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The Impact of Occupational Safety Resource Allocation on Reducing Accidents in Construction Projects: Implications for Procurement and Logistics Management

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ABSTRACT
The construction industry is among the most hazardous sectors because workers are exposed to risks associated with excavation, work at height, electrical activities, and heavy equipment. This study examines the impact of occupational safety resource allocation on reducing workplace accidents in Libyan construction projects using a quantitative descriptive–analytical approach. The findings indicate that inadequate financial, human, and organizational resources limit safety training, supervision, and the availability of personal protective equipment, thereby increasing accident occurrence. In contrast, adequate resource allocation strengthens occupational safety management and improves accident prevention. The study further highlights that effective procurement and logistics practices support the timely provision of safety resources, enhancing their implementation throughout project execution. It concludes that occupational safety should be integrated into project planning as a strategic investment and recommends strengthening safety budgeting, management commitment, procurement planning, logistics coordination, and continuous training to improve construction safety performance.
Keywords: Occupational Safety; Safety Resource Allocation; Construction Industry; Workplace Accidents; Safety Management; Procurement; Logistics.

1. INTRODUCTION

The construction industry is a fundamental contributor to economic growth, infrastructure development, and urban expansion. Despite its importance, it remains one of the most hazardous industries because construction activities involve excavation, work at height, electrical installations, material handling, and heavy equipment operations. These activities expose workers to multiple occupational hazards, making accident prevention a major concern for project stakeholders. Occupational safety has consequently become a critical element of construction project management. Its effectiveness depends not only on compliance with occupational safety regulations but also on the availability and efficient allocation of financial, human, technical, and organizational resources. Organizations that invest adequately in safety resources are generally more capable of implementing preventive measures, strengthening supervision, improving workforce competence, and creating safer working environments. Nevertheless, many construction organizations continue to regard occupational safety as an additional project expense rather than a strategic investment. This perception often results in inadequate safety budgets, insufficient training, limited availability of qualified safety professionals, and weak monitoring systems. Such shortcomings reduce the effectiveness of safety programmers and increase the likelihood of workplace accidents. The availability of safety

resources is also influenced by procurement and logistics activities. Personal protective equipment, emergency supplies, inspection tools, and other safety-related materials must be procured, transported, and delivered to construction sites when required. Effective procurement planning and logistics coordination therefore support occupational safety implementation by ensuring that essential safety resources remain available throughout project execution without altering the primary objective of safety management. Within the Libyan construction industry, occupational safety faces additional challenges arising from financial constraints, administrative limitations, and inconsistent enforcement of safety regulations. Although existing legislation establishes a framework for protecting workers, variations in organizational commitment and resource availability continue to affect the practical implementation of occupational safety requirements across construction projects. Accordingly, this study investigates the impact of occupational safety resource allocation on reducing workplace accidents in Libyan construction projects. It evaluates how the allocation of financial, human, and organizational resources contributes to strengthening occupational safety management and reducing accident occurrence. Furthermore, the study recognizes that efficient procurement and logistics practices facilitate the timely availability of safety resources, supporting their effective implementation and improving overall project performance.

2. LITERATURE REVIEW:

2.1 Local Studies

Research conducted in Libya has consistently highlighted the challenges that hinder the effective implementation of occupational safety in construction and industrial sectors. Although these studies differ in their objectives and research contexts, they collectively indicate that weaknesses in organizational commitment, resource availability, and safety management remain major barriers to reducing workplace accidents. Al-Fitouri and Al-Aribi (2019) examined occupational safety management practices within the Libyan construction industry. Their findings revealed that the principal challenge was not the absence of occupational safety regulations but the limited effectiveness of their implementation. The study emphasized that inadequate worker training, insufficient safety awareness, and weak enforcement mechanisms reduced compliance with occupational safety requirements and negatively affected site safety performance.

Mohamed Ibrahim Mohamed Ali (2019) investigated road traffic safety in Libya and reported that accident rates remained high because safety procedures were not consistently implemented. Although the study focused on road transportation, its findings demonstrate the broader impact of weak institutional safety management, which is equally relevant to construction projects where effective implementation of safety procedures is essential. Another Libyan study published in 2019 explored the relationship between occupational safety practices and organizational productivity. The findings showed that organizations investing in occupational safety achieved better operational performance and higher levels of efficiency, supporting the view that expenditure on occupational safety represents a strategic investment rather than an avoidable project cost. Qarash (2021) evaluated occupational safety and health management in Libyan oil companies. The study identified limited management commitment, inadequate employee training, and insufficient organizational support as major factors reducing the effectiveness of occupational safety programmers and adversely affecting employee performance. Ahmida and Arhuma (2024) presented a case study of a school construction project in Al-Zawiya to evaluate risk management practices during project implementation. The study concluded that many practitioners continued to rely on practical experience instead of

