

FACTORS AFFECTING SAFETY WORK BEHAVIOR OF WORKERS IN BUILDING CONSTRUCTION PROJECTS: A CASE STUDY OF HETAUDA SUB-METROPOLITAN CITY

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ABSTRACT

Worker safety behaviour is a critical determinant of occupational accident rates in the construction industry, particularly in developing countries where informal work practices dominate. In Nepal, private building construction projects are expanding rapidly in urban areas, yet empirical evidence on the behavioural and organizational drivers of construction safety remains limited. This study investigates the personal and organizational factors influencing worker safety behaviour in private building construction projects in Hetauda Sub-Metropolitan City.

A quantitative cross-sectional research design was adopted using a structured questionnaire survey administered to 95 respondents, including construction workers and professionals involved in medium-scale private building projects. Data were analyzed using descriptive statistics, Cronbach's alpha for reliability testing, Principal Component Analysis (PCA) for factor grouping, Relative Importance Index (RII) for prioritization, and Multiple Linear Regression for model validation using SPSS.

The results indicate that personal factors explain 60.3% ($R^2 = 0.603$) of the variance in worker safety behaviour, with safety awareness and worker attitude emerging as the strongest predictors. Organizational factors explain 66.4% ($R^2 = 0.664$) of the variance, where safety management practices and leadership commitment show significant positive influence, while safety inspection and incentive-based measures were statistically insignificant. The findings highlight a dominance of compliance-driven safety rather than a proactive safety culture.

The study provides evidence-based insights for local authorities and contractors to strengthen behavioural safety interventions and organizational commitment in private building construction projects. This study represents one of the first empirical attempts to develop and validate behavioural safety models for private building construction projects in Nepal's urban context.

Keywords: Worker safety behaviour; Organizational factors; Personal factors; PCA; Regression analysis

1. Introduction

The global construction sector is characterized by elevated occupational hazards, with human error and unsafe actions serving as the primary catalysts for site accidents. While structural and engineering safety measures have advanced, the ultimate success of risk mitigation depends heavily on the safety behaviour of individual workers (Neal and Griffin, 2006). In rapidly urbanizing developing nations, managing this behaviour is complicated by informal labor practices, low safety awareness, and inconsistent oversight (Adhikari, 1996). This study investigates the personal and organizational determinants of worker safety behaviour within the rapidly expanding urban and industrial hub of Hetauda Sub-Metropolitan City, Nepal.

1.1 Problem Statement and Hypotheses

While standard safety protocols exist, construction sites in developing urban centers like Hetauda frequently operate under compromised safety standards due to tight project timelines and cost-cutting (Yamane, 1967; Enshassi, 2003). The core issue is that safety interventions are often generic, ignoring the specific psychological and environmental drivers of worker compliance (Heinrich, 1941; Tam, Zeng and Deng, 2004). Without empirical data identifying whether individual traits or organizational environments exert a stronger influence on workers, local stakeholders cannot design effective safety programs (Sharma, 2019; Zhang et al., 2021).

To address this problem, this study tests the following hypotheses:

Hypothesis 1 (H1): Personal factors (safety knowledge and safety motivation) have a significant positive influence on worker safety compliance (Neal and Griffin, 2006; Sharma, 2019; Shrestha, 2022).

Hypothesis 2 (H2): Organizational factors (management commitment and supervisory safety climate) have a significant positive influence on worker safety compliance (Manjula and De Silva, 2014).

1.2 Regulatory Context in Nepal

The statutory framework governing workplace safety in Nepal is primarily anchored by the Labor Act (2017) and the National Building Code (NBC 208) (Government of Nepal, 2017; Government of Nepal, 2003). The Labor Act mandates that employers provide a safe working environment, establish safety and health committees, and supply appropriate personal protective equipment (PPE). Concurrently, NBC 208 outlines specific safety requirements for building construction sites.

However, a significant gap persists between regulatory intent and on-site reality (Nepal, 2017). Enforcement is highly fragmented, regulatory inspections are rare, and small-to-medium contractors frequently bypass safety provisions due to a lack of institutional accountability (Park, Lim and Shin, 2021; Zhang et al., 2021). This regulatory gap shifts the burden of safety directly onto the behavioral decisions of individual workers and local site management (Joshi, Shrestha and Vaidya, 2011; Nepal, 2017).

