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Sectoral Occupational Safety Compliance of Selected Construction Projects in the 4th District of Camarines Sur

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Abstract

This study investigates sectoral occupational safety compliance in selected public and private construction projects within the 4th District of Camarines Sur, Philippines. Recognizing the construction industry's high-risk nature, the research aims to assess and compare safety awareness levels across sectors using two standardized instruments: the Key Construction Safety Awareness Checklist and the DOLE-OSH Construction Safety Checklist. Employing a descriptive-correlational design, the study surveyed 20 construction workers – each representing a distinct site – to capture sector-specific safety practices and perceptions. Findings reveal that publicly-implemented projects exhibit higher general safety awareness (WM = 2.41) compared to private-contracted ones (WM = 2.33), particularly in workplace safety culture and equipment maintenance. However, both sectors showed critical gaps in training, hazard identification, and emergency preparedness. Correlation analysis yielded a high positive but statistically insignificant relationship ($\rho = 0.765$; $p = 0.0763$) in general safety awareness, while DOLE-OSH compliance demonstrated a very high and significant correlation ($\rho = 0.9879$; $p < 0.001$), suggesting strong alignment in core safety practices. The study concludes that while public projects benefit from institutional oversight, private projects demonstrate selective strengths in visible compliance elements. Both sectors require strategic improvements in safety training, emergency systems, and participatory governance. Recommendations include continuous safety education, enhanced signage, improved emergency facilities, and integration of wearable technologies. These findings contribute to the discourse on occupational safety governance and offer actionable insights for policymakers, contractors, and safety officers aiming to elevate construction safety standards across diverse project environments.

Keywords: Occupational Safety Compliance; Construction Sector; Public vs. Private Projects; DOLE-OSH Standards; Safety Awareness Assessment

INTRODUCTION

The construction industry remains one of the most hazardous sectors globally, with workers facing significantly higher risks of injury and death (ILO, 2023). In the Philippines, the Department of Labor and Employment (DOLE) reported that construction accounted for over 27% of occupational accidents in 2022, highlighting persistent safety issues, especially in rapidly developing provinces like Camarines Sur (DOLE, 2023). While Republic Act No. 11058 and DOLE Department Order No. 13 aim to promote Occupational Safety and Health (OSH), enforcement is often weak in provincial areas due to limited resources and oversight (Agapito & Recuenco, 2021).

Moreover, safety practices vary between public and private projects, with studies noting that public projects may struggle with bureaucratic inefficiencies, while private ones may prioritize cost over safety (Yiu et al., 2018; Gibb et al., 2021). Despite existing research on safety performance, few local studies offer comparative and mixed-method analyses of sectoral safety compliance. However, there is a dearth of studies which posit on the health and safety of construction projects especially in examining various levels of compliance. Hence, this study addresses that gap by examining institutional, managerial, and compliance differences between public and private construction projects in the 4th District of Camarines Sur to inform safety interventions.

Zid et al. (2018) emphasized that despite technological advancements in construction, occupational safety and health (OSH) continues to be undermined by human error and unsafe behaviors. Globally, the construction remains among the most hazardous industry, with studies attributing a significant proportion of workplace accidents and fatalities to unsafe acts and poor safety practices (Choudhry & Fang, 2008; Lingard et al., 2017). These behavioral factors persist as leading causes of incidents, underscoring the urgent need to strengthen OSH management systems and promote a culture of safety across all levels of construction projects.

In the 4th District of Camarines Sur, various Occupational Safety and Health (OSH) standards and practices are in place to reduce accidents, injuries, and fatalities in construction projects. However, the implementation and effectiveness of these safety measures often vary significantly between public and private sector projects, influenced by differences in management priorities, enforcement mechanisms, and resource allocation (Yiu et al., 2018; Agapito & Recuenco, 2021).

This study investigates the safety awareness – safety standards and operational practices – of public and private construction projects in ten (10) municipalities of the 4th District of Camarines Sur. The research specifically focused on selected ongoing construction projects - excluding completed ones – to evaluate real-time practices involving the use of personal protective equipment (PPE), fall prevention procedures, proper handling of electrical systems, safe use of tools and machinery, and overall site housekeeping. These elements are critical in minimizing occupational risks and ensuring a safe working environment. Specifically, the study sought to elicit answers for the following research questions:

1. What is the comparative mean level of safety awareness among workers in selected publicly-implemented and private-contracted construction projects in the 4th District of Camarines Sur, as measured by:
   1.1 Key Construction Safety Awareness Checklist; and,
   1.2 DOLE-OSH Construction Safety Checklist?

2. Is there a significant relationship between the safety awareness of publicly-implemented construction projects and privately-contracted projects?

3. Based on the results of the study, what strategic initiatives can be undertaken to improve workers' safety awareness?

By addressing these questions, the study aims to provide insights that will not only contribute to the local industry but also to broader discussions on improving safety practices in the construction sector. The findings may assist medium-sized construction firms in developing strategies that reduce accidents, enhance compliance, and increase project efficiency.

