# Analyzing the Factors that Affect the Labour Productivity of Various Major Items of Work in Construction Industries and Recommending Remedial Measures

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Abstract: Productivity plays a major role in the construction industry in which labour power is the only productive resource and the industry is mainly dependent upon human effort and performance. The resource inputs such as men, material, machinery, money and time produce outputs in the form of work. The success of any project depends upon the performance and availability of these resources and improves higher cost savings with minimal investment. In developing countries like India, proper labour management for productivity is one of the key factor to achieve higher efficiency in development process. Respondents were required for rating the factors that affect labour productivity with respect to importance and severity of the problems. In this research, control process involves accounting the actual productivity of labours and includes comparison and analysis of the causes to find measures to improve productivity

*Keywords:* Construction Resource Management, Descriptive, productive resource

#### 1. INTRODUCTION

Several studies related to labour productivity are performed for construction industry in past. Several of them were related to calculating the effect of productivity factors. Measureable calculations about the effects of those factors are required for several purposes, it includes estimation of the construction project, it's planning and scheduling. However, past study shows that it is tough to calculate such an impact, and at present there are no universally accepted standards to measure factors causing labour productivity loss in construction industry. This lack of methods for measureable assessments for the factors affecting labour productivity in construction, and this is supposed to be the topic of this research.

1.1 FACTS ABOUT CONSTRUCTION PRODUCTIVITY Following are a few facts about the construction productivity according to studies conducted by Adrian (1990):

i)Tuesday is studied as most productive day of the week.

ii) 10 a.m. is studied as most productive time of the day.

iii) The least productive time frame for labour is right before the finishing time.

iv) A labourer is capable of lifting approximately 94 pounds on his own.

v)If the labourer is engaged in performing the same task repeatedly, there is a chance of low productivity after 60-70 minutes of performing the same work.

vi) Friday has been proven to be the least productive day of the week.

The objective of this study focuses on views from the construction industry about various factors affecting labour productivity, analyzes factors affecting the labour productivity, and suggests appropriate measures that can be taken to improve labour productivity. The aim is supported by the objectives stated below:

i)Study and discuss various factors affecting labour productivity in construction industry.

ii) Analyze and calculate the mean values and ranks of those factors affecting labour productivity using Statistical Package for the Social Sciences (SPSS).

iii) To assess the impact of influenced factors on the variation of labour productivity.

### 2. LITERATURE REVIEW

Serdar Durdyev and Jasper Mbachu (2011) aims to identify the keyconstraints to on-site labour productivity; to analyse the relative levels of impact of the identified onsite labour productivity constraints; and to explore measures for improving productivity levels in the industry.

Shashank K. et al. (2014) stated the objectives of this research as, one, identifying the key factors affecting the variation of labour productivity in the construction projects in Bangalore, India, second, assessing the impact of the influenced factors on the variation of labour productivity and lastly, providing recommendations to reduce the variation of labour productivity.

Sherif M. Hafez et al. (2014) research is to identify the factors perceived affect labour productivity on construction projects which can be used by industry practitioners to develop a wider and deeper perspective of the factors influencing the efficiency of operatives, and provide guidance to construction managers for efficient utilization of the labour force, hence assist in achieving a reasonable level of competitiveness and cost effective operation.

Sunil V. Desale et al. (2013) paper elaborates the methodology used for controlling labour productivity which can be improved by cutting down un productivity time of the labour. The control process involves accounting of actual productivity of labours, comparing and analyzing the causes for finding the remedial measures to improve productivity. A case study approach is used to compare the B.B Masonry work, constructed at two similar, medium sized commercial construction projects located in at Walwadi area of Dhule city. The objectives of this case study are to qualify the potential benefits. For a concern site, Material related problems are identified and linked to the material management practices.

T. Czumanskia and H. Loddinga(2012) introduce a state-oriented approach providing the possibility to identify and prioritize the different impacts on labour productivity for subsequent process enhancements and evaluate state data of an assembly cell to establish a goal-oriented improvement process.

Thomas and Sakarcan (1994) built an ideal to describe the factors affecting labour productivity. In the model, two groups of factors determine the productivity performance, work environment and task to perform. Work- environment factors refer to how well a job is organized and accomplished.

