

Safety Practices in Cargo Handling Operations at Nasipit Port, Agusan Del Norte

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ABSTRACT

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Port safety culture research has grown globally and across the Association of Southeast Asian Nations (ASEAN) region, yet few studies have examined whether individual worker characteristics relate differently to the distinct operational stages of cargo-handling safety. This study evaluated safety practices in cargo-handling operations at Nasipit Port, Agusan del Norte, Philippines, and determined whether respondent profile characteristics related to planning, execution, and supervision specifically, rather than to cargo-handling safety as an undifferentiated whole. The study employed a quantitative descriptive-correlational design. Respondents were 50 port personnel directly involved in containership cargo-handling operations (14 Global Port Terminal employees, 20 Philippine Ports Authority personnel, and 16 stevedores), surveyed using a researcher-adapted questionnaire and analyzed using frequency and percentage distributions, weighted means, and Spearman rank-order correlation. Most respondents were male (80%) and aged 31 to 40 (52%), with basic safety training the most commonly attended program (42%). Execution recorded the highest safety rating (weighted mean = 3.9, "always"), followed by planning and supervision (3.8 each). Neither planning nor execution correlated significantly with any profile variable (all $p > 0.05$), but supervision correlated significantly with training attended ($\rho = 0.440$, $p = 0.001$) and age ($\rho = 0.287$, $p = 0.043$). These findings indicate that planning and

execution are governed by standardized procedure regardless of worker background, while supervisory competence specifically depends on accumulated, reflective training and experience, supporting the study's experiential learning theory framework and pointing toward targeted supervisory training as the most evidence-based investment for Nasipit Port.

INTRODUCTION

Ports and shipping remain essential economic drivers, sustaining trade through imports, exports, and transshipment, and their contribution to national economic growth positions them centrally within international maritime transportation (Kadir, Mohammad, Othman, Amrin, Muhtazaruddin, Abu-Bakar, & Muhammad-Sukki, 2020). Since long before recorded history, people and goods have traveled by sea across continents and oceans, and maritime transportation today encompasses passenger transport, fishing, marine-resource use, defense activity, and support services such as navigation and ship maintenance, remaining one of the most efficient methods for moving virtually any cargo. Approximately 10 billion tons of containerized and bulk cargo cross the world's oceans annually, accounting for 80% to 90% of global trade, and this maritime dependence means that disruptions to cargo flow carry consequences well beyond the ships and crews directly involved (Walker, Adebambo, Feijoo, Elhaimer, Hossain, Edwards, & Zomorodi, 2019); port and cargo systems are additionally exposed to natural hazards and climate extremes that compound routine operational safety risk (Lam & Lassa, 2017).

Because container fleets continue to grow in scale and complexity, safety culture has become a central research theme in port operations worldwide. Arslan, Kurt, Turan, and De Wolff (2016) developed a safety-culture assessment and improvement framework for shipping organizations, arguing that structured measurement of safety climate and key performance indicators allows companies to identify and remediate their weakest safety areas systematically. Corrigan, Kay, Ryan, Brazil, and Ward (2019) similarly found that human-factors awareness and safety culture in the port environment remain uneven, shaped by inadequate risk assessment, insufficient training, and increasingly large and fast port equipment, and they called for research focused on the specific complexities of port work. Dalaklis (2017) situated this concern within the broader safety-and-security architecture of shipping operations, arguing that safety and security functions, though analytically distinct, are operationally interdependent aboard vessels and within port facilities. At the causal level, Khan, Yin, Mustafa, and Wang (2024) modeled seaport hazardous-cargo accidents and identified a strong safety culture, encompassing shared commitment, open hazard reporting, and proactive training, as central to mitigating risk during loading and unloading; comparable stakeholder-priority modeling in the oil and gas sector similarly identifies management commitment and training investment, rather than any single technical control, as the dimensions stakeholders rank highest for safety culture improvement (Rahim, Ahmad, & Muhammad, 2024). Complementing this, Chauvin, Lardjane, Morel, Clostermann,

