Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

From formal compliance to a safety culture: risk management, internal audit, and the effectiveness of the ISM Code in maritime operations.

From formal compliance to safety culture: risk management, internal auditing and ism code effectiveness in maritime operations

From formal compliance to safety culture: risk management, internal auditing and the effectiveness of the ISM code in maritime operations

Eduardo Brandão Torment

Naval and Ocean Engineer from the Federal University of Rio de Janeiro (UFRJ), with an MBA in Project Management and an MBA in Finance from IBMEC.

SUMMARY

The International Safety Management Code established an international framework for the safe management of ships and the prevention of pollution, but its effectiveness depends on how the management system is incorporated into operational decisions. This article analyzes the relationship between the ISM Code, risk management, internal audit, and safety culture. The research is qualitative and bibliographic-documentary, based on official documents of the International Maritime Organization and academic studies on Safety Management Systems. The analysis distinguishes between documentary compliance and operational effectiveness and examines the role of hazard identification, risk assessment, non-conformity reporting, root cause investigation, corrective actions, competence, and management review. It is argued that internal audits are most useful when they verify the system's ability to control real risks, and not just the existence of procedures. A conceptual matrix is proposed that relates documentary evidence, observed practice, operational results, and organizational learning. It is concluded that the maturity of a Safety Management System depends on the integration of leadership, employee participation, audit quality, and continuous improvement.
Keywords: ISM Code; maritime safety; Safety Management System; internal audit; risk management; safety culture.

ABSTRACT

The International Safety Management Code established an international framework for safe ship management and pollution prevention, but its effectiveness depends on how the management system is embedded in operational decisions. This article examines the relationship between the ISM Code, risk management, internal auditing and safety culture. The study adopts a qualitative bibliographic and documentary approach based on official International Maritime Organization documents and academic research on Safety Management Systems. It distinguishes documentary compliance from operational effectiveness and discusses hazard identification, risk assessment, non-conformity reporting, causal investigation, corrective action, competence and management review. The article argues that internal operational audits are more useful when they test whether the system controls real risks rather than merely confirming the existence of procedures. A conceptual matrix linking documentary evidence, observed practice, operational outcomes and organizational learning is proposed. The study concludes that Safety Management System maturity depends on the integration of leadership, workforce participation, audit quality and continuous improvement.
Keywords: ISM Code; maritime safety; Safety Management System; internal audit; risk management; safety culture.

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.

Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

INTRODUCTION

The ISM Code was designed to establish an international standard for the safe management and operation of ships, in addition to pollution prevention. The IMO highlights that the code is based on principles and General objectives, because companies and vessels operate under different conditions, and this requires evaluation. of the identified risks to ships, personnel and the environment, with the establishment of safeguards. appropriate (IMO, 1993; IMO, 2017).

Adopted in 1993 by Resolution A.741(18), the ISM Code became mandatory on July 1st. In 1998, through Chapter IX of SOLAS, subsequent IMO guidelines reinforced its implementation. of the code and its relationship with safety culture, maintaining it as a central reference for Safety Management Systems in maritime transport (IMO, 2017).

The existence of a documented system, however, does not guarantee that risks are effectively contained. Controlled. Procedures may be formally up-to-date and still be poorly controlled. understood, circumvented under operational pressure, or disconnected from actual onboard conditions.

This problem shifts the discussion from compliance to effectiveness. An audit that verifies Only documents can tell if the system is formally structured. An audit guided by Risk management seeks to determine if critical controls are functioning, if deviations are being reported, and if causes are being identified. investigated and whether the organization learns.

The objective of this article is to analyze how internal auditing, risk management, and safety culture... They can strengthen the implementation of the ISM Code. The focus is on the capabilities of Safety Management. A system designed to produce safe behavior and continuous improvement, without reducing code to a list of... verification.

2 METHODOLOGY

The research adopts a qualitative, exploratory, and bibliographic-documentary approach. The main source Normative documentation refers to the official documentation of the International Maritime Organization concerning the ISM Code and other related matters. safety management and safety culture.