13cities among Jiangsu province. A ceteris paribus increase in the level of human capital is found to have a significant and positive impact on the regional labour productivity which has significance.

## **3.RESEARCH STUDY**

The first step of the research discusses the background, various definitions, measurement, problem Statement, misconceptions, and facts related to the productivity. The second step focuses on the previous studies about construction labour productivity and preparing various factors affecting it from the professional journals and texts. The third step of this research is the preparation of questionnaire and personal survey based on the various factors affecting labour productivity. The fourth step of the research is data collection. The fifth step of the research is the data analysis. SPSS is used to perform the required analysis and results and discussions will be made after analyzing data. The methodology of this project is explained in the flow chart as in Figure 3.1.



#### **4.QUESTIONNAIRE SURVEY**

Α questionnaire in a web-survey format comparatively requires less duration and saves cost for the researcher while permits respondents to response the questionnaire at their personal ease. However, for this approach the reply rate is usually lower as compared to face-to-face interviews. The purpose and approach used in the survey was fully explained to the respondents. Guidelines were provided to the respondents to ensure that the procedure was followed properly to reduce errors. During the survey period, some oversights were provided to help ensure the process was going smoothly and consistently. The questionnaire survey was conducted to the contracts manager, developers, consultants, project managers and contractors in the

construction firm. The questionnaire should have the signature and seal of the firm, showing the proof of survey taken.

## 5.RELATING THE QUESTIONNAIRE TO SAMPLE SIZE

The target groups in this study were professionals from the construction industry. The sample size can be calculated with the following equation for a 94% confidence level (Al-Shahri, M et al., 2001):

 $\begin{array}{l} n=n' \,/ \, \left[ 1+ \,(n'/N) \right] \\ \mbox{where, } n= \mbox{Total number of population} \\ V \ = \ a \ standard \ error \ of \ the \ sampling \ population. \end{array}$ 

n'=S2/V2= (0.5)2+(0.06)2= 69 (Usually, S= 0.5, .44 For N=255 and V = 0.06.)

To obtain 94% of confidence level, it was calculated to send the questionnaire to 55 organizations to accomplish a 94%. The questionnaire survey will be related to sample size, the total registered construction companies including builders, contractors and consultancies of Tamil Nadu and Kerala will be found out and answered questionnaire will be analyzed according to the sample size. The results and recommendations will be given according to the analysis.

## 6.DATA COLLECTION

In successfully achieving main objective of the study, one of the most important phase is collection of accurate data. Data collection is a procedure of collecting crucial data records for a certain sample or population of observations. For the research study, questionnaires were distributed to the respondents through direct contact in order to supply the necessary data to be used for the project work. Responses were collected on individual basis and also interviews were conducted with respondents in respect of questionnaires distributed.

## 7.DATA ANALYSIS

It is commonly believed, while performing different task on construction projects, disturbances can existent with diverse degrees of danger. In order to overcome with these different degrees, it was decided to consider five condition levels: affects with little degree, affects something, affects with average degree, affects with large degree and affects with very large degree. A clear specification of the standard conditions was necessary to enable respondents to clearly distinguish the degree of each adverse condition level. The concept of different degrees of severity for productivity factors was previously used in other studies.

#### 8.0VERALL ANALYSIS

Overall analysis is made by considering all the 55 samples that were collected.

Major factors affecting the technical group of a construction project by proper technical planning, changes occur in the way productive factors are organized and thereby increasing the efficiency of construction projects. Figure 4.1 shows 9 factors affecting labour productivity in technical group in x-axis, where, A- Clarity of technical specification, B-The extent of variation/change order during execution, C- Coordination level among design disciplines, D- Design complexity level, E- Rework, F- Site Layout, G- Drawings and specifications alteration during execution, H- Site restricted access, I- Accuracy of the estimate, and the mean value that is obtained from SPSS analysis in the y-axis.



Figure 4.1 Factors affecting labour productivity in technical group From figure 4.1, clarity of technical specification has a mean value of 4.071, which shows most of the companies agree that clarity of technical specification is a major factor that affects the technical factor of a construction project.