and Langard (2013) analyzed maritime collisions using a human-and-organizational-factors framework and found that communication breakdowns and organizational shortcomings, more than individual error alone, drive maritime accidents, reinforcing the argument that safety culture must be addressed systemically rather than individually. Kirwan, Bettignies-Thiebaut, Cocchioni, Baumler, and Carrera Arce (2022) extended this systemic view by proposing a safety-learning-culture model for shipping, in which open incident reporting and continuous organizational learning reduce the recurrence of preventable accidents, and in the Baltic Sea region, chemical-cargo accident preparedness research similarly finds that inter-agency coordination and specialized hazardous-materials training are decisive in limiting accident severity (Yliskylä-Peuralahti, 2017).

Within the ASEAN region, safety-culture research in ports has likewise grown. In Malaysia, Amirah, Him, Tambi, Haron, and Badrul (2020) proposed a safety-culture framework for the Malaysian port industry, emphasizing that management commitment and structured training are the two behavioral variables most strongly associated with promoting safety culture in cargo-handling operations. In Indonesia, Haryanto, Rahayu, and Sianturi (2020) examined port authority supervision of dangerous-goods loading and unloading at Tanjung Perak Port, Surabaya, and found that inadequate adherence to standard operating procedures, insufficient infrastructure, and limited supervisory personnel significantly undermined safety oversight, underscoring that supervision quality depends heavily on institutional capacity rather than on individual effort alone. In Turkey, though outside ASEAN, Senbursa's (2023) study of container-port employees offers a useful comparative reference: it found that organizational-culture dimensions, particularly time orientation, significantly affect job satisfaction, which in turn predicts employees' intention to remain, suggesting that organizational climate factors travel across cultural contexts in shaping port workforce behavior.

Nasipit, Agusan del Norte, hosts the government base port for the province's northern region. This medium-sized port handles copra, flour, bottled goods, fertilizers, chemicals, iron, steel, petroleum products, corn products, and forest products, and it receives vehicle carriers, oil product tankers, general cargo ships, roll-on/roll-off passenger vessels, and containerships. Because ports function as the economic hub of surrounding communities, port safety and cargo security require sustained management attention, and disruptions to maritime cargo flow can generate consequences that extend well beyond the vessels and crews directly involved (Walker et al., 2019).

Despite a growing global and ASEAN literature on port safety culture, few studies have examined whether individual worker characteristics, specifically age, sex, training attended, and years of experience, relate differently to the three distinct operational stages of cargo-handling safety: planning, execution, and supervision. This distinction matters because port authorities allocate limited training and staffing resources across these three stages, and knowing which stage is most sensitive to which worker characteristic can sharpen how that investment is targeted. This gap justifies the present study, which the researchers undertook to evaluate

safety practices in cargo-handling operations at Nasipit Port and to determine whether respondent profile characteristics relate to planning, execution, and supervision outcomes specifically, rather than to cargo-handling safety as an undifferentiated whole.

FRAMEWORK

This study anchors its explanation of safety performance in Kolb's (1984) experiential learning theory, which holds that learning occurs most effectively through a four-stage cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation. Kolb further identified four learning styles, diverging, assimilating, converging, and accommodating, reflecting individual differences in how learners engage with this cycle; applied to port operations, experiential learning theory suggests that workers develop cargo-handling safety competence primarily through repeated hands-on experience and reflective training, rather than through passive instruction alone.

This experiential-learning lens is paired with two international maritime safety instruments that operationalize the study's dependent variable. The *Code of Safe Practice for Cargo Stowage and Securing* (CSS Code) sets the global standard for safe cargo handling, directing ship owners and operators to verify that a vessel is suitable for a given cargo operation, to fit appropriate securing equipment, and to provide guidance for rough-sea contingencies and cargo-shifting remediation (International Maritime Organization, 2019). The *International Ship and Port Facility Security* (ISPS) Code complements the CSS Code by addressing the security of ships, ports, cargo, and personnel: it directs continuous monitoring of crew and passenger activity, threat detection, implementation of port-specific security plans, and clear assignment of security roles and responsibilities among port authorities (International Maritime Organization, 2004); together, these two codes illustrate the operational interdependence of safety and security functions in port settings more broadly (Dalaklis, 2017).

