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Analysis of Most InfluentialFactors affecting safety performance of Workers on construction Sites in Kandahar, Afghanistan

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Abstract **-** *This study examines the key determinants influencing construction site safety performance in Kandahar City and investigates how workers' experience and personal background relate to accident occurrence. A quantitative descriptive approach was employed, involving 385 structured questionnaires distributed equally among five stakeholder groups: project managers, engineers, contractors, safety officers, and laborers. Data were analyzed using Microsoft Excel and SPSS.*

Findings show that workers with greater experience demonstrate safer work practices and are less likely to be involved in safety incidents. Six categories of safety-influencing factors were assessed: historical, economic, psychological, technical/procedural, organizational, and environmental. Psychological factors were prioritized by laborers and contractors, highlighting the importance of communication, stress management, and interpersonal relations. Engineers rated historical factors—particularly age and work experience—as most influential, while project managers emphasized technical and procedural compliance. Safety officers identified organizational elements, such as team coordination and project structure, as critical.

Overall, historical factors emerged as the most dominant determinants of safety performance across all groups. The study concludes that stakeholder perceptions of safety vary significantly, requiring construction companies to adopt tailored and context-specific safety strategies that address each group's concerns. Strengthening experience-based staffing, capacity building, and institutional support can reduce workplace accidents, enhance safety culture, and improve project outcomes. The findings provide practical guidance for improving construction safety in Kandahar and offer insights relevant to similar developing-country contexts.

Keywords- *Construction Safety, Safety Performance, Stakeholder Perception, Kandahar City, Workplace Accidents, Organizational Support.*

I. Introduction

The construction industry is consistently recognized as one of the most hazardous fields worldwide (Saifullah & Ismail, 2012; Teo et al., 2005). This high-risk nature is reflected in data from the Bureau of Labor Statistics, which reports a 27% decrease in construction fatalities between 2003 and 2013, largely due to reduced employment during the 2007–2009 recession. Despite this decline, falls alone accounted for 35% of all fatalities during this period, highlighting the ongoing risks within the industry. To address these risks, it is essential to focus on construction site safety, which is influenced by a range of factors, as Sawacha et al. (1999) has found that historical, economic, psychological, technical, procedural, organizational, and environmental aspects are the most influencing factors. Additionally, safety culture plays a crucial role in managing occupational safety (Sherratt et al., 2025). Previous studies have explored a range of factors affecting safety performance on construction sites, identifying key influences such as workers' knowledge, management practices, and site conditions. For example, (Shah and Ullah, (2024)found that two primary reasons for safety risks include the

slow adoption of new safety tools and the shortage of personal protective equipment (PPE). Similarly, Ojo, (2010) identified that design changes during construction were the most frequent risk factor, followed closely by inadequate specifications. Additionally, Williams et al. (2018)emphasized that designers should carefully identify hazards within the design and clearly communicate these to contractors. Collectively, these findings provide a foundation for understanding the most relevant factors to consider for improving safety on construction sites, which will guide the focus of this study in Kandahar.

Despite existing studies, there is a clear gap in understanding the specific factors affecting safety performance on construction sites in Kandahar City. Most available studies focus mainly on urban and developed areas, which may not fully address the unique challenges faced in developing regions like Kandahar. The construction industry in Afghanistan, particularly in Kandahar, faces significant safety challenges, resulting in high rates of accidents, injuries, and fatalities. Despite progress in the development of the sector, safety risks remain a major concern. This research aims to explore Most Influential Factors effecting safety performance of Workers on construction Sites at Kandahar Afghanistan.

II. Problem Statement

The construction industry in Afghanistan, particularly in Kandahar, faces significant safety challenges, resulting in high rates of accidents, injuries, and fatalities. Despite progress in the development of the sector, safety risks remain a major concern. In Kandahar, although the construction industry is more advanced than in other regions of Afghanistan, it still struggles with weak safety protocols, leading to frequent accidents and fatalities. Previous studies have focused broadly on the safety issues in the global and national context, but little research has been conducted specifically on the factors affecting construction site safety in Kandahar. This study aims determine the key factors influencing safety on construction sites in Kandahar City. By exploring the unique challenges and conditions of this region, the research will offer a deeper understanding of the current safety practices and their limitations.

