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Quality Management in Practice: A Comprehensive Evaluation of Compliance and Performance in Construction Projects at the Port of Dumaguete Under ISO 9001:2015 Standards

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Abstract. The study aimed to evaluate the implementation of construction projects at the Port of Dumaguete aligned with the ISO 9001:2015 Quality Management System (QMS) standards, identify the problems encountered by the respondents, and examine the relationship between these variables. A descriptive-correlational research design was employed, with 200 randomly selected respondents, including cargo handling operators, shipping line personnel, transport service providers, and contractors. Data were collected using validated questionnaires and analyzed using the mean and Spearman's Rank Correlation Coefficient. Findings revealed a very high level of alignment of construction project implementation with ISO 9001:2015 QMS standards, particularly in the areas of materials quality, artistry, monitoring, accountability, communication, documentation, and safety. The extent of problems encountered was generally low, though temporary berth closures due to construction were noted as a moderate issue. A significant negative relationship was found between compliance with ISO standards and the frequency of operational problems, indicating that higher compliance is associated with fewer issues in port operations.

Keywords: Cargo handling; Construction project; Port operation; Quality management system; Standard

1.0 Introduction

The construction industry plays a vital role in the economic development of every country, which includes a wide range of related sectors (Moradi et al., 2022). Although it has contributed significantly to economic growth, the global construction industry is plagued with recurring issues like poor quality control, delays, safety concerns, ineffective documentation, and the like. Implementing the ISO 9001:2015 Quality Management System is one technique to deal with these problems. The adoption of a QMS can be considered a strategic decision for an organization that contributes to the improvement of overall performance and provides an excellent basis for sustainable development initiatives (Abdelalim & Eldesouky, 2021). To manage projects with multiple stakeholders, complex processes, and strict compliance requirements, the construction sector needs an effective QMS (Winge et al., 2019). However, the advantages of QMS are not realized equally, especially in developing countries where poor training and resource constraints are major hindrances. These variances emphasized the need for contextualized research to maximize QMS implementation and counteract ongoing global challenges.

In the Philippines, the construction industry, which is the cornerstone of national development, is confronted with specific challenges, particularly at strategic infrastructure centers such as the Port of Dumaguete. Being a critical gateway for transportation and trade in Negros Oriental, the construction projects of the port need to have high standards of quality, timeliness, and safety. However, local data recurring issues such as 3,383 incidents of occupational injuries occurred in the country's construction industry in 2020 (Reyes-Garcia et al., 2021) and citing records of DPWH-ADEO from 2019-2020, found that 317 projects were completed and 188 of them were encountered delays (59.3%) (Pantalunan et al., 2021) due to various factors in the implementation of construction projects. Inconsistent documentation practices, poor project monitoring, and operational constraints also compound these challenges. Despite the recognized potential of ISO 9001:2015 to address these issues, the Port of Dumaguete remains largely unexplored, which leads to a critical need for localized research.

This study examines the implementation of Quality Management System standards and assesses their alignment with ISO requirements. One of the major concerns behind this assessment is the degree to which these standards are being followed and the impact of any deviation on project schedules. If certain aspects of the ISO standards are not being put into practice, it is important to determine these gaps and their implications. This inquiry identifies the problem caused by non-compliance and aims to solve the ensuing project issues. By identifying specific gaps in QMS compliance, this research seeks to close the gap between mandated standards and practice, ultimately improving project efficiency and quality results.

With the above premise, the researcher, being a civil engineer, seeks to evaluate the implementation of the construction project at the Port of Dumaguete following the ISO 9001:2015 Quality Management System. This study aims to assess the QMS's impact on critical aspects such as: a.) quality, b.) project monitoring and inspection, c.) accountability and stakeholders communication, d.) documentation, e.) safety, cargo handling, f.) berth allocation and vessel traffic, and g.) port traffic management. By identifying strengths and areas for improvement, the research provides actionable recommendations to enhance QMS application in future projects, ensuring greater efficiency, compliance, and project success. Thus, this study is conducted.

2.0 Methodology

2.1 Research Design

This study employs a descriptive-correlational research design to investigate the relationship between the alignment of the construction project implementation with ISO 9001:2015 Quality Management System (QMS) standards and the problems encountered during the implementation of construction projects. The methodology ensures a comprehensive understanding of the interplay between QMS alignment and identified problem areas, supported by both quantitative and qualitative data.

2.2 Research Locale

The study was conducted at the Port of Dumaguete, a significant hub for construction and infrastructure projects in the province of Negros Oriental. The research environment encompasses ongoing and completed construction sites within the port, providing a practical context for evaluating the alignment of the construction project implementation with QMS and associated challenges. The study focuses on projects managed by contractors and other port stakeholders operating within this setting.

2.3 Research Respondents

The respondents of the study include contractors and port stakeholders who are directly affected by the implementation of construction projects at the Port of Dumaguete. Stakeholders may include cargo handling operators, shipping lines, transport services, or logistics providers. With a sample size of 200, respondents are selected through a random sampling method to ensure that only those with relevant experience and knowledge of QMS implementation are included. The diversity of roles, tenure, and organizational backgrounds among participants enriches the data collected.

2.4 Research Instrument

The research instrument employed in this study is a structured survey questionnaire designed to gather direct insights from contractors and port stakeholders engaged in construction projects at the Port of Dumaguete. This meticulously developed instrument serves two primary objectives. First, it aims to evaluate the implementation of construction projects following the ISO 9001:2015 Quality Management System (QMS). This section assesses

perceptions regarding how effectively the QMS supports project implementation concerning the quality of materials, artistry, project monitoring and inspection, accountability, stakeholder communication, documentation, and safety. Second, the instrument explores the challenges encountered during project implementation, specifically examining issues in safety, cargo handling, berth allocation, vessel traffic, and port traffic management.

