

A Preliminary Investigation on Factors Affecting Labours in Construction Projects

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Abstract

The construction industry plays a major role in any developing country. One of the main factors that influence the construction industry growth is productivity which is mainly associated with labor performance. The biggest problem in most of the construction industry is improving the performance and productivity of labors. This paper mainly deals with the study on labors in construction projects, identifying the major factors affecting labors and methods used to overcome the same. Several research papers have been collected and reviewed. Factors affecting labors in construction industry are collected from the review. The identified factors are divided into two categories such as external factors and internal factors. External factors include two sub factors and internal factors include seven sub factors. For that factors questionnaire has been framed which consists of the demographic profile of the respondent and responses for the questions framed based on factors identified. This questionnaire survey is conducted among various labors in construction projects. The collected data are analyzed using statistical package for the social science (SPSS) software and relative importance index method and the appropriate solutions are given for all impacts.

Keywords: *Construction, labors, factors, data collection and relative importance index.*

1. Introduction

Labor in construction industry can be characterized as all workforces involve in the process that had to carry out to accomplish and to achieve goal. Productivity in construction is often broadly defined as output per labor hour [2]. Since labor constitutes a major part of the construction cost and the quantity of labor hours in performing a task in construction is more susceptible to the impact of management than are materials or capital, this productivity measure is often referred to as labor productivity. The labor productivity insufficiency will affect the performance

of the overall project. Productivity has a great significance in construction [3]. Labor productivity constitutes a significant part of production input for construction project. In the construction industry, many external and internal factors are never constant and are difficult to forecast [5]. This factor leads to a continuous variation in labor productivity. It is necessary to make sure that the reduction in productivity does not alter the plan and schedule of the work and does not cause delays. The consequences of these delays could result in serious money losses [10]. Further, considerable cost can be saved if productivity is improved because the same work can be done with less manpower, thus reducing overall labor cost. Identification and evaluation of critical factors affecting labor construction productivity have become a critical issue facing project managers for a long time during increase productivity in construction industry [15]. Understanding critical factors affecting productivity of both favorable and unfavorable can be used to develop a strategy to reduce inefficiencies and to improve the effectiveness of project performance. Construction projects suffer various problems and complex factors such as cost, duration, quality and safety. Construction sector is disparate as it contains contractors, consultants, designers, owners, and others. The scope of this paper is to identify factors affecting labor productivity at a building construction project.

2. Objective

This study is conducted to achieve the following objectives.

- To identify the critical factors affecting labors in construction projects.
- To assess the impact of influenced factors on the construction projects.

3. Methodology

Various literatures related to the projects are reviewed. Based on the review, the factors affecting labors are identified which helps to frame a questionnaire. Questionnaire survey is conducted among labors of various companies. These survey responses are analyzed using SPSS software which gives frequency distribution of various respondents. To this frequency distribution relative importance index method is used and the ranking is provided. This analysis gives the most significant factors affecting labors in construction.

3.1 Identification of Factors

From several reviews of literature, the factors affecting labors in construction are identified [13].

1. Physical factors

The physical factors that affect labors in construction are

- Access to site
- Site congestion factor

2. Economic factors

The factors come under economic factor are

- On time payment
- Sufficient amount of payment
- Bonus and incentives

3. Motivational factors

It includes following sub factors such as

- High wages
- Motivational plan and activities
- Providing performance rewards

4. Psychological factors

Psychological factor includes

- Job satisfaction
- Work as per the workers' capacity
- Job security
- Participation in part of decision making by management

5. Organizational factors

The organization factors that affect labors in construction are

- Good supervision
- Providing proper training and education
- Proper communication
- Maintaining the flow of information
- Providing canteen, medical, accommodation and transport facility

6. Technological factors

Technological factor includes the following factors such as

- Innovative/complexity in design
- Construction error
- Quality of materials
- Type of equipments
- Accidents due to malfunctioning of equipments
- Guidance to operate special equipment

7. Safety factors

The factors come under safety factor are

- Safety precautions
- Allocation of special person for regular inspection
- Conducting safety programs

