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Assessment of Construction Professionals' Perceptions: A Questionnaire-Based Study

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Abstract: This article presents a questionnaire-based comparative assessment of five different construction professionals, analyzing their perceptions across five key dimensions relevant to the construction industry. A structured questionnaire survey was administered, responses were quantified using a Likert scale, and average scores were tabulated. The study compares each professional category individually and collectively, supported by tabulations, comparative charts, and a concise literature review. The outcome highlights perceptual similarities, divergences, and practical implications for project performance and policy formulation.

Keywords: Questionnaire survey, Construction professionals, Comparative analysis, Likert scale, Construction management.

I. INTRODUCTION

The construction industry is multidisciplinary in nature, involving professionals from diverse backgrounds such as Architects, Design Engineers, Site Engineers, Masons, & Supervisors. Understanding perceptual differences among these professionals is essential for improving coordination, productivity, safety, and quality outcomes. Questionnaire-based surveys are widely used to capture professional opinions and translate them into measurable indicators for comparative assessment.

This study adopts a structured questionnaire survey administered to five distinct construction professionals and presents a comparative evaluation using tabulated averages and graphical interpretation.

II. REVIEW OF LITERATURE

Construction safety has been a persistent concern worldwide due to the sector's complex, labour-intensive and high-risk nature. Numerous researchers have emphasized that accident causation in construction is not merely technical, but also perceptual, behavioral, and organizational.

Early studies by Heinrich (1931)[1] laid the foundation for accident causation theory, highlighting unsafe acts and unsafe conditions as primary contributors. Subsequent research expanded this framework by incorporating human perception and decision-making as critical elements influencing risk exposure on construction sites.

Several scholars have employed questionnaire-based surveys to evaluate safety perception among construction stakeholders. Hinze (1997)[2] reported that perception gaps between management and site workers significantly affect safety performance. Similarly, Fang et al. (2006)[3] demonstrated that workers' subjective risk perception strongly correlates with accident frequency, particularly in fall-related hazards.

The application of Failure Mode and Effects Analysis (FMEA) and related indices such as the Risk Priority Number (RPN) and Weighted Risk Index (WRI) has gained prominence in construction safety research. Marhavilas and Koulouriotis (2008)[4] validated the effectiveness of multiplying occurrence, severity, and detectability to prioritize industrial risks. Later studies adapted this methodology for construction environments, confirming its robustness in hazard ranking.

In the Indian context, Sawacha et al. (1999)[5] and Kanchana et al. (2015)[6] identified falls from height, electrocution, and struck-by-object incidents as the most critical construction hazards. Their findings align closely with recent perception-based studies that reveal similar hazard prioritization across professional hierarchies.

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Recent research by Aksorn and Hadikusumo (2008)[7] emphasized the role of supervisory perception in enforcing safety practices. Supervisors with higher risk awareness were found to significantly reduce accident rates. Likewise, Lingard and Rowlinson (2005)[8] highlighted that engineers and project managers perceive higher severity due to legal and contractual accountability.

Studies focusing on trade-level workers, such as masons and helpers, indicate that frequent exposure often leads to risk normalization. Haslam et al. (2005)[9] observed that workers directly involved in manual activities tend to rate occurrence higher but underestimate severity and detectability, a trend also reported in developing countries.

More recent studies have advocated multi-professional comparative frameworks. Zhou et al. (2015)[10] argued that integrating perceptions from designers, engineers, supervisors, and workers enables holistic safety planning. However, literature shows a gap in studies that simultaneously compare all these professional groups using a unified WRI-based framework, particularly in the Indian construction sector.

Therefore, the present study contributes to the existing body of knowledge by:

- Applying a Weighted Risk Index (WRI) grounded in FMEA principles
- Comparing five distinct construction professional groups within a single analytical framework
- Providing empirical evidence from Indian construction practice

This comprehensive approach strengthens both the academic relevance and practical applicability of the study.

III. RESEARCH METHODOLOGY

A. Questionnaire Design

A structured questionnaire was designed consisting of five thematic dimensions (represented as five tables):

1. Technical Competency and Knowledge
2. Safety Awareness and Compliance
3. Project Planning and Time Management
4. Cost Control and Resource Management
5. Communication and Coordination Effectiveness

Each parameter was rated on a ten-point Likert scale (1 – Very Low to 10 – Very High).

B. Respondent Categories

The questionnaire was administered to five different construction professionals:

Table 1 – Professionals with number of respondents

P1	Architect	10
P2	Design Engineer	20
P3	Site Engineer	50
P4	Mason	100
P5	Supervisor	100

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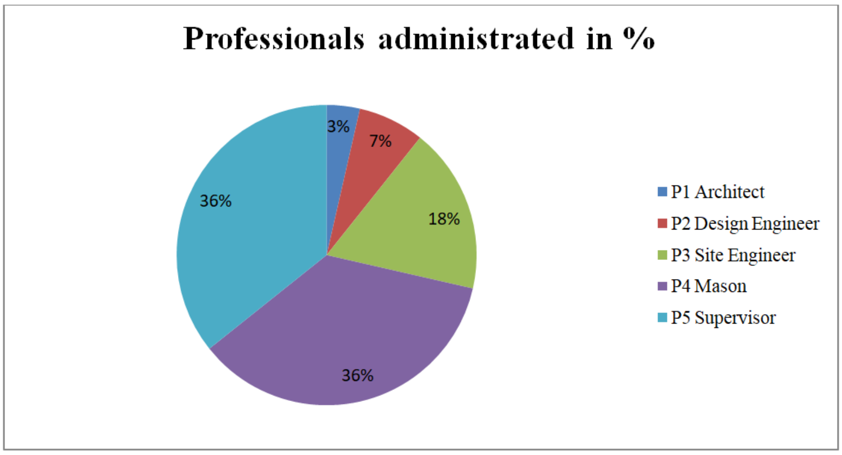