systematic risk assessment methods, increasing the possibility of accidents and reducing the effectiveness of preventive safety measures. Ismail and Rizq (2024) examined the influence of financial and administrative resources on occupational safety performance. Their statistical analysis confirmed that organizations allocating sufficient financial and managerial resources achieved more effective implementation of occupational safety measures, emphasizing the importance of strategic resource allocation in accident prevention. Abdullah and Jarad (2025) investigated occupational safety performance in Libyan oil facilities and reported that weak organizational safety culture, inadequate training, poor coordination among administrative units, and limited institutional support continued to reduce the effectiveness of occupational safety systems. Reports issued by the Libyan Occupational Safety and Health Council also indicate that outdated regulations, inconsistent enforcement, and limited awareness programmers continue to constrain the effective application of occupational safety requirements across different sectors. Collectively, the reviewed Libyan studies demonstrate that insufficient financial support, inadequate training, weak managerial commitment, and limited organizational resources remain the principal challenges affecting occupational safety performance. These findings provide a strong foundation for examining how the allocation of occupational safety resources contributes to reducing workplace accidents in Libyan construction projects. Furthermore, they indicate that ensuring the continuous availability of safety resources through effective organizational planning can support safer project implementation, a perspective that aligns with construction management practices relevant to procurement and logistics without changing the primary focus of the present study.

2.3 International Studies

International research has consistently demonstrated that effective occupational safety management depends on the availability and efficient allocation of organizational resources. Across different construction environments, researchers have emphasized that safety performance is strongly influenced by management commitment, workforce competence, financial investment, and continuous monitoring of safety practices.

Hallowell (2018) investigated the relationship between safety investment and construction project performance. The study concluded that organizations allocating adequate financial resources to occupational safety experienced significantly lower accident rates and reduced economic losses associated with workplace incidents. The findings further suggested that preventive investment in safety generates long-term organizational benefits that outweigh the initial implementation costs. Jin et al. (2019) examined the influence of safety climate on construction workers' behavior. Their results indicated that management commitment, effective communication, and employee participation substantially improved compliance with occupational safety procedures. The study highlighted that organizational culture plays a decisive role in promoting safe working practices and minimizing occupational risks. Mohammadi et al. (2020) evaluated the effectiveness of occupational safety management systems within construction projects. Their findings showed that systematic planning, continuous supervision, and periodic evaluation significantly enhanced safety performance while reducing accident frequency. The authors emphasized that safety management should be integrated into overall project management rather than treated as an independent administrative function. Lingard and Rowlinson (2021) reported that successful construction organizations allocate occupational safety resources strategically throughout all project phases. Their study demonstrated that sustained investment in training, supervision, and safety equipment contributes directly to improving worker protection and reducing workplace injuries. Zeibak-Shini et al. (2024) investigated the relationship between occupational safety resource allocation and organizational

safety performance. The study confirmed that sufficient financial, human, and organizational resources strengthen occupational safety implementation and significantly improve accident prevention in construction projects. Their findings provide strong empirical support for considering occupational safety resource allocation as a strategic component of project management. Collectively, international studies demonstrate that adequate resource allocation remains one of the most influential determinants of occupational safety performance. Although these studies primarily focus on safety management, they also indicate that the effectiveness of safety programmers depends on the timely availability of essential safety resources. Consequently, sound procurement planning and efficient logistics coordination provide operational support for occupational safety by ensuring that protective equipment, training materials, and other critical safety resources are available when required during project execution. This perspective complements the objectives of the present study without changing its primary emphasis on occupational safety resource allocation.

3. METHODS AND MATERIAL

3.1 Research Design

This research adopted a quantitative descriptive–analytical design to examine the relationship between occupational safety resource allocation and the reduction of workplace accidents in Libyan construction projects. The selected research design was considered appropriate because it enables the systematic collection of quantitative data and facilitates statistical analysis of the relationships among the study variables. Furthermore, this approach provides an objective basis for evaluating the proposed hypotheses and generating empirical evidence to support the study objectives

3.2 Study Population

The target population comprised professionals engaged in the Libyan construction industry who possess practical experience in occupational safety and project implementation. Participants represented a variety of professional roles, including civil engineers, safety engineers, project managers, site supervisors, inspectors, technicians, and construction workers. The inclusion of respondents from different professional backgrounds was intended to ensure that the collected data reflected diverse perspectives on occupational safety practices within construction projects.

3.3 Sample and Sampling Technique

A simple random sampling technique was employed to provide all eligible members of the study population with an equal opportunity to participate. Following data screening and verification, eighty completed questionnaires were considered valid and suitable for statistical analysis. Responses containing incomplete or inconsistent information were excluded to enhance the reliability of the research findings

3.4 Data Collection Instrument

Primary data were obtained using a structured questionnaire designed in accordance with the objectives of the research and the findings reported in previous studies. The questionnaire was organized into two principal sections. The first section collected demographic information describing the characteristics of the respondents. The second section contained statements measuring the study variables, including construction accident characteristics, administrative, technical, human, and financial causes of accidents, occupational safety management, occupational safety culture, occupational safety resource allocation, and the overall evaluation of occupational safety practices. Participants expressed their opinions using a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5).

