



# A DETAILED REPORT ON CONSTRUCTION LABOUR PRODUCTIVITY AND ITS IMPROVEMENT

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## Abstract

The most challenging issue in Construction industry is to improving the production efficiency from the labour. Many research have been done in the past periods, however a deeper understanding is still needed to improve the labour productivity. The main outcome from the literature is that there is no standard definition of productivity. It covers the construction labour productivity definitions, aspects and factors affecting it. The productivity of labour is important especially in developing countries, where most of the building construction work is still on manual basis. The aim of this study is to get the latest information and to identify the key factors that affect the labour productivity in and around Coimbatore. So survey is carried out through questionnaire and distribute to respondents who work at various projects in wide area in Coimbatore and the questionnaires are rated by experienced engineers, project managers and also with labours using their past experiences. And the data's are collected and analysed; using this the affected factors are identified and ranked, through this necessary steps are provided to improve the labour productivity.

**Keywords** — labour cost, Productivity, Time, Quality

## 1. INTRODUCTION

### 1.1. GENERAL

Construction industry faces lots of challenges with regard to problems associated with productivity. Productivity is one of the most important 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 and is usually linked to the performance of time, cost, and quality. Inefficient management of construction resources can result in low productivity. Therefore, it is important for construction managers to be familiar with the methods leading to evaluate the productivity of the equipments and the labourers in different crafts. To achieve the income expected from any construction project in general, it is important to have a good controlling hand on the productivity factors that contribute in the integrated production composition, like labour, equipment, cash flow, etc

### 1.2. OBJECTIVE

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

- Study and discuss various factors affecting labour productivity in construction industry
- To statistically analyze the factors affecting labour productivity
- Construction industry in particular has been known among the main consumers of resources and energy.
- To make recommendations to improve productivity in construction.

### 1.3 BACKGROUND OF LABOUR PRODUCTIVITY

Productivity can be defined in many ways. In construction, productivity is usually taken to mean labour productivity, that is, units of work placed or produced per man- hour. The inverse

of labour productivity, man- hours per unit (unit rate), is also commonly used.

Productivity is the ratio of output to all or some of the resources used to produce that output. Output can be homogenous or heterogeneous. Resources comprise: labour, capital, energy, raw materials, etc.

Productivity may then be defined as the ratio of earned to actual hours. The problem with this concept is in establishing reliable, for setting standards. It also depends on the method used to measure productivity, and on the extent to which account is taken of all the factors which affect it. At a project site, contractors are often interested in labour productivity. It can be defined in one of the following ways.

$$\text{Labour Productivity} = (\text{Output} / \text{Labour Cost})$$

Productivity measures can broadly be placed into two categories. Single factor, or partial, productivity measures relate a particular measure of output to a single measure of input, such as labour or capital. Multi- factor or total productivity measures (MFP) relate a particular measure of output to a group of inputs, or total inputs used. Productivity measures can also be distinguished by whether they rely on a particular measure of gross output or on a value-added concept that attempts to capture the movement of output. Of the most frequently used MFP measures, capital- labour MFP relies on a value-added concept of output labour- energy- materials MFP relies on a particular measure of gross output.

The five most widely used productivity concepts are

Labour productivity, based on gross output: This productivity measurement traces the labour requirement per unit of output. It reflects the change in the input coefficient of labour by industry and is useful for the analysis of specific industry labour requirements. Its main advantage as a productivity measure is its ease of measurement and readability; particularly, the gross output measure requires only price indices on gross output. However, since labour productivity is a partial productivity measure, output typically reflects the joint influence of many different factors.

Labour productivity, based on value-added: Value-added based labour productivity is useful for the analysis of micro-macro links, such as an individual industry's contribution to economy-wide labour productivity and economic growth. From a policy perspective, it is important as a reference statistic in wage bargaining. Its main advantage as a productivity measure is its ease of measurement and readability, though it does require price indices on intermediate inputs, as well as to gross output data. In addition to its limitations as a partial productivity measure, value- added labour productivity have several theoretical and practical drawbacks including the potential for double counting production of benefits and double deflation.

**Productivity and Labour**

On any construction site the contractor's financial gain is dependent, amongst other things, on completion of the work in good time and at the least cost, and the productivity of labour has a direct bearing on this being achieved.

The factors affecting the performance of labour generally fall into three categories.

- i. The human capacity for
- ii. Work
- iii. The competence of site management

<b>Factor</b>	<b>Explanation</b>	<b>Comments and suggestions for Improving the capacity</b>
Age	Peak capacity for physical work is generally reached between the age of 20-35	In older persons, especially in skilled jobs, experience and efficiency compensate for lower work capacity.
Nutrition	Capacity is	Establish project canteens to provide balanced meals. Arrange talks on nutrition.