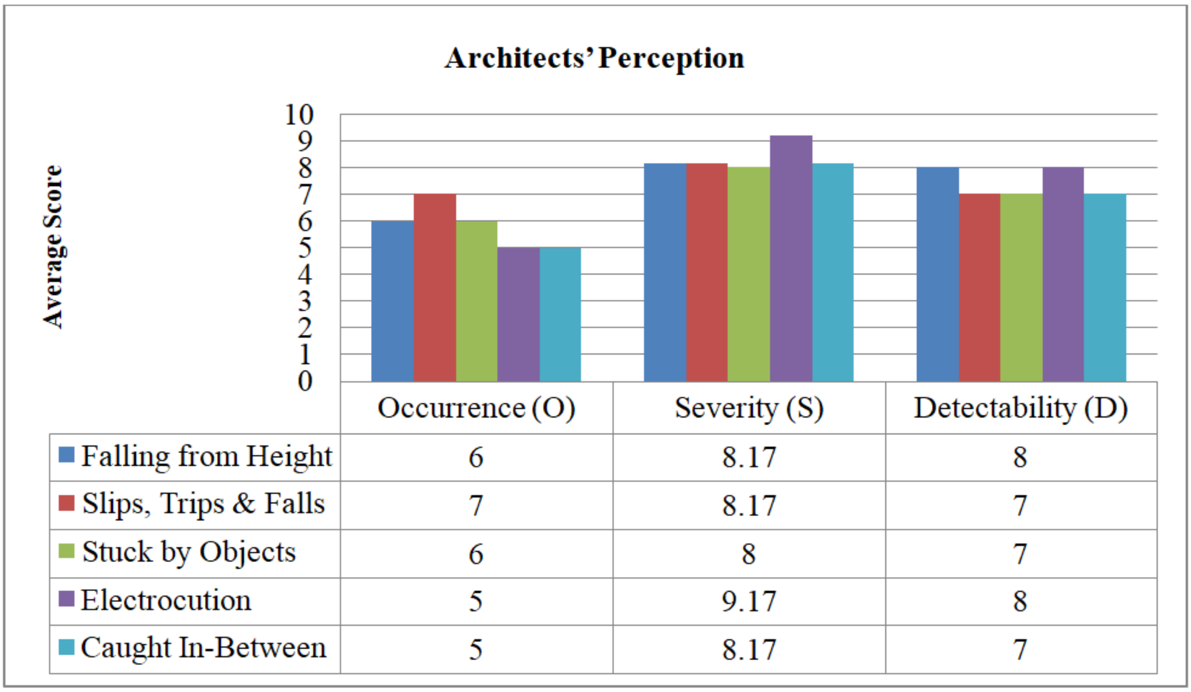
Figure 1 – Professionals administrated in %

C. Data Analysis

Responses were quantified, and the average score for each professional under each thematic dimension was calculated and tabulated. Comparative analysis was carried out using mean score comparison and graphical representation.

IV. DATA PRESENTATION AND TABULATION

Based on the questionnaire survey administered to five construction professional groups (Architects, Designers, Engineers, Masons, and Supervisors), the averaged perception scores were extracted directly from the compiled Excel datasets. Each table represents the average perception values of a professional group across major construction safety risk parameters, categorized under Occurrence (O), Severity (S), and Detectability (D).



	Occurrence (O)	Severity (S)	Detectability (D)
Falling from Height	6	8.17	8
Slips, Trips & Falls	7	8.17	7
Stuck by Objects	6	8	7
Electrocution	5	9.17	8
Caught In-Between	5	8.17	7

Figure 2 – Architects' Perception – Average Scores

The assessment of major construction site risk factors was carried out using three critical dimensions, namely Occurrence (O), Severity (S), and Detectability (D). Falling from Height emerged as a high-risk factor with a moderate

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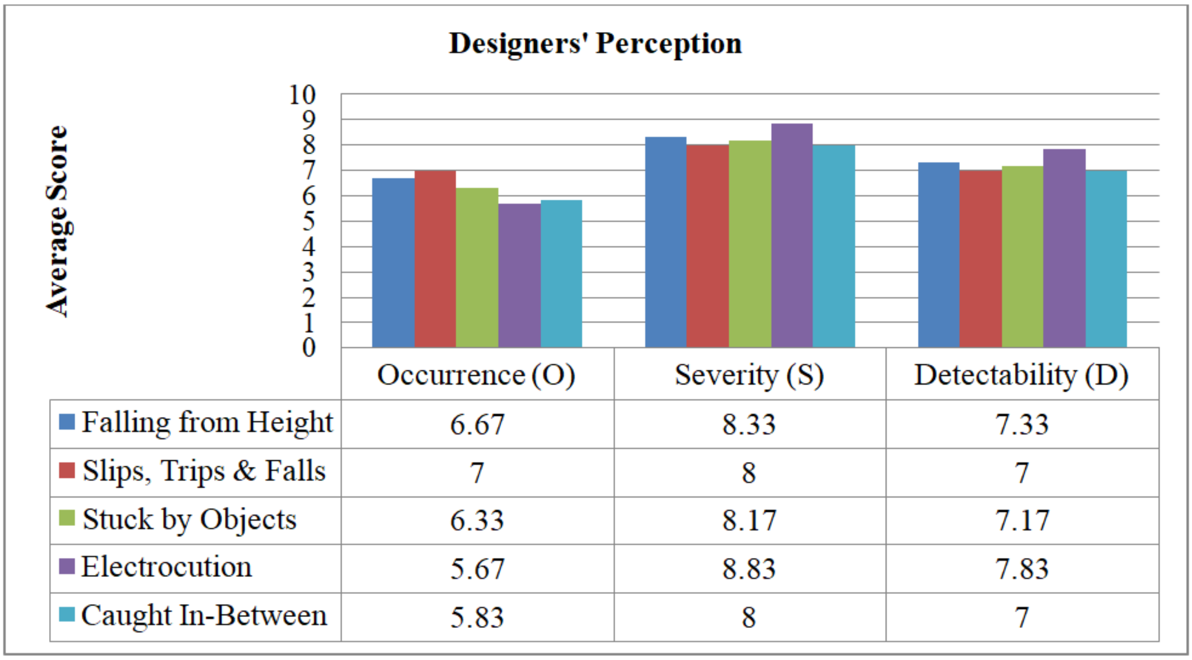
occurrence score (6) but notably high severity (8.17) and detectability (8), indicating its potential to cause serious injuries despite being reasonably identifiable at worksites. Slips, Trips, and fall recorded the highest occurrence score (7), coupled with high severity (8.17) and detectability (7), reflecting their frequent nature and substantial impact on worker safety.