3.5 Research Variables

The conceptual framework of this study was developed based on the relevant literature concerning occupational safety management and resource allocation in construction projects. The framework identifies the principal variables examined in the research and explains the relationships tested through the proposed hypotheses.

Independent Variable

- **Occupational Safety Resource Allocation**

Dependent Variable

- **Reduction of Workplace Accidents**

Mediating Variable

- **Occupational Safety Management**

Supporting Dimensions

The following dimensions were investigated to evaluate the organizational factors influencing occupational safety management and workplace accident reduction:

- **Construction Site Accident Characteristics**
- **Administrative Causes of Construction Accidents**
- **Technical Causes of Construction Accidents**
- **Human Causes of Construction Accidents**
- **Financial Causes of Construction Accidents**
- **Occupational Safety Culture**

The proposed framework assumes that adequate allocation of occupational safety resources strengthens occupational safety management, which in turn contributes to reducing workplace accidents. Furthermore, administrative, technical, human, and financial factors represent important organizational dimensions affecting the effectiveness of occupational safety management within construction projects.

3.5.1 Conceptual Framework

The conceptual framework of this study was developed based on the findings of previous literature and the proposed research hypotheses. It illustrates the relationships among the principal study variables and provides the theoretical foundation for the statistical analyses performed in this research. The framework assumes that occupational safety resource allocation contributes directly to reducing workplace accidents while organizational and operational factors influence occupational safety management, which supports safer construction project implementation.

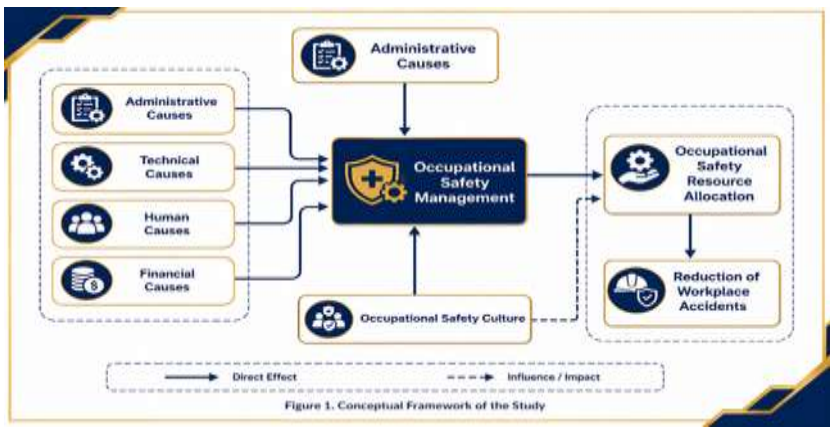


Figure 1. Conceptual Framework of the Study

3.6 Research Hypotheses

Based on the conceptual framework and the evidence reported in previous local and international studies, the present research proposes that effective allocation of occupational safety resources enhances occupational safety management and contributes significantly to reducing workplace accidents in construction projects. To empirically examine these relationships, one main hypothesis and five sub-hypotheses were formulated and tested using the statistical procedures presented in Chapter Four.

[1] Main Hypothesis

H1: Occupational safety resource allocation has a statistically significant effect on reducing workplace accidents in construction projects.

[2] Sub-Hypotheses

H1a: Administrative causes of construction accidents are significantly associated with occupational safety management.

H1b: Technical causes of construction accidents are significantly associated with occupational safety management.

H1c: Human causes of construction accidents are significantly associated with occupational safety management.

H1d: Financial causes of construction accidents are significantly associated with occupational safety management.

H1e: Occupational safety management is significantly associated with reducing workplace accidents.

3.7 Validity and Reliability

Before conducting the hypothesis testing procedures, the measurement instrument was evaluated to ensure that it possessed acceptable levels of validity and reliability. Establishing these measurement properties is essential for confirming that the questionnaire accurately measures the intended research constructs and provides dependable results for subsequent statistical analysis.

Construct validity was assessed using **Pearson correlation analysis** to examine the internal consistency between each study dimension and the overall questionnaire score. The obtained correlation coefficients were positive and statistically significant, indicating that all questionnaire dimensions were appropriately aligned with the theoretical constructs investigated in this research.

Reliability was evaluated using **Cronbach's Alpha coefficient**, which measures the internal consistency of the questionnaire items. The obtained coefficients demonstrated acceptable to very high levels of reliability across all study dimensions, confirming that the instrument provided consistent and dependable measurements suitable for statistical analysis. These findings support the use of the questionnaire as an appropriate instrument for examining the relationship between occupational safety resource allocation and workplace accident reduction in construction projects.