<p>Temperature humidity</p>	<p>Affect the rate at which heat can be dissipated from the human body by radiation, convection and evaporation of sweat, heat and humidity increase dangers of heat stroke and reduce work capacity</p>	<p>Start work at first light and avoid working during the heat of the day.</p>	<p>a variety of methods, all of which may be present in varying degrees. They include</p> <ul style="list-style-type: none"> <li>• Fear</li> <li>• Discipline                         <ul style="list-style-type: none"> <li>• Job Satisfaction</li> <li>• Financial Incentives</li> </ul> </li> </ul> <p>Fear: This includes fear of the supervisor and fear of losing a job and being out of work and destitute, especially in a country where no form of social security exists. This is a negative and unsatisfactory form of incentive.</p> <p>Discipline: This is exemplified by punctuality, lack of absenteeism, good standards of workmanship and the observance of site cleanliness and hygiene. When discipline is lacking, site morale is generally low and productivity is unsatisfactory. Ways of achieving site discipline include:</p> <p>Site rules drawn up and explained to all workers by either supervisors</p> <p>Supervisors; by personal example, setting a high standard in self-discipline.</p> <p>Matter of inevitability rather than severity. No breach of discipline should go unchecked.</p> <p>Developing self-discipline through pride in achievement.</p> <p>Job Satisfaction: Apart from work providing the means of satisfying the workers basic needs as to food, clothing and shelter, job satisfaction is obtained when the higher psychological needs of the worker, e.g. self-respect and personal dignity, are met. Individuals have a need to belong and for their usefulness to be apparent. Job satisfaction is obtained through a sense of achievement as to quality, output or other contributions, particularly if that achievement as to quality, output or other contributions, particularly if that achievement is recognized and acknowledged. Pride in craft and skill and a sense of responsibility are to be encouraged,</p>
<p>Health</p>	<p>Resistance to disease is affected by diet. Good hygiene and sanitation is essential to avoid occurrence of debilitating intestinal parasites.</p>	<p>Enforce strict site hygiene. Arrange talks on hygiene and sanitation.</p>	<p>Site rules drawn up and explained to all workers by either supervisors</p> <p>Supervisors; by personal example, setting a high standard in self-discipline.</p> <p>Matter of inevitability rather than severity. No breach of discipline should go unchecked.</p> <p>Developing self-discipline through pride in achievement.</p> <p>Job Satisfaction: Apart from work providing the means of satisfying the workers basic needs as to food, clothing and shelter, job satisfaction is obtained when the higher psychological needs of the worker, e.g. self-respect and personal dignity, are met. Individuals have a need to belong and for their usefulness to be apparent. Job satisfaction is obtained through a sense of achievement as to quality, output or other contributions, particularly if that achievement as to quality, output or other contributions, particularly if that achievement is recognized and acknowledged. Pride in craft and skill and a sense of responsibility are to be encouraged,</p>

**COMPETENCE OF SITE MANAGEMENT**

The various measures that may be taken to improve the physical work capacity or to motivate the workers will not be effective if site management is substandard. It is essential for the workers to have confidence in their supervisors. If the workers observe that site management is poor, unfair or corrupt, their morale, motivation and consequent productivity will be reduced. Examples of management shortcomings which reduce efficiency and productivity in this way include

**Motivation of Workers**

Workers are motivated in their work by

and rewarded with opportunities for advancement and promotion. Negative aspects which detract from job satisfaction and morale,

and which consequently affect productivity, are to be avoided. These are generally aspects which imply that the worker is held in low esteem by management and include:

- Poor working conditions and terms of employment
- Poor or subservient relations with supervisors

Financial Incentives: Incentive schemes of this nature are widely used in industrialized countries, but are often a source of contention and dispute between management and workforce. The schemes enable workers to earn bonuses over and above the normal rate of pay for achieving a rate of output at or above a predetermined standard. It is not always easy to work out what this standard performance should be, so that the output targets set by management of which the bonus earnings depend are often inaccurate.