Together, these frameworks position the independent variable of this study, port employee profile (age, sex, training attended, and years of experience), against the dependent variable of safety practices in cargo-handling operations, expressed through planning, execution, and supervision. Experiential learning theory predicts that the profile variable most directly tied to accumulated, reflective, hands-on learning, namely training attended, should show the strongest relationship with safety outcomes; the study's findings, discussed below, test this prediction directly.

OBJECTIVES

This study assessed the safety practices in cargo-handling operations at Nasipit Port through the following specific objectives: (1) determined the profile of respondents from Global Port Terminal employees, the Philippine Ports Authority, and stevedores in terms of age, sex, training attended related to cargo handling, and

years of experience; (2) described the extent of safety in containership cargo-handling operations at Nasipit Port as perceived by these respondent groups in terms of planning, execution, and supervision; and (3) determined whether a significant relationship exists between respondent profile and cargo-handling safety in each of the three domains.

METHODOLOGY

Research Design

The study used a quantitative descriptive-correlational design, gathering numerical data to statistically describe the population sample and test relationships among variables (Siedlecki, 2020). Surveys were used to collect data on respondent profile and perceived safety practices, and the design allowed the researchers to both characterize current conditions and test whether profile characteristics related systematically to safety-practice ratings.

Research Site

The study was conducted at Nasipit Port, Barangay Talisay, Nasipit, Agusan del Norte, approximately 2.3 kilometers from the Nasipit terminal proper. The Philippine Ports Authority designated the Port Management Office of Nasipit as an international base port serving the province's northern region.

Participants

Respondents were 50 port personnel directly involved in containership cargo-handling operations: 14 Global Port Terminal employees, 20 Philippine Ports Authority personnel, and 16 stevedores. All available personnel meeting these role criteria during the survey period were included.

Instrumentation

Data were gathered using a researcher-adapted survey questionnaire. The first section captured respondent profile (age, sex, training attended, and years of experience); the second section used a four-point Likert scale (4 = always, 3 = often, 2 = sometimes, 1 = never) adapted from the standardized instrument used by Hart (2019) in an analysis of cargo-handling performance and turnaround time at Tema Port, to measure perceived safety practices across planning, execution, and supervision.

Research Ethics Protocol

Participation was voluntary, and the researchers minimized risk of harm through prior risk assessment and adaptive data-collection procedures. Informed

consent was obtained using a bilingual (English and Cebuano) consent form confirming that respondents understood the study's purpose, were not coerced, retained their right to withdraw at any time, and were assured that their names and locations would remain confidential. All collected data were treated as confidential, stored on a password-protected flash drive accessible only to the research team, and used solely for the stated research purpose.

Data Collection

The survey and data collection process was carried out following a systematic and ethical framework. Formal permission was first sought by securing a letter of intent, signed by the research adviser, for submission to Nasipit Port management to authorize the survey schedule. Subsequently, the survey was administered to identified respondents at the port, with the researchers confirming each participant's understanding of the study and obtaining signed confidentiality agreements. The questionnaires were then manually distributed to ensure direct and accurate administration. Finally, the collected data were evaluated, and the resulting findings were used as the basis for the study's conclusions and recommendations.

Data Analysis

The researchers used frequency and percentage distributions to summarize respondent profile data, weighted mean to interpret the perceived extent of safety practices, and Spearman rank-order correlation to determine whether a significant relationship existed between respondent profile and cargo-handling safety in planning, execution, and supervision.