Theoretical Framework. The diagram presents an integrated yet orderly arranged theoretical underpinnings illustrating how safety practices in public and private construction projects are shaped through a multi-level interaction of institutional, organizational, managerial, and behavioral factors. At the top level is the Institutional Theory (Scott, 2014). This theory explores how structures – such as rules, norms, and routines – become established as authoritative guidelines for social behavior. It offers a comprehensive framework for understanding how institutions shape and are shaped by organizations. In application, this theory establishes the broader regulatory and policy environment, including government laws, DOLE inspections, and COA audits, which exert pressure particularly on public projects to adhere to formal safety standards.

Following Scott's theory is the Theory of Compliance and Enforcement (Burke, 2002). This theory contributes to the broader understanding of how enforcement mechanisms influence compliance behavior – particularly in regulatory and legal contexts. In application, this explains how regulatory mechanisms, such as inspections, penalties,

and incentives, drive organizations, especially in the public sector, to adopt visible safety compliance measures.

Figure 1
Multiple Theory Approach

This external influence feeds into the organization's internal values and practices, which leads to the next theory - the Organizational Safety Culture Theory (Cox & Flin, 1998). This theory investigates how shared values, beliefs, and practices within an organization influence safety-related behavior and outcomes. Cox and Flin critically examine the concept of safety culture, questioning its definition, measurement, and practical utility. Applying the tenets of this theory, a clear divergence emerges: public projects often reflect a bureaucratic, rule-based culture, while private projects may foster more cost-driven or adaptive safety cultures. The latter's cultural orientation is then translated into concrete practices through Safety Management Theory (Hale et al., 2010) - a theory that examines how structured interventions in organizational systems and culture can lead to measurable improvements in safety performance. The orientation focuses on the implementation of structured safety programs, training, and supervision mechanisms.

As risk is inevitable in every project, the next underpinning directs to the Risk Management Theory (Aven, 2015). Aven's contributions mark a significant evolution in how risk is conceptualized and managed – especially in light of uncertainty and complexity. This theory highlights how both sectors (public and private) recognize, evaluate, and mitigate hazards, but revealing key differences on how risks are prioritized and addressed across projects. Finally, Safety Culture Theory (Cooper, 2016) provides a behavioral lens through its triadic model – examining safety attitudes, observed behaviors, and situational factors. It ties all preceding layers together by assessing how safety policies and values ultimately manifest in day-to-day practices in construction sites.

This interconnected framework not only explains sectoral differences in construction safety but also provides a theoretical contribution by integrating external regulatory influences with internal organizational dynamics and individual behavior.

Conceptual Framework. Figure 2 illustrates the conceptual paradigm of the study. As illustrated, both boxes contain the same safety awareness checklists as observed by the construction projects subjected in the study. While both have the same measure parameters, the first box represents the level of safety awareness observed by workers from publicly-implemented construction projects. On the other hand, the second box represents the safety awareness among workers in privately-implemented construction projects. Probing the relationship of these two sectors – as symbolized by the arrow – is crucial because it examines whether sectoral implementation influences the level of safety awareness among stakeholders. It moves beyond general observations to test whether project ownership (public vs. private) correlates with differences in how safety is understood and prioritized. This correlation is relevant as it clarifies the

dynamics of accountability. If a significant relationship exists, it may reflect differences in regulatory enforcement, training protocols, or organizational culture between public and private sectors.

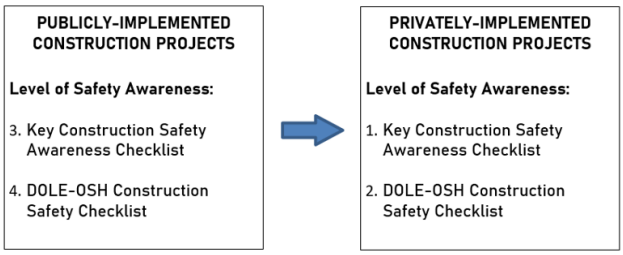

Figure 2
Conceptual Paradigm

More so, this correlation informs targeted interventions as the result can guide policy makers and contractors in designing sector-specific safety awareness campaigns or training modules. Lastly, this analysis strengthens the study's analytical depth by providing evidence-based insights into how implementation modality affects safety consciousness.

LITERATURES

Safety Management Systems: Institutional Foundations and Practices. A Safety Management System (SMS) provides an administrative framework through which construction firms structure their policies, procedures, and safety practices and meet regulatory and organizational goals. According to Jørgensen et al. (2019), effective management systems rely heavily on institutional mechanisms that reinforce accountability, continuous monitoring, and procedural discipline. This reflects the assumptions of Institutional Theory (Scott, 2014), where external pressures, such as government mandates and stakeholder expectations, shape organizational behavior.

Yin et al. (2021) provide empirical support for this view, showing that public infrastructure projects, guided by stricter procurement systems and auditing requirements, tend to maintain better oversight of safety protocols – particularly in equipment maintenance. The authors argue that these institutional safeguards, including third-party oversight and documentation, promote compliance, which aligns with this study's assumptions that public projects in the 4th District of Camarines Sur demonstrate stronger equipment-based safety awareness than their private counterparts.