1.3 Research Objectives

The primary objective of this research is to evaluate the key personal and organizational factors influencing worker safety behaviour in building construction projects within Hetauda Sub-Metropolitan City. Utilizing Principal Component Analysis (PCA) and Multiple Linear Regression on survey data from 95 construction professionals, this study seeks to quantify the relative

predictive power of these factors(Kothari, 2004; Joshi, Shrestha and Vaidya, 2011). Ultimately, the study aims to provide targeted, empirical recommendations that bridge the gap between Nepal's regulatory policies and actual on-site safety compliance.

In academic literature, safety behaviour is widely conceptualized as consisting of two distinct dimensions: safety compliance and safety participation(Sharma, 2019). Safety compliance refers to the mandatory behaviors workers must perform to maintain workplace safety, such as wearing personal protective equipment (PPE) and adhering to standard operating procedures(Nepal, 2017; Sharma, 2019). Conversely, safety participation encompasses voluntary behaviors, such as participating in safety meetings and helping co-workers with safety-related tasks, which contribute to a supportive safety climate(Manjula and De Silva, 2014; Sharma, 2019).

Despite the fact that this sector contributes the bulk of the national economy, the government has done very little to improve the occupational safety and health (OSH) sector in construction. The absence of reporting and documentation of accidents/incidents in this industry is also indicative of government shortcomings. Only fatalities or occurrences attracting national media interest are submitted to the appropriate authorities, demonstrating how outdated health and safety data are (Joshi, Shrestha and Vaidya, 2011).

Table 1 Identified Factors

Personal Factors	Organizational Factors
Perception of Probable Risks	Cautionary and Warning Systems
Mental State	OSH incentives
Previous exposure to accidents	Safety Monitoring and Inspection
Individual Motivation	Safety Guidelines and Policies
Discomfort with safety Instruments	Safety Awareness and Training
Intoxications	Management Commitment for Motivation
Hurry to complete	Penalizing Workers'
Indolence	Pressure From Management
Attitude	

2. Materials and Method

Research methodology encompasses the systematic processes, techniques, and approaches applied to investigate, identify, and analyze the subject matter (Kothari, 2004). This methodology has been designed in alignment with the objectives of the study and insights gained from the literature review. In this research, data will be gathered primarily through a structured questionnaire survey. The collected data will then be subjected to statistical methods to generate meaningful and interpretable results. The overall research procedure is illustrated in the flowchart, Figure 1.