8. Environmental factors

Environmental factor includes the following factors such as

- Climatic condition,
- Noise level and HVAC systems

9. Cultural factors

The cultural factors that affect labor are

- Fair treatment among labors
- Cultural characteristics

3.2 Questionnaire Preparation

A questionnaire is designed based on the fact that they had to be simple, clear and understandable for the respondents and at the same time they should be able to be interpreted well by the researcher. The questionnaire is designed in five point ratings which denote the following, 1. Very often, 2. Often, 3. Sometimes, 4. Seldom, 5. Never

3.3 Questionnaire Survey

In this study, the respondents are selected for the distribution of the questionnaire form. Labors are selected as the targeted respondents. The prepared Questionnaire on human resource management among labors in Construction industry is distributed to 56 labors and their response has been extracted.

4. Data Analysis

The collected data is analyzed using relative important index method and SPSS. SPSS software (Social Package for Statistical Service) is used to find out the reliability of the data's collected and frequency distribution of respondents. Using relative important index method, the relative important index value of various factors affecting labors are

calculated [16]. Based on the value the most important factors affecting the labor are identified.

4.1 Reliability Analysis

Prior to data analysis, the reliability of data was assessed using Cronbach’s Coefficient Alpha Method, which is commonly used as an estimate of the reliability of data. This was conducted for each factor to assess the reliability of the questionnaire. Unreliable factors were discarded; Reliability scores obtained from labor responses indicate adequate internal consistency [16]. The Cronbach’s alpha obtained for respondents’ data is given in Table 1.

Table 1: Reliability Statistics

<i>Cronbach's Alpha</i>	<i>No of Items</i>
0.648	30

Cronbach’s alpha value is 0.648. The value must be in the range of 0.6 to 1.0 if the data has to be reliable. Hence the data’s values are reliable.

4.2 Frequency distribution of respondents

Table 2 shows the frequency distribution of respondents.

Table 2: Reliability Statistics

S. No	Factors Affecting Labors	1	2	3	4	5
1	Access to the site become easy	1 9	2 2	1 2	3	0
2	Site congestion factor affect the labors	8	2 3	1 9	5	1
3	On time payment is provided	1 8	2 6	1 0	8	0
4	Payment provided is enough for their work	1 4	3 8	4	0	0
5	Providing bonus to the workers	2	1 3	1 5	1 8	8
6	Motivational plan and activities	6	1 2	1 5	1 6	7
7	Motivating the labors by providing higher wages	3	1 9	1 4	1 2	8
8	Management giving any performance rewards	3	1 6	1 3	1 0	1 4
9	Labors work with job satisfaction	6	1 8	1 5	9	8

10	Work allocated as per the capacity of labors	1 1	2 4	1 6	5	0
11	Job security is provided	1 3	2 9	1 0	3	1
12	Firm allows workers as a part of decision making	1 1	2 6	1 5	1	3
13	Good supervision is provided in work places	1 6	2 7	8	3	2
14	Proper training and education are provided by the firm	2 3	1 8	9	4	2
15	Proper communication between labor and top management	1 5	2 5	1 2	3	1
16	Flow of information is maintained	1 4	3 1	8	2	1
17	Medical care, Canteen/food, accommodation and transport facilities are available	1 3	2 5	1 4	4	0
18	Innovative/complexity in design makes comfort to workers	8	2 1	2 1	5	1
19	construction error commonly done by the labor	5	2 3	2 5	3	0
20	Good quality materials are provided by the firm	1 6	1 7	1 8	3	2
21	mishandling of equipment due to lack of training	1 8	2 3	1 0	3	2
22	Accident due to malfunctioning of equipments	5	2 3	2 1	4	3
23	proper guidance is provided to operate special equipments	6	2 1	2 2	5	2
24	Safety precautions provided when working	1 1	3 5	9	0	1
25	special person allotted for regular inspection	1 2	2 9	1 2	2	1
26	safety awareness programs are	4	1 8	2 2	7	5

	conducted by the firm					
27	Climatic Condition Will not Affect Your Working Performance	5	1 4	2 1	9	7
28	Proper noise control, lighting and HVAC system are provided	8	1 4	2 0	1 1	3
29	fair treatment for all irrespective of background	9	2 2	1 6	5	4
30	Cultural difference is making workers to work comfortably	1 4	1 8	1 9	2	3