### **VARIOUS FACTORS AFFECTING LABOUR PRODUCTIVITY**

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. Understanding critical 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 determine 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

Based on the study, Factors affecting construction labour productivity have been identified and are grouped into 15 categories according to their characteristics, namely

- Design factors
- Execution plan factors
- Material factors
- Equipment factors
- Labour factors
- Health and safety factors
- Supervision factors
- Working time factors
- Project factors
- Quality factors
- Financial factors
- Leadership and coordination factors
- Organization factors
- Owner/consultant factors

The top ten factors that affect the small and medium company

- Lack of material
- Labour strikes
- Delay in arrival of materials
- Financial difficulties of the owner
- Unclear instruction to labourer and high absentees of labours
- Bad weather (e.g. rain, heat, etc.)
- Non discipline labour and use of alcohol and drugs

### **MISUNDERSTANDINGS ABOUT LABOUR PRODUCTIVITY**

A study from (Adrian 1990) states the following general misconceptions about labour productivity. Key factor for low productivity in construction industry is labour. Because the construction industry is controlled by the weather, productivity cannot be improved

### **FACTS ABOUT LABOUR PRODUCTIVITY**

Following are a few facts about the construction productivity studied by Adrian (1990)

Tuesday is studied as most productive day of the week 10 a.m. is studied as most productive time of the day. The least productive time frame for labour is right before the finishing time A labourer is capable of lifting approximately 94 pounds on his own. 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. Friday has been proven to be

the least productive day of the week.

## **LITERATURE REVIEW**

### **COMPARATIVE STUDY OF LOCAL AND MIGRANT LABOURS FOR PRODUCTIVITY ENHANCEMENT IN**

Mr.S.S.Janagan,Prof K.Thirumalairaja-  
International Journal of Innovative Research in  
Science, Engineering and Technology,- ( Feb  
2014)

Construction labour management can make or break the profit on that job. Good relationship between workers and supervisors can improve the productivity in a high margin. By identifying the problems that each worker faces and finding appropriate actions to overcome those problems, one can improve the output to a high ratio.

### **STUDY ON THE FACTORS AFFECTING THE PERFORMANCE OF LABOURS IN INDIAN**

**CONSTRUCTION INDUSTRY** by  
B.VijayAntony  
Raj, Mrs.P.S.Kothai

Human Resource Management or HRM is the process of managing people in a company/firm as well as managing the existing inter-personal relationships. These two processes are key in the success and growth of a business. Human resource management is the management process of an organization's workforce, or human resources.

## **METHODOLOGY**

Survey research is defined as collection of different data by asking people questions. The data collection process used in this research had the option of two basic methods: questionnaires and personal interviews. A questionnaire was preferred as the best effective and suitable data-collection technique for the study. It was concluded that the questionnaire was described as a self-administered tool with web-design questions, an appropriate response. A 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. Data was collected from literature reviews from books, journals, articles, seminar conferences, and websites which emphasize building construction's labour productivity.

## **SURVEY PLANNING**

For the Core Nse Sa Trc Rh Us Ctu Td Iy O, Nem Fai I Et Le Dchnology was by used to send the survey questionnaire. Collecting general information on various factors affecting labor productivity in building construction all over coimbatore was the basic aim of the survey. 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 data were stored in order to maintain confidentiality, and the output was received from the Group Discussion Center (GDC) in the form of electronic mail, which included raw data sheets, summary sheets, and computer databases. Results included the overall statistics as well as individual statistics.

## **DESIGN OF QUESTIONNAIRE**

The questionnaire design practice advanced on a communicating basis. It was categorized into profile of the respondent and various factors affecting labour productivity in building construction. Questions in the respondent profile were created to collect information such as job position, experience of the work, locations of the current and/or previous works and contact information. It was studied, these questions in the survey were of great importance to the research by analyzing productivity loss concerns from a variety of different profiles from different regions. It was practical to anticipate that a location can have an impact on the loss of productivity due to various field disturbances, especially geographical and climatic conditions.

The set of questions, was targeting the factors affecting labour productivity in the different groups. It included factors affecting labor productivity. Respondents simply furnished of factors affecting productivity for given typical

condition. Hence, each respondent had a choice to select only one option for each factor. The responses were to be based on the understanding, knowledge and experience of the respondents and not related to any definite project. This simple and straight method was selected to establish a means of developing a list of factors affecting labor productivity in building construction.

**PILOT SURVEY AND QUESTIONNAIRE REVISION**

To improve the questionnaire section, a pilot study was accompanied. This section contained identification of different causes, collection, and conclusions of data. The application of this section benefited in better formation of the web- survey development , were sent by e-mail to laborers, contractors, architectures, owners, project managers, and project engineers of various building construction organizations. It was expected to complete and submit the response within 2 weeks. By the end of 2nd week, 25 responses collected from the pilot survey, 5 of those were incomplete and were removed from the set, leaving a total of 20 respondents in the database. Information obtained and the recommendations provided in from pilot survey are discussed below.

