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# Is there any relationship between safety, health and productivity of labourers in the construction industry?

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**Abstract:** *Construction industry is the most hazardous as it is labour intensive in nature. Labourers suffer a lot due to hard labour and erogenous tasks. Hence health, safety and productivity is affected. This study tries to examine the relationship between health, safety and productivity. The respondents included contractors and labourers in various construction sites such as residential projects, irrigation infrastructures, industrial shed, and commercial buildings. A methodological triangulation such as questionnaires, semi-structured interviews and field visit were done. Using SPSS, multiple regression was used for the study. The major finding proved that health does not influence labour productivity and safety does influence labour productivity. The study concludes with major recommendations to be followed by the management.*

**Keywords:** *1.Construction, 2.safety, 3.health, 4.productivity, 5.management.l*

## 1. INTRODUCTION

The Indian construction industry is a significant contributor to the economy; it forms around 9 percent of GDP (Ministry of Finance, 2019). Construction is a labour-intensive industry as labourers operate equipment, fabricate and install materials. They are the central productive workforce, and without humans, there would be no built environment. Construction work is at high risk because of outdoor operations, work-at heights, complicated on-site plants and equipment operation, and it is one of the most injury and accident-prone industries. Hence, labourers are exposed to construction site dangers, safety and health hazards.

The primary health hazards in construction are heat, radiation, noise, dust, shocks and vibrations. Though these health hazards cannot produce immediate symptoms, they can result in fatigue, signs of distress, depression posttraumatic stress disorder, Musco-skeletal disorders, back pain and work-related upper extremity disorders (Aryal, Ghahramani, & Becerik-Gerber, 2017; Boschman, van der Molen, Sluiter, & Frings-Dresen, 2013; Eaves, Gyi, & Gibb, 2016). Elmoujaddidi and Bachir, 2020).

Safety hazards are those that pose imminent dangers such as injury leading death of workers. Literature shows that injury is widespread in the Indian construction industry, and the possibility of a fatality in the construction sector is five times more than the manufacturing sector (Bharara et al. 2012; Singh et al. 2018).

All these problems lead to a low status on the labour market, increases the risk of unemployment, job loss, and low productivity. Productivity is one of the most critical factors affecting the overall performance of any construction site, large or small. There is a link between labour productivity, safety and health. Hence, improving worker's productivity, health and safety are significant concerns of the construction industry.

### **Objectives of the study**

The objectives of the study are

- To examine a relationship exists between health, safety and productivity.
- To suggest and to adopt safety management system practices and health promotion programmes by management

### **2. LIMITATIONS OF THE STUDY**

- The proposed research does not take into account the factors affecting construction workers such as unpredictable levels of skills, casually employed, job insecurity, long hours of work and minimum wages that tantamount productivity.
- The proposed study does not cover women because the industry is male-centric by nature.

### **Conceptual Framework**

Hawthorne Effect states that there is an influence of physical conditions on employee productivity. Nutritional theory of efficiency wage emphasis that workers need to eat healthy food to avoid illness and to work harder and productively. Person–environment fit states that there is an association between individual's biological or psychological needs such as values, goals, abilities, personality and environmental characteristics such as intrinsic and extrinsic rewards, demands of a job or role, cultural values, or attributes of other individuals and collectives in the person's social environment (Dewe, O'Driscoll, & Cooper, 2012). According to A.H Maslow, safety and security are the basic human needs. He states in hierarchy theory that freedom from a dangerous work environment, economic security, food, air, water and sleep are essential for a human being. Frederick Herzberg states in Two-factor theory (as cited in Aswathappa, 2011) that satisfaction and dissatisfaction are two factors that influence human behaviour. According to him, resentment happens due to unhygienic and poor working conditions. Clayton Alderfer in E-R-G model argues that employees are interested in satisfying existence needs (physiological and security factors), relatedness needs (being understood and accepted by people) and growth needs (self-esteem and self-actualisation)

### 3. METHODOLOGY

The approval was granted based on ethical issues considered during the planning of the study, and this included protection of participants from harm, seeking informed consent, privacy and confidentiality of data collected. Methodological triangulation was used such as questionnaires, semi-structured interviews and field visit.