5.3 Relative Importance Index

The collected data are analyzed to find the most significant factor affecting labors in construction. To rank the collected data Relative Importance Index method is used. It is a method which is an alternative to multiple regression method. RII method is applied to analyze the Likert (Ordinal) importance scale. The ranking is provided using the following formula

$$RII = \frac{\sum W}{AXN}$$

W- Weight of scale

A- Highest weight (5 in this study)

N- Total number of respondents (56 in this case)

6. Results and Discussions

Based on the relative importance indices, rank within the corresponding groups and overall ranks of the factors investigated are presented and discussed.

6.1 Physical Factor

The relative importance indices and ranks of two sub factors under physical factor are shown in Table 3.

Table 3: RII Ranking of Physical Factors

S. No	Factor	Physical Factors	RII	Rank
1	Factor 1	Access to site	0.40	2
2	Factor 2	Site congestion factor	0.49	1

Table 3 shows that the surveyed participants ranked 'site congestion factor, as the most important factor affecting the labor productivity and performance in this group, with RII of 0.49.

6.2 Economic Factor

The relative importance indices and ranks of two sub factors under economic factor are shown in Table 4.

Table 4: RII Ranking of Economic Factors

S. No	Factor	Economic Factors	RII	Rank
1	Factor 3	On time payment	0.39	2
2	Factor 4	Enough payment	0.36	3
3	Factor 5	Providing Bonus	0.66	1

Table 4 shows that the surveyed participants ranked 'providing bonus to workers' as the most important factor affecting the labor productivity and performance in this group, with RII of 0.66.

6.3 Motivational Factor

The relative importance indices and ranks of two sub factors under motivational factors are shown in Table 5.

Table 5: RII Ranking Of Motivational Factors

S. No	Factor	Motivational Factors	RII	Rank
1	Factor 6	Motivational plan	0.63	2
2	Factor 7	Higher wages	0.61	3
3	Factor 8	Rewards	0.65	1

Table 5 shows that the surveyed participants ranked 'providing rewards' as the most important factor affecting the labor productivity and performance in this group, with RII of 0.65.

6.4 Psychological Factor

The relative importance indices and ranks of two sub factors under psychological factor are shown in Table 6.

Table 6: RII Ranking of Psychological Factors

S. No	Factor	Psychological Factors	RII	Rank
1	Factor 9	Job satisfaction	0.58	1
2	Factor 10	work as per capacity	0.45	3
3	Factor 11	Job security	0.42	4

4	Factor 12	Decision making	0.46	2
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Table 6 shows that the surveyed participants ranked ‘job satisfaction’ as the most important factor affecting the labor productivity and performance in this group, with RII of 0.58.

6.5 Organizational Factor

The relative importance indices and ranks of two sub factors under organizational factor are shown in Table 7.

Table 7: RII Ranking of Organizational Factors

S. No	Factor	Organizational Factors	RII	Rank
1	Factor 13	Good supervision	0.41	3
2	Factor 14	Proper training	0.40	4
3	Factor 15	Communication	0.42	2
4	Factor 16	Information flow	0.40	4
5	Factor 17	Facilities	0.43	1

Table 7 shows that the surveyed participants ranked ‘facilities provided’ as the most important factor affecting the labor productivity and performance in this group, with RII of 0.43.

6.6 Technological Factor

The relative importance indices and ranks of two sub factors under the technological factor are shown in Table 8.

Table 8: RII Ranking of Technological Factors

S. No	Factor	Technological Factors	RII	Rank
1	Factor 18	Innovative design	0.50	3
2	Factor 19	construction errors	0.49	4
3	Factor 20	Good quality material	0.45	5
4	Factor 21	Mishandling of equipment	0.41	6
5	Factor 22	Accidents due to equipment failure	0.52	1
6	Factor 23	Proper guidance	0.51	2

Table 8 shows that the surveyed participants ranked ‘accidents due to equipment failure’ as the most important factor affecting the labor productivity and performance in this group, with RII of 0.52.