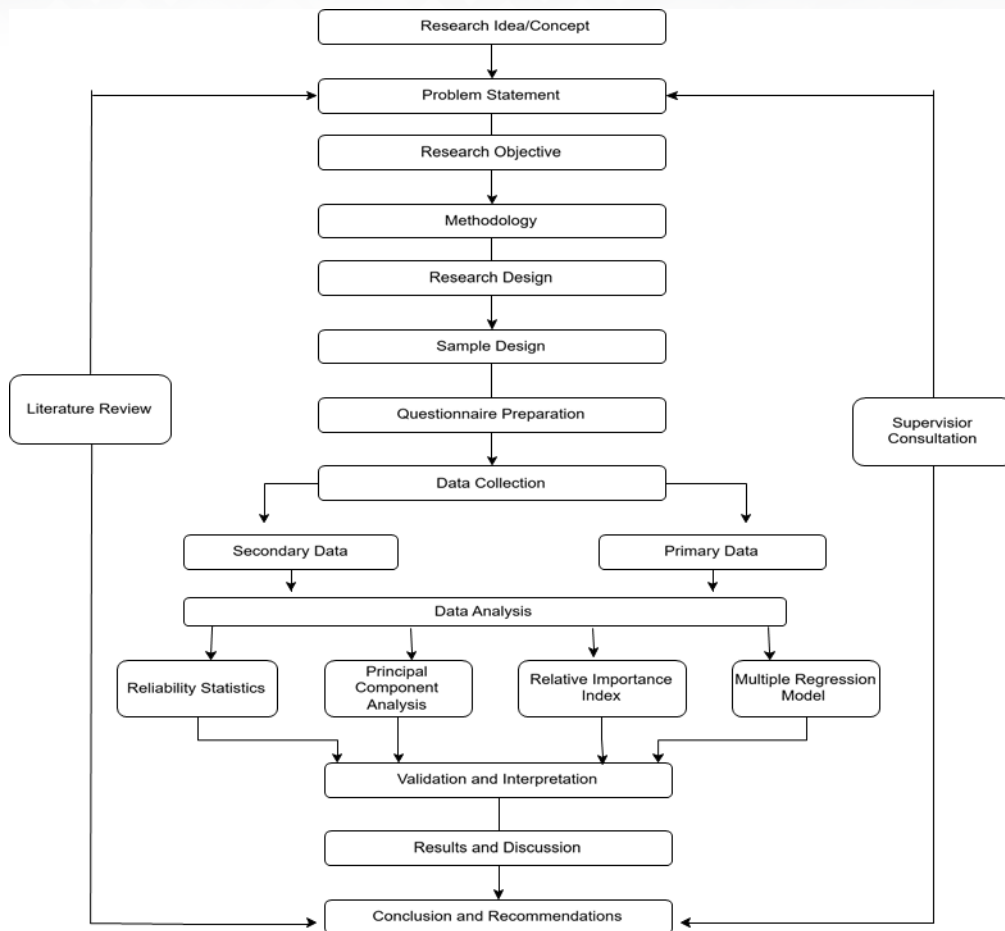


Figure 1 Research Methodology Chart

Sample Design and Population Definition

This research focuses on prioritizing factors that influence worker safety behavior at building construction sites in Hetauda Sub-Metropolitan City. To gather meaningful insights, a representative sample design was used to examine a smaller portion of the larger population. The target population consists of construction firms engaged in private building projects within this specific geographic area. Specifically, the study focuses on 10 ongoing private projects, selected based on their medium-scale nature with budgets ranging from NPR 2–10 crore.

Sample Size and Justification

Determining an appropriate sample size is essential for ensuring that the study results are statistically reliable and representative of the population. Since the total population (N) in this localized study zone is finite and known, Yamane's formula was applied to determine the baseline required sample size:

$$n = \frac{N}{1+N(e)^2} \quad \text{Eq 1}$$

Where,

N= Total Population

e = Margin of error (10%)

To ensure a cushion against incomplete responses, maximize statistical power for multivariate regression, and capture a broader demographic spread across the 10 active site locations, field distribution was expanded. This proactive oversampling successfully secured a final, robust dataset of 95 completed responses.

Sampling Technique

This study utilized a two-stage purposive sampling technique to ensure data relevance within the informal construction sector of Hetauda. Purposive sampling was deemed more practically feasible than random techniques due to the high worker mobility and the absolute absence of formal labor registries at private sites.

Operationalization and Reliability of Variables

The independent variables consist of 8 organizational items and 9 personal items. As shown in Table 2, their internal consistency is supported by Cronbach's alpha values of 0.803 and 0.700 respectively, satisfying standard social science baselines ($\alpha \geq 0.70$).

Table 2: Cronbach's Alpha Value

Factor Group	Cronbach's α	No. of Items
Organizational Factors	0.803	08
Personal Factor	0.7	09

Crucially, the dependent variable Safety Behaviour (Y) is measured as a distinct composite construct rather than a single subjective metric. It was quantified by computing a composite score from 9 distinct items adapted from Neal and Griffin (2006), equally balancing Safety Commitment, Safety communication and Safety Participation. The 9-item composite scale yielded a Cronbach's alpha (α) of 0.81, demonstrating high psychometric reliability for subsequent regression analysis.

Principal Component Analysis (PCA) Testing Criteria

Before extracting components, dataset factorability was evaluated using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. For the organizational dataset, the KMO value was 0.682. For the personal dataset, the KMO reached 0.622. While a threshold of 0.70 is optimal, a KMO above 0.60 is explicitly recognized by established literature (e.g., Reddy & Kulshrestha, 2019) as acceptable for factor mapping in exploratory social science research, especially when paired with a highly significant Bartlett's test ($p < 0.001$).

Sampling Design Limitation

While two-stage purposive sampling was practically necessary due to the fluid, informal nature of the workforce and the absence of a centralized labor registry at private construction sites in Hetauda, it is a non-probability sampling method. Consequently, this approach represents a significant limitation for the generalizability (external validity) of the findings. The results captured are highly localized to the selected medium-scale projects and may not accurately represent safety behaviors across the wider construction sector in Nepal.

Recommendation for Future Research:

To overcome this limitation and enhance generalizability, future studies should employ a probability-based stratified random sampling design. Researchers can achieve this by:

Defining Strata: Stratifying the target population based on key project characteristics such as geographical location (urban vs. rural), project scale (small, medium, or large/infrastructure projects), and contractor registration type (local vs. joint-venture/national contractors).

Random Selection: Compiling a comprehensive sampling frame of active projects through local municipal offices or the Federation of Contractors' Associations of Nepal (FCAN), and then randomly selecting both projects and workers within each stratum.

Implementing stratified random sampling would ensure that all segments of the construction workforce are proportionally and randomly represented, providing more robust, statistically generalizable insights for national safety policymaking.