Academic literature includes studies on the effectiveness of the ISM Code and recent revisions of Maritime Law. Safety Management Systems. Bhattacharya (2012) is used to discuss maritime participation. and organizational relations; Junaidi, Yudo, and Ab-Samat (2024) provide a review of trends in Research conducted between 2012 and 2022.

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.

Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

Recent works that discuss safety culture in various sectors are also considered.
specific maritime. This evidence is used within its context and is not
generalized automatically across the entire industry.
The analysis was organized into six dimensions: leadership, hazard identification, controls.
operational, competence, auditing, and learning. For each dimension, a distinction is made regarding existence.
Documentary evidence of implementation.
The conceptual matrix proposed at the end is not intended to measure maturity by scoring nor to replace...
Regulatory audits. Their function is to organize questions that allow for the evaluation of whether the system...
It works beyond just paper.

3. What the ISM Code aims to manage

The official purpose of the ISM Code is to provide an international standard for the safe management and operation of ships and pollution prevention. The IMO emphasizes that safety management depends on
Commitment, competence, attitudes, and motivation of people at all levels.
This formulation is important because the code is not limited to equipment. It deals with organization.
Responsibilities, communication, procedures, emergency preparedness, accident reporting.
Nonconformities, maintenance, documentation, audits, and management review form a system.
The principles-based approach allows for application to different organizations, but it also creates
Challenge: Generic procedures can formally satisfy a framework without reflecting risks.
specific to the operation. The company needs to translate broad objectives into controls that are appropriate to...
ship and the mission.

The IMO notes that serious accidents in the late 1980s revealed not only human error,
but management failures. The evolution that led to the ISM Code responds precisely to the need for
Integrate management on land and on board.
Therefore, SMS should be understood as an organizational control mechanism. Its performance
It depends on how management decisions influence actual work, resources, priorities, and response to...
deviations.

Figure 1. Selected milestones in the normative evolution of the ISM Code. Source: author's elaboration.
based on the International Maritime Organization (IMO).

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.

Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

4. DOCUMENTARY COMPLIANCE AND OPERATIONAL EFFECTIVENESS

Document compliance is necessary. Procedures need to exist, responsibilities must be defined.
The rules must be defined and records must allow for traceability. The problem arises when the existence
The document is then treated as sufficient evidence for control purposes.
A safe work procedure may be approved and still be impractical in the setting.
The actual condition of the vessel. A checklist can be filled out routinely without stimulating reflection. A
Non-conformity can be closed administratively without eliminating the cause that produced it.
Bhattacharya (2012), in qualitative research on the effectiveness of the ISM Code, found a
There is a significant difference between the understanding of managers and that of seafarers regarding the use of the code.
Study links limited seafarers' participation in health and safety management to conditions
employment issues and low-trust relationships with managers indicate that organizational factors
They can widen the gap between the system's purpose and its practical application.
Review published by Junaidi, Yudo and Ab-Samat (2024), based on articles indexed in Scopus.
Between 2012 and 2022, the effectiveness of Safety Management was identified as a research trend.
System, model development, and identification of sources of security problems. A
The continuation of this debate decades after the ISM became mandatory reinforces the difference between
Formal implementation and performance.
Internal auditing therefore needs to look for evidence of usage. It involves asking if a procedure exists.
This is different from observing how a task is prepared, executed, and interrupted when conditions...
They change.

5. Risk Management as the Core of the System

The IMO states that the ISM Code includes an assessment of all identified risks to ships and personnel.
and the environment and the establishment of appropriate safeguards. This guidance connects SMS to
a logic of identification, evaluation, control and review.
Identifying hazards requires close involvement in the operation. Changes in equipment, route, crew,
Workload or work method can create risks not captured by previous assessments. A system
Maduro treats risk assessment as a living process.
The quality of the assessment also depends on distinguishing between hazard, consequence, and control. Lists
Extensive descriptions of risks may convey an appearance of rigor without indicating which barriers are actually in place.
the event or reduce its severity.

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.

Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

Critical controls deserve special attention. If the failure of a barrier can produce consequences
Seriously, the organization needs to know how to verify its availability and effectiveness. Audits can
select higher-risk operations and track the entire chain between procedure, competence,
equipment, supervision and record keeping.