III. Objectives

The objectives of this research are outlined as follows:

- To determine factors that has the most effect on construction site safety in Kandahar City
- To study how workers' experience, background, and views on safety are linked to whether they have accidents or stay accident-free at work

IV. Research Methodology

The research adopts a quantitative design combined with a descriptive approach, which is ideal for examining the factors that influence safety performance on construction sites in Kandahar.

The study focuses on workers, project managers, safety officers, contractors and engineers employed at construction sites in Kandahar. These individuals come from diverse roles within various construction companies, each with different levels of safety experience and exposure. The used formula is the most common formula of sampling.It is based on factors such as population size, margin of error, confidence level, and the variability (standard deviation) of the population. In situations where the population size is unknown or large, Cochran's third edition provides a formula for calculating the sample size without requiring information about the total population (Cochran, 1977).

$$n = \frac{Z^2 \times p \times (1-p)}{E^2}$$

In the above formula, (n) denotes required sample size, (Z) confidence level, (p) estimated proportion of the population, and (E) margin error.

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We calculate the required sample size where reliability or confidence level 95% which gives us the Z value 1.96, estimated proportion of the population 50% because it is unknown, margin of error is 5%. Therefore,

$$n = \frac{1.96^2 \times 0.5 \times (1 - 0.5)}{0.05^2} = 384.16 \cong 385$$

The number of questionnairesto distribute are 385.

To ensure a fair representation from various groups (e.g., workers, safety officers, engineers), a **stratified random sampling** method is employed. This technique guarantees that workers from different construction companies in the region are adequately represented, providing a more accurate depiction of the factors affecting safety performance.

Therefore, for the stratified random sampling, if the population is unknow, it is preferred to equally distribute the groups. Therefore, each group will have the percentage of 20.

Table 1 Number of Questionnaires Distributed to Each Stakeholder Group

No	Strata (Group)	Percentage	Number of Questionnaires
1	Project Manager	20	77
2	Contractor	20	77
3	Safety Officer	20	77
4	Engineer	20	77
5	Labor	20	77

The primary tool for data collection is structured questionnaire containing a mix of question types, including Likert scale, and closed-ended questions.

A **pilot study**is conducted with a small sample of 10 respondents to test the clarity, relevance, and reliability of the questionnaire. The feedback is used to make necessary adjustments before the full-scale data collection. The data is gathered using two methods:

1. **Face-to-Face Interviews**: These are held with construction workers at their workplaces.
2. **Online Surveys**: These are distributed to participants who are not easily accessible for in-person interviews.

The survey data is analyzed using **SPSS** and **Excel**. The analysis includes:

- **Descriptive Statistics**: Summarizing respondents' demographic information and the frequency of safety incidents on construction sites, using measures like mean, frequency distribution, and percentages
- **SWOT Analysis**: Identifying the **Strengths**, **Weaknesses**, **Opportunities**, and **Threats** related to safety practices on construction sites in Kandahar
- **Correlation Analysis**: Exploring the relationships between worker experience, safety training, and the frequency of accidents.

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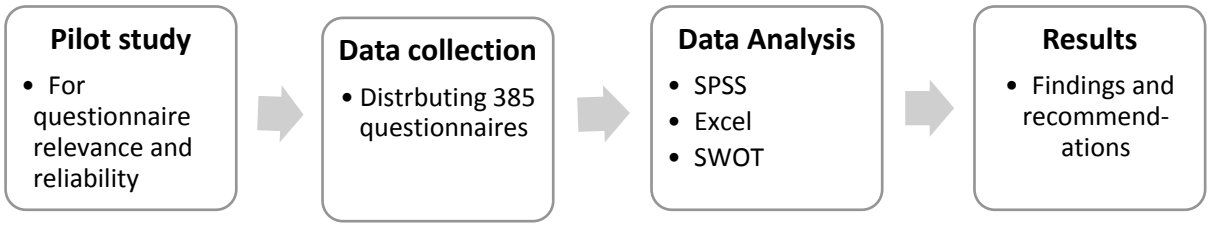

Figure 1 Data Collection process

V. Results

5.1 Demographic Information of the respondents

All five types of questionnaires contained three demographic questions related to age, years of experience, and level of education.

