

Analysis of Labour Productivity in Building Construction in the Central Gujarat

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Abstract-Improving the production efficiency is the most challenging issue in both developed and developing countries. Building construction projects are affected by so many problems such as cost, time, quality, safety etc. Today's competitive environment of building construction forces construction companies to increase their labour productivity values in order to keep their position in the industry. Therefore, identification and analysis of factors that affect labour productivity in building construction become a crucial issue. Total 46 factors were identified under 10 main groups. Residential and commercial type construction projects are considered for questionnaire survey. Total 126 questionnaires were distributed and out of these 95(75.39%) are successfully responded, and it is believed to be adequate for this study.

Keywords: Labour productivity, Building construction, Relative Importance Index (RII), Frequency Index (FI), Severity Index (SI)

I. INTRODUCTION

Construction industry faces lots of problems associated with productivity. Productivity is one of the most significant factors affecting the overall performance of any organization, whether large or small and the problems are usually associated with performance of labour. The performance of labour is affected by many factors.

Identification and evaluation of factors affecting labour construction productivity have become a critical issue facing project managers for a long time in order to increase productivity in construction industry. Understanding factors affecting productivity of both positive and negative can be used to prepare a strategy to reduce inefficiencies and to improve the effectiveness of project performance. Knowledge and understanding of the various factors affecting construction labour productivity is needed to decide the focus of the necessary steps in an effort to reduce project cost overrun and project completion delay, thereby increasing productivity and overall project performance.

II. RESEARCH OBJECTIVE

This research mainly aims to investigate important factors affecting labour productivity in building construction projects. Understanding these factors is helpful for the construction professionals in order to efficiently deliver the project as per the plan. This study can also be used by other researchers as an input for further studies related to labour productivity on construction projects. Following are the main objectives of the research work.

1. To study various factors affecting labour productivity in building construction.
2. To analyze and calculate the relative important of factors affecting labour productivity.
3. To make recommendations to improve labour productivity in building construction

III. RESEARCH METHODOLOGY

The research instrument used in this research is questionnaire which was designed in such a way that it ensures to address the objectives of the study categorized by different parts. The first part of the questionnaire is targeted to gather information about the respondents and firms profile. The second part contains the various aspects of labour productivity affecting factors to be rated by the respondents. The factors which were identified from previous research will be used as a basis for preparing a questionnaire to investigate its influence on the labour productivity of construction industry. Total 46 factors were identified under 10 main groups. A 5-point Likert scale was used for measuring of the level of effect of factors and 4-point Likert scale was used for measuring of the frequency of occurrence of factors. These questionnaires were distributed to Project Managers, Contractors and Engineers of a construction firm in Ahmadabad and Vadodara city.

The data collected from the questionnaire survey was analyzed using Microsoft Excel. The perspective of the respondent for factors affecting labour productivity has been analyzed to rank the factors based on their Relative important index, Frequency index and Severity index. Higher the value of index, more important is the factor affecting labour productivity in building construction.

IV. DATA COLLECTION

Project Managers, Contractors and Engineers of Ahmadabad and Vadodara city were targeted for the survey. Normally response rate is very low so the questionnaire was distributed to the various stakeholders more than the sample size requirement. A total of 126 questionnaires were distributed to different stakeholders in Ahmadabad and Vadodara. This study received 95 responses. Response rate for this survey is 75.39%.

V. DATA ANALYSIS

A. Relative Important Index (RII)

The primary data collected from the questionnaire survey were analyzed using Relative Importance Index method for ranking each factor from the perspective of project managers, contractors and engineers. A Five-point Likert scale was used for rating of the level of effect of factors, where 5 means critical effect and 1 means no effect. This was transformed to important indices for each factors as follows:

$$RII = \frac{\sum W}{A \times N} \quad \dots \text{(Equation 1)}$$

Where, W is the weighting given to each factor by the respondents (ranging from 1 to 5), A is the highest weight (i.e., 5 in this case), and N is the total number of respondents. Higher the value of RII, more important was the factor affecting labour productivity.