Questionnaires were developed with the help of literature review (Choudhry & Fang, 2008; Li, Ji, Yuan, & Han, 2017; Tam, Zeng, & Deng, 2004; Sawacha, Naoum, & Fong, 1999). Two standard questionnaires were developed and conducted at the 5-item Likert scale (Sawacha, Naoum, & Fong, 1999; Akintoye, McIntosh & Fitzgerald, 2000; Tam, Zeng, & Deng, 2004).

The targeted respondents were classified into two groups: contractors and workers. One questionnaire was the contractor's opinion about health, safety and productivity of labourers. A purposive sampling strategy was used as it helps to satisfy the specific needs of a project and recruit the population of interest (Robson, 2011 as in Eaves, Gyi, & Gibb, 2016). Using snowball sampling techniques, 112 construction workers were interviewed and the samples were grouped to residential, industrial, institutional and engineering. Labourers were given an information sheet before the interview explaining the purpose of the study and their right to withdraw and were asked to sign an informed consent sheet.

Semi-structured interviews were conducted to labourers with the help of questionnaires. Direct interaction with 2 project managers and 6 contractors helped to calculate labour productivity and the problems about safety and health. Labour productivity was calculated using the formula as Labour productivity = Output/ working hours where output is the area of formwork installed (m<sup>2</sup>/ man-hour). In order to overcome the difficulty of calculation of output and working hours daily, computation is taken monthly (Lim, 1996).

Data analyses were undertaken using the statistical package for social sciences (SPSS). In each data set, the appropriate equations were used to construct dependent and independent variable sets and their relationships. A multiple linear regression analysis was carried out to predict the values of a dependent variable, Y, given a set of p explanatory variables (x<sub>1</sub>, x<sub>2</sub>, ..., x<sub>p</sub>). The variable "labour productivity" is considered as the dependent variable, and safety and health are considered as independent variables.

$$Y = b_0 + b_1x_1 + b_2x_2$$

where

Y = labour productivity, b<sub>0</sub> = constant, x<sub>1</sub> = safety, x<sub>2</sub> = health

#### Hypothesis 1

H<sub>0</sub>: There is no significant relationship between safety, health and labour productivity

H1: There is a significant relationship between safety, health, and labour productivity

#### 4. MAJOR FINDINGS/ RESULTS

The output shows that this model is statically significant only for residential projects

Table 1. Types of construction sites

Types of Construction Site	tT	R	R Square	Adjusted Square	R	Std. Error of the Estimate
Industrial Shed	1	.378 <sup>a</sup>	.143	.074		1.09506
Commercial buildings	1	.137 <sup>a</sup>	.019	-.060		.24073
Irrigation Infrastructure	1	.270 <sup>a</sup>	.073	-.001		.53650
Residential projects	1	.733 <sup>a</sup>	.537	.500		.28665

Source: Primary data

Labour productivity = 1.520+ 0.813 (safety) – 0.230 (health). It implies that there is 53% (R2= .537) understanding that productivity has a relationship with safety and health in residential buildings from two different sites. The coefficient b1= 0.813 shows that safety and labour productivity are directly related, implying that as safety measures are increasingly adopted, more productivity and when safety measures decrease, productivity is also less. The coefficient b2= - 0.230 indicates that there is a negative link between labour productivity and health.

Table 2. Regression table

Types of Construction Sites	Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
			B	Std. Error	Beta		
Industrial shed	1	(Constant)	7.560	2.812		2.689	.013
		Safety hazards	.374	.766	.100	.489	.629
		Health hazards	1.003	.629	.325	1.593	.124
Commercial buildings	1	(Constant)	6.606	.619		10.680	.000
		Safety hazards	-.016	.154	-.020	-.102	.920
		Health hazards	.041	.062	.133	.663	.513
Irrigation Infrastructure	1	(Constant)	4.555	1.665		2.735	.011
		Safety hazards	.486	.399	.235	1.216	.235

		Health hazards	-.211	.261	-.156	-.808	.426
		(Constant)	1.520	.734		2.070	.049
Residential projects	1	Safety hazards	.813	.186	.596	4.377	.000
		Health hazards	-.230	.075	-.419	-3.081	.005

a. There are no valid cases in one or more split files. Statistics cannot be computed.