3.8 Statistical Analysis

The collected data were coded, entered, and analyzed using **IBM SPSS Statistics Version 26**. Both descriptive and inferential statistical techniques were employed to address the research objectives and evaluate the proposed hypotheses.

Descriptive statistical analysis included **frequencies, percentages, means, and standard deviations** to summarize respondents' demographic characteristics and evaluate their responses to the questionnaire items. These statistics provided an overall description of the study sample and the principal dimensions investigated.

Inferential statistical techniques were subsequently applied to examine relationships among the study variables and determine the statistical significance of the proposed hypotheses. The analytical procedures included **Pearson correlation analysis**, **Independent-Samples t-test**, **One-Way Analysis of Variance (ANOVA)**, and **Simple Linear Regression Analysis**. All statistical decisions were based on a significance level of **$\alpha = 0.05$**, which served as the criterion for accepting or rejecting the research hypotheses.

3.9 Ethical Considerations

The study was conducted in accordance with accepted principles of research ethics. Participation in the questionnaire survey was entirely voluntary, and respondents were informed of the purpose and academic nature of the research before providing their responses.

Participants were assured that all information would remain confidential and would be used exclusively for scientific research purposes. No personal identifiers were collected, and all statistical analyses were performed using anonymous data to protect participants' privacy. These procedures ensured compliance with ethical standards governing social science and construction management research.

4. RESULTS AND DISCUSSION

4.1 Respondents' Characteristics

A total of 80 valid questionnaires were analysed to describe the characteristics of the study participants. The sample included respondents representing different professional positions within the Libyan construction sector, providing a broad perspective on occupational safety practices. Civil engineers constituted the largest proportion of participants, followed by site supervisors, safety engineers, workers, and respondents from other occupational categories. Regarding professional experience, most respondents reported between five and ten years of experience, while more than one-third had over ten years of practical experience. In terms of project type, government projects represented the largest share of the sample, followed by residential, commercial, and infrastructure projects. The diversity of respondents indicates that the collected data adequately represent professionals involved in construction project management and occupational safety implementation.

Table 1. Demographic Characteristics of the Respondents (n = 80)

(a) Job Position

Job Position	Frequency	Percentage (%)
Civil Engineer	30	37.5
Safety Engineer	14	17.5
Site Supervisor	20	25.0
Worker	10	12.5
Other	6	7.5
Total	**80**	**100.0**

(b) Years of Experience

Years of Experience	Frequency	Percentage (%)
Less than 5 years	18	22.5
5–10 years	34	42.5
More than 10 years	28	35.0
Total	**80**	**100.0**

(c) Project Type

Project Type	Frequency	Percentage (%)
Residential	24	30.0
Commercial	16	20.0
Government	28	35.0
Infrastructure	12	15.0
Total	**80**	**100.0**

4.2 Normality Assessment

Before conducting the inferential statistical analyses, the distribution of the study variables was evaluated using the Kolmogorov–Smirnov normality test. The results presented in Table 2 indicate that all significance values exceeded the accepted threshold of 0.05, confirming that the data followed an approximately normal distribution. Consequently, the assumptions required for applying parametric statistical techniques were satisfied, allowing Pearson correlation analysis, independent-samples *t*-tests, one-way ANOVA, and simple linear regression to be performed with confidence.

Table 2. Normality Test Results

Study Variable	Kolmogorov–Smirnov	Sig.	Decision
Construction Site Accidents	0.086	0.200	Normally Distributed
Administrative Causes	0.091	0.187	Normally Distributed
Technical Causes	0.094	0.176	Normally Distributed
Human Causes	0.088	0.194	Normally Distributed
Financial Causes	0.097	0.169	Normally Distributed
Occupational Safety Management	0.082	0.200	Normally Distributed
Occupational Safety Culture	0.084	0.200	Normally Distributed
Occupational Safety Resource Allocation	0.079	0.200	Normally Distributed
Overall Evaluation	0.090	0.189	Normally Distributed

4.3 Validity and Reliability of the Research Instrument

The quality of the research instrument was assessed prior to hypothesis testing by examining both validity and reliability indicators. Internal consistency validity was verified using Pearson correlation coefficients, whereas Cronbach's Alpha coefficients were calculated to evaluate the reliability of each measurement dimension. The statistical results demonstrate strong positive validity coefficients together with high reliability values across all constructs, confirming that the questionnaire provided a dependable instrument for measuring the variables included in the study.