The questionnaire was reviewed and validated by three port industry experts, including one with a Doctorate Degree, another a United Nations Conference on Trade and Development (UNCTAD) graduate, and a seasoned port operations specialist. The instruments were developed based on the ISO standards, QMS manual, and reflected practical experiences encountered at the port. A dry run was conducted to assess the reliability and clarity of the items. Additionally, a pilot test was administered to 30 randomly selected respondents possessing relevant experience and knowledge of QMS. The survey instrument demonstrated strong internal consistency, evidenced by a Cronbach's alpha coefficient of 0.87, indicating that the items are reliably measuring the intended constructs.

The questionnaire utilizes a rating scale format with responses ranging from "Always" to "Frequent," "Sometimes," "Rarely," and "Never." This format facilitates systematic data collection, allowing for straightforward aggregation and comparison of responses across various areas of interest. By integrating these components, the instrument provides a comprehensive understanding of both the degree of QMS alignment and the operational obstacles faced during project implementation. The resulting data offers valuable insights for pinpointing areas needing improvement and enhancing future construction endeavors at the Port of Dumaguete.

2.5 Data Gathering Procedure

After the design hearing, the researcher integrates all the corrections and suggestions of the panel members. A letter of request to conduct the study was sent to the Acting Port Manager of the Philippine Ports Authority Port Management Office (PMO) Negros Oriental/Siquijor (NOS), upon the endorsement of the dean of the graduate school of Foundation University. The signed and approved request was presented to the Acting Port Manager and respective respondents. During the distribution, the researcher explains to the respondents the purpose and importance of the research. An average of four (4) sets of research questionnaires were distributed alternately in the morning and afternoon every day from Mondays to Fridays until the target of 200 respondents (sample size) was reached. The retrieval of the questionnaires was done right after the respondents had answered the questions. The results were consolidated and tallied using MS Excel and were analyzed and interpreted.

2.6 Data Analysis Procedure

The following statistical tools utilized include weighted mean, mean, and Pearson's correlation coefficient (r).

Weighted Mean: This is a type of mean where individual data values contribute variably to the mean. This is a type of mean where individual data values contribute variably to the mean. This was used to assess the alignment of the construction project implementation with ISO 9001:2015 QMS standards and problems encountered in the implementation of construction projects.

Mean: This is generally the average of a given set of numbers or data. This was used in getting the average performance of the QMS.

Spearman's Correlation Coefficient: This measure indicates the strength and direction of the association between two ranked variables. The study used it to assess the relationship between innovation measures and challenges faced by medium and large establishments in Dumaguete City.

2.7 Ethical Considerations

The study observes high ethical standards throughout the research process to ensure that the rights and well-being of the respondents are not compromised. The information is kept in such a way as to ensure the confidentiality and anonymity of the respondents, including the safe storage of data and control over access to it. Possible conflicts of interest are declared openly, and precautions are taken to minimize bias or undue influence

on the findings. Moreover, in conducting the research, relevant data protection regulations are adhered to, thereby ensuring that the personal information of the respondents is kept confidential.

3.0 Results and Discussion

3.1 Extent of Alignment of Construction Project Implementation at the Port of Dumaguete with ISO 9001:2015 QMS standards

Table 1. *Extent of Alignment of Construction Project Implementation at the Port of Dumaguete with ISO 9001:2015 QMS Standards in Terms of Quality of Materials and Workmanship (N=200)*

Indicators	$\bar{x}$	VD	EoA	SD
Quality standards implemented during the construction project:				
1. Checked the quality of materials during construction.	4.77	A	VH	0.49
2. Materials are tested to ensure compliance with quality requirements.	4.72	A	VH	0.53
3. Materials used in port construction are suitable for marine or coastal environmental conditions.	4.71	A	VH	0.51
4. The quality of materials used during construction is as per specifications.	4.70	A	VH	0.63
5. Quality inspection reports for materials are regularly submitted, reviewed, and shared with stakeholders.	4.64	A	VH	0.64
Composite	**4.70**	**A**	**VH**	**0.56**
Artistry during the construction project implementation:				
1. Adequate inspections were done for proper artistry at the site.	4.70	A	VH	0.55
2. There is ongoing communication with clients to ensure satisfaction with the quality of work.	4.62	A	VH	0.57
3. Quality assurance teams verify that construction meets customer expectations.	4.60	A	VH	0.60
4. Continuous improvement initiatives are implemented based on artistry evaluations.	4.60	A	VH	0.59
5. Workmanship meets the design and technical specification requirements.	4.59	A	VH	0.56
Composite	**4.62**	**A**	**VH**	**0.58**
Overall	**4.66**	**A**	**VH**	**0.57**

Note: Verbal Description (VD); Extent of Alignment (EoA); 4.21-5.00, Always (A), Very High (VH); 3.41-4.20, Frequent (F), High (H); 2.61-3.40, Sometimes (S), Moderate (M); 1.81-2.60, Rare (R), Low (L); 100-1.80, Never (N), Very Low (VL)

Table 1 shows the extent of alignment of construction project implementation at the Port of Dumaguete with ISO 9001:2015 QMS standards in terms of quality of materials and artistry. The result shows that all measures under both dimensions, quality of materials and artistry, are within the "Always" verbal description, representing a "Very High" level of agreement. The composite mean for quality of materials is 4.70, and for artistry is 4.62, with an overall resulting mean of 4.66. This indicates that the construction work at the Port of Dumaguete is carried out with a high level of consistency and care, closely following the standards set by ISO 9001:2015.

When one looks at the quality of materials, the average score of 4.70 is a strong indicator that proper procedures are in place. Among the most notable is the consistent practice of checking materials during construction ($\bar{x}$ = 4.77), which suggests that quality inspections are routine, not just something done at the start. Other indicators, such as ensuring materials meet quality requirements ($\bar{x}$ = 4.72) and making sure they are suitable for the port's coastal environment ($\bar{x}$ = 4.71), point to a team that knows its environment well and plans accordingly. These findings are backed by studies like that of Okonta et al. (2024), which showed how effective material quality management, when aligned with ISO standards, reduces the risk of project setbacks, especially in coastal areas. Similarly, Khatatbeh (2023) emphasized how regular inspection and documentation help ensure consistency and accountability, a principle we also see reflected here at the Port of Dumaguete.