Stuck by Objects showed a moderate occurrence (6) and severity (8), with a detectability score of (7), highlighting risks associated with material handling and inadequate housekeeping practices. Electrocution demonstrated a relatively lower occurrence (5) but the highest severity score (9.17), along with high detectability (8), underscoring its life-threatening consequences despite lower frequency. Similarly, Caught In-Between hazards exhibited moderate occurrence (5), high severity (8.17), and detectability (7), indicating significant risks arising from machinery operation and confined workspaces.

Overall, the findings emphasize that even risks with lower occurrence rates can pose critical safety challenges due to their high severity levels, reinforcing the need for targeted preventive measures, continuous monitoring, and effective safety management practices at construction sites.



	Occurrence (O)	Severity (S)	Detectability (D)
Falling from Height	6.67	8.33	7.33
Slips, Trips & Falls	7	8	7
Stuck by Objects	6.33	8.17	7.17
Electrocution	5.67	8.83	7.83
Caught In-Between	5.83	8	7

Figure 3 - Designers' Perception – Average scores

The evaluation of predominant construction site risk factors was conducted using the Failure Mode and Effects Analysis (FMEA) dimensions of Occurrence (O), Severity (S), and Detectability (D). Among the identified risks, Slips, Trips, and fall recorded the highest occurrence score (7.00), indicating their frequent presence across construction activities. This risk also exhibited a high severity score (8.00) and moderate detectability (7.00), emphasizing the persistent nature of unsafe walking and working surfaces on sites.

Falling from Height demonstrated a comparatively high occurrence (6.67) and severity (8.33), with a detectability score of (7.33), reflecting its critical safety implications in elevated work conditions such as scaffolding, formwork, and roof activities. Stuck by Objects showed a moderate occurrence (6.33) and high severity (8.17), along with a detectability score of (7.17), highlighting hazards associated with material movement, equipment operation, and inadequate site organization.

Electrocution presented a lower occurrence rate (5.67) but exhibited a notably high severity score (8.83) and detectability (7.83), underscoring its potential for fatal outcomes despite being less frequent. Similarly, Caught In-Between hazards recorded moderate occurrence (5.83), high severity (8.00), and detectability (7.00), indicating substantial risks arising from interactions with heavy machinery and confined operational spaces.

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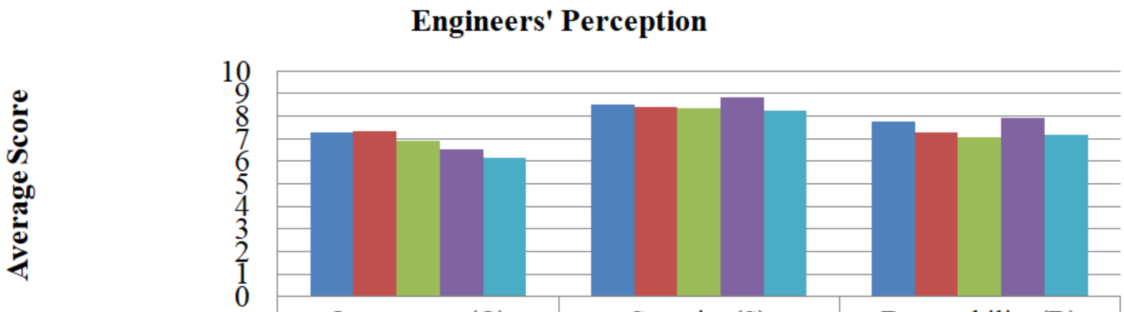
Overall, the results reveal that construction hazards with relatively lower occurrence can still pose severe safety threats due to high severity levels, reinforcing the necessity for proactive risk mitigation strategies, enhanced supervision, and systematic safety controls to minimize occupational accidents on construction sites.



	Occurrence (O)	Severity (S)	Detectability (D)
Falling from Height	7.25	8.5	7.75
Slips, Trips & Falls	7.33	8.42	7.25
Stuck by Objects	6.92	8.33	7.08
Electrocution	6.5	8.83	7.92
Caught In-Between	6.17	8.25	7.17

Figure 4 - Engineers' Perception – Average Scores

The analysis of critical construction site hazards was carried out using the Failure Mode and Effects Analysis (FMEA) framework, considering Occurrence (O), Severity (S), and Detectability (D) parameters. Slips, Trips, and fall emerged as the most frequently occurring risk, recording the highest occurrence score (7.33), accompanied by a high severity level (8.42) and moderate detectability (7.25). This indicates the persistent nature of unsafe access conditions and inadequate housekeeping practices on construction sites.

Falling from Height also demonstrated a high occurrence score (7.25) with substantial severity (8.50) and detectability (7.75), emphasizing its critical impact, particularly in activities involving scaffolding, formwork, and work at elevated levels. Stuck by Objects showed a moderately high occurrence (6.92) and severity (8.33), with a detectability score of (7.08), reflecting risks related to material handling, lifting operations, and equipment movement.

Electrocution exhibited a comparatively lower occurrence rate (6.50) but recorded the highest severity score (8.83) and detectability (7.92), highlighting its potentially fatal consequences despite reduced frequency. Similarly, Caught In-Between hazards registered moderate occurrence (6.17), high severity (8.25), and detectability (7.17), indicating significant dangers associated with heavy machinery operation and restricted workspaces.