Data Analysis and Statistical Procedure

Data were processed through a structured analytical hierarchy using Microsoft Excel for initial cleaning and IBM SPSS (Version 25) for advanced modeling. The analysis followed these sequential stages:

Descriptive & Reliability Analysis: Frequencies summarized demographics, while Cronbach's Alpha verified scale reliability (threshold ≥ 0.70).

Factor Analysis (PCA): Suitability was confirmed via KMO (≥ 0.70) and Bartlett's Test ($p < 0.05$). Principal Component Analysis (PCA) with Varimax rotation was then used to reduce 17 variables into uncorrelated components with eigenvalues > 1.0 .

Relative Importance Index (RII): RII was applied to rank these factors, providing a practical prioritization for on-site safety interventions.

Multiple Linear Regression (MLR): Finally, the extracted principal components were used as independent variables to model and validate their predictive influence on overall safety behavior.

Finally, multiple linear regression analysis was used to develop a predictive model examining the impact of organizational and personal factors (independent variables) on safety behaviour (dependent variable). This quantitative model provides insight into the strength and direction of relationships, enabling evidence-based recommendations for improving safety practices.

3. Result and discussion

This chapter presents the analysis, interpretation, and discussion of the collected data in line with the objectives set out in the methodology. It includes the findings from a questionnaire survey conducted to identify the factors influencing workers' safety behaviour in private building construction projects within Hetauda Sub-Metropolitan City.

Response Rate

A total of 95 completed questionnaires was received: 25 from organizational respondents (professionals such as engineers, supervisors, safety officers, and managers) and 70 from workers engaged in private building construction projects within Hetauda Sub-Metropolitan City. This represents the final dataset used for analysis in the study. Figure 3 and Figure 4 gives the respondent profile in terms of gender.

Organizational Respondents

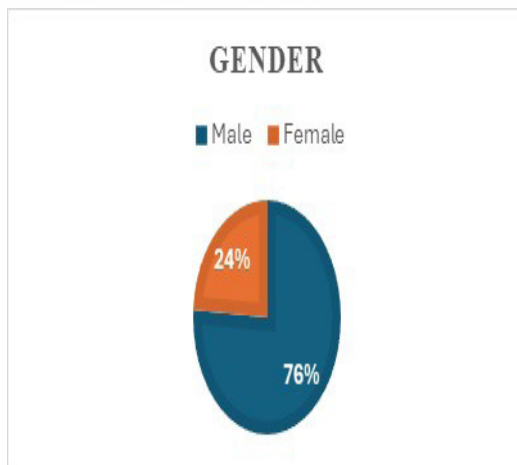


Figure 3 Gender of Organizational Respondents

Professional Respondents

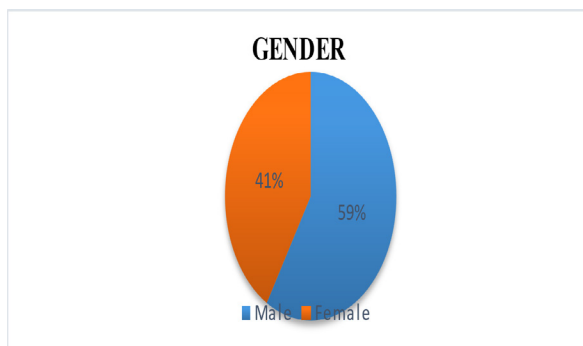


Figure 4 Gender of Workers

Reliability Statistics

Reliability tests were conducted separately for the organizational and personal factor items using SPSS. Behavioural items were excluded from reliability testing as they represent dependent variables (safety behaviour outcomes) rather than independent constructs.

The Cronbach's alpha value for the organizational factors was 0.803, while for the personal factors it was 0.700. The result is shown in Table 2. According to Nunnally (1978), a Cronbach's alpha value of 0.7 or higher indicates good internal consistency, whereas Taber (2017) notes that values above 0.6 are considered acceptable in social science research. Thus, both scales in this study demonstrate good internal consistency and are suitable for further analysis.

Principal Component Analysis:

The PCA was conducted separately for organizational and personal factors in SPSS to reduce large sets of items into key underlying components. Prior to extraction, the Kaiser-Meyer-Olkin (KMO)

test and Bartlett's Test of Sphericity were used to verify the suitability of the data for factor analysis. A varimax rotation was employed, eigenvalue > 1 was set as the extraction criterion, and factor loadings below 0.50 were suppressed.

