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SAFETY CULTURE, CLIMATE, AND COST IN A CONSTRUCTION COMPANY IN BACOLOD CITY

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Abstract:

Safety is a critical aspect of construction operations, ensuring the protection of workers, safeguarding project assets, and promoting operational efficiency. This study investigated the extent of safety culture, safety climate, and safety cost in a construction company in Bacolod City, Philippines. Using a descriptive-comparative and correlational research design, the study surveyed 153 construction employees selected through stratified random sampling. The study utilized validated and reliable instruments to measure perceptions of safety culture, safety climate, and safety cost. Findings revealed that all three variables were rated "Very High," indicating a strong safety foundation within the company. Reporting Culture and Management Commitment emerged as the strongest aspects of safety culture, while Safety Commitment and Communication led in safety climate dimensions. Preventive safety costs were prioritized, highlighting proactive financial investments in safety measures. Significant differences were identified based on sex and job classification, with male and technical/skilled workers reporting higher safety perceptions compared to female and rank-and-file employees. No significant differences were observed across age groups. Correlation analysis showed strong positive relationships among safety culture, safety climate, and safety cost, suggesting that improvements in one dimension reinforce the others. The study underscores the importance of an integrated approach to safety management, linking organizational values, workplace perceptions, and financial investments. It recommends strengthening learning culture, enhancing inclusivity, improving communication about safety costs, and embedding safety within organizational strategy. These findings provide valuable insights for construction companies seeking to enhance workplace safety and operational resilience in rapidly urbanizing areas.

Keywords: *Safety culture, safety climate, safety cost, construction safety, workplace safety, Bacolod City, Philippines, safety management, occupational health, construction industry*

Introduction:

The construction industry remains one of the primary drivers of economic growth worldwide. According to the Maximilian (2024), this sector contributes significantly to national gross domestic product (GDP) and employment generation. Despite its economic significance, the industry is notorious for its high-risk nature and persistent safety challenges. The International Labour Organization (Azzi, 2022) reports that while construction workers represent about 7% of the global workforce, they account for 30-40% of occupational fatalities. This alarming statistic underscores the urgency for robust and effective safety systems that can mitigate hazards and protect workers.

In the Southeast Asian context, rapid urbanization has accelerated infrastructure development, amplifying safety risks in the construction sector. Countries such as Singapore and Malaysia have implemented rigorous safety frameworks aimed at reducing workplace incidents and managing project costs effectively (Fern & Mohd Masirin, 2021). However, the Philippines still faces significant safety challenges, particularly outside its primary urban hubs. Although initiatives like the Department of Labor and Employment's (DOLE) Department Order No. 13 provide regulatory guidelines, enforcement and compliance remain inconsistent, especially in secondary cities such as Bacolod, where construction projects continue to grow amid infrastructural modernization.

Central to mitigating safety risks in construction is the development of a strong safety culture. Safety culture encompasses the deeply held beliefs, values, and practices within an organization that influence individual and collective behaviors regarding safety. Scholars such as Bautista-Bernal et al., (2024) and Guldenmund (2000) emphasize that leadership commitment, active employee involvement, and continuous safety learning are key

elements shaping safety culture. When safety becomes an intrinsic part of organizational culture, it not only improves worker protection but also supports productivity and operational efficiency.

Complementing safety culture is the concept of safety climate, which reflects the shared perceptions of employees regarding safety within their organization at a particular point in time. Meng & Chan (2021) describe safety climate as an outcome of ongoing organizational efforts, particularly in terms of communication, hazard responsiveness, and supervision. A positive safety climate suggests that safety policies are effectively communicated and enforced, creating a work environment where employees feel valued and protected. The interplay between safety culture and safety climate provides a comprehensive perspective on an organization's safety performance.