Change management is part of this reasoning. Technical or operational changes need to be
evaluated before becoming routine. The absence of an immediate incident does not prove that the change was
safe.

6. INTERNAL AUDIT: FROM CHECKLIST TO SYSTEM TESTING

Internal auditing is valuable when it produces reliable information for management. This requires...
sufficient independence, auditor competence, adequate sampling, and ability to compare
Documents with practical application.

A purely documentary approach tends to favor closed questions: is there a procedure,
There is a record, there is a signature. The risk-oriented approach adds questions of
Performance: the control is known, available, used, works under real conditions, and is
Revised when it fails?

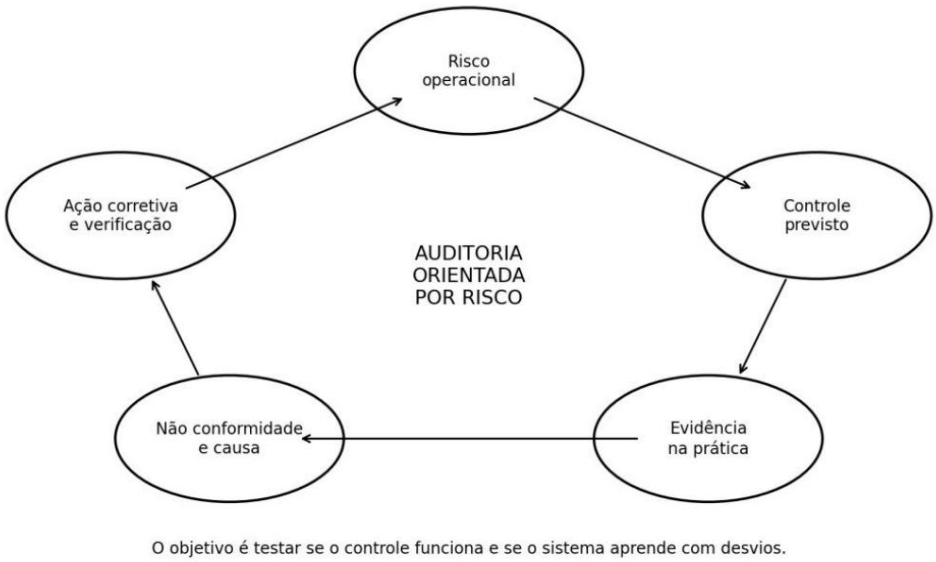

Figure 2. Conceptual cycle of risk-oriented internal audit. Source: author's elaboration with
based on the principles of the ISM Code and the literature on the effectiveness of Safety Management Systems.

Interviews, task observation, record tracking, and sampling of nonconformities.
They help to test consistency. Discrepancies between the procedure and the actual work should not be...
automatically interpreted as individual fault; may reveal inadequate procedure,
Insufficient resources or production pressure.

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.

Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

The auditor's competence is crucial. Knowledge of the ISM Code is necessary, but understanding it is essential.
Operations, technical interfaces, and human factors increase the ability to identify problems.
systemic.

The audit report also influences learning. Vague findings, such as 'improve
'training' hinders action. A good finding describes evidence, a requirement, or an expectation.
observed condition and associated risk, without extrapolating from what was verified.

7. NONCONFORMITY, CAUSE AND CORRECTIVE ACTION

Nonconformities are sources of information about the system. Close them quickly without
Understanding why they occurred can preserve the administrative indicator and manage risk.
The investigation into the cause needs to avoid circular answers. 'Human error' describes who made the mistake, but
It rarely explains why the error became possible or probable. Additional training may be
necessary, but does not replace procedure analysis, supervision, workload, interface,
maintenance or design.
An effective corrective action must address the identified cause and have a mechanism for subsequent verification.
Changing a document does not guarantee a change in behavior. It is necessary to confirm if...
The new control system was understood and is producing the expected effect.
Recurrence is a relevant indicator. When similar deviations appear in ships,
If different departments or audits involve different entities, the organization may be facing a systemic problem.
Aggregate analysis transforms isolated events into security intelligence.
This process brings organizational learning auditing closer to reality. The objective ceases to be...
Simply closing off findings reduces the likelihood of recurrence.