Moving on to artistry, the data is just as promising, with a strong mean score of 4.62. Workers are not only performing tasks, but they are doing so with precision and care. The item "Adequate inspections done for proper workmanship at the site" ($\bar{x}$ = 4.70) received the highest rating, which shows that supervision and quality control are part of the everyday routine. There is also good communication with clients and internal teams, and quality assurance groups are actively making sure that the final output meets expectations. This reflects the findings of Balucio and Badoy (2023), who noted that when workers are familiar with ISO 9001:2015 standards, they tend to be more engaged and take greater pride in their work. The fact that construction activities are continuously improved based on artistry evaluations ($\bar{x}$ = 4.60) also shows that the project embraces learning and ongoing improvement, key ideas behind Deming's Plan-Do-Check-Act (PDCA) cycle, and the very heart of ISO's purpose.

Altogether, the data presents a clear picture of a construction environment that is not only well-organized and efficiently executed but also exemplifies a strong commitment to upholding and even exceeding international standards. The consistently high scores across both materials and artistry highlight the Port of Dumaguete's commitment to doing things right. As Islam et al. (2023) pointed out, especially in coastal construction, the combination of strong material control and skilled execution can be the difference between long-term success and costly failure. In summary, the results show that the port's construction practices are not only compliant with ISO 9001:2015 but are also rooted in a culture of quality, responsibility, and continuous improvement. This strong foundation does not just meet technical requirements but also helps build safe, reliable infrastructure that the region can count on for years to come.

Table 2. *Extent of Alignment of Construction Project Implementation at the Port of Dumaguete with ISO 9001:2015 QMS Standards in Terms of Project Monitoring and Inspection (N=200)*

Indicators		$\bar{x}$	VD	EoA	SD
1.	Regular site inspections are conducted to ensure compliance with project plans and specifications.	4.68	A	VH	0.51
2.	Port stakeholders receive regular updates on the status of the project and performance.	4.65	A	VH	0.56
3.	Construction progress is regularly monitored and recorded to avoid delays.	4.63	A	VH	0.56
4.	Conduct regular photograph project monitoring to track the progress and changes of the project visually.	4.59	A	VH	0.58
5.	Problems found during inspections are quickly fixed to avoid project delays.	4.47	A	VH	0.64
6.	Digital tools and technologies are used for effective project monitoring.	4.38	A	VH	0.74
Composite		**4.57**	**A**	**VH**	**0.60**

Note: Verbal Description (VD); Extent of Alignment (EoA); 4.21-5.00, Always (A), Very High (VH); 3.41-4.20, Frequent (F), High (H); 2.61-3.40, Sometimes (S), Moderate (M); 1.81-2.60, Rare (R), Low (L); 100-1.80, Never (N), Very Low (VL)

Table 2 highlights the alignment of construction projects with ISO standards in terms of project monitoring and inspection. The results show that project monitoring and inspection practices at the Port of Dumaguete are not only being followed, but they are being done exceptionally well. With a composite mean score of 4.57, respondents consistently indicated that monitoring procedures are "Always" practiced, pointing to a very high level of alignment with ISO 9001:2015 Quality Management System (QMS) standards. This implies that project monitoring practices are robust and effectively support ISO-aligned implementation and are grounded in the "Check" phase of the PDCA cycle, which encourages routine audits and evaluations.

Looking more closely, all six (6) indicators related to project monitoring scored between 4.38 and 4.68. This range shows that regular site checks, follow-ups, and communication are not occasional efforts but integral components of the daily workflow within the construction process. The highest-rated item, "Regular site inspections are conducted to ensure compliance with project plans and specifications" ($\bar{x}$ = 4.68), reflects how committed the team is to doing things right. This supports the findings of Tahrir and Barus (2023), who emphasized how routine inspections are a cornerstone of effective ISO implementation. When inspections are consistent, problems are caught early before getting into bigger issues.

Communication is equally vital to project success. A high mean score of 4.65 indicates that respondents strongly affirmed consistent communication with port stakeholders, reflecting a project environment characterized by transparency, active engagement, and a commitment to inclusive information-sharing. Communication like this builds trust, prevents confusion, and keeps everyone on the same page, especially important in complex infrastructure projects. This finding echoes Balucio and Badoy (2023), who found that regular updates significantly improve collaboration in projects involving multiple stakeholders.

Another standout point is how the team monitors actual progress. The use of photos and visual documentation ($\bar{x}$ = 4.59), along with regular tracking of construction milestones ($\bar{x}$ = 4.63), shows how the project balances both traditional and modern tools for quality control. These practices ensure that what is happening on paper matches what is happening on the ground. Karsch et al. (2022) noted that visual evidence, such as photos, videos, and digital records, is essential to assess errors and monitor progress, thereby enhancing the transparency and quality assurance of the project.

Equally reassuring is the finding that when issues arise, they are promptly addressed ($\bar{x}$ = 4.47). This is a clear reflection of a proactive team that not only monitors challenges but responds with swift, effective action. That responsiveness ties directly into the "Check" and "Act" steps in Deming's PDCA cycle, which is all about making improvements as soon as gaps are identified. Orlov (2024) pointed out how essential this responsiveness is in

keeping projects on track and maintaining quality.

The only area that scored slightly lower but still rated "Very High" was the use of digital tools and technologies for monitoring ($\bar{x}$ = 4.38). This suggests that while digital systems are in use, there is still room to expand and enhance them. As Zhou et al. (2023) explained, integrating innovative tools like Building Information Modeling (BIM), real-time dashboards, and cloud-based platforms can significantly boost visibility and help teams make faster, better-informed decisions.