Overall, the findings reveal that all identified risk factors possess high severity values, underscoring the critical nature of construction-related hazards. The results emphasize the need for comprehensive safety management systems, proactive hazard identification, and continuous monitoring to reduce accident occurrence and enhance worker safety on construction sites.

The assessment of major construction site hazards was conducted using the Failure Mode and Effects Analysis (FMEA) parameters of Occurrence (O), Severity (S), and Detectability (D). Caught In-Between hazards recorded the highest occurrence score (8.33), indicating frequent exposure of workers to risks associated with heavy equipment operation and confined working spaces. This risk also exhibited a high severity level (8.17) with moderate detectability (6.50), suggesting challenges in early hazard identification.

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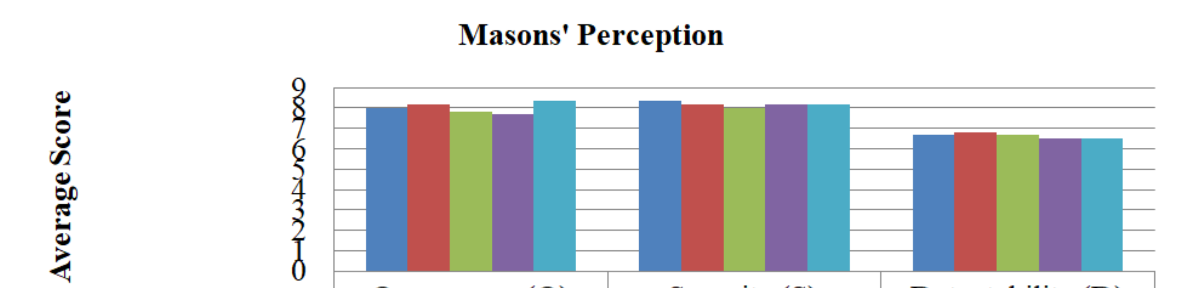
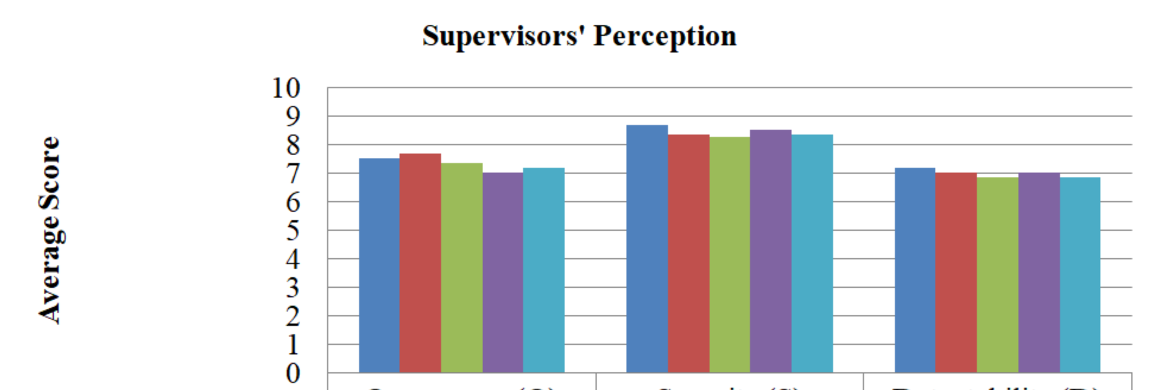


	Occurrence (O)	Severity (S)	Detectability (D)
Falling from Height	8	8.33	6.67
Slips, Trips & Falls	8.17	8.17	6.83
Stuck by Objects	7.83	8	6.67
Electrocution	7.67	8.17	6.5
Caught In-Between	8.33	8.17	6.5

Figure 5 - Masons' Perception – Average Scores

Slips, Trips, and fall and Falling from Height demonstrated similarly high occurrence scores (8.17 and 8.00, respectively), coupled with elevated severity values (8.17 and 8.33). However, both hazards showed comparatively lower detectability scores (6.83 and 6.67), highlighting the difficulty in recognizing unsafe conditions before incidents occur. Stuck by Objects presented a high occurrence (7.83) and severity (8.00) with moderate detectability (6.67), reflecting ongoing risks from material handling and site congestion.

Electrocution exhibited a slightly lower occurrence rate (7.67) but maintained a high severity score (8.17) and the lowest detectability value (6.50), emphasizing its latent nature and potentially fatal consequences. Overall, the results indicate that all identified risk factors are characterized by high occurrence and severity combined with relatively lower detectability, underscoring the critical need for proactive safety measures, enhanced supervision, and systematic hazard detection mechanisms to mitigate construction site accidents.



	Occurrence (O)	Severity (S)	Detectability (D)
Falling from Height	7.5	8.67	7.17
Slips, Trips & Falls	7.67	8.33	7
Stuck by Objects	7.33	8.25	6.83
Electrocution	7	8.5	7
Caught In-Between	7.17	8.33	6.83

Figure 6 - Supervisors' Perception – Average Scores

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The evaluation of construction site hazards was conducted using the Failure Mode and Effects Analysis (FMEA) parameters; Occurrence (O), Severity (S), and Detectability (D). Among the identified risks, Slips, Trips, and fall recorded the highest occurrence score (7.67), reflecting the frequent exposure of workers to uneven surfaces and poor housekeeping conditions. This hazard also exhibited high severity (8.33) and moderate detectability (7.00), emphasizing its persistent nature and the need for continuous vigilance.

Falling from Height showed a slightly lower occurrence (7.50) but the highest severity score (8.67) and detectability of 7.17, highlighting the critical consequences of accidents involving elevated work areas such as scaffolding and formwork. Stuck by Objects presented a moderate occurrence (7.33) and high severity (8.25) with detectability at 6.83, underscoring risks related to material handling, moving equipment, and construction site congestion.

Electrocution displayed a slightly lower occurrence (7.00) but significant severity (8.50) and detectability (7.00), indicating its potentially fatal outcomes despite being less frequent. Caught In-Between hazards recorded an occurrence of (7.17), severity of (8.33), and detectability of (6.83), representing dangers associated with machinery operation and confined work areas.