Personal Factors

Table 3 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.622
Bartlett's Test of Sphericity	Approx. Chi-Square 247.708

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was found to be 0.622, which is greater than the minimum threshold of 0.50 (Reddy & Kulshrestha, 2019). Also, Bartlett's Test of Sphericity yielded a Chi-square value of 247.708 with significance at $p = .000$, which is less than 0.005. This result in Table 3 shows that the variables are sufficiently correlated, and thus, the dataset is appropriate for conducting principal component analysis.

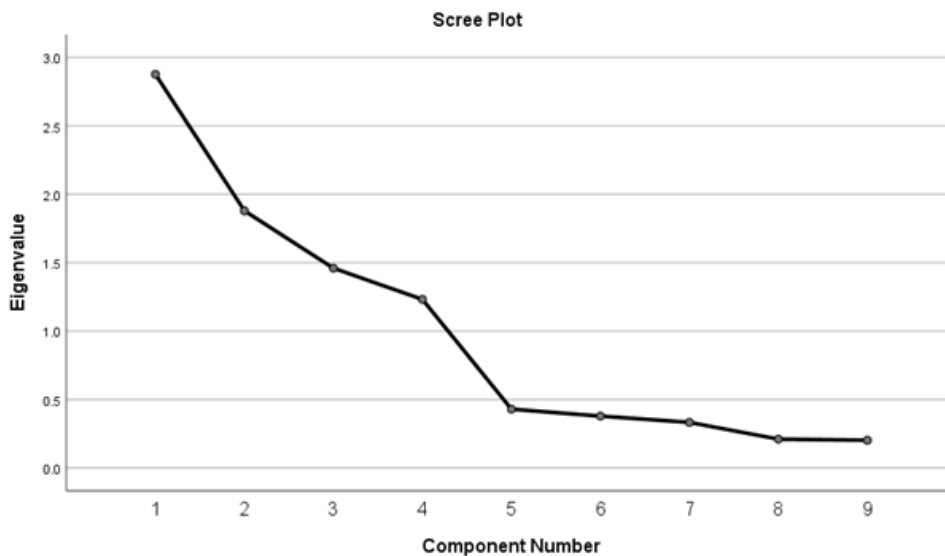


Figure 5 Scree Plot of Personal Factors

We can see from the produced scree plot in Figure 5 that there are 4 components with eigenvalues greater than 1, and we will thus classify these 4 components as factors as per Kaiser Criterion (1961). Thus, in totality, the 9 personal factor variables have been reduced to 4 components for further analysis.

Table 4 Total Variance

Components	1	2	3	4
Initial Eigenvalues				
Total	2.877	1.879	1.460	1.232
% Variance	31.961	20.877	16.218	13.686

Components	1	2	3	4
Cumulative %	31.961	52.838	69.056	82.742
Extraction Sums of Squared Loadings				
Total	2.877	1.879	1.460	1.232
% Variance	31.961	20.877	16.218	13.686
Cumulative %	31.961	52.838	69.056	82.742
Rotation Sums of Squared Loadings				
Total	2.362	1.804	1.647	1.633
% Variance	26.246	20.049	18.299	18.149
Cumulative %	26.246	46.294	64.593	82.742

The cumulative percentage shown in the Table 4 above explains the total variability of the components. It also shows the total amount of variance accounted for in the construct by factors with eigenvalues greater than 1.0. We can see that, in total, the 4 principal components accounted for 82.742 % of the overall variability which is shown in Table 5.

Table 5 Rotated Component Matrix for Personal Factors

Personal Factors	Component 1	Component 2	Component 3	Component 4
Discomfort with Safety Instruments	0.835			
Previous Exposure to Accidents	0.874			
Perception of Probable Risks	0.890			
Attitude		0.932		
Mental State		0.903		
Intoxications			0.901	
Individual Motivation			0.879	
Indolence				0.897
Hurry to Complete				0.897

Table 6 Group of Personal Factors

Safety Awareness Factors (PF1)	Worker Attitude (PF2)
Discomfort with Safety Instruments	Attitude
Previous Exposure to Accidents	Mental State
Perception of Probable Risks	
Motivation and Habits (PF3)	Carelessness (PF4)
Intoxications	Indolence
Individual Motivation	Hurry to complete

Prioritization of Personal Factors using Relative Importance Index

Prioritization of the personal factors was done using the Relative Importance Index (RII) analysis. The results are presented in the Table 7 below.