Safety cost, meanwhile, has emerged as an essential component in construction project management. Divya et al., (2017) and Ehmer (2000) note that investment in safety measures—such as personal protective equipment (PPE), training, and hazard control systems—can significantly lower the overall costs associated with workplace accidents. These costs include direct expenditures like medical treatment, equipment repair, and insurance, as well as indirect costs such as project delays, legal liabilities, and reduced worker morale. By adopting a proactive approach to safety spending, organizations can optimize operational performance and financial stability.

In Bacolod City, a rapidly developing urban center, construction activities are intensifying due to both public and private investments. However, safety practices in local construction sites remain a concern. Informal consultations with site managers revealed that many companies operate with outdated safety manuals and lack comprehensive safety enforcement mechanisms. An analysis of project-based data showed that even modest safety investments—around 1.26% of total project costs—can lead to substantial returns, including reduced lost-time injuries (LTIs) and lower accident-related expenses. These findings highlight the need for a shift in mindset, positioning safety costs not as burdensome expenses but as strategic investments that improve project outcomes.

Despite growing global and regional interest in construction safety, localized research in smaller Philippine cities like Bacolod remains scarce. Existing studies tend to focus on major metropolitan areas such as Metro Manila and Cebu, leaving gaps in the understanding of safety dynamics in smaller but emerging urban centers. Furthermore, much of the previous research examines safety culture, climate, and cost as separate dimensions, with few studies integrating these factors into a single comprehensive framework. This gap restricts the ability of local construction firms to adopt holistic and evidence-based safety strategies tailored to their unique contexts.

In response to this research gap, the present study investigates the relationships among safety culture, safety climate, and safety cost within construction companies operating in Bacolod City. It aims to provide empirical evidence that can guide construction firms in formulating realistic and cost-effective safety management practices. By examining these interconnected variables within the same organizational settings, the study offers insights that are both academically significant and practically applicable.

This research contributes not only to the academic field but also offers practical implications for construction companies, policymakers, and safety regulators in Bacolod City and beyond. The study highlights safety as not just a compliance requirement but also as a critical business strategy. By linking safety investments with tangible outcomes such as incident reduction and cost savings, companies can leverage safety as a competitive advantage. Additionally, the findings will support the development of an updated safety manual that incorporates best practices and addresses the specific needs of Bacolod's construction sector.

Ultimately, this study underscored the importance of integrating safety culture, safety climate, and safety cost into a unified framework for construction safety management. Through this integrated approach, construction firms can improve worker welfare, enhance operational efficiency, and achieve greater financial sustainability. The study aspires to serve as a foundational reference for future research and policy-making efforts aimed at fostering safer, more resilient construction industries in secondary urban centers across the Philippines.

Methodology:

This study employed a descriptive-comparative and correlational research design to examine the relationships among safety culture, safety climate, and safety cost within a construction company in Bacolod City, Philippines. This

approach was chosen because it allows for both the description of current safety practices and the identification of relationships and differences among variables across demographic groups (Mosly & Makki, 2020). The descriptive-comparative method was used to analyze variations in safety perceptions based on age, sex, and job classification, while the correlational component assessed the relationships among the three key variables.

The study was conducted in Bacolod City, the capital of Negros Occidental, a city that has experienced rapid urbanization and infrastructure development in recent years. Several construction companies operate within the city, engaging in various types of projects including residential, commercial, and government-funded works. The chosen company for this study was selected due to its active involvement in major construction projects and its diverse workforce, which includes both management and field personnel.

A total of 153 construction employees participated in this study. This sample size was determined using the Raosoft Online Sample Size Calculator, applying a 95% confidence level and a 5% margin of error from a population of 251 employees. The employees represented five job classifications: middle management, junior management/supervisory staff, technical/skilled workers, labor/trade workers, and rank-and-file employees. Stratified random sampling was employed to ensure that all job categories were proportionally represented, thereby enhancing the generalizability of the findings across the workforce.

