impact.
- *Safety culture*. A number of studies provide methodologies and criteria for assessing safety culture in the maritime sector. Ek and Akselsson (1999) evaluated the safety culture on board a passenger vessel in the Baltic Sea. Hahne et al. (2000) surveyed the attitudes and perceptions of shipping personnel. Stenmark (2000) aimed at "finding a workable definition of safety culture within a framework of organizational psychology." Sagen (1999) discusses the four columns of safety culture in the maritime field.
- *Lost-time injuries (LTI)*. Defined in safety science as "injury at work leading to unfitness for work and absence beyond the day of the accident," LTIs could be costly to shipping companies particularly in cases where the injured seafarer has to be flown out and replacement crew have to be flown in.
- *Vessel off-hire/delay*. Shipping companies incur losses for every day that a vessel is not engaged in loading, unloading, and transporting cargo. Delays could be caused by, *inter alia*, port State control detentions, accidents, accident investigations, vessel casualties, and vessel emergency repairs.
- *Crew repatriated or sent ashore for retraining*. An effective ISM Code should result in a decline in the number of crew sent ashore for retraining or repatriated for carrying invalid professional documents or for other ISM Code non-conformities.
- *Insurance premiums and claims level*. The Swedish Club study showed a link between the ISM Code and the number of insurance claims while Häkkinen (1995) confirms the link between safety levels and insurance premiums.
- *Active commitment of management to safety*. Kjellén et al. (1997), Cohen et al. (1975), and Smith et al. (1978) showed the positive link between greater safety and a management team that is actively involved in safety issues.

The two lists above do not claim to be complete and comprehensive sets of criteria for evaluating the ISM Code's effectiveness. The principal aim of this study is to show one way of learning lessons from other industries and disciplines that have had decades of experience in the assessment of regulatory frameworks and safety management systems.

While the ISM Code requires that shipping companies develop an SMS with a built-in self-perfecting mechanism, the Code itself is not equipped with the same type of mechanism. This is where research could be useful in identifying some criteria and overall industry goals that could give an indication of the state of the ISM Code, and provide a more scientific basis for drafting amendments. It might be difficult to attach minimum, maximum, or ideal values (whether numerical or normative) to the performance criteria until an initial study is conducted. However, scientific research into the ISM Code's performance could eventually lead to the development of practical assessment systems similar to those available to safety management in other industries.

7. Conclusion

During the February, 2001 session of the IMO Sub-Committee on Flag State Implementation, the Secretary-General of IMO made the following admonition: "We should not allow (the ISM Code) to become merely a paper exercise." This is in reaction to fears expressed by some sectors of the maritime industry that the physical trappings of a safety management system we now see in vessels and shipping companies are testimony to nothing more than just another cumbersome international maritime documentary exercise. This is why a studied basis should be made for giving any verdict on the Code's performance. If studies indicate that the Code is indeed achieving its intended results, then the fear is baseless. If studies indicate that the Code does not seem to make a significant dent in the accident statistics, then the research could also give clues as to how the situation may be improved. Mitchison and Papadakis (1999) emphasize that while safety performance measurement is useful in describing the present state of a safety management system, it is even more useful as a basis for improving the system's performance, i.e., by identifying weaknesses and targeting necessary interventions.

On the one hand, the non-prescriptive nature of that Code ensures that each SMS is tailor-fitted to the particular shipping company. On the other, it presents a challenge for assessment and evaluation. The dilemma facing the analyst is how to gather measurable and quantifiable data without intentionally causing the transference of prescriptive values to any ISM Code amendment exercise. This is the reason this paper advocates a mixed approach to evaluation. After reviewing ISM Code research, IMO documents, policy analysis literature, and safety science research, this study has proposed that a combined quantitative-qualitative approach of research be conducted. The paper has also offered the following criteria, under two broad headings, for evaluating the ISM Code's performance:

OUTPUT

- Port State control detentions related to ISM deficiencies or non-conformities
- ISM-related spot inspections requiring demonstration
- Re-inspections related to ISM deficiencies or non-conformities
- Reporting of ISM deficiencies and non-compliance by shipboard staff
- Annual review and interim surveys results

OUTCOME

- Accident rate and injury frequency
- Mortality rate
- Safety culture
- Lost-time injuries (LTI)
- Vessel off-hire/delay
- Crew repatriated or sent ashore for retraining
- Insurance premiums and claims level
- Active commitment of management to safety

Criteria could be added and deleted from these lists and a combination of any number of them could be applied in different studies. The above criteria are naturally subject to debate and are best assessed, justified, or rejected by the results coming out of any study that would apply them. In proposing these criteria it was shown that there is much that the field of maritime studies could learn from the experience in policy analysis and safety management in other industries.

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