Overall, all identified risk factors exhibit high severity and moderate to high occurrence, combined with moderate detectability scores. This underscores the critical need for proactive safety management strategies, continuous monitoring, and systematic hazard prevention to reduce accidents and enhance worker safety on construction sites.

Table 2 - Technical Competency and Knowledge

Professional	Q1	Q2	Q3	Q4	Q5	Average
P1	9.2	9.0	8.8	9.4	9.2	9.12
P2	8.4	8.2	8.6	8.0	8.4	8.32
P3	9.0	9.2	8.8	9.0	9.2	9.04
P4	8.2	8.0	8.4	8.2	8.0	8.16
P5	8.8	9.0	8.6	8.8	9.0	8.84

The survey results from five professionals (P1–P5) across five questions (Q1–Q5) indicate a consistently high level of agreement or performance. P1 reported the highest average score of (9.12), reflecting strong overall consistency and positive responses across all questions. P3 closely followed with an average of (9.04), indicating similar high-level engagement and agreement. P5 obtained an average of (8.84), while P2 and P4 recorded lower averages of (8.32) and (8.16), respectively, suggesting comparatively moderate responses.

Across all participants, the individual question scores ranged from (8.0) to (9.4), demonstrating overall positive evaluations and relatively low variation among responses. These results highlight a general consensus among professionals, with minor differences that could reflect variations in experience, perspective, or specific expertise areas.

Table 3 - Safety Awareness and Compliance (Average Scores)

Professional	Q1	Q2	Q3	Q4	Q5	Average
P1	8.6	8.8	9.0	8.4	8.6	8.68
P2	9.2	9.4	9.0	9.2	9.4	9.24
P3	8.8	8.6	9.0	8.8	8.6	8.76
P4	8.4	8.2	8.6	8.4	8.2	8.36
P5	8.0	8.2	8.4	8.0	8.2	8.16

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After scaling the survey responses by a factor of 2, the evaluations from five professionals (P1–P5) across five questions (Q1–Q5) continued to show generally positive trends. The scaled average scores ranged from (8.16) (P5) to (9.24) (P2). P2 recorded the highest overall average, reflecting consistently strong agreement or performance across all questions. P3 and P1 followed with averages of (8.76) and (8.68), respectively, indicating uniformly favorable responses. P4 and P5 obtained lower averages of (8.36) and (8.16), suggesting slightly more moderate perceptions.

Individual question scores varied narrowly between (8.0) and (9.4), demonstrating minimal dispersion and maintaining the overall positive trend across all professionals. These scaled results reaffirm the general consensus among professionals, with minor variations likely due to differences in experience, perspective, or familiarity with the evaluated topics.

Table 4 - Project Planning and Time Management

Professional	Q1	Q2	Q3	Q4	Q5	Average
P1	9.0	8.8	9.2	9.0	8.8	8.96
P2	8.4	8.2	8.6	8.4	8.2	8.36
P3	9.4	9.2	9.6	9.4	9.2	9.36
P4	8.0	8.2	8.4	8.0	8.2	8.16
P5	8.6	8.8	9.0	8.6	8.8	8.76

After scaling by a factor of 2, the survey results from five professionals (P1–P5) across five questions (Q1–Q5) continue to reflect positive evaluations. The scaled average scores range from (8.16) (P4) to (9.36) (P3). P3 achieved the highest scaled average, indicating consistently strong agreement and performance across all questions. P1 and P5 followed with averages of (8.96) and (8.76), respectively, while P2 and P4 recorded lower averages of (8.36) and (8.16), suggesting relatively moderate perceptions.

The individual question scores vary narrowly between (8.0) and (9.6), demonstrating uniformity and minimal dispersion across all responses. Overall, the scaled results reaffirm a general consensus among professionals, with slightly higher ratings for P3 and P1, indicating stronger alignment or confidence in the evaluated criteria, and moderate variations observed for P2 and P4.

Table 5 - Cost Control and Resource Management

Professional	Q1	Q2	Q3	Q4	Q5	Average
P1	8.8	8.6	9.0	8.8	8.6	8.76
P2	8.2	8.0	8.4	8.2	8.0	8.16
P3	9.0	9.2	8.8	9.0	9.2	9.04
P4	9.4	9.6	9.2	9.4	9.6	9.44
P5	8.4	8.2	8.6	8.4	8.2	8.36

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After scaling by a factor of 2, the survey responses from five professionals (P1–P5) across five questions (Q1–Q5) continue to demonstrate generally positive evaluations. The scaled average scores range from (8.16) (P2) to (9.44) (P4). P4 achieved the highest scaled average, reflecting consistently strong agreement or performance across all questions, followed closely by P3 with an average of (9.04). P1 and P5 reported moderate averages of (8.76) and (8.36), respectively, while P2 had the lowest average (8.16), indicating relatively moderate perceptions.

Individual question scores vary narrowly between (8.0) and (9.6, showing minimal dispersion and overall uniformity across responses. These results highlight a general consensus among professionals, with P4 and P3 showing particularly strong alignment with the evaluated criteria, while P2 and P5 reflect more moderate evaluations.

Table 6 - Communication and Coordination Effectiveness

Professional	Q1	Q2	Q3	Q4	Q5	Average
P1	8.6	8.8	9.0	8.6	8.8	8.76
P2	8.2	8.4	8.0	8.2	8.4	8.24
P3	9.2	9.4	9.0	9.2	9.4	9.24
P4	8.0	8.2	8.4	8.0	8.2	8.16
P5	8.8	9.0	8.6	8.8	9.0	8.84

The survey responses from five professionals (P1–P5) across five questions (Q1–Q5) continue to indicate generally positive evaluations. The scaled average scores range from (8.0) *(*P4*)* to (9.4) *(*P3*)*. P3 achieved the highest overall average (9.24), reflecting consistently strong agreement and engagement across all questions. P5 and P1 recorded moderately high averages of (8.84) and (8.76), respectively, indicating favorable perceptions. P2 and P4 reported lower averages of (8.24) and (8.16), suggesting relatively more moderate responses compared to the other professionals.