Table 2 Summary of demographic data

Role	Variable	Lowest	Highest	Average
Labor	Age	19 Years	60	20-30
	Experience	0-1 Year	30 Years	1-5 Years
	Education	Uneducated	Bachelor or Higher	Uneducated
Project Manager	Age	23 Years	49 Years	25-40 Years
	Experience	Less than 4 Years	10+ Years	10+ Years
	Education	Secondary Level	Bachelor or Higher	Bachelor or Higher
Engineer	Age	23 Years	56 Years	27-36 Years
	Experience	Less than one or 10+	10+ Years	4-5 Years
	Education	Bachelor or Higher	Bachelor or Higher	Bachelor or Higher
Safety Officer	Age	23 Years	54 Years	27-36 Years
	Experience	0-1 Years	10+ Years	4-5 Years
	Education	Bachelor or Higher	Bachelor or Higher	Bachelor or Higher
Contractor	Age	19 Years	54 Years	20-35 Years
	Experience	0-1 Years	10+ Years	2-3 Years
	Education	Uneducated	Bachelor or Higher	Bachelor or Higher

5.2 Descriptive Statistics Analysis

The data from the Likert-scale and ranking questions were subjected to descriptive analysis to determine central tendencies to acquire our objective. Key findings are presented below.

5.2.1 Engineers, Project Managers, Safety Officers, and Contractors

- Management commitment to safety
- Availability of personal protective equipment (PPE)
- Frequency of safety training
- Enforcement of safety rules
- Worker behavior towards safety
- Site supervision and inspection

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Engineers: The analysis of the responses showed that, from the engineers' perspective, the most influential factor affecting safety performance on construction sites is the historical factor. This factor received the highest average ranking score of 4.88.

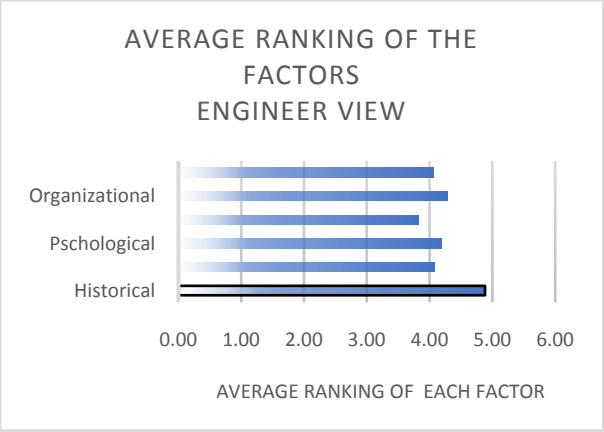

Figure 2 Average ranking of the factors views of Engineer

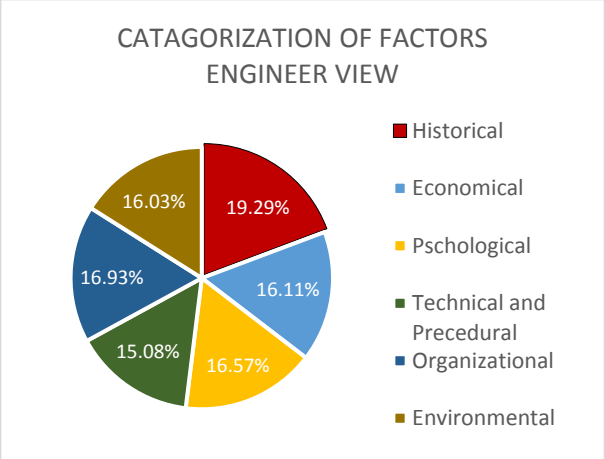

Figure 3 Categorization of factors view of Engineer

Project Manager: According to the project managers' perspective, the technical and procedural factors were identified as the most influential on safety performance at construction sites. These factors received an average ranking of 5, indicating their high importance compared to other factors evaluated in the study.