RESULTS AND DISCUSSION

Respondent Profile

Table 1

Respondent profile by role, age, sex, training attended, and years of experience

Profile variable	Category	<i>f</i>	%
Role	Global Port Terminal employee	14	28
	Philippine Ports Authority	20	40
	Stevedore	16	32
Age (years)	30 and below	11	22
	31–40	26	52
	41 and above	13	26
Sex	Male	40	80
	Female	10	20
Training attended	Basic safety training	21	42

Years of experience	Cargo handling and storage	13	26
	Hazardous materials (HAZMAT)	10	20
	Emergency response and crisis management	6	12
	1 year or below	8	16
	2–5 years	18	36
	6–10 years	15	30
	11 years and above	9	18

Most respondents (52%) were between 31 and 40 years old, suggesting that middle-aged workers form the operational backbone of cargo handling at Nasipit Port, combining physical capability with accumulated experience. Senbursa's (2023) finding that younger and older employees weigh organizational-culture dimensions differently, with younger workers favoring innovation and older workers favoring stability, suggests that this age composition may incline Nasipit Port's workforce toward experience-based, procedure-oriented safety practice rather than rapid adoption of new safety technology. Male respondents dominated the sample (80%), consistent with the historically male-dominated nature of dock and terminal labor and with social role theory's account of how traditional occupational sex segregation persists in physically demanding industrial settings (Eagly & Wood, 2016); Barreiro-Gen, Lozano, Temel, and Carpenter (2021) found that gender equality has remained a comparatively low sustainability priority for ports despite growing attention to other sustainability dimensions, a pattern reflected in Nasipit Port's workforce composition.

Basic safety training was the most commonly attended program (42%), followed by cargo handling and storage (26%), hazardous materials training (20%), and emergency response and crisis management (12%), indicating that foundational safety knowledge is broadly distributed even though specialized training in emergency response remains comparatively limited; this pattern is consistent with regional evidence that hazardous-materials-specific training, though less commonly attended, is a decisive factor in limiting the severity of chemical-cargo incidents when they do occur (Yliskylä-Peuralahti, 2017). Most respondents (36%) had two to five years of experience, followed by six to ten years (30%), suggesting a workforce with adequate but not extensive operational tenure overall. Nazwirman (2019) found that employees with longer tenure in port corporations exhibit greater competency in identifying hazards and applying safety best practices, which implies that Nasipit Port's comparatively junior experience profile may benefit from structured mentorship pairing less experienced staff with the port's smaller cohort of highly experienced personnel (18% with eleven or more years of experience).

Extent of safety in cargo-handling operations

Table 2

Extent of safety practices in containership cargo handling by domain

Safety domain	Weighted mean	Verbal description	Rank
Planning	3.8	Always	2.5
Execution	3.9	Always	1
Supervision	3.8	Always	2.5

Execution recorded the highest overall rating (mean = 3.9, "always"), led by respondents' agreement that appropriate safety materials are used, correct personal protective equipment is worn, and cargo-handling equipment is available upon request (each mean = 3.9). This finding indicates that the physical loading, unloading, and securing of cargo, arguably the operational stage of greatest immediate hazard, receives Nasipit Port's most consistent safety compliance. Notteboom, Pallis, and Rodrigue (2021) argue that effective port planning must integrate workforce management, training, and adherence to international safety standards as core components of operational risk mitigation, a pattern consistent with execution's strong performance here, since well-trained personnel executing established procedures are precisely what such integrated planning aims to produce.

Planning and supervision tied for the lowest rating among the three domains (mean = 3.8 each, "always"), though both remain in the consistently high range. For planning, the highest-rated items concerned use of on-site safety devices and alarmed perimeter security (both mean = 3.9); for supervision, the highest-rated items concerned communication with barges and shore personnel and completion of safety checklists, and enforcement of restricted-access security measures (both mean = 3.9). The lowest-rated single item across both tables was supervisory organization of tank cleaning and sweeping operations (mean = 3.6), suggesting a narrow but specific area where supervisory consistency could improve. Haryanto, Rahayu, and Sianturi (2020) found that inadequate infrastructure and limited supervisory personnel undermined dangerous-goods oversight at a comparable Indonesian port, a parallel that suggests Nasipit Port's slightly lower supervision rating may likewise reflect capacity constraints rather than a lack of supervisory will.

