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Investigating Factors Influencing

Labour Productivity in Construction Projects

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Abstract - ***In construction projects, approximately one-third of the total cost of the project is spent on labours. So, it is necessary for Site Engineers to keep an eye on productivity of Labour in any project to make maximum profit. Keeping this in mind, this topic has been chosen to find out the actual Labour productivity and its impact at sites. In this paper, 2 different types of projects (Residential building and Industrial building) in 2 different places (Thanjavur and Chennai) have been taken. It is found, based on the Schedule of Rates 2015 that labour productivity is lesser than expected in labour intensive works (e.g., Excavation) and it is comparatively higher in works where general standardization is introduced (e.g., Formwork). It is also observed that Productivity in Thanjavur is higher than that in Chennai.***

In this project, a survey is conducted to find out the factors affecting the labour productivity by way of questionnaire. The above factors have been ranked based on the survey and suitable conclusions have been derived to arrive at the optimal Labour Productivity in Construction Projects.

Key Words: *Labour productivity, Factors Affecting*

1. INTRODUCTION

Today, Labour productivity is of serious concern to the Nations' contractors. In response to this, the project intends to find the actual Labour productivity in site and investigates Labour productivity factors in Construction projects. The contractor is responsible for the coordination and control of construction operations so that the project will be conducted at an optimal level of productivity. Specifically, it is known that productivity is related, in part, to the following variables: Management (Proper Planning, Scheduling and Control); Labour (Union agreements, absenteeism, turnover, delays, availability, level of skilled craftsmen, and use of equipment); Government (regulations, social characteristics, environmental rules, climate, and political ramifications); contracts (Lump-sum, unit cost, and cost plus fixed fee); owner characteristics; and financing. It is hoped that the information presented will assist the industry in planning for projects.

1.1 Objectives

The Objective of this paper is:

a) To find out the Labour Productivity in the site
b) To find out the factors affecting the same
c) To suggest the ways to increase the Productivity

1.2 Purpose and Scope

This paper intends to find out the actual Labour productivity and examines the underlying structure of the factors affecting construction productivity from the Site-Engineers' perspective. The study began with the measurement of Actual Labour productivity in the sites and Collection of factors from Literature study, discussion with Site-Engineers' and observation from sites.

In order to identify the macro-view of factors affecting the productivity, 83 factors affecting the labour productivity (Table 1) have been found out as a whole. These factors have been sent to 10 Site-Engineers to filter relatively less important factors. After the target group filtered the less important factors, the author administered the survey with the remaining 14 factors (Table 2). These factors have been sent to more than 100 Site-Engineers who are working in different Construction projects. 57 out of 100 Site-Engineers replied for the Questionnaire. With these responses, the factors has been analyzed and they have been ranked.

1.3 CATEGORIES OF LABOUR

The nature of skill mix in building trades is of significance. The skills required to perform in building trades vary considerably. A Mazdoor could easily be used to assist a mason, concreter, painter or a carpenter. But the skill requirements begin to increase as one moves up the technology ladder. Skills required to become a formwork and centering carpenter are different from those required in a furniture making carpenter. Each of these trades is semi-independent, though a part of the construction process. On a building site the job exist in clusters of different trades, but the level of performance skills criteria cuts across clusters. Workers are classified as unskilled, semi, and skilled in each trade.

The myth of 'unskilled' worker should be noted. Even a head load carrier possesses a certain level of skill to arrange 22 bricks on her head; without this skill she may not be able to carry even 10 bricks at a time. Every person becomes minimally 'low skilled' worker within a few days of work on the site. Thus, a more appropriate classification would be unskilled, low skilled, semi-skilled, skilled and highly skilled, the last category should have the ability to train others and be interchangeable with supervisor.

Generally, masons, carpenters, blacksmiths, stone cutters, mechanics, drivers etc. are skilled workers. These personnel were called mistris if they reported directly to the Engineer, whereas if all the above categories of workers are working under or reporting to a mistri comes under semi-skilled category. In unskilled category, there are workers who are engaged on earth work, stone breaking and crushing, digging, transshipment, load carrying and similar works.

1.4 PROFILE OF BUILDING LABOUR

Some studies have found that construction labour is dominated by young, married, illiterate and unskilled males, mostly belonging to the scheduled caste and scheduled tribe, backward classes and the Muslim community, with a high family dependency load. Workers in the construction industry are often rural migrants who were mostly landless labour and on the brink of starvation in villages. They move to cities in search of work. About half of the total workers start as unskilled labour. Many remain unskilled. 90 percent of the workers say they entered jobs in the construction sector due to the compulsion of circumstances.