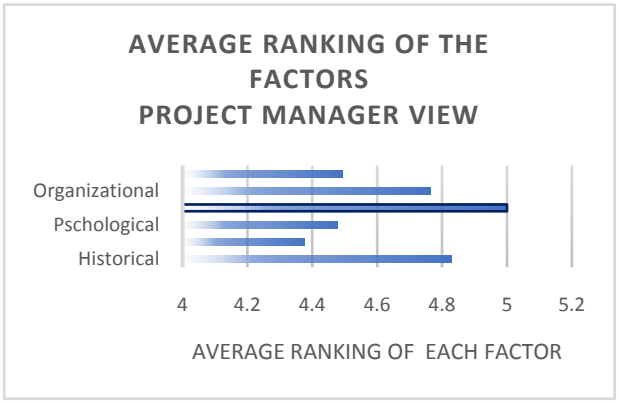

Figure 4 Average ranking of factors from the view of project manager

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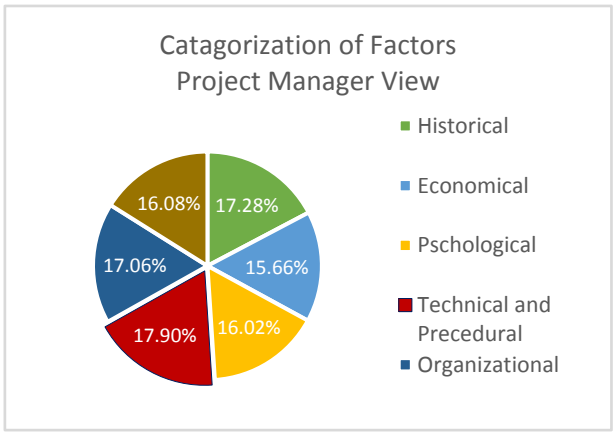

Figure 5 Categorization of factors from the view of project manager

Safety Officer: Based on the responses received, the findings revealed that, from the perspective of safety officers, the most influential factor affecting safety performance on construction sites is the organizational factor. This category received the highest average ranking score of 5.32 indicating its critical role in shaping safety outcomes within the construction environment.

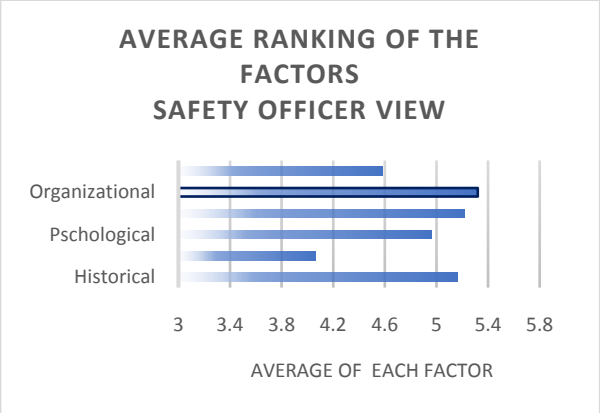

Figure 6 Average Ranking of the factors view of Safety officer

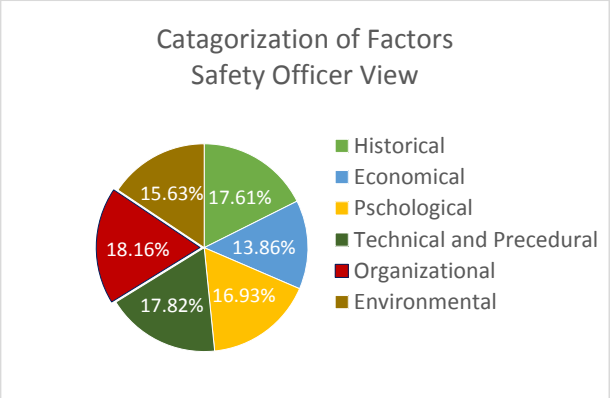

Figure 7 Categorization of factors from the view of safety officer

Contractor: The findings indicate that, from the contractors' point of view, the most influential factor affecting safety performance on construction sites is the psychological factor. This category, which includes aspects such as workers' motivation, communication, and mental state, received the highest average ranking score of 4.84, emphasizing its important role in promoting a safe and productive work environment.