Personal Protective Equipment (PPE) and Safety Training: Gaps in Safety Culture. The use and enforcement of Personal Protective Equipment (PPE) reflects a deeper safety culture, shaped by leadership commitment and workforce engagement. However, studies suggest systemic gaps in both awareness and implementation. Chen et al. (2020) found that safety training is often perceived as a compliance checkbox rather than a sustained behavioral process, especially in high-risk industries like construction. This supports the current study's observation that both public and private projects demonstrate only partial awareness of training needs, emphasizing the absence of a deeply embedded safety culture.

Abbas et al. (2022) further underscore the systemic challenges in developing countries, noting that while public projects face bureaucratic slowdowns, private contractors often lack both oversight and motivation to enforce PPE standards. These observations resonate with the principles of Safety Culture Theory, which stresses that safety performance is not only about systems but also about shared values and proactive leadership. The limited PPE enforcement, therefore, reflects broader organizational weaknesses rather than mere procedural lapses.

Hazard Prevention and Worksite Risk: Systemic Vulnerabilities. According to the Philippine Department of Labor and Employment (DOLE), construction sites are classified as high-risk environments under Department Order No. 198 (2018), mandating comprehensive safety programs. Despite this, accident rates remain high. Sofolahan et al. (2020) identified some contributing factors such as fragmented project teams, dynamic work conditions, and overlapping responsibilities – all of which weaken hazard control

mechanisms. From a risk governance perspective, this complexity suggests that hazard prevention requires more than compliance; it demands strategic alignment between leadership, planning, and frontline implementation. These findings support the current study's concern about fragmented compliance practices, especially in private projects. There is a need to reinforce an efficient, proactive and integrative risk governance.

Safety Policies and Organizational Commitment. A robust safety policy, according to Wang and Wu (2021), must include SMART goals (Simple, Measurable, Achievable, Realistic, and Timely) alongside written commitments from management. These principles were operationalized under the Safety Culture Theory, linking leadership behavior with frontline compliance.

Yankah (2012) emphasizes that without explicit role definitions and performance tracking, safety programs lack legitimacy. The contrast between private firms' reactive safety measures – often driven by client demands or reputational concerns (Lee et al., 2023) – and the public sector's more formalized but slower systems suggests a tension between flexibility and structure. This aligns with the Institutional Theory (Scott, 2014) view that private firms may resist regulation unless incentivized, while public agencies, though compliant, are often hindered by bureaucratic inertia.

Leadership and the Construction Safety Climate. Effective safety leadership has been identified as a transformative factor in shaping site-level safety culture. Sankar and Anandh (2024) found that site supervisors directly influence workers' safety attitudes through communication, role modeling, and active engagement. Their findings support the idea that safety culture is not only institutionally embedded but also relationally enacted. This study's finding – that supervisor engagement varies widely between projects – echoes this, suggesting that leadership at the micro-level is a critical enabler of safety performance, regardless of project ownership.

Strategic Safety Planning and Risk Governance. Integrating safety considerations into project planning is essential for long-term accident prevention. Panuwatwanich and Al-Haadir (2019) employed structural equation modeling to show that top-management support, when linked to safety planning early in the project lifecycle, significantly improves safety outcomes. Their findings reinforce the importance of strategic alignment, which Institutional Theory (Scott, 2014) also supports by stressing the influence of leadership behavior on organizational routines.

In Camarines Sur, there is an assumption that strategic safety planning is inconsistently practiced, especially among private firms, where short-term cost and schedule concerns often override safety considerations. This undermines systemic resilience, thus, increasing exposure to site-level hazards.

Comparative Analyses of Public vs. Private Sector Safety Standards. Sectoral differences in safety implementation have long been debated. Cabahug (2014), in a study conducted in Cagayan de Oro City, noted widespread safety policy neglect across both sectors but particularly in private sites, where financial constraints and contractor discretion reduced compliance. Meanwhile, Mencias et al. (2022) found that although safety programs in Cabanatuan's public projects are largely in place, areas such as emergency preparedness and policy enforcement remain weak.

Taken together, these studies highlight two major insights: (1) public projects benefit from stronger institutional scaffolding but often struggle with agility and adaptability; (2) private projects can be more responsive but suffer from inconsistent safety oversight. These findings align with both Institutional Theory (public compliance driven by formal requirements) and Safety Culture Theory (private firm variability tied to leadership and values).

Synthesis and Implications. The reviewed literature, when organized thematically and interpreted through Institutional Theory (Scott,

2014) and Safety Culture Theory (Cooper, 2016), reveals systemic tensions in the safety practices of construction projects. Public projects are institutionally compliant but face implementation delays, while private projects are agile yet inconsistently regulated. Across both sectors, there is a shared need for leadership engagement, sustained training, and strategic safety integration.

By synthesizing these findings, this study builds a conceptual bridge between organizational systems, policy enforcement, and worker-level safety behaviors – providing a strong foundation for analyzing sectoral differences in construction safety compliance in the 4th District of Camarines Sur.