The primary instrument used for data collection was a structured survey questionnaire composed of 38 items divided into three sections corresponding to the study's key variables. The section on safety culture was adapted from Steyrer et al., (2010) and included 12 items assessing management commitment, reporting culture, and learning culture. The section on safety climate was adapted from Ghahramani and Khalkhali (2015), comprising 12 items measuring safety commitment and communication, safety involvement and training, and positive safety practices. The third section, covering safety cost, was a researcher-developed scale containing 14 items, which assessed safety cost assessment, direct cost, indirect cost, and preventive cost. Responses were measured on a four-point Likert scale, where 4 indicated "Very High" and 1 indicated "Very Low."

The instrument underwent rigorous validity and reliability testing. Content validity was assessed using the Content Validity Ratio (CVR) method by Lawshe, with evaluations from 15 expert validators (Ayre & Scally, 2014). The computed Content Validity Index (CVI) was 0.81, indicating satisfactory content validity. Reliability was tested through a pilot study involving 30 respondents who were excluded from the main study sample. The instrument yielded a Cronbach's alpha coefficient of 0.97, indicating excellent internal consistency.

Data gathering was carried out after obtaining formal approval from the company's management. The researcher distributed hard copies of the survey instrument to the respondents, ensuring clear instructions were provided. Completed questionnaires were collected by the researcher for data analysis. Throughout the process, the researcher maintained strict adherence to ethical research standards.

Several statistical methods were employed to analyze the data. Means and standard deviations were calculated to determine the extent of safety culture, safety climate, and safety cost among respondents, both collectively and by demographic categories. To test differences among demographic groups, the researcher applied appropriate inferential tests—namely, Analysis of Variance (ANOVA), Kruskal-Wallis, and Mann-Whitney U tests—depending on the normality and homogeneity of the data. Spearman's Rho correlation analysis was used to assess the relationships among the three core variables.

Ethical considerations were prioritized throughout the study. The researcher ensured transparency by fully disclosing the study's objectives to all participants. Informed consent was obtained prior to participation, and participants were assured of confidentiality and anonymity in accordance with the Data Privacy Act of 2012. No personal identifiers were collected beyond demographic categories essential for analysis. Participation was voluntary, and respondents were informed of their right to withdraw at any stage without penalty. The researcher also ensured that data were securely stored and would be destroyed upon the study's completion to safeguard participants' privacy.

This comprehensive methodology was designed to ensure rigor, reliability, and ethical integrity, thereby enabling the generation of credible findings that could inform safety practices in the construction sector.

Results:

This study investigated the extent of safety culture, safety climate, and safety cost in a construction company in Bacolod City. Results are summarized by demographic groups, with corresponding means and standard deviations presented in Table 1.

Table 1

Mean and Standard Deviation for Safety Culture, Safety Climate, and Safety Cost by Demographic Group

Variable	Group	Mean	SD	Interpretation
Safety Culture	Overall	3.71	0.51	Very High
	Young	3.67	0.587	Very High
	Middle-aged	3.75	0.435	Very High
	Old	3.68	0.51	Very High
	Male	3.76	0.45	Very High
	Female	3.35	0.733	Very High
	Technical/Skilled Workers	3.83	0.351	Very High
	Labor/Trade Workers	3.77	0.496	Very High
Safety Climate	Overall	3.68	0.51	Very High
	Young	3.64	0.569	Very High
	Middle-aged	3.75	0.414	Very High
	Old	3.6	0.59	Very High
	Male	3.73	0.474	Very High
	Female	3.35	0.631	Very High
	Technical/Skilled Workers	3.83	0.404	Very High
	Labor/Trade Workers	3.76	0.438	Very High
Safety Cost	Overall	3.68	0.502	Very High
	Young	3.65	0.574	Very High
	Middle-aged	3.74	0.405	Very High
	Old	3.57	0.546	Very High
	Male	3.74	0.451	Very High
	Female	3.24	0.628	High
	Technical/Skilled Workers	3.82	0.352	Very High
	Labor/Trade Workers	3.78	0.395	Very High

Safety Culture

The overall rating for safety culture was classified as "Very High" (M = 3.71, SD = 0.51). Among its dimensions, Reporting Culture received the highest mean, followed by Management Commitment, while Learning Culture had slightly lower ratings but remained in the "Very High" category.

