

# A STUDY OF VARIOUS FACTORS AFFECTING LABOUR PRODUCTIVITY IN ROAD CONSTRUCTION AND SUGGESTIONS TO IMPROVE IT

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**Abstract** — *The construction industry is the second largest industry after agriculture. Construction is normally classified into buildings and infrastructure projects. Construction industry comprises of a large number of Labours. Various studies were carried out on building projects related to productivity. The productivity of the labour varies according to work nature. This study is to identify and analyze what all are the factors that affects the productivity of labour in road construction. The questionnaire is prepared based on various literatures and data collected from the site. The most significant factor that affects the productivity is identified through the Relative Importance Index (RII) method. The findings indicate the top factors affecting the productivity of the labour are work area restriction, inspection delays, construction method, poor soil condition, unavailability of experienced labours, delays in decision making, high quality of required works and lack of training.*

**Keywords** - *Productivity, labour, RII method, factors affecting productivity*

## I. INTRODUCTION

### A. General

Construction is the world's largest and most challenging industry. Human resource today has a strategic role for productivity increase of any organization, and this makes it superior to the industrial competition. With the effective and optimum uses of it, all the advantages supplied by the productivity growth can be obtained. Construction is a key sector of the national economy in countries all around the world, as traditionally it took up a big portion in nation's total employment and its significant contribution to a nation's revenue as a whole. However, until today, construction industries are still facing a number of problems regarding the low productivity, poor safety and insufficient quality.

Productivity is the one of the most important factors that affects overall performance of any small or medium or large construction industry. There are number of factors that directly affect the productivity of labour, thus it is important for any organization to study and identify those factors and take an appropriate action for improving the labour

productivity. At the micro level, if we improved productivity, ultimately it reduces or decreases the unit cost of the project and gives the overall best performance of the project. There are number of activities involved in the construction industry. Thus the effective use and proper management regarding labour is very important in construction operations, without which those activities may not be possible..

### B. Construction industry in India

There are over 2.5 crore of construction workers in the country covering unskilled, semi-skilled and skilled levels constituted by masons, carpenters, bar benders, plumbers, electricians, tile layers, glass fitters, concrete workforce, etc. Other than those directly involved in the construction. Process a large amount of employment is produced due to the forward and backward linkages with the industry e.g. construction materials industry, real estate, etc. The work is handled by builders from the private sector, small contractors or petty contractors (Chotta Thekkedars) and construction groups with different degrees of capabilities from the micro to macro level projects.

Construction skills were transferred from father to children on a hereditary basis, more so the skills of masonry and carpentry. These have undergone changes over the years and construction skills are now acquired by the workers as a part of on-the-job training. They come to the Construction Projects as unskilled workers and over a period of time working with the main mason at the construction site, acquire levels of skilled workers. Normally, a learning curve of the order of 5 to 10 years is needed for the transformation. As a result, their productivity and quality of work in the initial period are also reflected in the work progress.

### C. Productivity

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

Labor is one of the basic requirements in the construction industry. Labor productivity usually relates manpower in terms of labor cost to the quantity of outputs produced

Achieving better labor productivity requires detailed studies of the actual labor cost. Various labors have different variables affecting their productivity levels. For every project, productivity, cost, quality, and time have been the main concern. Better productivity can be achieved if project management includes the skills of education and training, the work method, personal health, motivational factors, the type of tools, machines, required equipment and materials, personal skills, the workload to be executed, expected work quality, work location, the type of work to be done, and supervisory personnel.

**D. Objective and scope**

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 labor productivity.

The aim is supported by the objective stated below.

- i. Study and discuss the various factors affecting labor productivity in the construction industry.
- ii. Analyze and calculate the Relative Important Index (RII) of those factors affecting labor productivity.
- iii. To statistically analyze the factors affecting labor productivity.
- iv. To make recommendations to improve labor productivity in construction.

**II. RESEARCH METHODOLOGY**

**A. General**

This chapter describes the methodology used in this research. It includes research procedures, research population, sample size, questionnaire design. It also describes the approach of data collection and analysis of data.