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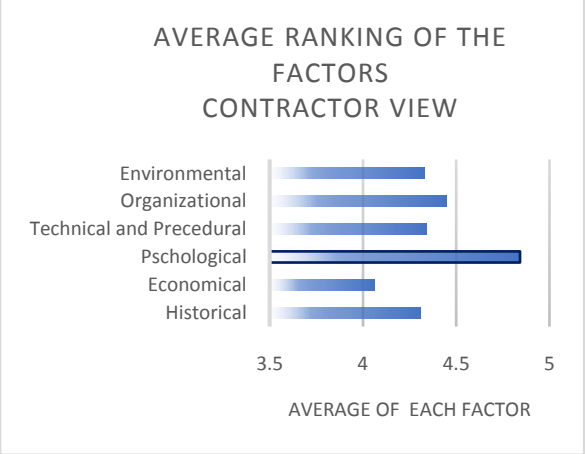

Figure 8 Average Ranking of the factors view of contractors

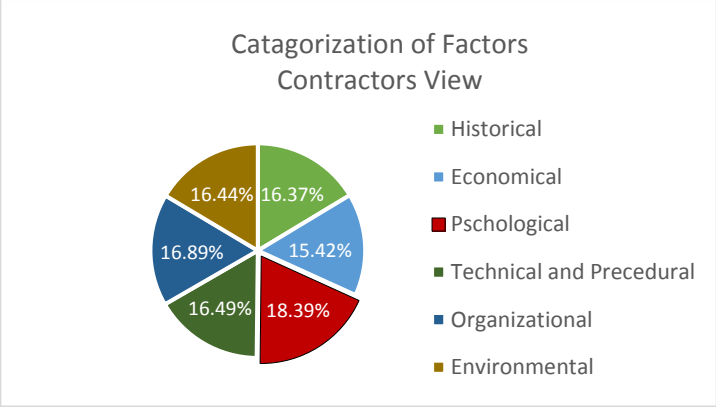

Figure 9 Categorization of factors from the view of contractors

Labor: According to the laborers' perspective, the most influential factor impacting safety performance on construction sites is the psychological factor. This includes elements such as communication, motivation, and mental well-being. It received the highest average ranking score of 5.03, indicating that laborers consider their psychological state a key component in ensuring safety on the job site.