Table 3. Internal Consistency Validity (Pearson Correlation)

Study Variable	Pearson Correlation (r)	Sig.
Construction Site Accidents	0.841	0.000
Administrative Causes	0.867	0.000
Technical Causes	0.822	0.000
Human Causes	0.903	0.000
Financial Causes	0.846	0.000
Occupational Safety Management	0.918	0.000
Occupational Safety Culture	0.927	0.000
Occupational Safety Resource Allocation	0.941	0.000
Overall Evaluation	0.889	0.000

Table 4. Reliability Analysis (Cronbach's Alpha)

No.	Study Dimension	Items	Cronbach's Alpha	Reliability Level
1	Construction Site Accidents	5	0.842	High
2	Administrative Causes	3	0.856	High
3	Technical Causes	2	0.811	Good
4	Human Causes	2	0.887	High
5	Financial Causes	3	0.834	High
6	Occupational Safety Management	4	0.901	Very High
7	Occupational Safety Culture	4	0.918	Very High
8	Occupational Safety Resource Allocation	4	0.926	Very High
9	Overall Evaluation	3	0.879	High
Overall Questionnaire	**30**	**0.947**	**Very High**	

4.4 Descriptive Analysis

Descriptive statistical analysis was performed to examine respondents' evaluations of the principal dimensions investigated in this study. Mean scores and standard deviations were calculated for each dimension to determine the degree of agreement among participants. Overall, the results reveal consistently high levels of agreement, indicating that respondents perceived administrative, technical, human, financial, and managerial factors as important contributors to occupational safety performance and workplace accident occurrence in construction projects.

4.4.1 Construction Site Accident Characteristics

The descriptive statistics reported in Table 5 indicate that respondents considered falls from height to be the most common type of accident occurring on construction sites, as reflected by the highest mean score. Scaffold collapse and equipment-related incidents were also perceived as frequent safety concerns, while falling materials and electrical accidents received comparatively lower—but still high—evaluations. The overall mean demonstrates a very high level of agreement, suggesting that these accident categories remain significant occupational safety challenges within the Libyan construction industry.

Table 5. Descriptive Statistics for Construction Site Accident Characteristics

Item	Mean	SD	Rank	Level
Falls from height frequently occur on construction sites	**4.44**	0.73	1	Very High
Scaffold collapse is a common accident	**4.38**	0.79	2	Very High
Equipment-related accidents occur frequently	**4.36**	0.76	3	Very High
Falling materials injure workers on site	**4.29**	0.82	4	Very High
Electrical accidents are common in construction projects	**4.18**	0.91	5	High
Overall Mean	**4.33**	**0.80**	—	**Very High**

4.4.2 Administrative Causes of Construction Accidents

Table 6 demonstrates that administrative shortcomings represent one of the principal sources of workplace accidents. Insufficient supervision achieved the highest level of agreement, emphasizing the importance of continuous monitoring during project execution.

Participants also highlighted the absence of qualified safety engineers and the lack of comprehensive occupational safety planning as major organizational deficiencies contributing to accident occurrence. The overall findings underline the critical role of effective administrative management in strengthening workplace safety

Table 6. Descriptive Statistics for Administrative Causes

Item	Mean	SD	Rank	Level
Poor supervision leads to workplace accidents	**4.48**	0.68	1	Very High
Absence of a qualified safety engineer affects safety performance	**4.41**	0.72	2	Very High
No clear occupational safety plan exists	**4.39**	0.75	3	Very High
Overall Mean	**4.43**	**0.72**	—	**Very High**

4.4.3 Technical Causes of Construction Accidents

The findings presented in Table 7 indicate that technical deficiencies continue to represent a major source of occupational risk. Poor workmanship was identified as the most influential technical factor, followed closely by failure to comply with engineering specifications. These results suggest that improving construction quality control and ensuring strict adherence to technical standards are essential measures for reducing accident occurrence

Table 7. Descriptive Statistics for Technical Causes

Item	Mean	SD	Rank	Level
Poor workmanship leads to accidents	**4.36**	0.78	1	Very High
Failure to comply with engineering specifications increases risk	**4.31**	0.81	2	Very High
Overall Mean	**4.34**	**0.80**	—	**Very High**

4.4.4 Human Causes of Construction Accidents

As illustrated in Table 8, respondents identified human-related factors as having a substantial influence on workplace accidents. Inadequate worker training achieved the highest evaluation among all accident-related dimensions, highlighting the importance of continuous competency development. Failure to consistently use personal protective equipment also received a high level of agreement, emphasizing the need for stronger compliance with occupational safety requirements. Collectively, these findings demonstrate that investment in workforce development represents a fundamental component of accident prevention.