Labour laws for contract labour in the construction industry are, by and large, at par with those for other categories of labour employed in various industry groups. However, mentioned must be made of some laws which are of direct relevance to construction labour, namely:

- Contract Labour (Regulation and Abolition) Act, 1970;
- Inter-State Migrant Labour (Regulation of Employment and Conditions of Service) Act, 1979;
- Building and Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996;
- Building and other Construction Workers Welfare Cess Act, 1996

2. METHODOLOGY

The study involves the following set of processes namely literature review, On-site measurement of Labour Productivity, Questionnaire Survey and conclusion in a step-by-step process explained in detail in the following chapters. The study has been divided into two parts, with a motive to make a practical as well as a statistical study to know the current productivity through on-site measurement and questionnaire survey.

2.1 ON-SITE MEASUREMENT

This has been done by taking 2 different projects in different places. The measurement of labour productivity is carried out for 8 different items of works and they are Excavation, Concreting, Bar bending, Shuttering, Brickwork, Wood work, Plastering and Painting. These 8 works has been chosen because these works involve more than 90 percent of the total cost in any construction project. Minimum of 3 observations to a maximum of 11 observations have been made to different items of works underlying above. After observing the productivity of all the 8 items of work, it has been compared with the productivity in All India Schedule of Rates - 2015

2.2 QUESTIONNAIRE SURVEY

The second part of this study is the questionnaire survey to obtain results regarding the same scope, but from the practical experience of Site-Engineers who are a part of the process. Around 83 factors have been taken into account for the survey, which are obtained from

literature survey, observation from sites and discussion with Site-Engineers. If the questionnaire had been prepared with all the 83 factors, then, it would be difficult to attain the actual result. So, as a first stage, it was decided to filter the less important factors through response from 10 site-engineers. After this stage, there was 14 factors and these 14 factors have been taken into account for the formation of questionnaire. These 14 factors have been analyzed for Chance of occurrence and Impact. This has been sent to 100 site-engineers out of which 57 replied. With these response, the factors have been ranked, analyzed and suitable conclusions has been evolved to achieve the optimal Labour Productivity in Construction Projects.

2.2.1 GENERAL

Questionnaire is a type of research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. In our project, Questionnaire survey has been chosen to arrange the factors based on the Chance of Occurrence and Impact it makes on the Labour Productivity.

2.2.2 COLLECTION OF FACTORS

The factors have been collected from Literatures, Discussions with Site-engineers and personal observation from sites. As a whole, 83 factors have been collected and listed in table 2.1 as follows

Table 2.1 Factors affecting productivity

S. No	Factors	S. No	Factors
1	Inadequate instruction provided	43	Lack of extension chords
2	Not receiving directions due to size of the project	44	Misplaced tools
3	Different languages spoken by workers	45	Inexperienced tool room attendants
4	Shortage of personal	46	Poor quality
	protective equipment		power tools
5	Availability of consumables	47	Non-Availability of material
6	Restrictive project policy on consumables	48	Poor material quality
7	Non-Availability of hand tools	49	Non-Availability of bulk commodities
8	Non-Availability of power tools	50	Drawing errors
9	Errors in prefabricated material	51	Slow response to questions with drawings
10	Non- Availability of drawings	52	Non-Availability of man lift
11	Non-Availability of crane or forklift	53	Delay in work permits
12	Waiting for people and/or equipment to move material	54	Absenteeism
13	Out of sequence work assignments	55	Being notified of mistakes when they occur
14	Not receiving compliments for doing a good job	56	Fair/just performance review's
15	Lack of goals for craft workers' qualified foremen	57	Lack of construction knowledge for Supervisors

16	Foremen allowing crafts to work autonomously	58	Lack of proper resource allocation
17	Lack of authority to discipline craft workers	59	Excessive paperwork
18	Not having proper managerial and administrative support	60	Lack of "big picture" view on behalf of the workers
19	Disregard of crafts' productivity improvement suggestion	61	Lack of communication among site management
20	Craft worker importance	62	Superintendent's people skill
21	Lack of site safety resources	63	Unqualified superintendents
22	Lack of experience on behalf of superintendents	64	Micromanagement on behalf of superintendent
23	Respect for craft workers	65	Inconsistent safety policies established by different supervisors
24	Political/performance competitions within company	66	Different per diem rate
25	Different work rules by superintendents	67	Material storage area too far from workface
26	Incentives for good performance	68	Shortage of temporary facilities
27	Insufficient size of material storage area	69	Slow decisions
28	Non-Coordination between the trades	70	Incorrect crew size
29	Vehicle traffic routes	71	Difficulty in tracking material
30	Not having Weather protection	72	Non-Availability of skill training
31	Non-legibility of drawings	73	Needed information not on drawings
32	Jobsite orientation program	74	Craft workers' pride in their work
33	Availability of health and safety training	75	Motivated craft workers
34	Qualified craft workers	76	Unequal pay on projects in a geographic area
35	Craft workers' incentive	77	Poor equipment maintenance
36	Craft workers' trust in supervisors	78	Maintenance of power tools
37	Equipment repairs	79	Jobsite congestion