- Questionnaire should always start with the general information of the organization
- To get more suitable and consistence meaning some factors should be rearranged.
- Factors repeated with similar meaning should be removed.
- Some factors should be changed
- Better and accurate questionnaire related to the topic was achieved from the pilot study

**METHODOLOGY FLOW CHART**

SPSS (Statistical Package for the Social Sciences)

Statistics is a software package used for statistical analysis. Long produced by SPSS Inc., it was acquired by IBM in 2009. SPSS is a widely used program for statistical analysis

in social science. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, Sdata miners, and others. In addition to statistical analysis, data management (case selection, file reshaping, creating derived data) and data documentation (a metadata dictionary was stored in the data file) are features of the base software. In Civil Engineering field Statistical package for the social science (SPSS) software is mainly used for analyzing the questionnaires.

Statistics included in the base software: Descriptive statistics: Cross tabulation, Frequencies, Descriptive, Explore, Descriptive Ratio Statistics

**RELATIVE IMPORTANT INDEX (RII)**

The questionnaires are collected and analysed using statistical software package SPSS v 21. The ranking of factors was calculated based on Relative

$$RII(\%) = \sum a * \frac{n}{N} * \frac{100}{5}$$

Where:

- RII = Relative Important Index
- a = constant expression weight
- n = frequency of response
- N = total number of response

Importance Index

**DATA COLLECTED FROM THE SURVEY**

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 (Bohrnstedt and Knoke, 1994). A total of 125 questionnaires were sent to construction professional through e-mail in early November 2014. By the due date, a total of 77 questionnaires were received, resulting in a nearly 66.4% reply rate (Table 4.1). Missing data frequently occur after the respondent chooses not to response a question or when the respondent rejects to answer the question. (Kim, 1993). The most serious concern presented in the responses was some missing data. Some of the unclear response was clarified over the

phone. A total of 6 (i.e., 4.8%) invalid data received were deleted from research study. The reason to discard the data was incompleteness and invalid responses

**STATICAL DATA OF QUESTIONNAIRES SENT AND RECEIVED**

Description	No.	Percentage of Total (%)
Total Questionnaires Sent	125	100
Total Questionnaires Received	83	66.4
Invalid Data	6	4.8
Used for Study	77	61.6

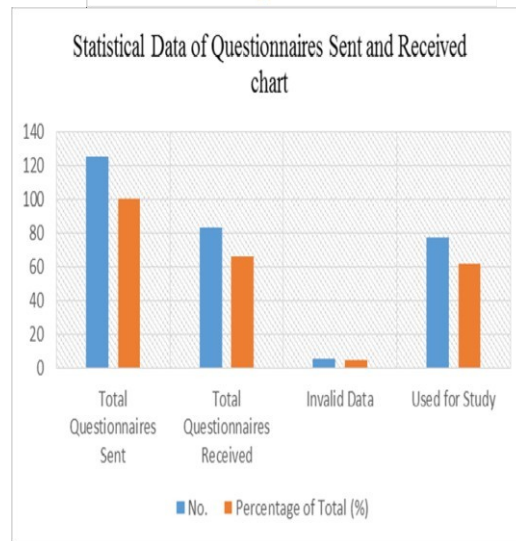
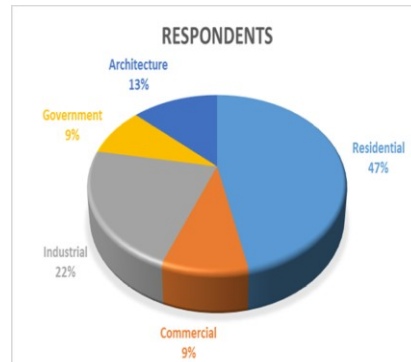
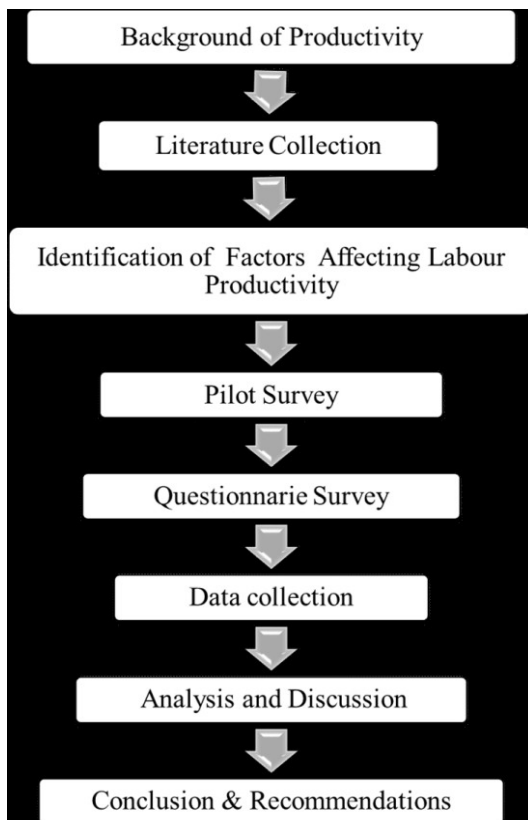


Fig : 4.1 Statistical Data of Questionnaires Sent and Received



**SIZE OF ORGANIZATION (Employees)**

The average number of employees in an organization was 36. Only building construction projects were considered for the study.

