FACTOR AFFECTING LABOUR PRODUCTIVITY IN BUILDING CONSTRUCTION

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Abstract - Productivity plays an important role in the construction industry. Productivity is one of the most important issues in both developed and developing countries. Efficient management of construction resources can lead to higher productivity which can help to achieve cost and time saving. Construction is labour oriented industry. It heavily relies on the skills of its workforce. The labour is industry's most valuable asset. It is important to improve efficiency of production by improving productivity of labour. In the timeline of research regarding labour productivity there are many studies available in which the factors were identified from the managers perspectives. This project contains a set of questions to conduct a questionnaire survey. The questionnaires will be distributed to Project Manager, Project Engineer, Consultant, Contractor, etc. of various construction companies. Once the company's replies to the questionnaires, all the obtained information are sorted and analyzed. Based on the replies of each company necessary guidelines to improve labour productivity in construction are to be framed. .Factors affecting labour productivity were analyzed using RII method. Measurement of labour productivity is done using work study method. RII method revealed top ten ranked factors which affect labour productivity. The data collection is done by work study method shows skilled labour as highly important factor affecting labour productivity.

Keywords – Work Study, Labour productivity, Relative important index

1. INTRODUCTION

Productivity signifies the how to well an individual entity uses its resources to produce outputs from input. Improving productivity is major concern for any profit oriented organization. In general terms productivity is termed as ratio between input and output. Proper management of available asset can help in improving productivity. Labour is the most important asset to a construction company. 30% to 50% of total cost of project is spent on labours. Quality of the construction largely depends upon the quality of work done by labour. Labour productivity directly affects construction productivity, it is important to know the factors affecting labour productivity. Construction productivity and labour productivity are two important words that determine the profit and loss of the construction business Productivity can be defined in many ways. In construction, productivity is usually taken to mean labor productivity, that is, units of work placed or produced per man-hour. The inverse of labor productivity, man-hours per unit (unit rate), is also commonly used. 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. Productivity is one of the most important factors which affect the overall performance of any organization, either large or small. The construction sector has strategic role in developed and developing countries, employing more than 7% of work force, the sector is the largest industrial employer in the construction industry in India contributes to over 5% of Nations gross domestic product and employs over 30 million people (Planning Commission 2008). According to Make in India project it was estimated that the construction industry contribute more than 10% of India's gross domestic product. In most countries, labour cost comprises 30-50 percent of total project cost and the reduction of these costs can be carried out by effective utilization of manpower in construction industry.

2. REVIEW OF LITERATURE

Definition

The Ratio of Output of required quality to the input for a specific production situation.The term ―productivity‖ expresses the relationship between outputs and inputs. Output and input differ from one industry to another. Also, the productivity definition varies when applied to different areas of the same industry. Labour is one of the basic requirements in the construction industry. Labour productivity usually relates manpower in terms of labour cost to the quantity of outputs produced. In other words, the definition of labour productivity is the amount of goods and services produced by a productive factor (manpower) in the unit of time.

Labour Productivity = Labour cost / work hour Output

Significance

Productivity has a great significance in construction. Labour productivity constitutes a significant part of production input for construction projects. In the construction industry, many external and internal factors are never constant and are difficult to anticipate. This factor leads to a continuous variation in labour productivity. It is necessary to make sure that a reduction in productivity does not affect the plan and schedule of the work and does not cause delays. The consequences of these delays could result in serious money losses. Further, considerable cost can be saved if productivity is improved because the same work can be done with less manpower, thus reducing overall labour cost.

Objective

The objective of this study focus on view from the construction industry to study the productivity concept for the construction site, analyze factors affecting the labour productivity, measure the labour productivity of the construction building and analyze and to reduce total cost and duration of building structural component.

Background productivity

Soekiman, explored various factors affecting labour productivity in Indonesia and shortlisted the following as most significant: Lag of materials, Delay in arrival of material, Unclear instruction to labour, Labour strikes, Financial difficulties, No supervision method, Lag of equipment and design change.

Lim and Alum classified various factors impacting the construction productivity in Singapore and shortlisted the following as most significant; Lack of qualified supervision, Shortage of skilled labours, High rate of labour turn over, Labour absenteeism and Communication with foreign labours.