METHODOLOGY

Research Design. This study adopts a descriptive-correlational research design to examine occupational safety compliance among selected construction projects in the 4th District of Camarines Sur. The descriptive component addresses the first research question by profiling the level of safety awareness among workers using two standardized instruments: the Key Construction Safety Awareness Checklist and the DOLE-OSH Construction Safety Checklist. Through quantitative survey methods and descriptive statistics, the study captures sectoral safety practices across public and private construction sites, providing a baseline understanding of compliance levels.

The correlational aspect of the design seeks to determine whether a significant relationship exists between the type of project implementation (public vs. private) and workers' safety awareness. Rather than comparing group means, the study investigates the statistical association between sector type and awareness scores, using appropriate inferential tests such as Pearson's r or Spearman's rho. This approach allows the researcher to explore whether sectoral affiliation influences safety consciousness, offering insights into potential gaps in occupational safety governance.

Population and Research Setting. A total of 20 construction projects – 10 from publicly-implemented projects and 10 from privately-contracted projects – in the 4th District of Camarines Sur, Philippines were purposively selected based on clearly defined operational criteria to ensure the relevance and focus of the study. Only projects that were actively under construction during the data collection period were considered. Projects were categorized into two types: public construction projects, which are funded, managed, or supervised by government agencies such as the Department of Public Works and Highways (DPWH) or local government units (LGUs); and private construction projects, which are financed and executed by private developers, contractors, or companies. All selected sites involved vertical structures, such as school buildings, office buildings, and commercial facilities.

The study employed a site-based purposive sampling strategy, selecting one construction worker from each of 20 distinct construction sites across the 4th District of Camarines Sur. This 1:1 ratio was strategically chosen to ensure site-level representation, acknowledging that safety practices and awareness may vary significantly depending on the operational context of each site. By anchoring each respondent to a unique location, the study captures a broad cross-sectional view of sectoral safety compliance, minimizing intra-site bias and enhancing the comparability of responses across diverse project environments. However, it is acknowledged that the small sample size (n = 20) may limit the statistical power and representativeness of the findings. As such, the results are intended for contextual analysis rather than generalization to the wider population. Despite its modest scale, the data reflects meaningful patterns within this targeted population (construction worker).

This approach aligns with the principle that purposive sampling is appropriate when the goal is to capture variability across key contextual factors, especially in occupational health studies. As Khan (2020) notes, purposive sampling is effective in assessing safety

knowledge and practices among construction workers when site-specific conditions are central to the research focus. In this case, the sampling method supports the inferential aim of examining relationships between project type (e.g., public vs. private) and safety awareness, while also ensuring that no single site disproportionately influences the findings.

In terms of sampling, while the sample size is modest, its strategic distribution across multiple sites strengthens the validity of the results and aligns with the study's goal of mapping safety awareness across a geographically and operationally varied landscape.

Demographic Profile of Respondents. The demographic profile (Table 1) reveals that the majority of respondents were male (85%), which aligns with the gender composition typically observed in the construction industry. Most participants were aged between 36 and 45 years old (40%), followed by those aged 26–35 (35%), suggesting a workforce that is largely in its prime working years. This age distribution may reflect a balance of experience and physical capability, both critical in construction roles.

Table 1
Frequency and Percentage Distribution of Respondents' Demographic Profile

Demographic Profile	Category	Frequency (n=20)	Percentage
Sex	Male	17	85%
	Female	3	15%
Age	26 – 35 years old	7	35%
	36 – 45 years old	8	40%
	46 and above	5	25%
Position	Safety Officer	12	60%
	Site Engineer	6	30%
	Project Foreman	2	10%
Years of Experience	1 – 5 years	3	15%
	6 – 10 years	9	45%
	11 years and above	8	40%
Safety Training (COSH / BOSH)	Yes	16	80%
	No	4	20%

Notably, 60% of respondents identified as Safety Officers, indicating that the study captured insights from personnel directly responsible for implementing and monitoring safety protocols. The inclusion of Site Engineers (30%) and Project Foremen (10%) adds depth to the data, allowing for a more nuanced understanding of safety awareness across hierarchical roles.

In terms of experience, nearly half of the respondents (45%) had 6–10 years in the field, while 40% had over 11 years, suggesting a seasoned workforce with substantial exposure to construction environments. This is complemented by the finding that 80% of respondents had undergone safety training (COSH/BOSH), which may positively influence their safety awareness and compliance. The relatively high proportion of trained personnel supports the study's focus on evaluating safety practices and suggests that most respondents are equipped with foundational knowledge of occupational safety standards. Overall, the demographic profile indicates a mature, experienced, and safety-conscious sample, strengthening the reliability of insights drawn from their responses.

Research Instrument. The primary research instrument was a structured survey questionnaire designed to assess safety awareness and compliance among workers in public and private construction projects. It measured knowledge, attitudes, and behaviors related to occupational safety standards, accident prevention, and adherence to site protocols. The instrument comprised three sections: (1) demographic profile (e.g., age, experience, job role), (2) key dimensions of construction safety awareness, and (3) the DOLE-OSH Construction Safety Checklist to evaluate compliance practices. Items were rated using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), capturing perceptions on hazard recognition, PPE usage, and site-level safety behaviors.

