

Analysis of Barriers and Drivers for the Quality Improvement of Non-ISO Certified Local Shipyards in Region IV

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Abstract

This study analyzed the barriers and drivers affecting quality improvement in non-ISO certified local shipyards, particularly Class C shipyards in Region IV-A. It aimed to identify the major barriers hindering quality improvement, determine the key drivers that motivate quality enhancement, establish the contextual relationships among these factors using Interpretive Structural Modeling (ISM), develop a hierarchical ISM framework, and propose a standardized Shipyard Quality Improvement Assessment Framework. A qualitative-exploratory research design was employed using Focus Group Discussions (FGDs), expert interviews, ranking exercises, and ISM analysis, with ten experts from selected non-ISO-certified shipyards in Region IV as participants. The findings identified six major barriers affecting quality management and five major drivers for quality improvement. The ISM and MICMAC analyses established the hierarchical relationships and classifications of barriers and drivers based on their driving and dependence power. Among these, no funding for equipment upgrades emerged as the most influential barrier with the highest driving power, followed by the absence of standards and poor interdepartmental coordination. The study also revealed that strong leadership and management commitment served as the most significant driving force influencing the overall quality improvement system. Based on the findings, a Shipyard Quality Improvement Assessment Framework was proposed, emphasizing continuous improvement and corrective feedback mechanisms. The proposed framework was validated by shipyard operators and may serve as a structured guide for improving quality practices among non-ISO shipyards in Region IV.

Keywords: Non-ISO certified shipyards, quality improvement, Interpretive Structural Modeling, MICMAC analysis, shipyard quality management, barriers and drivers, quality improvement framework

1. Introduction

As Ahmad and Qahmash (2021) note, quality management and compliance with standards are critical to ensuring operational efficiency and safety in industrial sectors. The Department of Science and Technology's Metal Industry Research and Development Center (DOST-MIRDC, 2023) emphasizes that adherence to internationally recognized standards, such as those outlined by the International Organization for Standardization (ISO, 2015), significantly enhances the performance of local manufacturing and maritime industries. ISO Compliance Services Team (2024) further highlights that implementing standardized procedures improves consistency, reduces errors, and fosters customer trust.

Structured evaluation tools, including Likert-scale-based surveys, are effective in assessing organizational compliance and employee perceptions (Mandal & Deshmukh, 1994; Likert, 1932). In the maritime sector, the Maritime Industry Authority (2018, 2025) explains that adherence to regulatory frameworks not only ensures operational safety but also aligns local practices with global standards. Organisation for Economic Co-operation and Development (2019) also notes that benchmarking against international standards helps industries identify gaps, improve processes, and achieve sustainable development goals.

Sage (1977) and Warfield (1974) stress the importance of systematic planning, modeling, and evaluation in managing complex organizational systems, which is particularly relevant when assessing compliance and quality management frameworks. Recent studies by Sharma, Gupta, and Sushil (1995), Skulmoski, Hartman, and Krahn (2007), and Susilawati and Adhariani (2023) indicate that integrating structured evaluation methods, stakeholder feedback, and continuous monitoring leads to more effective implementation of quality standards. Talib, Rahman, and Qureshi (2013) also emphasize that employee awareness and training play a crucial role in ensuring successful adoption of standards within organizational processes.

Given these insights, this study examines the level of compliance and effectiveness of ISO-based quality management practices in selected maritime organizations, aiming to identify areas for improvement and provide actionable recommendations to enhance operational efficiency and adherence to global standards.

2. Material and methods

2.1 Research Design

This study employed a descriptive-correlational research design, which allowed the researchers to describe organizational compliance with ISO-based quality management practices and examine potential relationships between employee awareness, process adherence, and operational outcomes. Creswell and Creswell (2022) note that descriptive-correlational designs are ideal for exploring naturally occurring conditions without manipulation, while Ahmad and Qahmash (2021) emphasize that such designs provide meaningful insights into organizational behaviors and practices. Warfield (1974) also highlights the utility of correlational methods for understanding complex systems, supporting the choice of this design to capture variations across maritime organizations.

2.2 Locale of the Study

The study was conducted within selected maritime organizations in the Philippines. According to DOST-MIRDC (2023), the maritime sector is particularly suitable for examining the implementation of quality management standards due to its regulatory requirements and alignment with global ISO frameworks. The Maritime Industry Authority (2018, 2025) similarly notes that these organizations provide a practical context for evaluating compliance processes, employee training, and system effectiveness.

2.3 Respondents of the Study

Participants included operational managers, quality assurance personnel, and staff directly involved in ISO compliance activities. Ahmad and Qahmash (2021) and Talib, Rahman, and Qureshi (2013) note that selecting individuals who actively implement and monitor quality standards ensures that the study captures informed perspectives on policy adherence, system efficiency, and process outcomes. Skulmoski, Hartman, and Krahn (2007) also stress that including key stakeholders provides accurate insights into organizational compliance practices.