8. LEADERSHIP, PARTICIPATION AND SAFETY CULTURE

The IMO states that commitment from senior management is the cornerstone of good safety management.
This statement has practical consequences: priorities are communicated through goals, resources, and decisions.
Operational actions shape behavior more than formal statements.
Safety culture is not an additional document. It appears in how the organization reacts to...
Delays, error reporting, task interruption, and conflict between production and safety. If you report
Problems lead to indiscriminate punishment, and the system may lose essential information.

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.

Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

Bhattacharya's study (2012) highlights the importance of the participation of seafarers and
Trust. An SMS may require upward communication, but low-trust relationships reduce trust.
The willingness to report problems or question practices.
Recent studies continue to examine culture and implementation. The review by Junaidi, Yudo, and Ab-
Samat (2024) shows that SMS effectiveness remains a central theme in the literature. This suggests that
Maturity is not an automatic consequence of the length of time a rule has been in effect.
Mature leadership looks for weak signs, not just accidents. Near misses, operational deviations,
Barrier failures and audit observations can reveal deterioration before a serious event.

9. RISK-BASED COMPETENCE AND TRAINING

Training is often used in response to findings, but its effectiveness depends on...
diagnosis. If the problem is inadequate equipment or a procedure incompatible with the task,
Repeating training may not resolve the root cause.
Competence combines knowledge, skill, and the ability to apply both in real-world conditions.
For critical operations, verification must go beyond certificates and course attendance.
Simulations, exercises, supervised observation, and practical assessment can provide evidence.
closer to the execution. In emergencies, familiarity with the role and communication is so important.
Formal knowledge of the procedure is important.
Technological change also creates new needs. Digital systems, automation, and new
Energy architectures can introduce interfaces and hazards that require continuous updating.
Alternative fuels and energy storage are cited here as examples.
documented technological changes in the sector, and not as areas of professional experience.
specific to the author.
SMS (Safety Management System) therefore needs to connect the competency matrix to the real risks of the fleet. Training
Generic advertising has limited value when it doesn't keep pace with changes in operations.

10 Indicators and Management Review

Safety indicators can either help or distort the truth. The number of accidents is important, but low numbers are not.
Frequency does not prove the absence of risk. Rare events can coexist with degraded barriers.
Leading indicators, such as near miss reports, barrier tests, overdue maintenance,
The completion of corrective actions and the quality of exercises can reveal conditions prior to the accident.
However, poorly designed numerical targets can encourage underreporting.

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.

Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

Management review should interpret indicators as a whole. Increased reporting may indicate...
Deterioration, but it can also reflect greater confidence in the system. Context is essential.
Internal audits provide another source of trends. Repeated findings, delays in action, and
Discrepancies between ships may indicate governance problems that do not appear in statistics.
of accidents.

The maturity of the system lies in its ability to transform this data into decisions. Measuring without acting.
It creates bureaucracy; acting without measuring reduces the ability to verify effectiveness.

11 CONCEPTUAL MATRIX OF SMS EFFECTIVENESS

Based on the analysis, a conceptual matrix with four levels of evidence is proposed. The first is
Documentary: policies, procedures, and records exist and are controlled. The second is
Behavioral: people understand and apply the controls. The third is operational: barriers.
They function and deviations are detected. The fourth stage is for learning: findings, incidents, and changes.
They change the system.

The matrix does not assign scores nor is it intended to certify conformity. Its function is to prevent a
The only category of evidence should be treated as sufficient proof of effectiveness.
A procedure may meet the documentation requirements but fail at the behavioral level. A crew
You may know the procedure, but operating with degraded equipment compromises the level.
Operational. An organization can correct individual events without learning systemically.
Internal audits can use this logic to select samples. For each critical control, the
The auditor looks for evidence at all four levels and identifies where there is a breach.
The advantage of this approach is connecting governance and the board. Effectiveness ceases to be...
the sole responsibility of the crew, and now includes system design, resources, leadership and
revision.

12 DISCUSSION

The ISM Code created a common security management language, but its effective application depends
organizational processes that cannot be evaluated solely by the presence of documents.
The literature reviewed reinforces the relevance of participation, trust, and effectiveness of SMS and
learning capacity. These elements help explain why formally structured systems
Similarities can produce distinct behaviors.