Table 1: Top most factor affecting labour productivity by RII method

ID	Factors	RII	Rank
C1	Shortage of material	0.905	1
I1	Poor resources management	0.901	2
A1	Frequent changes in the Design	0.886	3
B2	Delays in decisions making	0.884	4
D1	Lack of equipment and tools	0.880	5
H3	Lack of communication between stake holders	0.874	6
E8	Lack of training	0.867	7
E2	Incompetence of labors	0.836	8
J1	Effect of bad weather	0.825	9
F1	Accidents during construction	0.817	10

B. Frequency Index (FI)

The frequency index is computed for each factor to identify how frequently that factor occurs in construction project. The factors are ranked based on frequency index values. From the ranking assigned to each factor, it is possible to identify the most frequently occur factors, which affecting labour productivity. A Four-point Likert scale was used for rating frequency of occurrence of factors, where 4 means very often and 1 means none. This was transformed to frequency indices for each factor as follows:

$$FI = \frac{\sum W}{A \times N} \quad \dots \text{(Equation 2)}$$

Where, W is the weighting given to each factor by the respondents (ranging from 1 to 4), A is the highest weight (i.e., 4 in this case), and N is the total number of respondents. Higher the value of FI, more frequently it occurs in project.

Table 2: Top most factor affecting labour productivity by FI method

ID	Factors	FI	Rank
I2	Too much work load	0.632	1
A1	Frequent changes in the Design	0.600	2
H3	Lack of communication between stake holders	0.595	3
E8	Lack of training	0.589	4
B7	Inspection and Instruction delay	0.587	5
I1	Poor resources management	0.584	6
J1	Effect of bad weather	0.576	7
D1	Lack of equipment and tools	0.563	8
I4	Mistakes during construction (Rework)	0.555	9
B2	Delays in decisions making	0.553	10

C. Severity Index (SI)

The severity index is computed for each factor to identify the most sever factors affecting labour productivity in building construction.. The factors are ranked based on severity index values. In order to rank the overall impact of labour productivity affecting factors on construction projects, the Severity Index (SI) which is the multiplication of the importance and frequency indices was used for each factor.

$$\text{Severity Index} = \text{Importance Index} \times \text{Frequency Index} \quad \dots \text{(Equation 3)}$$

Table 3: Top most factor affecting labour productivity by SI method

ID	Factors	SI	Rank
A1	Frequent changes in the Design	0.532	1
I1	Poor resources management	0.526	2
H3	Lack of communication between stake holders	0.520	3
I2	Too much work load	0.515	4
E8	Lack of training	0.511	5
D1	Lack of equipment and tools	0.496	6
B2	Delays in decisions making	0.489	7
C1	Shortage of material	0.488	8
J1	Effect of bad weather	0.476	9
B7	Inspection and Instruction delay	0.465	10

VI. CONCLUSION

The aim of study is to identified and analyzes factors affecting labour productivity in building construction in central Gujarat. Forty-six factors were considered for the study, which were categorized in ten main groups as Design and Specification, Supervision, Material, Equipment and Technology, Labour, Safety, Project, Stake Holders, Contractor and Management and External Factors.

The top ten factors influencing labour productivity rated by their level of effect and frequency of occurrence are Frequent changes in the design, Poor resources management, Lack of communication between stake holders, Too much work load, Lack of training, Lack of equipment and tools, Delays in decisions making, Shortage of material, Effect of bad weather (rain, wind, high/low temperature etc.) and Inspection and instruction delay.

VII. FUTURE SCOPE

In this study, residential and commercial types of projects are considered for research purpose. So work can be extended for other different types of construction projects like industrial project, infrastructural project etc.

Here only factor affecting labour productivity in building construction are identified and analyzed. In case researchers can also measure productivity on construction site by taking case study and then analyze it for different types of project.

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