Table 7 RII Analysis of Personal Factors

Personal Factor	RII	Rank
Intoxications	0.615	1
Attitude	0.612	2
Perception of Probable Risks	0.600	3
Mental State	0.595	4
Indolence	0.594	5
Individual Motivation	0.594	6
Previous Exposure to Accidents	0.591	7
Hurry to Complete	0.582	8
Discomfort with Safety Instruments	0.577	9

Organizational Factors

Table 8 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.682
Bartlett's Test of Sphericity	Approx. Chi-Square	122.642

The KMO measure of sampling adequacy is 0.682, which ascertains the possibility of conducting factor analysis as the value is greater than 0.5 (Reddy & Kulshrestha, 2019) which is shown in Table 8. Also, the significance value in Bartlett's Test of Sphericity is 0.000, which is less than 0.05 and therefore rejects the null hypothesis that the correlation matrix is an identity matrix.

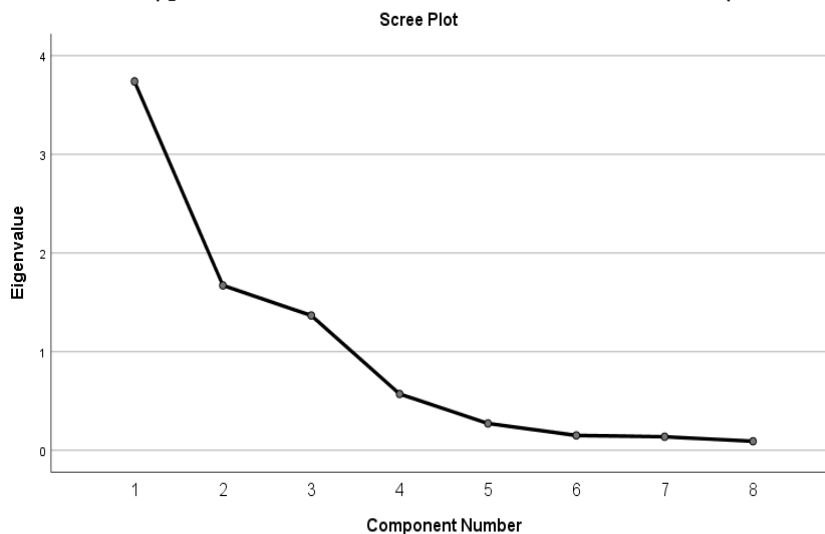


Figure 6 Scree Plot of Organizational Factors

Thus, the significant statistical test shows that the correlation matrix is not an identity matrix and the factors are correlated and suitable for conducting principal component analysis.

We can see from the produced scree plot in Figure 6 that there are 3 components with eigenvalues greater than 1, and we will thus classify these 3 components as factors as per Kaiser Criterion (1961). Thus, in totality, the 8 organizational factors have been reduced to 3 components for further analysis which is shown in Table 10.

Table 9 Total Variance

Components	1	2	3
Initial Eigenvalues			
Total	3.739	1.671	1.367
% Variance	46.736	20.890	17.084
Cumulative %	46.736	67.626	84.710
Extraction Sums of Squared Loadings			
Total	3.739	1.671	1.367
% Variance	46.736	20.890	17.084
Cumulative %	46.736	67.626	84.710
Rotation Sums of Squared Loadings			
Total	3.422	1.792	1.562
% Variance	42.781	22.399	19.530
Cumulative %	42.781	65.180	84.710

The cumulative percentage shown in the Table 9 explains the total variability of the components. It also shows the total amount of variance accounted for in the construct by factors with eigenvalues above 1.0. We can see that in totality the three principal components accounted for 84.710 % of the overall variability.

Table 10 Rotated Component Matrix for Organizational Factors

Organizational Factors	Component		
	1	2	3
Safety Guidelines and Policies	0.904		
Safety Awareness and Training	0.953		
Penalizing Workers'	0.852		
Management Commitment for Motivation	0.927		
Pressure from Management		0.927	
Safety monitoring and Inspection		0.905	
Cautionary and Warning Systems			0.845
OSH incentives			0.868

Table 11 Group of Organizational Factors

Safety Management and Implementation (OF1)	Leadership (OF2)
Management Commitment for Motivation	Pressure from Management
Safety Awareness and Training	Safety Monitoring and Inspection
Safety Guidelines and Policies	
Penalizing Workers	Safety Inspection and Incentives (OF3)
	OSH incentives
	Cautionary and Warning Systems