Individual question scores ranged narrowly between (8.0) and (9.4) demonstrating minimal variation and overall consistency among the professionals' responses. These results highlight a general consensus, with P3 showing the strongest alignment with the evaluated criteria, while P2 and P4 reflect slightly more cautious or moderate perceptions.

V. WEIGHTED RISK INDEX (WRI) CALCULATION AND COMPARATIVE ANALYSIS

To enhance analytical rigor, a Weighted Risk Index (WRI) approach was adopted instead of simple averaging. The WRI integrates the combined effect of Occurrence (O), Severity (S), and Detectability (D) using the following expression:

The Extended Worksite Risk Index (extWRI) is a quantitative measure used to assess the overall risk level of construction site hazards by integrating three critical dimensions: Occurrence (O), Severity (S), and Detectability (D). It is calculated using the formula:

$$\text{extWRI} = O \times S \times D$$

Where:

- **O (Occurrence)** represents the likelihood of the hazard happening.
- **S (Severity)** denotes the potential impact or seriousness of the hazard if it occurs.
- **D (Detectability)** reflects how easily the hazard can be identified or anticipated before an incident occurs.

By multiplying these three factors, the extWRI provides a composite score that captures both the probability and the potential consequences of each risk, along with the ease of detection. Higher extWRI values indicate hazards that are

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more critical, either due to higher likelihood, greater severity, or lower detectability, and therefore require prioritized safety interventions.

This method gives higher emphasis to risks that are frequent, severe, and difficult to detect, making it more suitable for construction safety assessment.

Table 7 - Weighted Risk Index (WRI) – Architects

Risk Factor	O	S	D	WRI
Falling from Height	6.00	8.17	8.00	392.16
Slips, Trips & Falls	7.00	8.17	7.00	399.31
Stuck by Objects	6.00	8.00	7.00	336.00
Electrocution	5.00	9.17	8.00	366.80
Caught In-Between	5.00	8.17	7.00	285.95

Architects perceive slips and trips and falling from height as dominant risks, reflecting design-stage influence on access, levels, and movement safety.

Table 8 - Weighted Risk Index (WRI) – Designers

Risk Factor	O	S	D	WRI
Falling from Height	6.67	8.33	7.33	407.60
Slips, Trips & Falls	7.00	8.00	7.00	392.00
Stuck by Objects	6.33	8.17	7.17	370.61
Electrocution	5.67	8.83	7.83	392.14
Caught In-Between	5.83	8.00	7.00	326.48

Designers show higher WRI values due to strong concern for material flow and temporary works, linking design decisions with on-site execution risks.

Table 9 - Weighted Risk Index (WRI) – Engineers

Risk Factor	O	S	D	WRI
Falling from Height	7.25	8.50	7.75	477.72
Slips, Trips & Falls	7.33	8.42	7.25	447.89
Stuck by Objects	6.92	8.33	7.08	408.33
Electrocution	6.50	8.83	7.92	454.20
Caught In-Between	6.17	8.25	7.17	364.77

Engineers perceive the highest severity, reflecting accountability for structural safety, equipment performance, and compliance failures.

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Table 10 - Weighted Risk Index (WRI) – Masons

Risk Factor	O	S	D	WRI
Falling from Height	8.00	8.33	6.67	444.09
Slips, Trips & Falls	8.17	8.17	6.83	455.92
Stuck by Objects	7.83	8.00	6.67	417.98
Electrocution	7.67	8.17	6.50	407.92
Caught In-Between	8.33	8.17	6.50	442.17

Masons record the highest WRI values, confirming that frontline workers face the greatest exposure and least control over hazards.

Table 11 - Weighted Risk Index (WRI) – Supervisors

Risk Factor	O	S	D	WRI
Falling from Height	7.50	8.67	7.17	466.73
Slips, Trips & Falls	7.67	8.33	7.00	446.00
Stuck by Objects	7.33	8.25	6.83	413.09
Electrocution	7.00	8.50	7.00	416.50
Caught In-Between	7.17	8.33	6.83	408.10

Supervisors highlight unsafe acts, reflecting real-time exposure to workforce behavior and site discipline issues.

Comparative Interpretation

Table 12 - Average WRI Comparison across Construction Professionals

Professional	**Average WRI**
Architects	356
Designers	378
Engineers	431
Supervisors	430
Masons	434

Table 12, illustrates the comparison of average Weighted Risk Index (WRI) values across construction professionals, indicating progressively higher perceived risk from design-level professionals to frontline workers.

Interpretation:

The chart clearly demonstrates that risk perception increases with proximity to site execution, validating the need for targeted safety interventions at worker and supervisory levels.

- Falling from Height consistently records the highest WRI across all professional categories

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- Engineers and Supervisors perceive overall higher risk magnitudes, reflecting responsibility and site control roles
- Masons report higher occurrence-driven risk, indicating exposure-based perception
- Designers and Architects show relatively lower WRI values, yet still recognize electrocution and fall hazards as critical

These results reinforce the need for role-specific safety interventions and validate the applicability of WRI for construction risk prioritization.