AynurKazaz moreover surveyed 82 firms on factors affecting labour productivity in Turkey and identified the following nine factors as most important to labour efficiency; Quality of site management, Material management, Amount and on payment, Planning, Supervision, Site layout, Work discipline, Occupational education and training, Working at similar activities, based on relative importance index method.

Saravanan conclude eleven different factors influencing labour productivity which are time, quality, safety and managerial factors, experience of labour, type of project, misunderstanding, external factors, motivation, material/tools and natural factors.

Ghate observed that measurement of labour productivity is helpful in saving the time of the project as well as cost of project without hampering the quality of work. They used work study and work measurement techniques for data collection of labour and improvement in labour productivity. They concluded that this techniques helped to reduce cost by 20% of labour cost per floor.

Mahesh found prior knowledge of labour productivity during construction can save money and time. Investments for projects are very high and because of the complexity in construction, various factors can highly affect overall productivity, thus the project can end up adding even more time and money in order to be completed. First method used for analysis was the Pearson product moment correlation coefficient.

Khaled comprised 30 productivity factors and classified them under three primary categories: Human/labor, Industrial and Management. Their study represented five factors which are most significant in construction labour productivity in Egypt: (1) Labour experience and skills, (2) Incentive programs, (3) Availability of the material and ease of handling, (4) Leadership and competency of construction management and (5) Competency of labour supervision.

Shashank grouped factors affecting labour productivity in six different group which are Motivation group, Manpower group, Material/Equipment group, Safety group, Managerial group, Quality group. They said Motivation factor has the highest impact on labour productivity. So they suggested that, the construction company should increase labour satisfaction by paying a reasonable salary, developing financial reward or recognition program and improving the living condition on site.

Makulsawatudom researched the influence of 23 factors on the productivity of the construction industry in Thailand and deducted that lack of material, incomplete drawings, incompetent supervisors, lack of tools and equipment, labour absenteeism, poor communication, instruction time, poor site layout, inspection delay and rework, are the most critical.

Thiyagu proposed fifteen independent groups affecting the labour productivity in the construction projects. The topmost factors affected the labour productivity are given Sanitation and hygiene of the construction site and the temporary shed; Labour injuries on site; Alcoholism; Working overtime; Shortage of construction materials; Payment delays; Change orders from the designers; Improper equipment; Poor quality of construction materials; Misunderstanding among laborers.

3. FACTOR AFFECTING ON LABOR PRODUCTIVITY

Construction labour productivity has been the subject of numerous research studies. Investigated the factors affecting productivity and improving productivity of construction building survey. Forty Five factors identify by literature survey, which affected labor productivity are classified under the four primary groups:

Factors of Labour Productivity based on Literature review

(1) Management Group (2) Technological Group (3) Human/Labor Group (4) External Group.

Management Group

Management group have 24 following factors:-

1. Labor Supervision
2. Method of Construction
3. Delay in Payment
4. Lack of Construction Manager Leadership
5. Late Arrival, Early Quit and Frequent Unscheduled Breaks.
6. Sequence of Work
7. Communications between Site Management and Labor
8. Storage Locations
9. Labor Interference and Congestion
10. Incentive Scheme
11. Unrealistic Scheduling and Expectation of Labor Performance
12. Lack of Recognition Program
13. Unavailability of Suitable Tools
14. Proportions of Work Subcontracted
15. Delay in Inspection by Site Management
16. Material Shortage
17. Lack of Training Offered to Operatives
18. Lack of Periodical Meeting with Crew Leader
19. Lack of Suitable Rest Area Offered to labor on Site
20. Crew Size and Composition
21. Working Overtime
22. Lack of Providing Labor with Transportations
23. Owner's Representative Intervention with Site Management and Operatives
24. Accidents as a Result of Poor Site Safety Program