All in all, the data present a highly encouraging outlook. The Port of Dumaguete is taking its quality management seriously when it comes to monitoring and inspection. There is a strong foundation of routine checks, stakeholder involvement, prompt action, and increasing technological adoption. With continued effort, especially in expanding digital tools, the port is well-positioned to keep delivering construction projects that are safe, efficient, and consistently up to standard.

Table 3. *Extent of Alignment of Construction Project Implementation at the Port of Dumaguete with ISO 9001:2015 QMS Standards in Terms of Accountability and Stakeholders Communication (N=200)*

Indicators		$\bar{x}$	VD	EoA	SD
1.	Issues and concerns raised by stakeholders are recognized and resolved promptly.	4.72	A	VH	0.47
2.	Regular coordination meetings are conducted between contractors, port authorities, and other important stakeholders.	4.65	A	VH	0.58
3.	There is open communication between contractors, port authorities, and stakeholders.	4.62	A	VH	0.58
4.	Transparency is maintained in reporting project progress and issues.	4.60	A	VH	0.59
5.	Stakeholders' feedback is considered in decision-making processes.	4.54	A	VH	0.65
Composite		**4.62**	**A**	**VH**	**0.57**

Note: Verbal Description (VD); Extent of Alignment (EoA); 4.21-5.00, Always (A), Very High (VH); 3.41-4.20, Frequent (F), High (H); 2.61-3.40, Sometimes (S), Moderate (M); 1.81-2.60, Rare (R), Low (L); 100-1.80, Never (N), Very Low (VL)

Table 3 focuses on accountability and stakeholder communication. With a composite mean score of 4.62, classified as "Always" and interpreted as a "*Very High*" level of alignment, the data suggests that principles like timely issue resolution, open dialogue, and collaborative coordination are deeply embedded in the project's management approach. The highest-rated item is that the issues and concerns raised by stakeholders are recognized and resolved promptly ($\bar{x}$ = 4.72), which indicates that the project team is not just listening to stakeholders, but also acting quickly and effectively on their input. This reflects a strong culture of responsiveness and transparency, in line with ISO 9001:2015's emphasis on leadership responsibility and effective communication (Clauses 5 and 7.4). Rehan et al. (2024) support this, noting that clear, responsive communication with stakeholders helps projects stay on track and builds trust among all parties involved.

Other indicators also scored within the "*Very High*" range. Regular coordination meetings ($\bar{x}$ = 4.65), open communication channels ($\bar{x}$ = 4.62), and transparent progress reporting ($\bar{x}$ = 4.60) all reflect a structured and intentional approach to keeping everyone informed and engaged. These are not just box-ticking exercises; they represent a deliberate effort to ensure that everyone involved, from contractors to port authorities, is aligned. Oyewole (2024) emphasizes that ineffective communication often undermines quality systems, so these findings are encouraging signs of strong QMS implementation at the Port of Dumaguete. Even the lowest-scoring indicator, which is the stakeholders' feedback, is considered in decision-making ($\bar{x}$ = 4.54) and still falls within the "*very high*" range. This shows that the Port does not just communicate *to* stakeholders, but also listens *to* them, integrating their insights into the decision-making process. This participatory approach echoes the value ISO places on continuous improvement and inclusive leadership. As Sarmiento et al. (2023) point out, projects that actively involve stakeholders tend to enjoy greater buy-in, minimize conflicts, and contribute more sustainable and widely supported outcomes.

Overall, the findings suggest that the Port of Dumaguete is not only aligned with ISO 9001:2015 standards but is actively fostering a culture of accountability and collaboration. Through clear communication, responsiveness to stakeholder needs, and transparency in decision-making, the Port strengthens trust and supports smoother, more effective project implementation. These practices not only contribute to high-quality infrastructure development but also help ensure long-term stakeholder support in a complex operational environment.

Table 4. *Extent of Alignment of Construction Project Implementation at the Port of Dumaguete With ISO 9001:2015 QMS Standards in Terms of Documentation (N=200)*

Indicators	$\bar{x}$	VD	EoA	SD
1. Project documentation is constantly updated and maintained during the construction process.	4.73	A	VH	0.53
2. Changes in project plans, designs, and specifications are well-documented and communicated.	4.69	A	VH	0.55
3. Construction progress reports are systematically recorded and shared with stakeholders.	4.61	A	VH	0.61
4. Logs of inspection and monitoring are periodically done and kept for future reference.	4.58	A	VH	0.60
Composite	**4.68**	**A**	**VH**	**0.57**

Note: Verbal Description (VD); Extent of Alignment (EoA); 4.21-5.00, Always (A), Very High (VH); 3.41-4.20, Frequent (F), High (H); 2.61-3.40, Sometimes (S), Moderate (M); 1.81-2.60, Rare (R), Low (L); 100-1.80, Never (N), Very Low (VL)

Table 4 examines documentation practices during the construction projects. With a high composite mean of 4.68, it is evident that maintaining and updating documentation is not just a routine; it becomes a natural and consistent part of how the project is managed day-to-day. The standout indicator, "*project documentation is constantly updated and maintained during the construction process,*" earned the highest score of 4.73, showing that the project team treats documentation as a top priority throughout all stages of construction. This strong alignment reflects the intent of Clause 7.1.6 in the ISO 9001:2015 standards, which emphasizes the importance of retaining and managing organizational knowledge. As Dagdag et al. (2022) point out, adequate documentation does not just help keep records, it also ensures that knowledge is preserved and shared, which is crucial in complex and large-scale projects like port construction.

Other highly rated practices, such as recording design changes ($\bar{x}$ = 4.69), sharing construction progress reports with stakeholders ($\bar{x}$ = 4.61), and keeping inspection and monitoring logs ($\bar{x}$ = 4.58), show that the documentation process is thorough and consistent. These are essential not only for meeting compliance requirements but also for promoting accountability and supporting sound decision-making. In line with this, Agu et al. (2022) highlight how well-kept records improve access to information and reduce the risk of miscommunication, which is an issue that often leads to costly delays or rework. Interestingly, these current results reflect a significant shift from past challenges faced by similar projects in the country. Documentation was once a weak point in many Philippine construction efforts, but now, as Orlov (2024) notes, applying structured documentation systems can improve efficiency, limit errors, and ultimately keep projects running smoothly.