Though researcher-developed, the questionnaire was anchored on established frameworks from the International Labour Organization (ILO), DOLE standards, and relevant academic literature. Content validation was conducted by occupational safety and construction management experts during the title and pre-oral defense at the Polytechnic University of the Philippines. A pilot test

involving 20 non-sample construction sites yielded a Cronbach's alpha of 0.75, indicating acceptable reliability. Responses were averaged per dimension, with awareness levels interpreted as follows: 1.00–1.66 = Not Aware, 1.67–3.32 = Moderately Aware, and 3.33–5.00 = Highly Aware. These thresholds enabled clear categorization of safety practices across sectors.

Data Analysis. To address the first research question, the study employed mean scores as the primary statistical treatment. This method allowed for the quantification of responses from both the Key Construction Safety Awareness Checklist and the DOLE-OSH Construction Safety Checklist. By calculating the average scores across items, the study was able to assess the general level of awareness among respondents, providing a clear numerical representation of safety compliance. The use of mean values is appropriate for Likert-scale data and facilitates straightforward interpretation of awareness levels across different safety dimensions.

For the second research question, which sought to determine whether a significant relationship exists between project type (public vs. private) and safety awareness, the study utilized the Spearman rank-order correlation. This non-parametric test was chosen due to the ordinal nature of the data and the relatively small sample size. Spearman's rho measures the strength and direction of association between two ranked variables, making it suitable for examining whether sectoral affiliation is linked to variations in safety awareness scores. The application of this test supports the study's inferential aim and provides statistical evidence on whether project implementation type influences safety consciousness among workers.

Data Gathering. Data collection was conducted over three months (February–April 2025) across active public and private construction sites in the 4th District of Camarines Sur, Philippines. This period allowed for broad coverage of site conditions and worker profiles. Surveys were administered on-site during breaks or after work hours to avoid operational disruption and ensure contextual relevance.

Participants included engineers, architects, site supervisors, and safety officers selected through purposive sampling, targeting individuals directly engaged in construction and safety practices. The researcher coordinated with project managers to secure access and invite eligible respondents.

Survey instruments were printed and personally distributed. Prior to participation, respondents received verbal and written instructions, signed informed consent forms, and were assured of their right to withdraw at any time. Emphasis was placed on honest responses, with no right or wrong answers.

Completed questionnaires were collected immediately to maintain confidentiality. No personal identifiers were recorded; data were numerically coded and analyzed in aggregate. Ethical safeguards ensured anonymity and protected participants from employment-related repercussions.

Initial hesitation from some respondents was addressed through close coordination with site managers, reinforcing the voluntary and non-threatening nature of the study. These procedures ensured reliable data collection while upholding ethical standards and participant welfare.

RESULTS

Level of safety awareness among workers in selected public and private construction projects in the 4th District of Camarines Sur.

The comparative analysis of safety awareness between public-implemented and private-contracted construction projects in Camarines Sur's 4th District, as shown in Table 2, reveals sectoral differences shaped by regulatory and organizational contexts. Public projects consistently scored higher in general safety awareness (WM = 2.76 vs. 2.38), workplace safety culture (2.70 vs. 2.36), and equipment maintenance (2.42 vs. 2.32), suggesting

stronger institutional oversight and standardized safety protocols. These findings align with Zhou et al. (2021), who emphasize the role of regulatory enforcement in cultivating safety-conscious environments.

Table 2

Mean Distribution of Safety Awareness Based on the Key Dimensions of Construction Safety Awareness

Key Dimensions of Construction Safety Awareness	Public Implemented Construction		Private-Contracted Construction	
	WM	Verbal Interpretation	WM	Verbal Interpretation
1. General safety awareness	2.76	Highly Aware	2.38	Highly Aware
2. Training and preparedness	2.18	Sometimes Aware	2.24	Sometimes Aware
4. Workplace safety culture and behavior	2.70	Highly Aware	2.36	Highly Aware
5. Hazard identification and risk management	2.02	Sometimes Aware	2.32	Sometimes Aware
6. Safety equipment and maintenance	2.42	Highly Aware	2.32	Sometimes Aware
7. Final thoughts of construction safety	2.40	Highly Aware	2.36	Highly Aware
Average mean:	**2.41**	**Highly Aware**	**2.33**	**Sometimes Aware**

Legend: 1.00 – 1.66 Not Aware; 1.67 – 2.33 Sometimes Aware; 2.34 – 3.00 Highly Aware

However, both sectors demonstrated low awareness in training and preparedness (WM = 2.18 for public; 2.24 for private) and hazard identification (2.02 vs. 2.32), indicating systemic gaps in proactive safety education and risk management. While private projects showed slightly better performance in hazard recognition, neither sector achieved "Highly Aware" status in these critical dimensions. Arewa and Farrell (2020) argue that effective safety compliance requires not only awareness but also structured interventions and continuous training – elements currently lacking in both contexts.