6.7 Safety Factor

The relative importance indices and ranks of two sub factors under safety factor are shown in Table 9.

Table 9: RII Ranking of Safety Factors

S. No	Factor	Safety Factors	RII	Rank
1	Factor 24	safety precautions	0.40	3
2	Factor 25	Inspection	0.43	2
3	Factor 26	Safety awareness	0.51	1

Table 9 shows that the surveyed participants ranked ‘safety awareness’ as the most important factor affecting the labor productivity and performance in this group, with RII of 0.51.

6.8 Environmental Factor

The relative importance indices and ranks of two sub factors under environmental factor are shown in Table 10.

Table 10: RII Ranking of Environmental Factors

S. No	Factor	Environmental Factors	RII	Rank
1	Factor 27	Climatic condition	0.53	2
2	Factor 28	Noise control and HVAC system	0.55	1

Table 10 shows that the surveyed participants ranked ‘providing noise control and HVAC systems’ as the most important factor affecting the labor productivity and performance in this group, with RII of 0.55.

6.9 Cultural Factor

The relative importance indices and ranks of two sub factors under cultural factor are shown in Table 11.

Table 11: RII Ranking of Cultural Factors

S. No	Factor	Cultural Factors	RII	Rank
1	Factor 29	Fair treatment	0.46	2
2	Factor 30	Cultural difference	0.50	1

Table 11 shows that the surveyed participants ranked ‘cultural difference’ as the most important factor affecting the labor productivity and performance in this group.

6.10 The Overall Ranking

The overall perceived effects of the factors surveyed are summarized in Table 12. The top ten factors affecting the labors in construction projects which

Table 12: RII Ranking of Factors Affecting Labors

S.No	Factors	Factors Affecting Labors	RII	Rank
1	Factor 1	Access to the site become easy	0.40	25
2	Factor 2	Site congestion factor affect the labors	0.49	13
3	Factor 3	On time payment is provided	0.39	29
4	Factor 4	Payment provided is enough for their work	0.36	30
5	Factor 5	Providing bonus to the workers	0.66	1
6	Factor 6	Motivational plan and activities	0.63	3
7	Factor 7	Motivating the labors by providing higher wages	0.61	4
8	Factor 8	Management giving any performance rewards	0.65	2
9	Factor 9	Labors work with job satisfaction	0.58	5
10	Factor 10	Work allocated as per the capacity of labors	0.45	16
11	Factor 11	Job security is provided	0.42	21
12	Factor 12	Firm allows workers as a part of decision making	0.45	16
13	Factor 13	Good supervision is provided in work places	0.41	23
14	Factor 14	Proper training and education are provided by the firm	0.40	25
15	Factor 15	Proper communication between labor and top management	0.42	21
16	Factor 16	Flow of information is maintained	0.40	25
17	Factor 17	Medical care, Canteen/food, accommodation and transport facilities are available	0.43	19
18	Factor 18	Innovative/complexity in design makes comfort to workers	0.50	11
19	Factor 19	construction error commonly done by the labor	0.49	13
20	Factor 20	Good quality materials are provided by the firm	0.45	16
21	Factor 21	mishandling of equipment due to lack of training	0.41	23

shown in Fig. 1 are as follows: Providing bonus to the workers, Motivational plan and activities, Motivating the labors by providing higher wages, Management giving any performance rewards, Labors work with job satisfaction, Proper noise control, lighting and HVAC system are provided, Climatic Condition Will not Affect Your Working Performance, Accident due to malfunctioning of equipments, proper guidance is provided to operate special equipments, safety awareness programs are conducted by the firm.

The results show that 3 of the top 5 ranked factors are from the motivational factors which indicated that it’s the most significant factor among the whole factors.