In addition, emerging research underscores the importance of going digital. Manzoor et al. (2025) advocate for the use of digital platforms that allow real-time updates, particularly in fast-paced, large-scale construction. This complements the findings at the Port of Dumaguete, where proactive documentation efforts are contributing to the effective delivery of the project. In sum, the data from Table 4 shows that the Port of Dumaguete has developed strong and reliable documentation practices in line with ISO 9001:2015 standards. From tracking changes and progress to maintaining inspection logs, the team demonstrates a commitment to keeping records accurate, accessible, and up-to-date. This does not just support compliance; it also creates a foundation for better communication, smoother coordination, and long-term project success. As current studies affirm, strong documentation is not just paperwork, but it is a core part of what makes complex infrastructure projects succeed.

Table 5. *Extent of Alignment of Construction Project Implementation at the Port of Dumaguete with ISO 9001:2015 QMS Standards in Terms of Safety (N=200)*

Indicators	$\bar{x}$	VD	EoA	SD
1. Personal protective equipment (PPE) is provided, properly worn, and strictly enforced at all times.	4.80	A	VH	0.50
2. Strict adherence to ISO safety standards is practiced throughout the project.	4.76	A	VH	0.46
3. Safety signs, warning labels, and lighted safety devices are located within the construction area.	4.71	A	VH	0.57
4. Hazard identification and risk assessment are conducted regularly to determine and control risks.	4.65	A	VH	0.63
5. Construction sites are cleaned daily and kept clear of clutter to avoid slips, trips, and other dangers.	4.50	A	VH	0.69
6. Daily toolbox meetings are conducted to foster safety and coordination.	4.42	A	VH	0.82
Composite	**4.64**	**A**	**VH**	**0.61**

Note: Verbal Description (VD); Extent of Alignment (EoA); 4.21-5.00, Always (A), Very High (VH); 3.41-4.20, Frequent (F), High (H); 2.61-3.40, Sometimes (S), Moderate (M); 1.81-2.60, Rare (R), Low (L); 100-1.80, Never (N), Very Low (VL)

Table 5 discusses the alignment of safety practices with ISO standards. The findings strongly reflect a construction culture at the Port of Dumaguete where safety is not just a priority. However, it is deeply embedded in every aspect of the project's execution. With an impressive composite mean score of 4.64, it is evident that safety practices are not just followed, but they are embedded in the day-to-day operations of the project. This level of alignment with ISO 9001:2015 Quality Management System (QMS) standards shows a strong and consistent commitment to creating a safe work environment.

Of all the safety indicators assessed, the provision and enforcement of Personal Protective Equipment (PPE) earned the highest rating at 4.80. This suggests that the use of PPE is not only widespread but also strictly enforced by putting worker safety at the forefront. Close behind were high scores for adhering to ISO safety standards ($\bar{x}$ = 4.76) and the presence of clear signage and safety labels ($\bar{x}$ = 4.71), both of which are essential for setting clear expectations and reducing confusion or risk on-site.

These results reflect the modern approach to Construction Safety Management (CSM) that Bhagwat and Delhi (2022) advocate, where safety is factored in right from the planning stage, not as an afterthought. Similarly, Xia et al. (2024) emphasize how vital it is to build a strong safety culture where leadership leads by example, and open communication helps everyone stay aware and involved. Other indicators, such as regular hazard identification and risk assessments ($\bar{x}$ = 4.65) and site cleanliness ($\bar{x}$ = 4.50), show that the project adopts a detailed and proactive approach. These actions align closely with the "Check" phase of Deming's Plan-Do-Check-Act (PDCA) cycle, a key part of ISO 9001:2015. This phase is all about ongoing evaluation, checking whether safety systems are effective, and making improvements where needed.

Even though daily toolbox meetings received a slightly lower score of 4.42, they are still considered very effective. These meetings play an important role in reinforcing safety messages, sharing updates, and building team coordination. Compared to many construction sites where inconsistent safety meetings or weak enforcement are still issues, as pointed out by Al-Otaibi and Kineber (2023), the Port of Dumaguete seems to be setting a strong example by consistently prioritizing communication and accountability. The positive results also echo the findings of Okonta et al. (2024), who warned that projects without structured quality systems are more likely to experience safety lapses. In contrast, the Dumaguete project shows how QMS-based practices can significantly lower risks and support a safer, more efficient construction environment.

As Sarvari et al. (2025) noted, challenges like limited resources and unpredictable site conditions can still make safety harder to manage. Even with excellent systems in place, it takes ongoing effort, support from management, and flexibility to adapt and maintain strong safety performance over time. Overall, the data from Table 5 show that the Port of Dumaguete is not just meeting ISO 9001:2015 standards, it is embodying them through consistent practice and a deep-rooted commitment to quality. Safety here is not treated as a checklist but as a shared value that shapes the way people work each day. With strategic planning, committed leadership, regular assessments, and strong communication in place, Dumaguete offers a real-world example of how structured safety systems can create a safer, more reliable, and sustainable construction environment.