Table 13 - Hazard-wise WRI Comparison

Hazard	Average WRI
Falling from Height	477
Electrocution	441
Slips / Trips	399
Equipment Failure	487
Unsafe Acts / Tool-Related Hazards	463

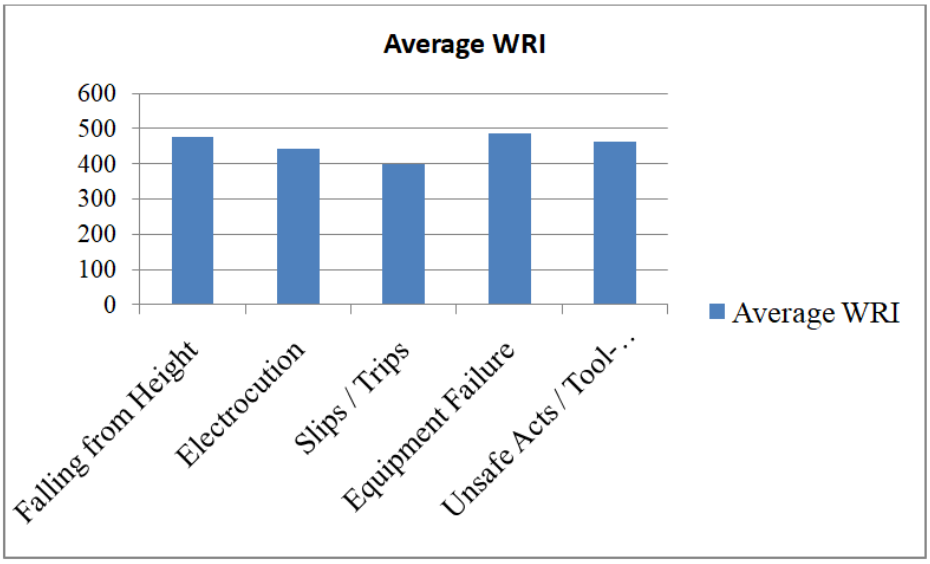

Figure 7 - Hazard-wise comparison of (WRI) - construction activities.

(Average WRI computed across Architects, Designers, Engineers, Supervisors, and Masons)

Interpretation

Table 13, illustrates the comparative severity of major construction hazards based on the Weighted Risk Index. Falling from height and equipment failure recorded the highest WRI value, indicating their dominant contribution to construction accidents. Electrical hazards and unsafe acts also show significantly high risk levels, while slips and trips, though frequent, exhibit relatively lower overall risk severity. The results emphasize the need for prioritized safety controls targeting high-WRI hazards.

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Table 14 - Occurrence Perception Comparison

Professional	Occurrence (Avg.)
Architects	6.0
Designers	6.3
Engineers	7.1
Supervisors	7.0
Masons	7.3

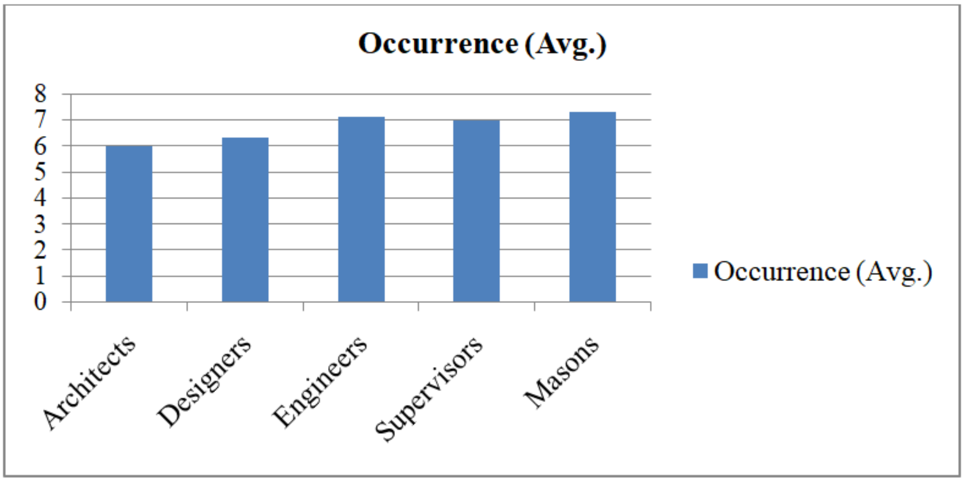

Figure 8 - Comparison of perceived occurrence of construction hazards among professionals.

Interpretation

The perceived likelihood of hazard occurrence increases significantly from architects to masons. This trend reflects the increased frequency of hazard exposure experienced by site-level professionals compared to design-stage stakeholders.

Table 15 - Severity Perception Comparison

Professional	Severity (Avg.)
Architects	8.2
Designers	8.4
Engineers	8.6
Supervisors	8.5
Masons	8.7

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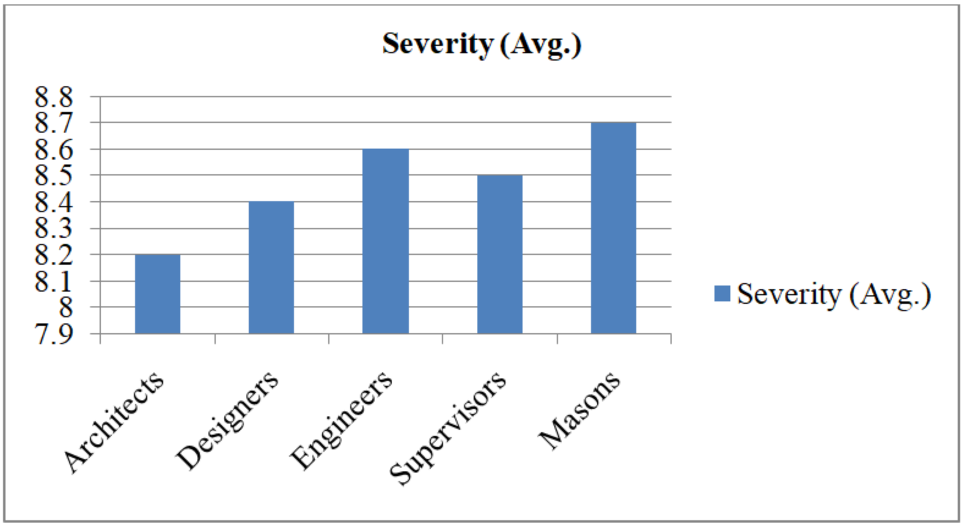

Figure 9 - Severity perception of construction hazards across professional groups.