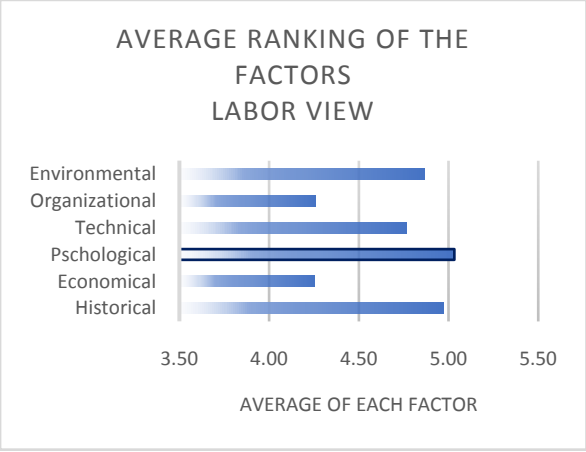

Figure 10 Average Ranking of the factors from the view of labor

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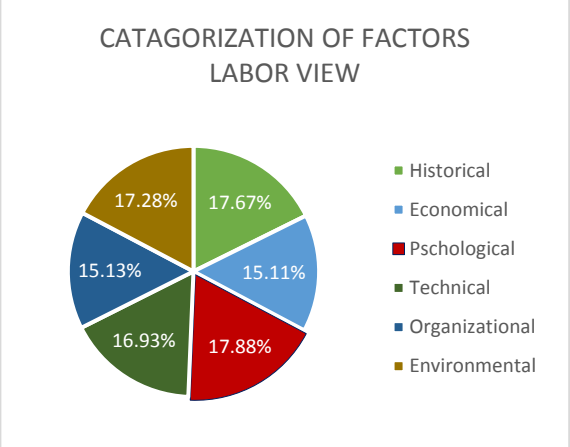

Figure 11 Categorization of factors from the view of labor

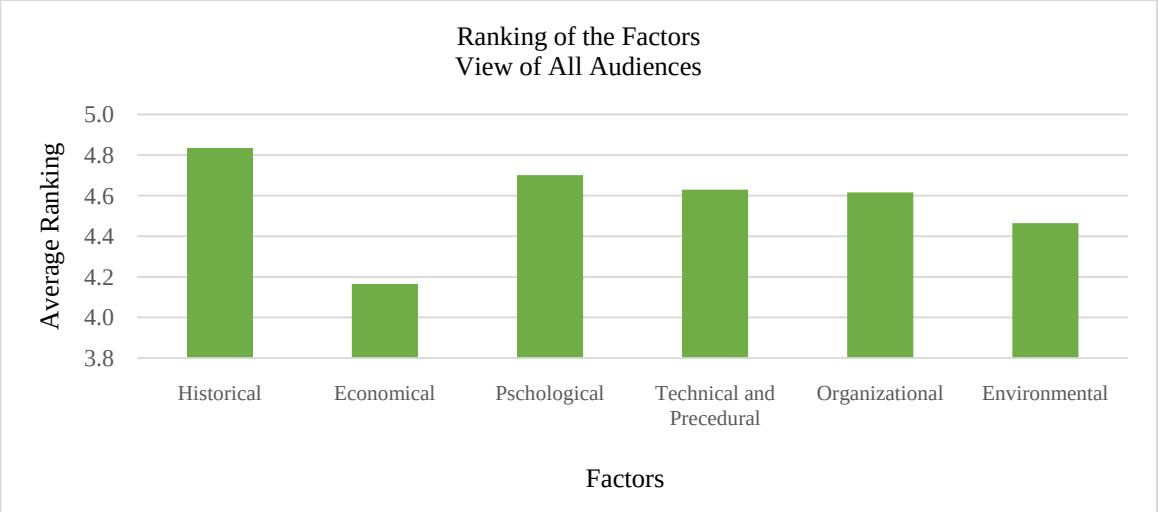

Figure 12 Ranking of the Factors from View of All Audiences

5.3 Most Influential Factors From the view of All Audience

The most influential factor affecting safety performance at construction sites in Kandahar, as identified by all groups of respondents, is the **historical factor**, as illustrated in the figure. By calculating the average scores of all the listed factors from the perspectives of all audiences, it was revealed that historical factors had the highest impact.

Figure 12 presents the average percentage of all factors influencing safety performance as viewed by all audiences. Among these, the **historical factor** emerged as the most influential, receiving an average of **17.6%**, which was higher than the percentages of all other factors

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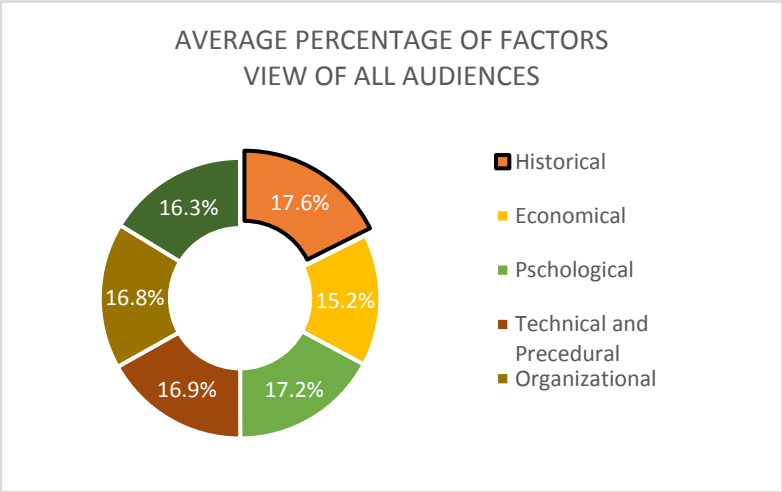