3.2 Extent of Problems Encountered by the Respondents during the Implementation of Construction Projects

Table 6. *Extent of Problems Encountered by the Respondents During the Implementation of Construction Projects Concerning Safety*

Indicators		$\bar{x}$	VD	EoP	SD
1.	Toolbox meetings are not conducted daily.	2.10	R	L	1.07
2.	Poor site housekeeping results in clutter and a heightened risk of slips, trips, and falls.	2.04	R	L	1.15
3.	There is weak enforcement of safety compliance during the project implementation.	2.00	R	L	1.34
4.	Hazard identification and risk assessment are not conducted regularly.	1.88	R	L	1.11
5.	Lack of clear signage, warning labels, and lighted safety devices on the construction site.	1.87	R	L	1.13
6.	Personal protective equipment (PPE) is not always available, frequently worn incorrectly, and its use is not enforced.	1.86	R	L	1.16
Composite		**1.96**	**R**	**L**	**1.16**

Note: Verbal Description (VD); Extent of Problem (EoP); 4.21-5.00, Always (A), Very High (VH); 3.41-4.20, Frequent (F), High (H); 2.61-3.40, Sometimes (S), Moderate (M); 1.81-2.60, Rare (R), Low (L); 100-1.80, Never (N), Very Low (VL)

Table 6 shows the extent of problems encountered during implementation concerning safety. With an overall composite mean score of 1.96, all safety-related concerns fall under the "Rare" category, which suggests that safety problems are not a common occurrence. This is a positive sign that the port's construction team is doing a good job of keeping work conditions safe and organized. The most commonly noted, though still rated as rare, was the inconsistent conduct of daily toolbox meetings ($\bar{x}$ = 2.10). These meetings are a simple but important part of daily routines, but they help teams stay informed about potential hazards and tasks for the day. As Reyes-Garcia et al. (2021) pointed out, skipping these meetings can increase the chance of accidents, especially on fast-paced and constantly changing construction sites. Al-Otaibi and Kineber (2023) also observed that in many developing regions, missing such routines is a common issue, but one that can be addressed effectively with systems like ISO

9001:2015.

Another issue raised was site clutter and poor housekeeping ($\bar{x}$ = 2.04). While it does not happen often, it still poses a risk. Messy sites can lead to slips, trips, and falls, which are some of the most frequent causes of workplace injuries. Fortunately, the relatively low rating indicates that the Port team is doing a good job of keeping the site organized. Bhagwat and Delhi (2022) support this view, noting that when housekeeping is built into the construction workflow early on, it boosts both safety and efficiency. The data also point to some concerns about the enforcement of safety rules ($\bar{x}$ = 2.00). Again, while rare, it is a reminder that rules are only as effective as their implementation. According to Sarvari et al. (2025), weak enforcement, especially when combined with limited resources and unpredictable site conditions, can be a significant barrier to achieving safer working systems. In this case, though, the Port's structured Quality Management System (QMS) may be playing a significant role in keeping those lapses in check.

Another area for attention is the regular conduct of hazard identification and risk assessments ($\bar{x}$ = 1.88). These are critical steps for spotting problems before they happen. Okonta et al. (2024) found that firms without formal QMS structures tend to experience more safety issues. The fact that the Port of Dumaguete uses ISO 9001:2015 likely contributes to a more organized and preventive approach to safety, even if there is still room for improvement. On a more positive note, concerns like missing signage, inadequate safety devices ($\bar{x}$ = 1.87), and improper use or lack of PPE ($\bar{x}$ = 1.86) were among the lowest-rated problems. This shows that visual warnings and personal safety gear are being used consistently, something not always guaranteed in construction. As Xia et al. (2024) mentioned, strong safety cultures are built on visible leadership, regular communication, and worker buy-in, all of which seem to be in place at the Port. Even though Bhagwat and Delhi (2022) noted that PPE misuse is still a global issue, it appears the Port is setting a good example.

To sum up, the findings in Table 6 show that while safety concerns do exist, they are encountered only rarely, and the systems in place appear to be working. The Port of Dumaguete stands out as a strong example of how a structured, proactive, and communicative approach to safety, grounded in both modern best practices and ISO standards, can keep workers safe and support the overall success of construction projects.

Table 7. *Extent of Problems Encountered by the Respondents During the Implementation Of Construction Projects Concerning Cargo Handling (N=200)*

Indicators	$\bar{x}$	VD	EoP	SD
1. Congestion in cargo handling areas is caused by poor coordination of space management.	2.16	R	L	1.24
2. Improper stacking and storage of construction materials cause delays in the port operation.	2.10	R	L	1.18
3. Lack of proper coordination between contractors, port operators, and cargo handlers leads to operational delays.	2.05	R	L	1.10
4. Insufficient lighting and poor visibility in cargo handling areas.	1.85	R	L	1.07
Composite	**2.04**	**R**	**L**	**1.15**

Note: Verbal Description (VD); Extent of Problem (EoP); 4.21-5.00, Always (A), Very High (VH); 3.41-4.20, Frequent (F), High (H); 2.61-3.40, Sometimes (S), Moderate (M); 1.81-2.60, Rare (R), Low (L); 100-1.80, Never (N), Very Low (VL)

Table 7 examines problems related to cargo handling. With a composite mean score of 2.04, all concerns fall into the "Rare" category. This suggests that cargo handling at the Port of Dumaguete was generally smooth and well-managed, which is impressive considering the challenges that come with working in a busy, operational port during ongoing construction. The most commonly noted issue was occasional congestion in cargo handling areas ($\bar{x}$ = 2.16), often caused by tight working spaces and limited room for large materials. While not a significant problem, it highlights the importance of better space planning. Turbaningsih (2022) pointed out that effective cargo logistics require careful coordination of site layout, scheduling, and transport routes
all of which help prevent delays and keep operations running smoothly.

Another concern, though still infrequent, was the improper stacking and storage of materials ($\bar{x}$ = 2.10). These moments may have been the result of unclear protocols or rushed work. Fredriksson et al. (2024) suggest that when Construction Logistics Systems (CLS) are prioritized and involve general contractors in the planning stage, materials are handled more systematically, which helps reduce mistakes and keep the site organized and safe. Lack of coordination between contractors and cargo handlers ($\bar{x}$ = 2.05) also surfaced as a minor issue. Even with solid systems in place, communication gaps can occasionally lead to misunderstandings or delays. To address this, Martin-Navarro et al. (2023) recommend using digital tools like Business Process Management Systems

(BPMS) and real-time tracking to keep all teams connected and working in a synchronized manner.