Relationship Between Profile and Safety Practices

Table 3

Correlation between respondent profile and cargo-handling safety practices

Safety domain	Profile variable	Correlation coefficient (rho)	p-value	Decision
Planning	Age	0.022	0.877	Not significant
	Sex	0.081	0.577	Not significant

Execution	Training attended	0.174	0.227	Not significant
	Years of experience	-0.236	0.098	Not significant
	Age	0.161	0.265	Not significant
	Sex	0.023	0.876	Not significant
Supervision	Training attended	0.231	0.106	Not significant
	Years of experience	-0.102	0.481	Not significant
	Age	0.287	0.043	Significant
	Sex	0.163	0.259	Not significant
	Training attended	0.440	0.001	Significant
	Years of experience	-0.201	0.162	Not significant

Neither planning nor execution correlated significantly with any profile variable (all $p > 0.05$), indicating that these two operational stages are governed by standardized procedures and organizational policy rather than by individual worker characteristics such as age, sex, training attended, or years of experience. This finding echoes Kadir and colleagues' (2020) argument that structured, port-wide risk-management frameworks, rather than individual attributes, are what convert planning intentions into safety outcomes. Supervision, by contrast, correlated significantly with training attended ($\rho = 0.440$, $p = 0.001$) and, less strongly, with age ($\rho = 0.287$, $p = 0.043$), while showing no significant relationship with sex or years of experience. This finding directly supports the study's experiential learning theory framework (Kolb, 1984): supervisory competence, which requires synthesizing communication, security enforcement, and situational judgment in real time, appears to depend on the kind of reflective, cumulative learning that structured training programs provide, more than on passive tenure or demographic characteristics. Amirah, Him, Tambi, Haron, and Badrul (2020) similarly identified management commitment and training, rather than workforce demographics, as the two behavioral variables most strongly associated with port safety culture, a pattern this study's supervision findings directly reproduce. The weaker but still significant association with age is consistent with the view that older workers bring accumulated situational judgment to supervisory decision-making even when this cannot be reduced to formal training alone (Senbursa, 2023).

CONCLUSIONS

Safety practices in cargo-handling operations at Nasipit Port are performed at a consistently high level across all three domains assessed, with execution rated

highest and planning and supervision tied for a still-high second. This study's principal contribution beyond existing literature is its demonstration that worker profile characteristics relate to cargo-handling safety in a highly domain-specific rather than uniform way: neither planning nor execution correlated significantly with age, sex, training attended, or years of experience, while supervision correlated significantly with training attended and, more weakly, with age. This finding supports and refines the study's experiential learning theory framework by showing that the theory's predicted relationship between reflective, accumulated learning and safety performance holds specifically for judgment-intensive supervisory tasks rather than for the full range of cargo-handling activities, indicating that procedural standardization, not individual learning history, is what drives consistent planning and execution performance at this port. These findings indicate that structured supervisory training, rather than broad-based training investment across all cargo-handling functions, represents the most evidence-based opportunity for improving safety outcomes at Nasipit Port.

TRANSLATIONAL RESEARCH

These findings could be translated into a targeted supervisory-training investment plan for Nasipit Port. Because training attended and age, specifically, relate to supervision performance while planning and execution do not, it is suggested that port management, the Philippine Ports Authority, and Global Port Terminal consider prioritizing structured supervisory training and mentorship, pairing less experienced or less trained personnel with older, more experienced supervisors during real-time cargo operations to help transfer the reflective, judgment-based competencies this study identifies as training- and experience-dependent.

Since tank cleaning and sweeping supervision scored lowest among all individual items assessed, this specific task may warrant targeted procedural reinforcement and refresher training. It is recommended that these findings be translated into a simple, plain-language supervisory training bulletin and checklist, in English and Cebuano, that Nasipit Port's stevedores, Global Port Terminal employees, and Philippine Ports Authority personnel could use directly without needing to interpret the full statistical findings.

This would support practical uptake among comparable Philippine and ASEAN seaports facing similar workforce-training allocation decisions.

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