Figure 13 Average percentage of Factors from the view of all Audiences

5.4 Pearson Correlational Analysis

Pearson Correlation Analysis measures the strength and direction of a linear relationship between two continuous variables. The correlation coefficient (r) ranges from –1 to +1, indicating negative, no, or positive correlation.

This analysis will help us acquire our second objective easily. To bring it back, our second objective was to correlate workers experience with their accident history.

Table 3 Pearson correlation analysis

Pearson Correlation Analysis			
Experience	Experience -0.485	Accidents Per Year 1	Sample Size
Accidents Per Year	Experience 1	Accidents Per Year -0.485	77

From the above table, you can see that labors' experience negativly relates at a rate of -0.485 with their accidents. This means that the more experienced a labor is, the less likely he faces accidents.

5.5 Matrix Correlation Analysis

Matrix correlation is performed to examine the strength and direction of relationships among multiple variables simultaneously.

Table 4 Matrix correlation

	Historical	**Economical**	**Psychological**	**Technical Procedural**	**Organizational**	**Environmental**
Historical	1.0	0.066	-0.008	0.2	0.06	0.2
Economical	0.07	1.0	-0.037	0.1	0.1	0.1
Psychological	-0.008	-0.04	1.0	**0.31**	0.3	0.2
Technical Procedural	0.2	0.1	0.3	1.0	0.2	0.3
Organizational	0.064	0.064	0.064	0.06	1.0	0.06
Environmental	0.15	0.15	0.15	0.15	0.15	1.0

The matrix correlation analysis examined the relationships among six factors affecting safety performance. The results showed generally weak correlations, with most values below 0.3. The strongest positive relationship was between the Psychological and Technical Procedural factors (r = 0.31).

VI. Conclusion

The findings revealed that different groups prioritized different factors based on their roles and experiences. Laborers and contractors viewed psychological factors such as relationships, communication, and stress management as the most influential in ensuring safety on site. This suggests that the mental state and emotional well-being of workers, as well as the ability to share concerns or understand instructions, strongly affect their performance and risk of accidents. In their view, a safe environment depends heavily on how well workers interact, stay focused, and manage their feelings under pressure. Engineers emphasized the historical factor, where aspects like a worker's experience and age were considered key to safe performance. Their preference for this factor indicates that they believe learning from the past, including past mistakes, training, and long-term involvement in the field—builds the kind of knowledge that helps avoid risks. For engineers, experienced workers are more skilled at identifying hazards and applying safety practices effectively.

Project managers prioritized technical and procedural factors, focusing on modern construction techniques, tools, and the willingness to follow safety codes and standards.

This reflects their role in overseeing site operations and ensuring that workers use proper tools and methods. In their view, safety performance improves when projects use up-to-date technology and when teams follow established procedures correctly.

Safety officers, particularly those in governmental projects, viewed organizational factors as most critical to maintaining safety. These include team coordination, project structure, and relationships between staff members. From their perspective, having clear roles, organized workflows, and a well-managed team creates a safer and more efficient work environment.

From the view of all audiences, the historical factor was considered the most influential. Figure 17 shows that this factor received the highest average percentage (17.6%) compared to others. This means that experience, age, and past safety practices are seen as the strongest elements influencing safety on construction sites in Kandahar. Workers and stakeholders appear to agree that those who have been involved in construction for longer periods tend to behave more safely and help prevent accidents through their practical knowledge.

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