Prioritization of Organizational Factors using Relative Importance Index

The results are presented in the Table12,

Table 12 RII Analysis of Organizational Factors

Organizational Factor	RII	Rank
OSH Incentives	0.619	1
Safety Guidelines and Policies	0.605	2
Cautionary and Warning Systems	0.605	2
Safety Awareness and Training	0.595	3
Safety Monitoring and Inspection	0.586	4
Penalizing Workers	0.576	5
Management Commitment for Motivation	0.570	6
Pressure From Management	0.568	7

Multiple Regression Analysis

The final regression equation for personal factor is:

$$SB \text{ Overall} = -0.217 + 0.530(PF1) + 0.336(PF2) + 0.178(PF4) + 0.039(PF3) \quad \text{Eq 2}$$

Discussion of Personal Factors Regression Model

The regression model shows that Safety Awareness (PF1) ($\beta = 0.528$, $p < .001$) and Worker Attitude (PF2) ($\beta = 0.355$, $p < .001$) are the primary drivers of safety behavior. This aligns with the Theory of Planned Behavior (Ajzen, 1991), suggesting that in Hetauda, a worker's intent to act safely is governed by their knowledge and mindset. However, a critical finding is that Motivation and Habits (PF3) were not statistically significant ($p = 0.618$).

In the context of the Nepalese construction industry, this lack of significance can be explained by economic necessity. Most workers in Hetauda are daily-wage earners; their primary motivation is finishing the task to secure their day's pay rather than psychological safety motivation. As noted by Manjula and De Silva (2014), while mindset is important, the Habit of working safely is often overridden by the pressure to complete work quickly in informal labor markets. This suggests that

in Hetauda, awareness alone is not enough to change behavior if the economic pressure to work fast remains high.

The negative constant represents a statistical adjustment of the regression line and has no practical interpretation, as Likert-scale factor scores do not reach zero (Plonsky & Ghanbar, 2018). Overall, the model confirms that personal factors account for more than half of the variance in safety behaviour ($R^2 = 0.579$) within the private building projects of Hetauda.

The final regression equation for Organizational factor is:

$$SB\ Overall = -0.063 + 0.594(OF1) + 0.328(OF2) + 0.123(OF3) \quad Eq\ 3$$

Discussion of Organizational Factors Regression Model

The multiple linear regression results indicate that Safety Management and Implementation (OF1) have the strongest positive effect on worker safety behaviour ($\beta = 0.615$, $p < .001$), followed by Leadership (OF2) ($\beta = 0.357$, $p = .013$). These findings align with Ismail et al. (2012) and Choudhry (2014), who argue that management commitment and site-level leadership are the most critical drivers of safety compliance. In the Hetauda context, this suggests that safety is highly dependent on direct supervision and formal rules. Since the local industry is largely informal, workers rely on the Naike (foreman) or supervisor to set the safety standard for the site.

A key finding, however, is that Safety Inspection and Incentives (OF3) was not a significant predictor ($p = 0.385$). This is a significant departure from studies in more developed construction markets. In Hetauda's private building projects, this lack of significance is likely due to the absence of formal reward systems. Workers in these small-to-medium projects rarely receive Safety Bonuses or formal incentives for following protocols. Furthermore, Inspections are often seen as a formality rather than a behavior-changing event. Consequently, the Promotional side of safety is currently less effective in Nepal than the Command-and-Control side (OF1).

While the regression constant is negative, it serves as a mathematical adjustment for the best fit of the Likert-scale data and has no direct practical interpretation (Plonsky & Ghanbar, 2018). Overall, the organizational model is highly robust, explaining 61.6% of the variance in safety behaviour (Adjusted $R^2 = 0.616$). This indicates that organizational factors actually have a slightly higher predictive power over worker behavior than personal factors in the Hetauda construction sector.

Deconstructing the Divergence Between RII and Regression: The Case of "Intoxications"

A notable finding emerges when comparing the univariate ranking from the Relative Importance Index (RII) with the multivariate results from the Multiple Linear Regression. In Table 7, "Intoxications" was identified as the highest-ranked personal factor ($RII = 0.615$, Rank 1), indicating that respondents individually perceive substance use and on-site impairment as a critical threat to safety. However, during Principal Component Analysis (PCA), this variable loaded heavily onto the third personal factor (PF3: Motivation and Habits), which subsequently proved to be statistically insignificant within the regression model ($p = 0.618$).

This structural shift highlights a critical distinction between descriptive perceptions and multivariate predictive power:

Univariate vs. Covariant Structure: While the RII captures the isolated, aggregate agreement of workers regarding the importance of an individual item, regression analyzes how the broader latent construct (PF3) predicts the composite variance of actual safety behaviour (Y) while simultaneously

controlling for all other variables.