Overall, public construction sites were rated "Highly Aware" (average WM = 2.41), while private sites were "Sometimes Aware" (average WM = 2.33). This suggests that public sector projects benefit from more consistent safety practices, yet both sectors require strategic improvements in training, hazard mitigation, and participatory safety planning. The findings underscore the need for integrated safety programs that combine regulatory enforcement with behavioral and educational initiatives to elevate occupational safety standards across the construction industry.

In Table 3, the comparative analysis of safety awareness based on the DOLE-OSH Construction Safety Checklist reveals that both public and private construction sectors in Camarines Sur's 4th District fall within the "Sometimes Aware" category, with private projects scoring slightly higher (WM = 2.28) than public ones (WM = 1.99). Notably, private sites demonstrated stronger awareness in areas such as safety signages (WM = 2.45) and welfare facilities (WM = 2.37), both rated "Highly Aware." These findings suggest that private contractors may prioritize visible compliance elements, possibly driven by reputational concerns and client expectations (Lee et al., 2023). However, reliance on signages alone, as Rahim et al. (2021) caution, cannot substitute for comprehensive safety training and management systems.

Table 3

Mean Distribution of Safety Awareness Based on the DOLE-OSH Construction Safety Checklist

Construction Safety Checklist (DOLE - OSH)	Public Implemented Construction		Private-Contracted Construction	
	WM	Verbal Interpretation	WM	Verbal Interpretation
1. Construction Safety and Health Program	2.18	Sometimes Aware	2.27	Sometimes Aware
2.Personal Protective Equipment	2.25	Sometimes Aware	2.25	Sometimes Aware
3.Safety Personnel	1.68	Sometimes Aware	2.18	Sometimes Aware
4.Emergency Occupational Health Personnel and Facilities	1.78	Sometimes Aware	2.28	Sometimes Aware
5.Construction Safety Signages	1.74	Sometimes Aware	2.45	Highly Aware
6.Safety on Construction Heavy Equipment	2.16	Sometimes Aware	2.27	Sometimes Aware
7.Construction Safety and Health Committee	1.85	Sometimes Aware	2.28	Sometimes Aware
8.Construction Safety and Health Training	1.88	Sometimes Aware	2.24	Sometimes Aware
9.Construction Worker's Skills Certificate	2.00	Sometimes Aware	2.20	Sometimes Aware
10. Worker's Welfare Facilities	2.16	Sometimes Aware	2.37	Highly Aware
Average mean:	**1.99**	**Sometimes Aware**	**2.28**	**Sometimes Aware**

Legend: 1.00 – 1.66 Not Aware; 1.67 – 2.33 Sometimes Aware; 2.34 – 3.00 Highly Aware

Public projects, while generally lower in mean scores, showed comparable awareness in personal protective equipment (PPE) and heavy equipment safety (WM = 2.25 and 2.16, respectively), reflecting adherence to standard safety provisions. Yet, both sectors ranked safety personnel and emergency health facilities among the lowest, with public projects scoring critically low in safety officer deployment (WM = 1.68). This points to a systemic shortage of qualified personnel capable of implementing on-the-ground hazard control, a concern echoed by Opoku and Boakye (2022), who emphasize the centrality of trained safety officers in mitigating construction risks.
Overall, the findings highlight a fragmented approach to occupational safety compliance,

where both sectors exhibit selective strengths but lack holistic integration of OSH standards. While private projects may appear more safety-conscious in certain checklist items, this may reflect surface-level compliance rather than deep institutional commitment.

As Basart-González et al. (2020) argue, effective safety culture requires not only visible measures but also embedded systems of accountability, training, and personnel support – elements that remain underdeveloped across both public and private construction domains.

Significant relationship between the safety awareness of publicly-implemented construction projects and privately-contracted projects. Table 4 presents the Pearson r test between the construction safety awareness of publicly-implemented construction projects and privately-contracted projects. The correlation coefficient (ρ = 0.765) and p-value (0.0763) were computed to determine the monotonic relationship between the two sectors' safety compliance ratings. The result suggests a high positive correlation, indicating that as safety practices improve in one sector, a similar trend is observed in the other. However, because the p-value exceeds 0.05, this relationship is not statistically significant, likely due to the small sample size or closely clustered values.

The high positive correlation seen in the data aligns with findings from Ramos et al. (2021), who noted that both public and private construction projects in the Philippines have been increasingly influenced by the implementation of Occupational Safety and Health (OSH) standards under Republic Act No. 11058 (RA No. 11058), leading to comparable safety compliance behaviors across all divisions and sectors.

Similarly, Alshammari et al. (2020) highlighted that cross-sectoral training programs, government regulations, and third-party inspections have contributed to standardizing safety protocols between public and private construction projects in Southeast Asia. Their study reported a convergence in safety practices, especially in areas like hazard identification and the use of personal protective equipment (PPE), which supports the positive correlation found in the study.

However, the lack of statistical significance (p = 0.0763) echoes concerns raised by Zhou and Mohammad (2022), who emphasized that small sample sizes (such as in this study) and aggregated Likert-scale responses often reduce the statistical power needed to validate correlations in construction safety research. They recommend using larger datasets or mixed methods to supplement quantitative results.