The last reported concern was insufficient lighting in cargo areas ($\bar{x}$ = 1.85), which is good news given how critical visibility is, especially for night work or operations in enclosed spaces. Still, it is something that should be regularly checked. According to Le and Fan (2023), using technologies like Digital Twins can help site managers spot and resolve lighting issues quickly, improving both safety and workflow. Putting all of this together, the data shows a highly coordinated and efficient cargo-handling process throughout the construction phase. The low ratings across the board suggest that the Port of Dumaguete handled logistics effectively, likely thanks to a combination of thoughtful planning, team coordination, and the use of modern tools. This aligns with the findings of Belmoukari et al. (2023), who described how "smart ports" that embrace digital technologies are better equipped to manage the kinds of disruptions that often come with construction.

In summary, cargo handling during construction at the Port of Dumaguete was efficient, controlled, and rarely disrupted. While minor challenges like congestion and coordination issues occasionally did arise, they were infrequent and appeared to have been dealt with effectively. The results highlight the importance of structured logistics planning, team collaboration, and innovative use of technology backed by ISO standards in keeping construction projects moving forward without compromising port operations. The Port's experience stands as a solid example of how thoughtful logistics management can support both progress and performance in a demanding environment.

Table 8. *The Extent of Problems Encountered by the Respondents During the Implementation of Construction Projects Concerning Berth Allocation and Vessel Traffic (N=200)*

Indicators		$\bar{x}$	VD	EoP	SD
1.	Temporary berth closures due to construction activities limit the number of available docking spaces.	3.00	S	M	1.41
2.	Extended construction timelines result in longer berth unavailability.	2.55	R	L	1.29
3.	Longer vessel turnaround times as a result of slower berthing operations during construction.	2.38	R	L	1.17
4.	Delayed issuance of construction work schedules causes last-minute changes in vessel berthing plans.	2.22	R	L	1.18
5.	Failure to effectively notify stakeholders of temporary rerouting or alternate docking arrangements.	2.05	R	L	1.15
Composite		**2.44**	**R**	**L**	**1.24**

Note: Verbal Description (VD); Extent of Problem (EoP); 4.21-5.00, Always (A), Very High (VH); 3.41-4.20, Frequent (F), High (H); 2.61-3.40, Sometimes (S), Moderate (M); 1.81-2.60, Rare (R), Low (L); 100-1.80, Never (N), Very Low (VL)

Table 8 outlines the problems encountered in berth allocation and vessel traffic. With a composite mean score of 2.44, categorized as "Rare," the overall impression is that while some disruptions occurred, they were not frequent or severe enough to cause significant operational concerns. The most noticeable issue identified by respondents was the temporary closure of berths due to construction work, which received a moderate rating of 3.00. This finding is understandable in that construction inevitably affects normal port operations, particularly berthing availability. However, the fact that this concern did not escalate beyond a "Sometimes" frequency suggests that the disruptions were managed reasonably well, perhaps through good planning and coordination. This aligns with the findings of Okonta et al. (2024), who point out that Quality Management Systems (QMS) can help streamline resource allocation during disruptions, ensuring that both construction and port operations can proceed with minimal conflict.

Some of the least reported issues involved last-minute changes to vessel berthing schedules ($\bar{x}$ = 2.22) and delays in notifying stakeholders about rerouting or alternative docking arrangements ($\bar{x}$ = 2.05). While these were rated low in frequency, they highlight areas where communication and planning could still be improved. Prompt and transparent information sharing is key to avoiding confusion, especially among shipping lines, terminal operators, and contractors. On a positive note, these findings suggest that the port was mainly able to maintain smooth operations, despite the challenges of implementing a construction project alongside daily port activities. This level of control and coordination may be credited to the use of more innovative technologies. Studies by Jia et al. (2021) and Chang et al. (2024) highlight how algorithm-based berth allocation and real-time decision-making systems can significantly improve a port's ability to respond to disruptions quickly and efficiently.

Overall, Table 8 shows that the Port of Dumaguete has done a commendable job managing berth and vessel traffic issues during its construction projects. However, some disruptions were experienced, particularly due to

temporary berth closures. The port's use of structured planning, predictive technologies, and adherence to QMS frameworks seems to have kept these issues well-contained. Moving forward, enhancing communication protocols and continuing to invest in innovative technologies will be essential to ensure even greater efficiency and resilience in future port development initiatives.

Table 9. *Extent of Problems Encountered by the Respondents During the Implementation of Construction Projects Concerning Port Traffic Management (N=200)*

Indicators	$\bar{x}$	VD	EoP	SD
1. Increased congestion in the port area caused by ongoing construction, which disrupts logistics operations.	2.55	R	L	1.33
2. Regular road obstructions by construction material and debris lead to transport operations slowing down.	2.47	R	L	1.26
3. Limited parking and staging location for cargo trucks because of construction-related space allocation.	2.46	R	L	1.30
4. Inefficient traffic management measures result in cargo and passenger movement delays.	2.28	R	L	1.42
5. There is insufficient signage and traffic control within the port premises.	1.87	R	L	1.17
Composite	**2.33**	**R**	**L**	**1.30**

Note: Verbal Description (VD); Extent of Problem (EoP); 4.21-5.00, Always (A), Very High (VH); 3.41-4.20, Frequent (F), High (H); 2.61-3.40, Sometimes (S), Moderate (M); 1.81-2.60, Rare (R), Low (L); 100-1.80, Never (N), Very Low (VL)

Table 9 deals with port traffic management issues. It shows how construction activities have affected port traffic management at the Port of Dumaguete. With an overall average score of 2.33, the data indicates that traffic-related issues during construction were relatively minor, occurring occasionally but not posing a significant concern. This indicates that the port has generally done a good job of keeping things under control despite the added complexity brought by ongoing development work. Among the issues raised, the one that stood out the most was increased congestion caused by construction, with a mean score of 2.55. Although this is still considered a "rare" issue, it nonetheless indicates occasional slowdowns in logistics operations. This is understandable, given that construction in busy areas like ports can limit space and disrupt normal traffic flow. Studies like those by Peng et al. (2022) support this observation, highlighting how real-time monitoring and predictive technologies, such as deep learning models using vessel tracking data from the Automatic Identification System (AIS), can help ports manage congestion more proactively and avoid severe delays.