Major factors affecting the human/ labour group of a construction project

Figure 4.2 shows the results obtained from the analysis which shows 15 factors affecting labour productivity in human/ labour group in x-axis, where, A- Motivation of labour, B- Increase of labourer age, C- Skill of labour, D- Physical fatigue, E- Shortage of

experienced labour, F- Labour personal problems, G-Labour dissatisfaction, H- Labour disloyalty, I-Misunderstanding among labour, J- Lack of competition, K- Reassignment of staff/ crew, L-Labour working for more than 10 years, M-Government regulation, N- Basic wages, O- Inspection delay, and the mean value that is obtained from SPSS analysis in the y-axis.



Figure 4.2 Factors affecting labour productivity in human/ labour group

From figure 4.2, shortage of experienced labour has a mean value of 4.214, which shows most of the companies agree that experience and skill of the labour is the major factor that affects the human/labour factor of a construction project.

Major factors affecting the management group of a construction project



Figure 4.3 Factors affecting labour productivity in management group From figure 4.3, lack of labour supervision has a mean value of 4.0, which shows most of the companies agree that supervision of labour is the major factor that affects the management factor of a construction project.

Major factors affecting the material management group of a construction project

Productivity is greatly affected if required materials, construction equipments, or tools are not available. In order to increase productivity, it is necessary to select equipment with proper size and characteristics most suitable for the job conditions. The 5 various affecting factors in this group in x-axis, where, A-Shortage of materials, B-Shortage of tools and equipments, C- Unsuitability of materials storage location, D-Construction methods, E-Payment delay, and their means from the analysis in y-axis is given in figure 4.4.



Figure 4.4 Factors affecting labour productivity in Overall factors affecting labour productivity of a construction project

From figure 4.4, payment delay has a mean value of 4.17, which shows most of the companies agree that delay in payment of labour is the major factor that affects the material management factor of a construction project

0	A	В	С	D	Е
Mean	3.7	3.6	3.0	3.1	4.1

 Table 4.2 Overall Ranking of factors affecting labour

 productivity

Factors affecting labour productivity	Mean	Rank
Shortage of experienced labour	4.2143	1
Payment Delay	4.17	2
Skill of labour	4.0	6
Labour working for more than 10years	4.0	7
Rework	3.9643	8
Construction managers lack of leadership	3.9643	9
Inspection delay	3.9643	10
Basic wages	3.8929	11
Accidents as a result of poor site safety		
Clarity of technical specification	4.0714	3
Lack of labour supervision	4.0	4
Coordination level among design	4.0	5
disciplines		
program	3.8929	12
Physical fatigue	3.8214	13
Labour disloyalty	3.8214	14
Working for 7 days a week without holiday	3.8214	15
Labour dissatisfaction	3.7857	16
Working overtime	3.75	17
Violation of safety precautions	3.75	18
Shortage of materials	3.7143	19
Accuracy of the estimate	3.6786	20
Increase of labourer age	3.6786	21

## © June 2025 | IJIRT | Volume 12 Issue 1 | ISSN: 2349-6002

Misunderstanding among labours	3.6786	22
Shortage of tools and equipments	3.6786	23
Working at high place	3.6786	24
Inefficiency of equipments	3.6786	25
Lack of competition	3.6429	26
Lack of labour surveillance	3.6429	27
Design complexity level	3.6071	28
Misuse of time schedule	3.6071	29
Proportion of work subcontracted	3.5714	30
Reassignment of staff/ crew	3.5357	31
Motivation of labour	3.50	32
Unrealistic scheduling and expectation of	3.4643	33
labour performance		
Government regulation	3.3929	34

The result in Table 4.2 shows overall ranking of 70 factors that negatively affect labour productivity, identified in this study knowledge of productivity are very important because low productivity cause losses to the governing agencies and also influence the economy of the construction industry, which can finally affect the economy of the country. Prior knowledge of labor productivity can save money and time during construction. Investments made for construction projects are very high and because of the high complexity in construction, various factors can highly affect overall productivity which leads to the requirement of more time and money for a project to be completed. This research is intended to identify the probable factors affecting labour productivity in building construction.