**NUMBER OF PROJECTS PER YEAR**

The average number of construction projects undertaken per year was 3-5.

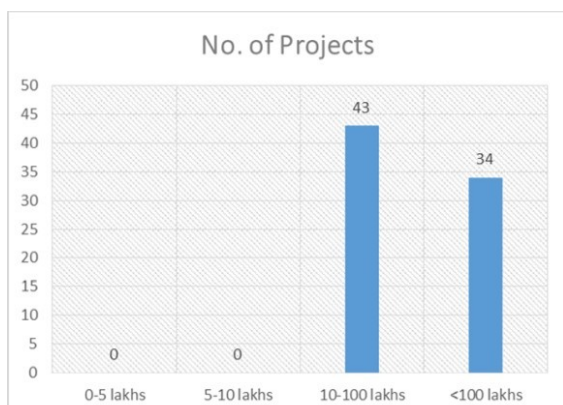
Only building construction projects were considered for the study.

**TYPE OF CONSTRUCTION PROJECTS**

The type of construction organizations that responded is shown in Table- 4.2 Only building construction project were considered.

**TYPICAL SIZE OF PROJECTS**

The size of the projects in Indian rupees undertaken by the respondents' companies is shown in Table 4.3. Only building construction projects were considered for the study. Table 4.



Typical Size of Projects, Research was performed considering, factors affecting labour productivity for building construction were identified, and their RII was calculated. These factors were classified into five groups: manpower factors, external factors, communication factors, resources factors, and miscellaneous factors. Different groups used in the study are discussed in detail.

## **CONCLUSION**

The theoretical model of this study proposed fifteen independent groups affecting the variation of Labour Productivity in the construction projects namely Labour factors, Supervision factors, External factors, Owner/consultant factors, Execution plan factors, Designer, Working time factors, Equipment factors, Financial factors, Quality factors, Project factors, Organization factors, Leadership and coordination factors, Health and safety factors. This research is intended to identify the causes of probable factors affecting labour productivity in building construction. This study investigates all possible factors through a structured questionnaire administered all over Coimbatore. The survey results are subjected to analysis, and the ranking of factors is calculated using the Relative Important Index. The basic ideas of the research is to study various factors affecting labor productivity on construction.

The target groups in this study were construction professionals. Total of 125 questionnaires were distributed, and 83 questionnaires (66.4 % response rate) were returned. Because project engineers, project managers have vast experience in construction, their adequate experiences were a proper suggestion to study about the various construction factors affecting labor productivity.

From the result and analysis the top most 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. So we have to recommend some ideas to develop the labour productivity from this research.

## **REFERENCES**

1. Mr. A .A. Attar<sup>1</sup>, Prof. A.K. Gupta, Prof.D.B.Desai-A Study of Various Factors Affecting Labour Productivity and Methods to Improve It.- IOSR Journal of Mechanical and Civil Engineering (IOSR- JMCE) ISSN: 2278-1684,PP:(11-14)
2. I.Fagbenle Olabosipo, O.Ogunde Ayodeji, D.Owolabi James-Factors Affecting the Performance of Labour in Nigerian Construction Sites - ISSN 2039 - 2117 Mediterranean Journal of Social Sciences Vol.2, No.2, May 2011MCSE - PP:(251-257)
3. P. Ganesh prabhu & D. Ambika- Study on Behaviour of Workers in Construction Industry to Improve production efficiency- International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development (IJCSEIERD) ISSN 2249-6866, Vol. 3, Issue 1, Mar 2013, PP(59-660)
4. Mr.S.S.Janagan, Prof K.Thirumalairaja-Comparative Study of Local and Migrant Labours for Productivity Enhancement in Construction Field -International Journal of Innovative Research in Science, Engineering and Technology,- ( Feb 2014)- PP:(26-35)
5. Jelle van Lottuma, Jan Luiten van Zanden- Labour productivity and human capital in the European maritime sector of the eighteenth century- Explorations in Economic History 53 (2014,) PP: (83– 100).
6. Mostafa E. Shehata, Khaled M. El-Gohary Towards improving construction labour productivity and project performance (3rd march 2012)