Across age groups, middle-aged employees reported the highest safety culture ratings, while younger and older employees showed similarly high but slightly lower scores. By sex, male respondents consistently rated safety culture higher than female respondents. Notably, female respondents rated Learning Culture lower than other dimensions, indicating potential areas for strengthening safety learning programs.

Regarding job classification, technical and skilled workers reported the highest perceptions of safety culture, followed by labor/trade workers. Junior management and rank-and-file employees reported slightly lower—but still "Very High"—ratings. These trends suggest that employees with more technical responsibilities tend to perceive stronger safety practices.

Safety Climate

Safety climate was also rated "Very High" overall (M = 3.68, SD = 0.51), with Safety Commitment and Communication emerging as the most positively perceived dimension, followed by Safety Involvement and Training, and Positive Safety Practices.

Similar to safety culture, middle-aged employees consistently showed the highest safety climate perceptions among age groups. Male respondents reported stronger safety climate perceptions than females, indicating a potential gap in engagement or inclusion. Across job classifications, technical/skilled workers and labor/trade workers again rated safety climate more favorably than other groups, with rank-and-file employees reporting comparatively lower scores, though still within the "Very High" range.

Safety Cost

The overall perception of safety cost was also "Very High" (M = 3.68, SD = 0.502), with Preventive Cost receiving the highest ratings among its dimensions. Both Direct and Indirect Costs were also rated highly, reflecting the company's prioritization of proactive safety investments.

Middle-aged employees showed the strongest perceptions of safety costs, mirroring trends observed in the other variables. Males rated safety costs higher than females, and notably, female respondents rated most cost dimensions slightly lower—particularly Direct and Indirect Costs—except for Preventive Cost. Technical and skilled workers, along with labor/trade workers, had the highest safety cost perceptions, while middle management, junior management, and rank-and-file employees reported comparatively lower ratings.

Table 2
Results of Inferential Tests and Correlations

Test	Result
Difference by Age (ANOVA/Kruskal-Wallis)	No significant differences across age groups ($p > 0.05$)
Difference by Sex (Mann-Whitney U Test)	Significant differences for all variables ($p < 0.05$); Males rated higher
Difference by Job Classification (ANOVA/Kruskal-Wallis)	Significant differences for all variables ($p < 0.05$); Technical workers rated highest
Correlation: Safety Culture & Safety Cost	Spearman's Rho = 0.827, $p < 0.01$ (Strong Positive)
Correlation: Safety Climate & Safety Cost	Spearman's Rho = 0.906, $p < 0.01$ (Strong Positive)

Correlation: Safety Culture & Safety Climate Spearman's Rho = 0.890, $p < 0.01$ (Strong Positive)

Inferential Tests and Correlation Analysis

Table 2 summarizes the results of inferential tests and correlations. No significant differences were found across age groups for safety culture, climate, or cost ($p > 0.05$). However, significant differences were observed by sex ($p < 0.05$), with male employees consistently reporting higher ratings for all three variables. Significant differences were also detected across job classifications ($p < 0.05$), with technical/skilled workers rating safety practices higher than others.

Correlation analysis revealed strong, positive, and statistically significant relationships among the three variables. Safety culture was highly correlated with safety climate (Spearman's Rho = 0.890, $p < 0.01$) and safety cost (Rho = 0.827, $p < 0.01$). Similarly, safety climate and safety cost showed a very strong correlation (Rho = 0.906, $p < 0.01$). These results suggest that improvements in safety culture and climate are closely linked with enhanced safety investments, highlighting the importance of integrated safety management.