38	Pulling people off a task before it is done	80	Reasonable project goals and milestones
39	Different pay scales for the same job on a project	81	Layoff of qualified craft workers
40	Respect for craft workers and foremen	82	Not providing incentives and compliments for good performance
41	Awareness of on-site activities and project progress	83	Difference in Salary Paid by Various Sub-Contractors
42	Lack of power source for tools		

In the above list of factors, 57 factors have been obtained from various literatures and the remaining factors were obtained from personal observations at sites

2.2.3 FILTERING THE FACTORS

The factors have been filtered as a step before the preparation of questionnaire survey to minimise the number of factors. Here, the less important factors have been filtered so that the results obtained will be more accurate. All the factors have been sent to 10 site-engineers working in different sites and they are requested to select up to 20 important factors whichever they feel based on their experience. After getting back the response from all the site-engineers, the factors which are selected only once are neglected. Then, there were only 14 factors. The 14 factors are listed below in table 5.2. With these factors, the questionnaire has been prepared. The number of factors were kept as small as possible for effective response of the questionnaire.

Table 2.2 Factors used in preparation of Questionnaire

S. No	Factors
1.	Poor quality power tools
2.	Material storage area too far from workplace
3.	Equipment repairs
4.	Inadequate instruction provided
5.	Shortage of personal protective equipment
6.	Non - Availability of material
7.	Lack of construction knowledge for Supervisors
8.	Lack of proper resource allocation
9.	Lack of communication among site management people
10.	Non - Availability of drawings
11.	Not providing Incentives and Compliments for good performance
12.	Non - Availability of skill training
13.	Different languages spoken by workers
14.	Difference in Salary paid by various Sub-Contractors

5.4 – PREPARATION OF QUESTIONNAIRE

Questionnaire has been prepared with the above mentioned 14 factors. All these 14 factors have been divided into 2 sub-questions (Recurring and Impact it makes on the productivity). The questionnaire has been prepared in Google forms. E-mail id was necessary to fill the form to avoid repeated entries and unauthorized

entries. The link of the questionnaire has been sent to more than 100 respondents. The prepared questionnaire is shown in the figure below

Name

Designation

Company

E-mail address *

Poor quality power tools

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Non - Availability of drawings at the time of execution

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Material storage area too far from workplace

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Equipment repairs

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Inadequate instruction provided

	Low	2	3	4	High
Chance of Occurrence					
Impact			**Error! Not a valid embedded object.**		

Shortage of personal protective equipment

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Non - Availability of materials

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Lack of construction knowledge for Foreman

	Low	2	3	4	High

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Lack of proper resource allocation

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Lack of communication among site management

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Not providing Incentives and Compliments for good performance

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Non - Availability of skill training

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Different languages spoken on a project

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Difference in Salary paid through Sub-Contractors

	Low	2	3	4	High
Chance of Occurrence					
Impact					

Suggestions

Figure 2.1 Prepared Questionnaire Survey

3.CONCLUSION

In construction projects, the contractors used to think that the labour productivity is to be maximum to complete the project in short duration. But, at the same time, due to speedy execution of work, occurrence of error is high and if that happens, considerable amount of money and time will be wasted to set right the error. So, it is important for the labour productivity to be optimal. In our project, we have measured the labour productivity in 2 sites and the factors affecting the productivity have been listed. The works that are above the nominal productivity can be brought down to optimal productivity by doing those works with more accuracy. Apart from that, the productivity of works that are low have to be improved. For that, a survey has been conducted based on questionnaire survey.

The results of the questionnaire survey show that Lack of communication among site management people is the prominent reason for the reduction in productivity. Factors such as Lack of construction knowledge for Supervisors and Non - Availability of skill training are the other reasons that affect the productivity. Hence, it is

concluded that these factors have to be kept in mind while executing a construction project to achieve the optimal labour productivity

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