b. Dependent Variable: Labour Productivity

Source: Primary data

One of the key factors that impact workers' health is supervisory practices and safety leadership. The study shows that supervisors or contractors in the residential site provide adequate support in footing health hazards and giving a good deal of attention to improve the health of the labourers

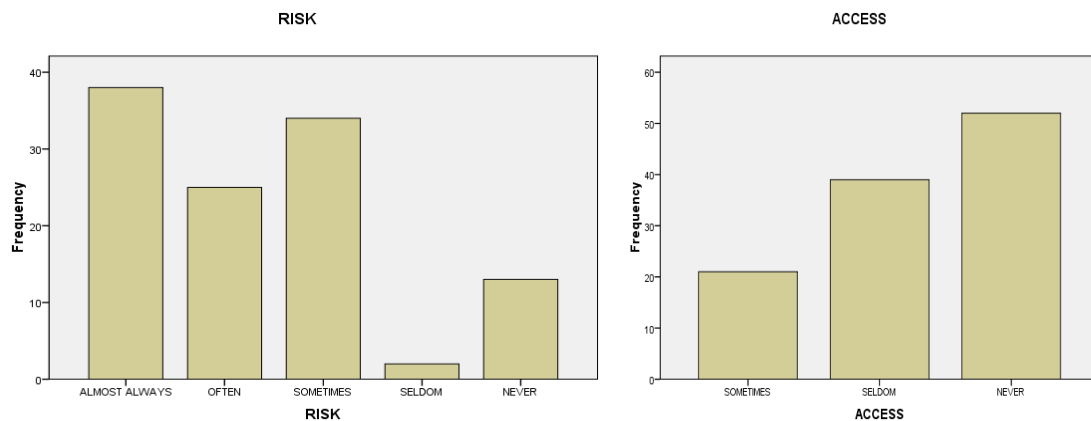
Table 3: Inspection by Contractors

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly agree	2	100.0	100.0	100.0

Figure I show the general opinion of labourers working in different construction sites about personal safety. A majority feel high risks in the outside environment, and personal safety and very few have no fear about their safety. Figure II shows access to drinking water. 41% of the total respondents have voiced their concerns that they had no access to safe drinking water at the workplace.

Figure I- Opinion about personal safety

Figure II- Access to safe drinking water



**Source: Primary data**

## 5. RECOMMENDATIONS

The study recommends contractors and management to ensure safety management system practices, health promotion programmes by management to improve health, safety and workers' productivity

Workplace health promotion comprises of the following such as the processes of protecting workers from illness by medical diagnosis and health screening. On-site, workers, are suggested very basic such as better toilet facilities and hot running water and taking regular rest breaks is essential to vent the points of exhaustion. Few suggestions include using rucksack and knee pads, more machinery to alleviate heavy lifting, retirement and pension advice, better supervision of younger workers and more apprenticeships. Workers need to take vitamins and supplements to improve health would be beneficial for developing and maintaining healthy lifestyles.

Programmes can be conducted by management to prevent fatalities by identifying and investigating work situations and then formulate prevention strategies such as scaffolding must be inspected by authorities regularly. Proper personal equipment such as safety shoes, gloves, hard hats, safety glasses and noise mufflers. Keeping work areas clean and free of debris will lessen the chances of construction worker injuries and help prevent worksite accidents such as slips, trips, and falls. Providing ambulance services is also necessary to give first aid.

Short term framework for improving productivity is the adaptation of new procurement methods and the new organisational structures such as the proper channel of communication. Another measure is to train existing workers and to continuously upgrade the management and technical skills of contractors and supervisors. Long term measure is to use mechanisation to replace human labour and to conduct research wherever possible.

## 6. CONCLUSION

Human resources alone have tremendous growth value. If the output is greater than the sum of inputs, then the enterprise is productive. Increased efforts should be directed at improving labour productivity and by providing practical tools and resources. The factors such as health and personal safety are essential to a worker and when effectively combined in a symbiotic manner increases overall productivity. Once health protection and promotion programs are intertwined and deployed strategically, a healthier workforce becomes a safer workforce and vice versa. Hence this proposed study provides a pathway for policyholders to implement a new theoretical framework and a policy measure. Although the small sample does not allow generalisation to a broader population, the findings are useful as a foundation upon which to develop further investigations

"Don't blame the people, fix the system."

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