Table 8. Descriptive Statistics for Human Causes

Item	Mean	SD	Rank	Level
Insufficient training increases workplace accidents	**4.61**	0.58	1	Very High
Workers do not consistently use personal protective equipment	**4.52**	0.63	2	Very High
Overall Mean	**4.57**	**0.61**	—	**Very High**

4.4.5 Financial Causes of Construction Accidents

The descriptive results presented in Table 9 indicate that financial constraints significantly influence occupational safety performance. Participants agreed that insufficient safety budgets constitute the most important financial factor affecting accident prevention, followed by reductions in safety expenditure during project implementation. Furthermore, the perception of occupational safety as an unnecessary financial burden continues to limit investment in preventive measures. These findings reinforce the importance of integrating dedicated safety resources into project financial planning

Table 9. Descriptive Statistics for Financial Causes

Item	Mean	SD	Rank	Level
Insufficient budget is allocated for occupational safety	**4.45**	0.70	1	Very High
Safety expenditures are reduced during project execution	**4.40**	0.74	2	Very High
Occupational safety is considered a financial burden on the project	**4.22**	0.89	3	Very High
Overall Mean	**4.36**	**0.78**	—	**Very High**

4.4.6 Occupational Safety Management System

The descriptive statistics presented in Table 10 indicate that respondents expressed a consistently positive evaluation of occupational safety management practices implemented within construction projects. Conducting risk assessments before commencing work received the highest level of agreement, reflecting the perceived importance of proactive hazard identification. The availability of emergency response plans and the systematic documentation of workplace accidents also achieved high evaluations, suggesting that organizations recognize the value of structured safety management procedures. Although regular safety meetings recorded the lowest mean within this dimension, the level of agreement remained high. Overall, the results demonstrate that respondents considered occupational safety management practices to be well established, while still recognizing opportunities for continuous improvement in routine safety communication and monitoring.

Table 10. Descriptive Statistics for Occupational Safety Management System

Statement	Mean	SD	Rank	Level
Risk assessments are conducted before starting work	**4.32**	0.81	1	Very High
A clear emergency response plan is available	**4.28**	0.84	2	Very High
Workplace accidents are recorded and analyzed	**4.26**	0.87	3	Very High
Regular safety meetings are conducted	**4.17**	0.91	4	High
Overall Mean	**4.26**	**0.86**	—	**Very High**

4.4.7 Occupational Safety Culture

The results summarized in Table 11 demonstrate that occupational safety culture represents a significant component of effective construction safety management. Respondents strongly agreed that occupational safety should be regarded as a priority throughout project execution, indicating substantial organizational awareness of safety-related responsibilities. Worker awareness of occupational hazards and compliance with established safety procedures also received high evaluations. Although reporting workplace hazards achieved the lowest score within this dimension, respondents nevertheless expressed a positive perception of communication regarding safety issues. Collectively, these findings suggest that strengthening organizational safety culture can contribute to improving employee commitment and reducing occupational risks

Table 11. Descriptive Statistics for Occupational Safety Culture

Statement	Mean	SD	Rank	Level
Occupational safety is considered a project priority	**4.47**	0.69	1	Very High
Workers are aware of workplace hazards	**4.39**	0.74	2	Very High
Workers comply with occupational safety instructions	**4.34**	0.79	3	Very High
Workplace hazards are reported easily	**4.18**	0.90	4	High
Overall Mean	**4.35**	**0.78**	—	**Very High**

4.4.8 Occupational Safety Resource Allocation

Table 12 presents respondents' evaluations of occupational safety resource allocation within construction projects. The findings indicate that the availability of sufficient financial, human, and organizational resources plays a decisive role in supporting occupational safety implementation. Participants expressed strong agreement regarding the importance of allocating adequate safety budgets, providing qualified safety personnel, and ensuring that essential protective equipment is available throughout project execution. The consistently

high mean scores indicate that respondents consider resource allocation to be one of the principal determinants of successful occupational safety management.

Table 12. Descriptive Statistics for Occupational Safety Resource Allocation

Statement	Mean	SD	Rank	Level
Workers receive continuous occupational safety training	**4.59**	0.58	1	Very High
Personal protective equipment is adequately available	**4.53**	0.63	2	Very High
Qualified safety engineers are available	**4.48**	0.69	3	Very High
A dedicated occupational safety budget is allocated	**4.44**	0.71	4	Very High
Overall Mean	**4.51**	**0.65**	—	**Very High**

4.5 Group Differences Among Respondents

To investigate whether respondents' evaluations varied according to their demographic characteristics, an Independent-Samples t-test was performed. The statistical results presented in Table 13 indicate that no significant differences were detected between the comparison groups with respect to occupational safety management, occupational safety resource allocation, or workplace accident reduction, as all probability values exceeded the adopted significance level of 0.05. These findings suggest that respondents expressed broadly consistent views regardless of their demographic classification, indicating a common understanding of occupational safety issues across the surveyed population.