22	Factor 22	Accident due to malfunctioning of equipments	0.52	8
23	Factor 23	proper guidance is provided to operate special equipments	0.51	9
24	Factor 24	Safety precautions provided when working	0.40	25
25	Factor 25	special person is allotted for regular inspection	0.43	19
26	Factor 26	safety awareness programs are conducted by the firm	0.51	10
27	Factor 27	Climatic Condition Will not Affect Your Working Performance	0.53	7
28	Factor 28	Proper noise control, lighting and HVAC system are provided	0.55	6
29	Factor 29	fair treatment for all irrespective of background	0.50	11
30	Factor 30	Cultural difference is making workers to work comfortably	0.46	15

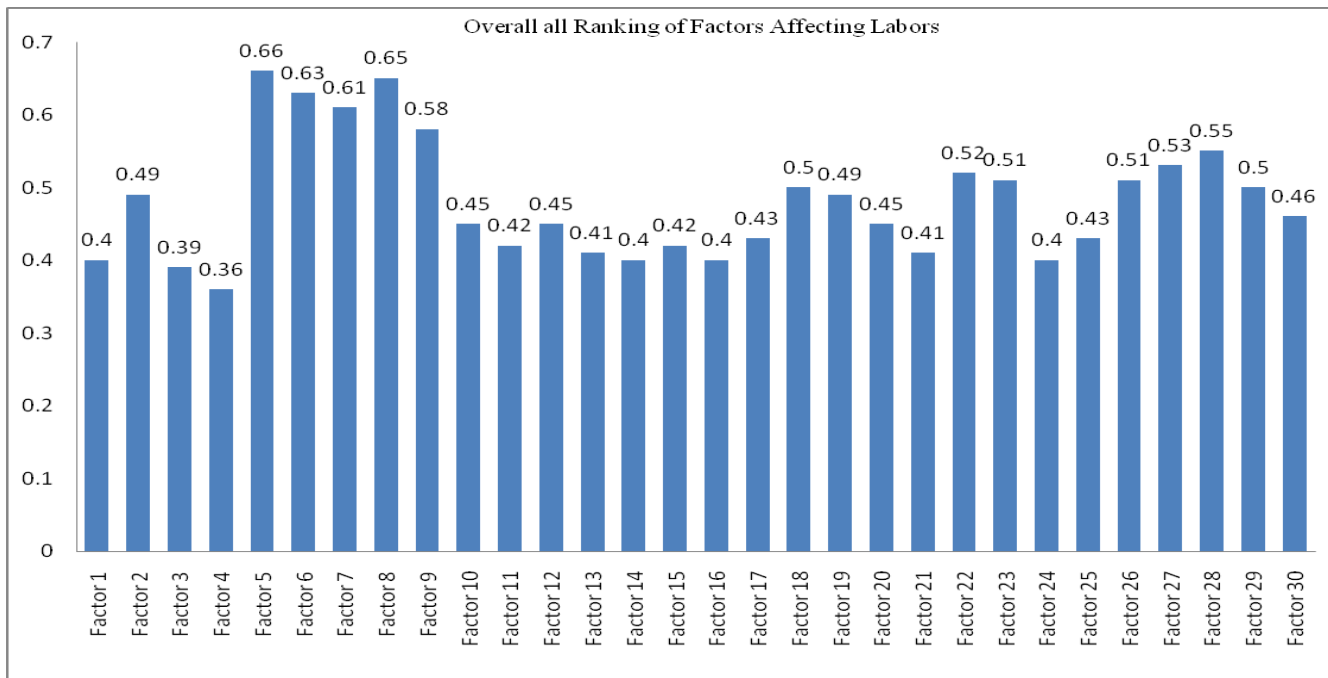


Fig. 1 Overall Ranking

7. Conclusion

The study revealed that the significant factors affecting labor in construction industry are Providing bonus to the workers, Motivational plan and activities, Motivating the labors by providing higher wages, Management giving any performance rewards, Labors work with job satisfaction, Proper noise control, lighting and HVAC system are provided, Climatic Condition Will not Affect Your Working Performance, Accident due to malfunctioning of equipments, proper guidance is provided to operate special equipments, safety

awareness programs are conducted by the firm.. Majorly it can be categorized under motivational, economic and safety factors. In conclusion, it is believed that the outcomes of this study can assist in achieving high labor productivity by focusing and acting upon the most important factors.

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