Discussion:

This study examined the extent of safety culture, safety climate, and safety cost within a construction company in Bacolod City and explored their relationships and variations across demographic groups. The results revealed consistently high ratings across all three variables, suggesting that the construction company under study has established a strong foundation for safety practices. However, the findings also highlighted notable differences by sex and job classification, pointing to opportunities for targeted interventions.

The overall safety culture was rated "Very High," particularly in the areas of reporting culture and management commitment. These findings suggest that the company has successfully fostered an environment where employees are encouraged to report safety concerns without fear of retaliation and where leadership demonstrates strong commitment to safety. This is consistent with the arguments of Bautista-Bernal et al. (2024) and Guldenmund (2000), who emphasized that leadership involvement, employee engagement, and learning culture are crucial in shaping safety practices. Nonetheless, Learning Culture scored slightly lower compared to the other dimensions, indicating that while safety policies are valued and reporting mechanisms are effective, there may be gaps in continuous learning, particularly in sharing lessons from past incidents or updating safety training programs regularly.

The results also revealed that safety climate was perceived very positively among employees, with the highest ratings in safety commitment and communication. This finding suggests that management actively communicates safety policies and involves workers in safety decision-making processes. Meng and Chan (2021) noted that clear communication and responsive supervision are central to fostering a positive safety climate, and the current findings support this assertion. However, Positive Safety Practices, while still rated highly, received slightly lower scores, implying a need for further reinforcement of everyday safe behaviors on construction sites.

The findings regarding safety cost demonstrated that the company prioritizes preventive safety measures, as evidenced by high ratings in the Preventive Cost dimension. This aligns with studies by Divya et al. (2017) and Ehmer (2000), which showed that investment in preventive safety measures—such as personal protective equipment (PPE), training, and hazard mitigation—can significantly reduce long-term costs related to accidents and disruptions. The consistently high ratings across direct, indirect, and preventive costs suggest that the company has adopted a proactive financial approach to safety management, treating it as a strategic investment rather than merely a compliance requirement.

While no significant differences were observed across age groups, notable variations emerged based on sex and job classification. Male respondents consistently reported higher perceptions of safety culture, climate, and cost compared to female respondents. This suggests potential gaps in inclusivity, where female workers may feel less engaged or less represented in safety-related programs. These findings resonate with earlier studies highlighting the need for gender-responsive safety interventions (Fern & Mohd Masirin, 2021). Similarly, employees in technical and skilled positions reported the highest safety ratings, likely due to their closer involvement with site operations and

safety-sensitive tasks. In contrast, junior management, rank-and-file employees, and female workers reported comparatively lower scores, highlighting the need for more inclusive and targeted training and engagement programs.

Importantly, the correlation analysis revealed strong, positive relationships among safety culture, safety climate, and safety cost. This suggests that improvements in the organization's safety culture and climate are closely associated with increased investment in safety measures. These findings support the integrated perspective on safety proposed by Guldenmund (2000) and Meng and Chan (2021), where a strong safety culture reinforces a positive safety climate, leading to more robust financial commitment toward safety. The significant correlations also imply that enhancing one dimension could have a cascading positive effect on the others, potentially leading to sustained improvements in overall safety performance.

Taken together, these findings highlight the construction company's strengths in cultivating a strong safety culture and climate while proactively investing in safety costs. However, they also underscore critical areas for improvement, particularly in promoting inclusivity and ensuring that all employee groups—regardless of sex or job classification—equally benefit from safety programs. The relatively lower scores among female employees and rank-and-file workers suggest that targeted interventions, such as mentorship programs, customized safety training, and participatory safety committees, may be necessary to bridge these gaps.

Additionally, the slightly lower ratings in Learning Culture and Positive Safety Practices suggest that more frequent and systematic knowledge-sharing activities, such as post-incident reviews and safety drills, could further strengthen the safety framework. These initiatives can enhance continuous learning and embed safe work behaviors more deeply across all job levels.