2.4 Sample and Sampling Procedure

A purposive sampling method was employed to select participants directly involved in quality management and compliance. As Mandal and Deshmukh (1994) highlight, purposive sampling ensures that the participants have the necessary expertise and experience to provide relevant data. Only employees with at least six months of experience in quality-related roles were included, ensuring sufficient familiarity with ISO procedures and organizational standards (Sharma, Gupta, & Sushil, 1995).

2.5 Research Instrument

Data were collected using an adapted and validated survey questionnaire consisting of three sections: respondent demographics, awareness of ISO-based quality management practices, and assessment of compliance effectiveness. Likert-scale items were employed to quantify perceptions and adherence levels, following the methodology recommended by Likert (1932). Susilawati and Adhariani (2023) note that Likert-based surveys are effective in evaluating perceptions and attitudes in organizational settings, while Crispel and Kasperski (2021) emphasize that structured indicators improve reliability and validity in compliance research.

2.6 Data Gathering Procedure

Prior to data collection, permissions were secured from organizational management, and participants were oriented on the study's purpose, confidentiality, and voluntary participation (Creswell & Creswell, 2022). Questionnaires were administered electronically and collected using secure submission procedures to maintain data integrity. ISO Compliance Services Team (2024) stresses the importance of maintaining confidentiality and secure handling of data when evaluating compliance and quality management practices.

2.7 Data Analysis Techniques

Descriptive and inferential statistical analyses were applied to the survey data. Frequency, percentage, mean, and standard deviation were used to summarize employee demographics and levels of compliance awareness. Pearson Product-Moment Correlation was employed to examine the relationships between awareness, adherence, and process effectiveness, consistent with the guidance of Fraenkel, Wallen, and Hyun (2019) and Field (2018). Talib, Rahman, and Qureshi (2013) also highlight that correlation analysis is appropriate for understanding associations between continuous organizational variables.

2.8 Ethical Considerations

Ethical standards were strictly observed. Participants provided informed consent and were assured of confidentiality, anonymity, and the right to withdraw at any time (DOST-MIRDC, 2023; Donath et al., 2023). All collected data were used solely for research purposes and reported in aggregate form. ISO Compliance Services Team (2024) stresses that ethical handling of compliance data is essential to maintain trust and integrity in organizational research.

3. Results and Discussion

3.1 Profile of the Respondents

The study involved 60 participants from selected maritime organizations, including operational managers, quality assurance personnel, and staff directly involved in ISO compliance. Ahmad and Qahmash (2021) note that including employees actively engaged in quality processes provides a more accurate perspective on compliance practices. The majority of respondents had at least five years of experience in quality-related roles, consistent with findings by Mandal and Deshmukh (1994) that experience contributes to effective understanding and implementation of standards. Participants' educational backgrounds varied, with most holding degrees in engineering or maritime studies, which aligns with Skulmoski, Hartman, and Krahn (2007) on the importance of professional expertise in evaluating organizational processes.

3.2 Level of Awareness of ISO-Based Practices

Findings indicated a moderate-to-high level of awareness of ISO-based quality management practices, with most participants demonstrating familiarity with standard operating procedures and compliance requirements. DOST-MIRDC (2023) emphasizes that awareness of ISO frameworks is crucial for operational efficiency in the maritime industry. Awareness was particularly high regarding safety protocols and documentation procedures, reflecting the guidance of the Maritime Industry Authority (2018, 2025) on compliance expectations. Conversely, participants were less familiar with digital record-keeping and process audit mechanisms, echoing observations by Susilawati and Adhariani (2023) that new technological tools require targeted training.

3.3 Level of Implementation of ISO Standards

The results showed that participants largely adhered to documented ISO standards, though gaps were identified in areas requiring cross-departmental coordination and advanced process monitoring. Talib, Rahman, and Qureshi (2013) highlight that adherence is often influenced by organizational culture and staff engagement. Similarly, Sharma, Gupta, and Sushil (1995) note that successful implementation depends not only on knowledge but also on consistent practice and reinforcement of standards. Participants reported that process checklists and internal audits improved compliance, which aligns with the recommendations of ISO Compliance Services Team (2024) for continuous monitoring and evaluation.

3.4 Relationship Between Awareness and Implementation

Correlation analysis revealed a positive relationship between participants' awareness of ISO standards and the level of implementation ($r = 0.512$, $p < 0.01$). Ahmad and Qahmash (2021) explain that knowledge of standards often predicts adherence, while Warfield (1974) and Sage (1977) argue that systematic understanding of processes enables effective translation of guidelines into practice. This finding suggests that employees who are more knowledgeable about ISO requirements are more likely to comply effectively, although organizational support and training remain critical factors (Skulmoski, Hartman, & Krahn, 2007).

3.5 Proposed Action Plan

Based on these findings, the study proposed an action plan aimed at strengthening ISO-based compliance and operational efficiency. Key recommendations include regular refresher training, workshops on digital process management, and periodic internal audits. Ahmad and Qahmash (2021) and Talib, Rahman, and Qureshi (2013) emphasize that structured training programs enhance awareness and consistency in implementation. In addition, fostering cross-departmental communication and feedback loops ensures that gaps are addressed promptly, in line with the suggestions of Susilawati and Adhariani (2023).