In this study, factors that affect the productivity of road construction has been obtained from various literature studies. Questionnaires were designed on structural basis to get information about the personal data of the respondents and their experience on issues related to productivity in construction. About sixty questionnaires were sent to the construction industry by mail and interviews were conducted among construction personnel namely contractor, client, consultant, engineer and labour.

The data collected were analysed using the relative importance index (RII) method to rank the factors contributing to productivity on construction sites. The RII for each factor was computed from the analysis of the rating indicated by the respondents with the use of five-point likert scale. The value of 5,4,3,2 and 1 were respectively to very high, high, medium, low and very low. After ranking suggestions can be provided for improving the productivity. Figure 1.1 shows the research methodology of the project

**B. Methodology Chart**

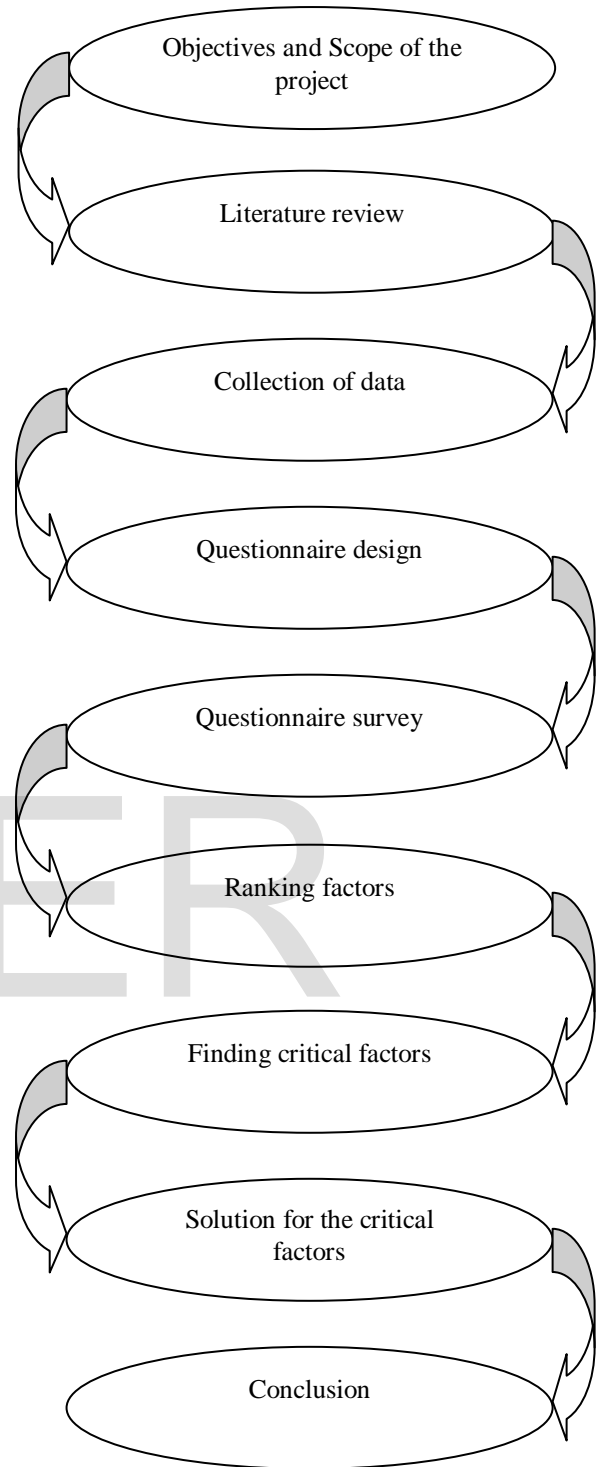


Fig 1.1 Methodology flowchart

### III. DATA COLLECTION

#### A. Pilot survey

Pilot survey is carried out among contractors, engineers and about the factors affecting productivity. From the pilot survey the following details are collected which are categorized under sub-divisions like Communication, equipment, External Factors, Financial, Health and Safety, Labour, Management, Material, Planning Factors, Project, Quality, Reworks, Site Layout, Time.