Table 13. Independent-Samples *t*-Test Results

Variable	Group 1 Mean	Group 2 Mean	t-value	p-value	Decision
Occupational Safety Management	4.31	4.24	0.784	0.435	No Significant Difference
Occupational Safety Resource Allocation	4.49	4.53	−0.631	0.530	No Significant Difference
Accident Reduction	4.37	4.29	0.917	0.362	No Significant Difference

4.6 One-Way Analysis of Variance (ANOVA)

A one-way analysis of variance (ANOVA) was conducted to determine whether respondents' perceptions differed across the study groups. As summarized in Table 14, none of the examined variables exhibited statistically significant differences because all significance values were greater than 0.05. This result indicates that participants shared comparable perceptions regarding construction site accidents, occupational safety management, safety culture, and occupational safety resource allocation. The consistency of these responses

enhances the reliability of the findings and suggests that the identified safety issues are commonly experienced across different respondent groups.

Table 14. One-Way Analysis of Variance (ANOVA) Results

Variable	F-value	p-value	Decision
Construction Site Accidents	**1.274**	**0.286**	No Significant Difference
Occupational Safety Management	**1.116**	**0.333**	No Significant Difference
Occupational Safety Culture	**0.942**	**0.394**	No Significant Difference
Occupational Safety Resource Allocation	**1.487**	**0.231**	No Significant Difference
Overall Evaluation	**1.328**	**0.271**	No Significant Difference

4.7 Pearson Correlation Analysis

Pearson correlation analysis was employed to examine the relationships among the principal variables included in the research model. As shown in Table 15, all correlation coefficients were positive and statistically significant at **$p < 0.001$**, indicating strong associations among occupational safety resource allocation, occupational safety management, occupational safety culture, and workplace accident reduction. The highest correlation coefficient was observed between occupational safety resource allocation and workplace accident reduction (**$r = 0.748$**), suggesting that greater investment in occupational safety resources is closely associated with improved safety outcomes in construction projects. These findings provide empirical support for the proposed conceptual framework and demonstrate that strengthening safety resources is accompanied by improvements in overall occupational safety performance

Table 15. Pearson Correlation Matrix

Variable	1	2	3	4
1. Occupational Safety Resource Allocation	**1.000**			
2. Occupational Safety Management	**0.720**	**1.000**		
3. Occupational Safety Culture	**0.691**	**0.703**	**1.000**	
4. Workplace Accident Reduction (Overall Evaluation)	**0.748**	**0.684**	**0.712**	**1.000**

Note: All correlation coefficients were statistically significant at **$p = 0.000$ ($p < 0.001$)**.

Project Management Implication: The significant positive correlations observed in this study indicate that effective allocation of occupational safety resources contributes to improved safety performance. These findings also suggest that incorporating safety resource planning into project planning and procurement activities can support the timely availability

of safety equipment, training programmers, and supervisory resources throughout construction project implementation.

4.8 Regression Analysis

Simple linear regression analysis was performed to evaluate the extent to which occupational safety resource allocation predicts the reduction of workplace accidents in construction projects. The regression results demonstrate that the proposed model is statistically significant, confirming that the independent variable exerts a meaningful influence on the dependent variable. The positive regression coefficient indicates that improvements in occupational safety resource allocation are associated with corresponding improvements in accident prevention. Furthermore, the coefficient of determination shows that occupational safety resource allocation explains a substantial proportion of the variation in workplace accident reduction, highlighting its importance as a strategic factor in improving construction safety performance.

Table 16. Simple Linear Regression Analysis

Regression Statistic	Value
Coefficient of Determination (R^2)	**0.518**
Significance Level (p-value)	**0.000**
Decision	Significant Positive Effect
Interpretation	Occupational safety resource allocation significantly predicts workplace accident reduction.

The regression analysis further confirms that occupational safety resource allocation is an important managerial factor influencing construction safety performance. From a project management perspective, integrating safety requirements into procurement planning and resource allocation processes may enhance the effectiveness of occupational safety implementation without altering overall project objectives.

4.9 Summary of Hypothesis Testing

The research hypotheses were evaluated using the statistical analyses presented in the previous sections. The findings provide empirical support for the proposed research model, demonstrating statistically significant relationships between occupational safety resource allocation and workplace accident reduction. Similarly, the analyses confirmed significant associations between occupational safety management and the administrative, technical, human, and financial factors investigated in this study. Consequently, the main hypothesis and the corresponding sub-hypotheses were supported according to the adopted significance level, indicating that effective allocation of occupational safety resources contributes directly to improving safety performance within construction projects.

Table 17. Summary of Hypothesis Testing

Hypothesis	Statistical Test	Test Value	p-value	Decision
H1 (Main Hypothesis)	Simple Linear Regression	**R^2 = 0.518**	**0.000**	Supported
H1a	Pearson Correlation	**r = 0.720**	**0.000**	Supported
H1b	Pearson Correlation	**r = 0.691**	**0.000**	Supported
H1c	Pearson Correlation	**r = 0.684**	**0.000**	Supported
H1d	Pearson Correlation	**r = 0.712**	**0.000**	Supported
H1e	Pearson Correlation	**r = 0.684**	**0.000**	Supported

Overall, the hypothesis testing results demonstrate that allocating sufficient occupational safety resources positively influences construction safety performance. These findings emphasize that safety planning should be incorporated into project resource management and procurement practices to improve project sustainability and reduce workplace accidents.