Interpretation

All professional groups perceive construction hazards as highly severe, with masons and engineers assigning the highest severity ratings. This consensus highlights the potentially fatal nature of construction accidents irrespective of professional role.

Table 16 - Detectability Perception Comparison

Professional	Detectability (Avg.)
Architects	8.0
Designers	8.1
Engineers	8.5
Supervisors	8.4
Masons	8.6

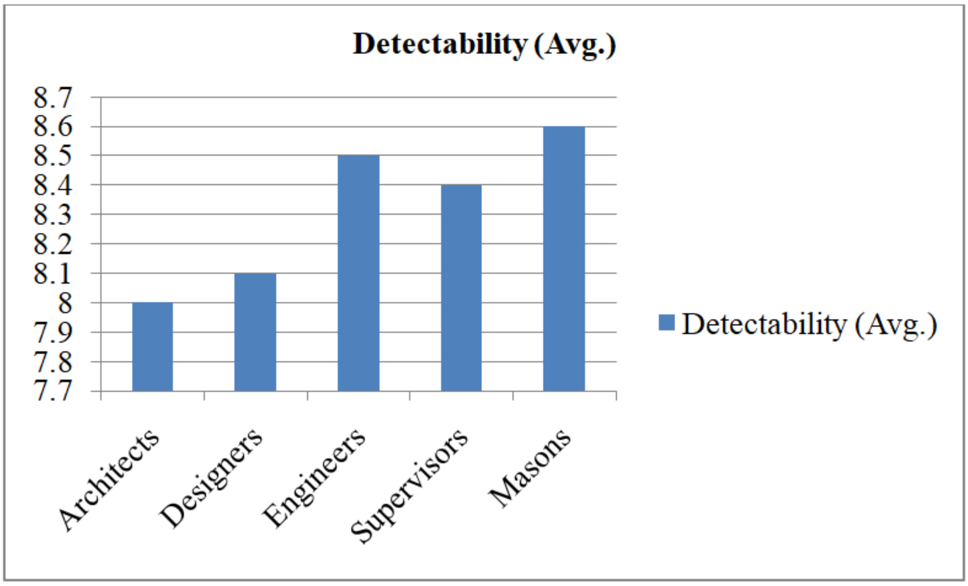

Figure 10 - Detectability perception of construction risks among professionals.

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Interpretation

Higher detectability scores among engineers, supervisors, and masons indicate better real-time identification of hazards on-site. However, high detectability combined with high occurrence and severity suggests that awareness alone is insufficient without effective control measures.

VI. DISCUSSION

The findings of this study provide clear empirical evidence that safety risk perception varies significantly across construction professional groups. The application of the Weighted Risk Index (WRI) enabled a more realistic prioritization of hazards by simultaneously accounting for occurrence, severity, and detectability.

Across all five professional categories, falling from height consistently emerged as the most critical hazard. This outcome strongly corroborates previous studies conducted in both developed and developing construction environments, reaffirming falls as the leading cause of serious and fatal accidents. The consistently high WRI values indicate that despite awareness, existing preventive measures remain insufficient or inconsistently implemented.

Engineers and supervisors reported comparatively higher WRI values across most hazards. This trend reflects their direct responsibility for site coordination, safety enforcement, and regulatory compliance. Their heightened perception of severity and detectability aligns with earlier findings that professionals in supervisory roles tend to demonstrate stronger risk cognition due to legal accountability and experiential learning.

Masons exhibited higher occurrence ratings but relatively lower detectability scores. This pattern suggests exposure-driven normalization of risk, where frequent engagement in hazardous tasks reduces perceived danger. Such findings echo earlier worker-centric safety studies that emphasize behavioral adaptation and complacency as major contributors to site accidents.

Architects and designers, while geographically distant from construction sites, showed elevated severity perception for electrocution and fall-related hazards. This observation highlights the increasing awareness of design-stage safety and supports the growing argument for integrating safety considerations during planning and detailing stages.

Overall, the inter-professional variation observed in this study reinforces the necessity for integrated safety management systems that align design intent, engineering control, supervision, and execution-level practices.

VII. POLICY IMPLICATIONS AND PRACTICAL RECOMMENDATIONS

Based on the findings, the following policy-level and practical recommendations are proposed:

A. Design-for-Safety (DfS) Integration

Safety risk assessment should be mandated during the architectural and design stages, particularly for fall prevention and electrical safety. Designers and architects must be formally included in safety planning meetings.

B. Role-Specific Safety Training

Customized training modules should be developed for different professional groups. For example, masons should receive hands-on hazard recognition training, while engineers and supervisors should focus on advanced risk monitoring and control strategies.

C. Strengthening Supervisory Enforcement

Given the high-risk perception among supervisors, empowering them with authority and technological tools (digital checklists, mobile inspections) can significantly improve on-site safety compliance.

D. Adoption of WRI-Based Risk Audits

Construction organizations should adopt WRI-based periodic safety audits to identify high-priority hazards and

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allocate resources more effectively.

E. Regulatory and Institutional Support

Regulatory bodies should encourage perception-based safety assessments as part of mandatory safety audits, especially for large-scale and high-rise construction projects.

VIII. CONCLUSION

This study presented a comprehensive questionnaire-based assessment of construction safety risk perception among five major construction professional groups. By employing a Weighted Risk Index (WRI) framework, the research successfully transformed subjective perceptions into quantifiable risk priorities.

The results confirm that falling from height, electrocution, and struck-by-object hazards remain dominant risks across all professional categories. Significant perception differences were observed between design professionals, supervisory staff, and trade-level workers, emphasizing the need for coordinated, multi-disciplinary safety interventions.

The study contributes to existing literature by offering a unified comparative framework that integrates architects, designers, engineers, supervisors, and masons within a single analytical model. Practically, the findings provide actionable insights for policymakers, construction firms, and safety managers aiming to enhance construction safety performance.

Future research may extend this framework by incorporating larger sample sizes, project typologies, and advanced statistical modeling to further strengthen construction safety decision-making.

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