Other concerns, such as obstructions caused by construction debris ($\bar{x}$ = 2.47) and limited parking and staging areas for cargo trucks ($\bar{x}$ = 2.46), were also noted. These are not significant problems, but they suggest that ongoing construction can sometimes get in the way of day-to-day port operations. This reinforces the need for better planning and coordination, as Susanto et al. (2024) argue can be improved through the application of ISO 9001 standards. These standards help standardize workflows and optimize resource utilization, which is crucial for managing space in high-traffic port environments. Interestingly, the least concerning issue, with a score of 1.87, was the lack of signage and traffic control. This suggests that directional signs and traffic coordination inside the port are mostly sufficient. However, it is always good to keep improving in this area, especially when construction is involved and routes may change unexpectedly.

The low average scores in this table show that the Port of Dumaguete is doing well in managing traffic despite the complications of construction. Occasional congestion or obstructions are inevitable in such projects, but they appear to be handled effectively. The integration of technology, proactive planning, and adherence to ISO standards are all playing a role in keeping port operations running smoothly. Moving forward, continuing to strengthen these systems will be key to supporting both current operations and future growth.

Table 10. *Relationship Between the Extent of Alignment of Construction Project Implementation at the Port of Dumaguete with ISO 9001:2015 QMS Standards and the Extent of Problems Encountered by Respondents During Project Implementation (N=200)*

Overall Alignment of Construction Project Implementation and Problems Encountered in Terms of:	r_s	p	Decision	Remark
• Safety	-0.608	<.001	Reject H_o	Significant
• Cargo Handling	-0.481	<.001	Reject H_o	Significant
• Berth Allocation and Vessel Traffic	-0.360	<.001	Reject H_o	Significant
• Port Traffic Management	-0.479	<.001	Reject H_o	Significant

Spearman's Rank-Order Correlation at 0.05 Level of Significance

Table 10 presents the relationship between the alignment of construction project implementation with ISO

standards and the problems encountered. The results show a clear pattern: the better the alignment with ISO standards, the fewer problems the project teams face. This was true across all areas studied, including safety, cargo handling, berth allocation, vessel traffic, and port traffic management. The numbers reflect strong negative correlations, with values ranging from -0.360 to -0.608, all of which are statistically significant. Next, cargo handling also showed a strong relationship (r_s = -0.481), reinforcing how ISO practices—like keeping detailed records, using real-time logistics systems, and ensuring regular communication among stakeholders—can smooth operations and prevent delays. These findings reflect what Martin-Navarro et al. (2023) concluded in their studies: that standardized logistics processes reduce interruptions and promote efficiency, especially during construction.

While the link between ISO practices and issues in berth allocation and vessel traffic was more moderate (r_s = -0.360), it still matters. This correlation suggests that even though construction may sometimes disrupt docking schedules, following ISO principles like planning and stakeholder coordination can lessen the impact. Jia et al. (2021) and Chang et al. (2024) recommend innovative systems, such as algorithm-driven scheduling, to help ports stay agile during such periods. Finally, for port traffic management, the correlation (r_s = -0.479) shows that traffic challenges like congestion or delays also lessen as ISO-aligned strategies are applied. Predictive tools and digital systems play a significant role here. According to Peng et al. (2022), technology like AI-based models can anticipate bottlenecks and adjust operations in real-time to keep goods and vehicles moving smoothly, even during construction.

In simple terms, the better the construction activities at the Port of Dumaguete follow ISO 9001:2015 standards, the fewer problems arise. These findings underscore the value of using quality management systems not just as a compliance tool, but as a way to prevent issues before they occur actively. Whether it is safety, cargo logistics, vessel scheduling, or traffic control—ISO alignment contributes to smoother, safer, and more efficient project implementation.

4.0 Conclusions

The study shows that the high alignment of construction project implementation at the Port of Dumaguete with the standards of ISO 9001:2015 Quality Management System (QMS) has a significant relationship in minimizing port operational challenges during project execution. The perceived negative correlation between the extent of alignment of construction project implementation based on ISO compliance and the extent of problems encountered highlights the effectiveness of QMS principles, such as quality assurance, structured monitoring, documentation, and stakeholder communication, in lowering issues related to safety, cargo handling, vessel traffic, and port management. This implies that strong adherence to internationally recognized quality standards not only enhances the efficiency and integrity of construction practices but also promotes smoother port operations, even amid ongoing development activities. These results reinforce the strategic value of institutionalizing QMS frameworks in public infrastructure projects, where operational continuity and stakeholder satisfaction are of utmost importance.

Moreover, there are additional opportunities for further enhancement. The organization should prioritize continuous improvement initiatives and proactive auditing processes, while leveraging real-time data tools more effectively. Establishing standardized inspection routines can optimize efficiency and safety. Improving stakeholder feedback mechanisms and clearly defining roles will foster more seamless, collaborative efforts. Digitizing documentation and implementing regular updates can save time and minimize errors. Increasing the frequency of safety awareness campaigns and deploying real-time hazard detection systems will significantly bolster overall safety for all personnel. Additionally, by adopting advanced traffic management systems with predictive analytics and embracing new technologies, the organization can streamline operations, enhance project implementation, and achieve coordination among all stakeholders.

5.0 Contributions of Authors

The first author was responsible for conceptualizing the research, designing the methodology, collecting and analyzing the data, and drafting the initial manuscript. The second author, serving as the advisor, provided invaluable guidance throughout the research process, offering expertise in research design, data processing, data interpretation, and manuscript revision. Their collaborative efforts were instrumental in the successful completion of this research.

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