Table 4
Pearson r test between construction safety awareness of publicly-implemented construction projects and privately-contracted projects

Variable Category	Sector		Statistical Results		
	Public	Private	Correlation Coefficient	p-value	Interpretation
1. General Safety Awareness	13.8	11.9	0.765	0.0763	High positive correlation
2. Training and Preparedness	10.9	11.2			
3. Workplace Safety Culture and Behavior	13.5	11.8			
4. Hazard Identification and Risk Management	10.1	11.6			
5. Safety Equipment and Maintenance	12.1	11.6			
6. Final Thoughts of Construction Safety	12.0	11.8			

Furthermore, Fernandez & Tagle (2023) observed that while safety perceptions in public and private projects may align on paper due to similar guidelines, implementation varies in intensity and monitoring, particularly in resource-limited areas. This may explain the minor discrepancies in individual category scores (e.g., General Safety Awareness being higher in public sector).

The table effectively demonstrates the alignment of safety practices across sectors but also reveals the need for further validation due to the lack of statistical significance. This supports a growing body of literature that suggests sectoral safety practices are becoming more alike, driven by common legal frameworks and shared training programs, yet still subject to operational and resource-based variability.

The analysis in Table 5 demonstrates a very high positive correlation (ρ = 0.9879) between public and private construction sectors in terms of implementing core safety requirements. This relationship is also statistically significant ($p < 0.001$), indicating that as safety practices improve in the public sector, a closely aligned improvement is observed in the private sector, and vice versa.

Table 5
Pearson r test between the DOLE-OSH Construction Safety Checklist of publicly-implemented construction projects and privately-contracted projects

Variable Category	Sector		Statistical Results		
	Public	Private	Correlation Coefficient	p-value	Interpretation
1. Construction Safety and Health Program	15.3	15.9			
2. Personal Protective Equipment	9.0	9.0			
3. Safety Personnel	10.1	13.1			
4. Emergency Occupational Health Personnel and Facilities	10.7	13.7	0.9879	0.0001	Very high positive correlation
5. Construction Safety Signages	22.7	31.9			
6. Safety on Construction Heavy Equipment	15.1	18.2			
7. Construction Safety and Health Committee	46.3	57.0			
8. Construction Safety and Health Training	9.4	11.2			
9. Construction Worker's Skills Certificate	2.0	2.2			
10. Worker's Welfare Facilities	17.3	19.0			

These findings suggest a strong alignment in safety policy enforcement and resource allocation between both sectors, possibly due to shared compliance requirements under Republic Act No. 11058 and DOLE Department Order No. 13, Series of 1998, which mandate standardized occupational safety and health practices in all construction projects in the Philippines.

Moreover, these results align with Tayao et al. (2021), who emphasized that both sectors have increasingly adopted comprehensive safety programs, especially in large- scale or government-monitored projects. The consistently high scores in areas such as Safety Committees, Signage, and Welfare Facilities further suggest that external audits and institutionalized OSH training have played a vital role in improving compliance uniformly across sectors.

In contrast to the earlier analysis (on general safety perceptions), this dataset reflects concrete, observable safety practices and requirements, which are often enforced and monitored more strictly. This might explain why the relationship here is not only stronger but also statistically significant. Overall, this strongly supports the argument that sectoral differences in core safety compliance are minimal, particularly in regulated domains where guidelines are clearly outlined and monitored by government and third-party bodies.

Strategic initiatives to improve workers' safety awareness. The need to improve construction safety awareness is crucial, especially considering the gaps found in safety practices in both the public and private construction sectors. While there is good adherence to basic safety practices, some areas, including emergency preparedness and safety signage, revealed serious shortcomings that could threaten worker safety.

Comprehensive and Continuous Safety Training. Safety training plays a crucial role in reducing accidents in construction. Tariq et al. (2020) also emphasized that continuous safety training lowers accident rates and boosts awareness.

Enhanced Safety Signage and Communication Systems. One significant gap identified in the study is the lack of adequate construction safety signs. This problem is not just an issue for this study; other research also highlights the need for clear and visible signs to reduce accidents. Chen et al. (2021) state that proper signage is crucial for guiding workers through risky areas and keeping them aware of potential dangers.

Improved Emergency Occupational Health Personnel and Facilities. Research by Lin and Chen (2020) points out that poor emergency preparedness, such as not having enough first-aid equipment or qualified medical staff, can worsen the effects of accidents and delay medical help. Construction companies should invest in adequate emergency health resources,

like well-equipped first-aid stations and on-site medical personnel.

Strengthening Compliance and Monitoring Mechanisms. Nguyen et al. (2021) suggest that regular safety audits, along with a system for tracking and addressing non-compliance, can help spot potential issues before they lead to accidents. This proactive approach also emphasizes the importance of safety among workers and management, fostering a culture of accountability.