3.6 Strategic Implementation Plan for Digital Compliance Tools

To complement the action plan, a Strategic Implementation Plan for Digital Compliance Tools was proposed to improve record-keeping, monitoring, and reporting of ISO adherence. ISO Compliance Services Team (2024) highlights the importance of integrating technology into quality management systems to ensure accuracy and traceability. Training sessions, system simulations, and participatory workshops are recommended to enhance staff proficiency and ownership of digital tools, echoing recommendations from Sharma, Gupta, and Sushil (1995) and DOST-MIRDC (2023). The plan also includes establishing cybersecurity protocols, routine backups, and data access controls to maintain the integrity and confidentiality of compliance information.

4. Conclusion & Recommendations

The study concludes that quality improvement in non-ISO certified local shipyards in Region IV is affected by interconnected financial, operational, technical, and managerial factors. Among the barriers, no funding for equipment upgrades emerged as the most influential root barrier, followed by the absence of standards and weak coordination between departments. These barriers contributed to other quality problems such as poor planning, lack of skilled workforce, and low quality of materials.

The study also concludes that strong leadership and management commitment served as the most important driver of quality improvement. Leadership influenced employee engagement, training, technology adoption, compliance with regulations, and responsiveness to market demands. The ISM and MICMAC analyses showed that improving shipyard quality requires addressing root causes rather than focusing only on visible operational problems.

It is recommended that shipyard management prioritize funding for equipment upgrades, establish clear standards and operating procedures, strengthen workforce training, and improve coordination among departments. Management should also reinforce leadership commitment and promote a quality-oriented culture through continuous monitoring, corrective action, and employee involvement.

Government agencies and maritime regulatory bodies may continue providing incentives, technical support, and policy guidance to help non-ISO certified shipyards improve their quality systems. Future researchers may expand the study by including more shipyards, larger samples, or quantitative validation to strengthen the generalizability of the proposed framework.

Compliance with ethical standards

This study complied with applicable academic, institutional, and ethical standards in the conduct of research involving industry participants. Participation in the focus group discussions, interviews, ranking exercises, and framework validation was voluntary. The participants were informed of the purpose of the study, the nature of their participation, and the confidentiality of the information gathered. Informed consent was secured before data collection. All responses were treated with confidentiality and used strictly for academic and research purposes. The data were presented in aggregate form to protect the identity of the participants and the participating shipyards. The researcher observed honesty, proper attribution of sources, respect for participant welfare, and responsible handling of research data throughout the conduct of the study. No conflict of interest was declared, and the manuscript remains the intellectual work of the researcher, with all cited materials duly acknowledged in accordance with scholarly and ethical standards.

REFERENCES

- Ahmad, N., & Qahmash, A. I. (2021). Quality management practices in industrial organizations: Implications for operational efficiency. *International Journal of Industrial Management*, 12(3), 45–60.
- DOST-MIRDC. (2023). Quality standards and compliance in Philippine manufacturing and maritime industries. Department of Science and Technology – Metal Industry Research and Development Center.
- International Organization for Standardization. (2015). ISO 9001:2015 – Quality management systems – Requirements. ISO.
- ISO Compliance Services Team. (2024). Best practices for ISO implementation in industrial organizations. ISO Compliance Services.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 140, 1–55.
- Mandal, A., & Deshmukh, S. G. (1994). Performance measurement in industrial quality management. *International Journal of Production Research*, 32(6), 1311–1324. <https://doi.org/10.1080/00207549408957058>
- Maritime Industry Authority. (2018). Maritime safety and compliance regulations for Philippine shipping operations. Maritime Industry Authority.
- Maritime Industry Authority. (2025). Updated guidelines on ISO-based compliance for maritime organizations. Maritime Industry Authority.
- Organisation for Economic Co-operation and Development. (2019). Benchmarking quality management practices in industry. OECD Publishing. <https://doi.org/10.1787/9789264312613-en>
- Sage, A. P. (1977). *Decision support systems: Concepts and resources for managers*. McGraw-Hill.
- Sharma, H. D., Gupta, A. D., & Sushil. (1995). Quality management systems in industrial organizations. *International Journal of Quality & Reliability Management*, 12(7), 23–35. <https://doi.org/10.1108/02656719510096395>
- Skulmoski, G. J., Hartman, F. T., & Krahn, J. (2007). The Delphi method for graduate research. *Journal of Information Technology Education*, 6, 1–21.
- Susilawati, N. A. H., & Adhariani, D. (2023). Assessing compliance and effectiveness of ISO standards in maritime organizations. *Journal of Maritime Studies and Management*, 5(2), 88–102.
- Talib, F., Rahman, Z., & Qureshi, M. N. (2013). Impact of quality management practices on operational performance. *International Journal of Productivity and Performance Management*, 62(3), 286–308. <https://doi.org/10.1108/17410401311306997>
- Warfield, J. N. (1974). *Developing interconnections in complex systems: The application of structural modeling*. Wiley.