4.10 Discussion

The findings of this study demonstrate that occupational safety resource allocation represents a critical organizational capability for improving safety performance in construction projects. Rather than being viewed solely as a regulatory requirement, the results indicate that adequate allocation of financial, human, technical, and organizational resources provides the foundation for effective accident prevention and sustainable safety management. The consistently high evaluations obtained across the study dimensions suggest that workplace accidents are primarily associated with organizational deficiencies in planning, supervision, training, and resource availability rather than isolated operational failures.

The descriptive analysis identified administrative shortcomings, technical deficiencies, human-related factors, and financial constraints as the principal contributors to workplace accidents. Among these dimensions, inadequate worker training and insufficient supervision received the highest evaluations, highlighting the importance of competent management, continuous workforce development, and proactive safety planning throughout construction projects. These findings indicate that improving occupational safety requires a comprehensive management approach that integrates safety considerations into routine project planning and decision-making processes.

The correlation and regression analyses further confirmed that occupational safety resource allocation is significantly associated with improved safety performance and reduced workplace accidents. These results suggest that organizations allocating sufficient safety resources are more capable of implementing preventive measures, maintaining effective supervision, and improving compliance with occupational safety requirements. Consequently, investment in occupational safety resources should be considered a strategic organizational practice rather than an additional project expense.

The present findings are consistent with previous national and international studies. Similar to the conclusions reported by **Hallowell (2018)**, the results confirm that investment in

occupational safety resources generates organizational benefits that extend beyond regulatory compliance. Likewise, the findings support the work of **Zeibak-Shini et al. (2024)**, which emphasized the importance of systematic safety resource allocation in improving construction safety performance. The agreement with recent Libyan studies further indicates that insufficient safety budgets, limited training opportunities, and weak managerial commitment remain common organizational challenges affecting occupational safety implementation across the Libyan construction sector.

From a practical perspective, the results demonstrate that improving occupational safety depends on systematic planning, effective resource allocation, and continuous organizational commitment. Integrating occupational safety requirements into project planning, procurement planning, and logistics coordination can enhance the timely availability of safety equipment, qualified personnel, and other essential safety resources throughout project execution. Accordingly, occupational safety should be regarded as an integral component of construction project management that simultaneously protects workers, improves organizational performance, and supports sustainable project delivery.

5. Conclusion

This study confirms that occupational safety resource allocation plays a decisive role in improving safety performance and reducing workplace accidents within Libyan construction projects. The statistical analyses demonstrate that adequate financial, human, technical, and organizational resources significantly strengthen occupational safety implementation, while inadequate supervision, insufficient worker training, and limited safety budgets remain the principal barriers to effective accident prevention.

The findings further indicate that successful occupational safety management extends beyond compliance with safety regulations. Sustainable improvements in construction safety require strategic planning, effective resource allocation, strong managerial commitment, and continuous investment in workforce development. Organizations adopting this proactive approach are better positioned to minimize workplace accidents and improve overall project performance.

Furthermore, the study demonstrates that integrating occupational safety considerations into project planning, procurement planning, and logistics coordination enhances the availability of essential safety resources throughout project execution. Consequently, occupational safety should be regarded as a strategic investment that supports worker protection, organizational efficiency, and the sustainable delivery of construction projects.

6. Recommendations

Based on the findings obtained from the statistical analyses, the following recommendations are proposed to improve occupational safety performance in Libyan construction projects:

1. Construction organizations should allocate adequate financial resources for occupational safety and integrate safety requirements into project planning, budgeting, and procurement activities from the earliest stages of project development to ensure the continuous availability of safety resources throughout project implementation.
2. Continuous occupational safety training programmers should be implemented to improve workers' awareness, technical competence, and compliance with safety

procedures, while promoting an organizational culture that encourages active participation, effective communication, and leadership commitment to workplace safety.

3. Construction companies should strengthen occupational safety management by appointing qualified safety professionals, conducting regular safety inspections and risk assessments, and ensuring continuous monitoring of compliance with established safety standards.
4. Government authorities should strengthen the enforcement of occupational safety regulations by improving inspection systems, monitoring compliance, and encouraging construction organizations to adopt best occupational safety practices.
5. Construction organizations are encouraged to adopt modern digital technologies and integrated safety management systems to improve hazard identification, accident reporting, decision-making, and overall occupational safety performance.
6. Project managers should integrate occupational safety resource planning into overall project resource management, procurement planning, and logistics coordination to ensure the timely provision of personal protective equipment, safety devices, qualified personnel, and other essential safety resources throughout project execution.
7. Future research should investigate additional organizational, behavioural, technological, and supply chain factors that may influence occupational safety performance across different construction environments.

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