Integrating Technology for Enhanced Safety Management. According to Zhao et al. (2020a), adding technology to safety protocols allows for better tracking of safety practices, more efficient hazard identification, and quicker responses to potential risks. Construction companies should invest in wearable equipments, such as smart helmets and vests that can detect environmental hazards like toxic gas levels, temperature changes, or physical fatigue.

Promoting Worker Engagement and Ownership of Safety Practices. Companies can set up safety committees with both management and workers. This allows for open communication and teamwork on safety issues. Additionally, rewarding workers for following safety standards and helping create a safer work environment can further encourage safety-focused behavior.

DISCUSSION

The findings of this study reveal nuanced sectoral differences in occupational safety awareness and compliance among construction projects in Camarines Sur's 4th District. Publicly-implemented projects consistently demonstrated higher levels of general safety awareness, workplace safety culture, and equipment maintenance, suggesting that institutional oversight and standardized protocols contribute to stronger safety practices. These results align with Zhou et al. (2021), who underscore the role of regulatory enforcement in shaping safety-conscious environments.

However, both public and private sectors showed critical gaps in training, hazard identification, and emergency preparedness. Despite the public sector's overall "Highly Aware" rating (WM = 2.41), and the private sector's "Sometimes Aware" rating (WM = 2.33), neither achieved high awareness in proactive safety dimensions. This supports Arewa and Farrell's (2020) assertion that awareness alone is insufficient without structured interventions and continuous training.

The comparative analysis using the DOLE-OSH Construction Safety Checklist further complicates the narrative. While private projects scored slightly higher (WM = 2.28) than public ones (WM = 1.99), both sectors remained within the "Sometimes Aware" category. Notably, private contractors excelled in visible compliance elements such as signage and welfare facilities, possibly driven by reputational concerns (Lee et al., 2023). Yet, low scores in safety personnel and emergency health facilities – especially in public projects – highlight systemic deficiencies in on-site hazard control, echoing Opoku and Boakye's (2022) emphasis on the importance of trained safety officers.

The correlation analyses offer mixed insights. The Pearson r test for general safety awareness yielded a high positive correlation ($\rho = 0.765$) but lacked statistical significance ($p = 0.0763$), likely due to sample size limitations. In contrast, the correlation for DOLE-OSH compliance was both very high ($\rho = 0.9879$) and statistically significant ($p < 0.001$), indicating strong alignment in core safety practices across sectors. This supports the notion that legal frameworks like Republic Act No. 11058 and DOLE Department Order No. 13 have standardized safety protocols, as noted by Tayao et al. (2021).

Conclusion. The comparative analysis of occupational safety compliance across public and private construction projects in Camarines Sur's 4th District reveals a complex interplay between institutional oversight and operational execution. Publicly-implemented projects exhibit stronger safety awareness, particularly

in areas influenced by regulatory mandates and standardized protocols. This suggests that government-led initiatives benefit from structured frameworks and accountability mechanisms that promote consistent safety culture. Conversely, private-contracted projects demonstrate selective strengths in checklist-based compliance, excelling in visible safety elements such as signage and welfare facilities. These strengths may reflect market-driven motivations, including client expectations and reputational management, rather than deeply embedded safety systems.

Despite these sectoral distinctions, both public and private projects fall short in achieving holistic safety integration. Critical dimensions such as training, hazard identification, and emergency preparedness remain underdeveloped, pointing to systemic gaps that transcend sectoral boundaries. The high correlation in safety practices – particularly in DOLE-OSH compliance – suggests that shared regulatory environments are fostering convergence. However, the lack of statistical significance in general safety awareness and the uneven implementation of safety personnel and emergency systems underscore persistent operational disparities.

Ultimately, the findings highlight the need for a unified, multi-dimensional approach to occupational safety – one that combines regulatory enforcement with proactive education, technological innovation, and participatory governance to ensure safer construction environments across all sectors.

Recommendations. To address the fragmented safety compliance observed across public and private construction sectors, a multi-pronged strategy is essential. First, comprehensive and continuous safety training programs must be institutionalized across all project types. These should go beyond basic orientations and include scenario-based learning, hazard simulations, and refresher modules tailored to evolving site conditions. As Tariq et al. (2020) emphasize, sustained training significantly reduces accident rates and fosters a proactive safety culture.

Second, enhancing emergency response systems is critical. Construction sites must be equipped with accessible first-aid stations, trained medical personnel, and clear emergency protocols. Lin and Chen (2020) highlight that delays in medical intervention can exacerbate injuries, underscoring the need for robust on-site health infrastructure.

Third, strengthening monitoring and accountability mechanisms through regular audits, digital compliance logs, and third-party inspections can reinforce adherence to safety standards. Nguyen et al. (2021) advocate for transparent tracking systems that identify and rectify lapses before they escalate.

Fourth, leveraging technology – such as smart helmets, wearable sensors, and mobile safety apps – can enhance real-time hazard detection and response (Zhao et al., 2020b).

Finally, promoting worker participation through joint safety committees, feedback channels, and incentive programs cultivates ownership and collective responsibility.

Together, these initiatives can bridge sectoral gaps and elevate occupational safety standards across Camarines Sur's construction industry and beyond.

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