Lack of Behavioral Variance: Although workers universally recognize that intoxication is highly dangerous (yielding a high RII score), the baseline behavioral variance of actual on-site safety compliance is driven far more aggressively by primary dimensions like structural safety knowledge and daily operational compliance. Consequently, when evaluated alongside dominant predictors, the overall construct of habits and motivation (PF3) fails to emerge as an independent, statistically significant predictor of behavioral outcomes.

4.2 Interpretation of Organizational Predictors

The multivariate regression analysis revealed that the third organizational factor (OF3: Safety Inspection and Incentives) was statistically insignificant ($p = 0.385$) in predicting worker safety behaviour.

Rather than concluding that reward structures are entirely absent from the sector, this statistical insignificance demonstrates that perceived incentives, as currently experienced by the workforce, do not predict actual safety compliance. This empirical reality strongly indicates that the existing safety incentives and site inspection regimes deployed by medium-scale contractors in Hetauda are either fundamentally too weak to alter worker habits or are applied too inconsistently to establish a reliable behavioral framework. Consequently, without a rigorous, predictable reinforcement mechanism, on-site inspections fail to translate into sustained behavioral compliance.

4. Conclusion

The study concludes that worker safety behavior in Hetauda's private construction sector is a multi-dimensional construct more heavily dictated by organizational governance (Adjusted $R^2 = 0.616$) than by individual personal attributes (Adjusted $R^2 = 0.579$)

1. Safety management and implementation (OF1) emerged as the most significant predictor ($\beta = 0.615$), indicating that safety on-site is primarily a top-down result of formal guidelines and disciplinary measures rather than an autonomous individual choice
2. Furthermore, the predictive significance of leadership and pressure (OF2) suggests that safety behavior remains largely reactive, with workers adhering to protocols primarily when under the direct physical supervision of informal leaders like "Naikes"
3. Crucially, the statistical insignificance of personal motivation and habits (PF3) indicates that in Nepal's informal labor market, economic necessity and job security effectively override internal safety inclinations
4. Ultimately, these findings imply that improving occupational safety in Hetauda requires a fundamental shift from passive awareness campaigns to a structured organizational environment that leverages strict enforcement, formal policies, and the empowerment of site-level leadership
5. Thus this study also evaluated the personal and organizational determinants of worker safety behaviour within the rapidly urbanizing construction sector of Hetauda Sub-Metropolitan City, Nepal. Utilizing survey data from 95 construction professionals processed through Principal Component Analysis (PCA) and Multiple Linear Regression, the empirical findings supported both core hypotheses. Personal factors specifically safety knowledge and motivation exert a significant positive influence on safety compliance. Concurrently, organizational factors primarily management commitment and a supportive supervisory safety climate serve as critical institutional drivers of

behavioral compliance on site.

Notably, the statistical insignificance of the safety inspection and incentives factor ($p = 0.385$) indicates that current on-site enforcement and reward structures fail to predict actual behavioral outcomes. Furthermore, the divergence between the high univariate ranking of individual risks (such as intoxication) and their insignificance in multivariate modeling underscores that aggregate risk awareness alone does not independently translate into sustained behavioral compliance when evaluated alongside dominant safety management variables.

Actionable Recommendations for Hetauda Contractors

To bridge the gap between regulatory intent and on-site behavioral compliance, local contractors operating medium-scale private building projects in Hetauda should immediately execute the following targeted interventions:

Implement Mandatory Weekly Toolbox Talks: Contractors must institute a formalized, mandatory 15-minute safety briefing at the start of every work week. These “toolbox talks” should explicitly focus on the high-risk operational hazards specific to G+2 to G+4 structures, such as edge protection when working at heights, scaffolding stability, and correct manual material handling techniques.

Standardize Structured, Predictable Reinforcement Mechanisms: Because existing incentives are currently too weak or applied too inconsistently to predict behavior, site management must implement standard, visible reinforcement frameworks. This includes establishing a transparent peer-nomination system (e.g., “Monthly Site Safety Champion”) tied to immediate, practical rewards, alongside a strict, consistently applied three-strike warning protocol for PPE non-compliance.

Establish Joint Site Safety and Health Committees: In alignment with the spirit of the Labor Act (2017), contractors across localized projects should form active site safety committees composed of both management representatives and frontline laborers. These committees must conduct weekly collaborative site walkthroughs to identify hazards, directly enhancing the supervisory safety climate and fostering a shared sense of safety accountability among the informal workforce.

Conflict of Interest

The authors declare no conflict of interest.

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