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.

Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

Internal auditing occupies a strategic position because it observes the interface between the prescribed system and the...

The system in practice, when limited to a checklist, can reproduce the same formality that should be followed.
test.

A risk-driven audit does not abandon requirements. It uses the requirements as a starting point.

The process involves starting the study and seeking evidence that the associated controls produce the expected effect.

It is also necessary to avoid overconfidence in indicators of the absence of accidents. Safety

It involves low-frequency, high-consequence events, making it important to observe barriers.
deviations and antecedent signs.

The main managerial implication is that a mature SMS (Safety Management System) combines compliance, competence,

Participation and learning. Neither of these dimensions alone is sufficient.

CONCLUSION

The ISM Code remains one of the central frameworks for international maritime safety management.

Its purpose goes beyond the production of documentation and extends to the safe management of ships and...
pollution prevention.

The normative history of the code shows its consolidation since its adoption in 1993 and its mandatory nature.
from 1998 onwards. The continued research on effectiveness demonstrates, however, that

Implementation is an ongoing process.

Documentary compliance is a necessary but not sufficient condition. Procedures need to be
understood, applicable, and capable of controlling real risks.

Risk management provides the link between general requirements and the specific conditions of each operation.

Evaluations need to keep pace with technical, human, and organizational changes.

Internal auditing can be a learning tool when it compares documents with practice.

Select relevant risks and describe evidence accurately.

Nonconformities should be treated as information. The quality of the root cause analysis and the

Effectiveness verification determines whether the system learns or simply closes records.

Leadership influences priorities and trust. People's willingness to report problems.

It depends on how the organization reacts to errors, delays, and conflicts between safety and production.

Competence needs to be demonstrated in practice, especially in critical tasks and environments.
technological change.

Indicators should combine results and leading signs. The absence of accidents should not be...
interpreted in isolation as evidence of control.

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.

Machine Translated by Google

Year VII, v.2 2026 | Submission: 03/10/2026 | Accepted: 03/14/2026 | Publication: 03/17/2026

The proposed conceptual framework integrates documentary, behavioral, operational, and other evidence.
Learning. It does not replace regulatory auditing, but it facilitates a more in-depth assessment.
of effectiveness.

For maritime organizations, the main analytical recommendation is to shift the question from 'do we have the
'procedure?' should be changed to 'what evidence demonstrates that this control works?'.
Future research could empirically test relationships between audit quality and audit culture.
Reporting, recurrence of non-conformities, and safety performance in different segments of
fleet.

It is concluded that the maturity of the Safety Management System is achieved when the ISM Code ceases to be a priority.
It goes from functioning merely as a documentary obligation to structuring decisions, behavior, and
organizational learning.

REFERENCES

BHATTACHARYA, Syamantak. The effectiveness of the ISM Code: a qualitative inquiry. Marine Policy, vol. 36, no. 2, p. 528-535, 2012. DOI: 10.1016/j.marpol.2011.09.004.

INTERNATIONAL MARITIME ORGANIZATION (IMO). Resolution A.741(18): International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management (ISM) Code). London: IMO, 1993.

INTERNATIONAL MARITIME ORGANIZATION (IMO). Resolution A.1118(30): Revised Guidelines on the Implementation of the International Safety Management (ISM) Code by Administrations. London: IMO, 2017.

JUNAIDI, Arif; YUDO, Hartono; AB-SAMAT, Hasnida. Identify the Trends on Maritime Safety Management System Studies: A Review. TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation, vol. 18, no. 4, p. 775-784, 2024. DOI: 10.12716/1001.18.04.03.

ZHANG, Pengfei; CHEN, Qiong; MACDONALD, Tobias; Wang, Xinjian. A critical examination of safety culture in the superyacht industry. The Journal of Navigation, vol. 77, no. 1, p. 100-115, 2024. DOI: 10.1017/S0373463324000195.

This is an open access article published under the Creative Commons Attribution license, which allows its use.
Distribution and reproduction in any medium, without restrictions, provided the original work is properly cited.