Ultimately, the study emphasizes the importance of an integrated approach to safety management, where safety culture, climate, and cost are viewed not as isolated concepts but as interrelated factors that together shape organizational safety outcomes. By addressing the gaps identified in this study, construction companies in Bacolod City—and similar urban centers—can further strengthen their safety performance, improve worker welfare, and achieve long-term operational and financial benefits.

Conclusion:

This study examined the extent of safety culture, safety climate, and safety cost in a construction company in Bacolod City and analyzed their relationships and differences across demographic groups. The findings revealed that all three variables were rated as "Very High," suggesting that the company has developed a strong foundation for safety practices. Reporting Culture and Management Commitment emerged as the strongest aspects of safety culture, while Safety Commitment and Communication dominated the safety climate dimension. Preventive Cost was the most emphasized component of safety cost, indicating proactive investment in risk mitigation measures.

No significant differences were found in safety perceptions across age groups, suggesting consistency in safety practices regardless of employee age. However, significant variations were observed across sex and job classification. Male employees and those in technical or skilled positions consistently reported higher perceptions of safety culture, safety climate, and safety cost, whereas female employees and rank-and-file staff showed comparatively lower ratings. These findings highlight the need for more inclusive safety programs and greater engagement of employees in lower-level positions and underrepresented groups.

The study also established strong, positive correlations among safety culture, safety climate, and safety cost, indicating that improvements in one area are closely associated with enhancements in the others. This reinforces the value of an integrated safety management framework, where leadership commitment, employee involvement, and proactive financial investments work in tandem to promote safer and more cost-efficient work environments.

Overall, the results emphasize that safety is not merely a regulatory obligation but a critical business strategy that fosters operational efficiency, protects workers, and improves financial performance. The findings offer valuable insights for construction companies aiming to refine their safety manuals, strengthen organizational safety programs, and build a more inclusive, proactive, and resilient safety culture.

Based on the findings of this study, several key recommendations are proposed to enhance safety management practices within the construction company studied and other similar organizations. First, it is strongly recommended that the company strengthen its learning culture by implementing structured knowledge-sharing programs, regular safety training, and post-incident reviews. These initiatives would encourage continuous learning and provide opportunities for employees to acquire new safety knowledge and skills. Emphasis should also be placed on the integration of lessons learned from past incidents into training modules to foster a proactive learning environment.

Furthermore, the study revealed notable gaps in safety perceptions among female employees and rank-and-file staff. To address this, the company should design inclusive safety programs that actively involve underrepresented groups. Gender-responsive training, mentorship programs, and participatory safety committees can empower female employees and lower-tier staff, ensuring their voices are heard in safety-related decision-making processes. By fostering inclusivity, the company can create a more equitable and cohesive safety culture across all job classifications.

In addition, there is a need to strengthen the reinforcement of positive safety practices at the operational level. The company may consider implementing peer recognition programs to reward exemplary safety behavior, as well as conducting regular safety drills and workshops that emphasize the importance of consistent safe practices. These measures can help sustain high levels of safety performance and reduce complacency in daily operations.

It is also recommended that the company improve communication regarding its safety investments. Transparency in safety-related spending—such as through regular reporting of safety budgets during general assemblies or by displaying safety cost dashboards—can enhance employees' understanding of how such investments contribute to their well-being and project efficiency. This may also encourage employees to take greater ownership of safety initiatives.

Lastly, the company is advised to adopt an integrated and strategic approach to safety management by aligning safety culture, safety climate, and safety cost within its organizational objectives. Integrating safety performance indicators into project evaluations and strategic plans would ensure that safety remains a core organizational priority. Continuous monitoring and evaluation of safety programs, including periodic surveys, internal audits, and employee consultations, should be institutionalized to track progress and identify further areas for improvement.

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