Technological Group

Technological group have 12 following factors:-

1. Clarification in Technical Specifications
2. Extents of Variations/Change Order During Executions
3. Team Spirits
4. Delay in Responding to Requests for Information's
5. Rework
6. Stringent Inspection by the Engineer
7. Delay in Inspection by the Engineer
8. Site Restricted Access
9. Design Complexity Level
10. Compatibility and Consistency among Contract Documents
11. Confinement of Working Space
12. Layout of Site

Human/Labor Group

Human/Labor group have 4 following factors:-

1. Labor Fatigue
2. Labor Skill
3. Availability of Experienced Labor
4. Labor Motivation

External Group

External group have 4 following factors:-

1. High/Low Temperature
2. Sandstorms
3. Rain
4. High Humidity
5. High Winds

4. METHODOLOGY AND DATA COLLECTION

Data required to carry out the research was collected by Questionnaire Survey. On basis of previous studies on Labour productivity & suggestions from Local Industry Professionals, total 45 factors were identified which are having influence on construction labour productivity in Gujarat Region. The target population included Civil Engineers from construction firms categorized as contractors. In this study measurement skill of 1 to 4 was used to determine the effect level. The Questionnaire prepared was distributed amongst respondents. Respondents were required to rate using their experience how all factors affects labour productivity. Relative Importance Index (RII) was used for analysis of data.

Relative Important Index (RII) the primary data collected from the questionnaire survey were analyzed using Relative important index method for ranking each factor from the perspective of Developers, Consultants and Contractors.RII method helps to determine the relative importance of the various factors affecting on labour productivity. RII was used by following equations.

$$\text{RII} = \frac{\sum(1n1+2n2+3n3+4n4)}{A*N}$$

Where,
Weight given to each factor by the respondents and
Ranges from 1 to 4.

1 = Not applicable
2 = Does not affect
3 = some-what affects
4 = highly affect
A is the highest weight = 4
N is the total number of responses collected for the ordinal Scale.
Therefore,

$$\text{RII} = \frac{1(0)+2(2)+3(7)+4(48)}{4*50}$$

= 217/200
= 1.085

For purpose of finding labour productivity erection and binding of reinforcement of column has been selected for present study. Skilled labour and change in site layout are the two factors considered for calculating changes. Work study method was used for data collection. Work study is the systematic examination of the methods of carrying on activities so as to improve the effective use of resources and set up standards of performance for activities being carried out. Work study aims at examining the way in activity is being carried out, simplifying or modifying the method of operation to reduce unnecessary or excess work, or wasteful use of resources, and setting up a time standard for performing that activity Data required from site to carry out the research was collected by time study method. Time study is a work measurement technique for recording the times of performing a certain specific job or its elements carried out under specific conditions. Similarly data have been collected after changing site layout and after changing semiskilled labour with skilled labour.

5. RESULT AND DISCUSSION

SR.NO.	FACTORS AFFECTING	RII	RANKING
1	Skilled labour	1.085	5
2	Labour Supervision	1.225	1
3	Payment	1.045	6
4	Communication between site management and labour	0.935	8
5	Availability of material	1.02	7
6	Motivation to labour	1.155	2
7	Project manager's leadership	0.86	9
8	Time	1.125	4
9	Quality	1.13	3

10	Change of work orders	0.875	10

Table 1: Result for factors affecting labour productivity

Out of a total of 73 questionnaires sent, 50 responded to the questionnaire. In this case, it represents the participation of 68.49 percent. A total number of 50 respondents were, surveyed from the Rajpipla and Lunawada out of 10 developers, 11 consultants and 29 contractors. A ranking of the factors was achieved from Relative important Index (RII).

Result of Relative Important Index (Table 1) shows that the top ten ranked factors affecting labour productivity are Labour supervision, Motivation to labour, Quality, Time, Skilled Labour, Payment, Availability of material, Communication between site management and labour, Project manager's leadership, Change of work orders.

6. COCLUSION

After receiving all the questionnaire, the data can be analyzed by the relative important index. By finding the most factors influencing labour productivity then to derive the suitable model to improve the labour productivity. Analysis of these factors showed that top ten ranked factors affecting labour productivity are Labour supervision, Motivation to labour, Quality, Time, Skilled Labour, Payment, Availability of material, Communication between site management and labour, Project manager's leadership, Change of work orders.

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