- **Financial**
  - Payment delay by Owners
  - Financial Condition of a Contractor
  - Shortage of Funds
- **Management**
  - Construction method
  - Lack of Supervision
  - Delays in decision Making
  - Land acquisition
- **External Factors**
  - Rain
  - High and Low Temperature
  - Political/Government Problems
  - Traffic
- **Quality**
  - High Quality of Required Works
  - Inspection delays
- **Equipment**
  - Improper procurement and equipment planning
  - Unavailability of Equipment
  - Equipment shifting delays
  - Old and inefficient equipments
  - Unskilled operators
- **Health and Safety**
  - Accidents
  - Noise
  - Safety consciousness
  - Individuals health
- **Site Layout**
  - Accessibility
  - Poor soil condition
  - Project location
  - Work area restrictions
- **Planning factors**
  - Working 7 days per week without taking holiday
  - Poor Work Planning
  - Misuse of time schedule
- **Material**
  - Material Shortages
  - Material transportation delays
  - Material procurement policy
  - Material storages

- **Labour**
  - Lack of Training
  - Unavailability of Experienced Labours
  - Based on Age
  - Physical fitness
  - Roaming or Unnecessary Moving
  - Over Burden
- **Reworks**
  - Client side
  - Repair and Repetition of works
  - Design issues
- **Project**
  - Type of work/activity
  - Clarity of details specified
  - Client side
- **Time**
  - Work overtime
  - Increasing no of labours in order to accelerate the work
- **Communication**
  - Poor communication
  - Instruction time / unclear instruction

#### B. Questionnaire framing

The relevant data for this investigation were collected from literature review and construction experts identify what are the factors affecting productivity.

As the outcome of pilot survey, there are 48 factors which are identified as major factors affecting productivity. These factors are tabulated in the questionnaire format.

The survey is carried out with contractors, structural engineers and architects to collect the required data.

Likert scale is used to rank the importance of each factors. This ranges from 1 to 5.

Table I-Importance scale for ranking the factors:

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

### IV. DATA ANALYSIS AND RESULTS

#### A. Data analysis method

The survey evaluation was done by using Relative Important Index (RII) method and found the top most factors affecting productivity. The following formula is used to calculate the relative importance index.

The formula used in the Relative Important Index

$$RII = \frac{\sum (X_i * Y_i)}{(Z_i * 5)} \quad (1)$$

Where,

RII = Relative Importance Index

$X_i$  = number of responses to the factors

$Y_i$  = the value of rating

$Z_i$  = total number of responses to the factors

**B. RII Value for factors by overall respondents**

Factors affecting the productivity in road construction are ranked by the overall respondents. The results of RII and ranking in the overall respondents as shown in the table II.

Table II- Overall RII value for factors affecting productivity

S.no.	Factors	RII
1.	Payment Delay by Owners	0.527
2.	Financial Condition of a Contractor	0.573
3.	Shortage of Funds	0.645
4.	Construction method	0.682
5.	Lack of Supervision	0.636
6.	Delays In Decision Making	0.655
7.	Land acquisition	0.618
8.	Rain	0.573
9.	High and Low Temperature	0.482
10.	Political/Government Problems	0.573
11.	Traffic	0.645
12.	High Quality of Required Works	0.655
13.	Inspection Delays	0.7
14.	Improper procurement and equipment planning	0.491
15.	Unavailability of Equipment	0.545
16.	Equipment shifting delays	0.545
17.	Old and inefficient equipments	0.573
18.	Unskilled operators	0.645
19.	Accidents	0.473
20.	Noise	0.473
21.	Safety Consciousness	0.573
22.	Individuals health	0.591
23.	Accessibility	0.636
24.	Poor soil condition	0.682
25.	Project location	0.645
26.	Work Area Restrictions	0.736
27.	Working 7 Days Per Week Without Taking Holiday	0.491
28.	Poor Work Planning	0.545
29.	Misuse of time schedule	0.536
30.	Material Shortages	0.536
31.	Material transportation delays	0.5
32.	Material procurement policy	0.518
33.	Material storages	0.536
34.	Lack of Training	0.655

35.	unavailability of Experienced Labours	0.673
36.	Based on Age	0.582
37.	Physical fitness	0.564
38.	Roaming or Unnecessary Moving	0.573
39.	Over Burden	0.573
40.	Client side	0.555
41.	Repair and Repetition of works	0.555
42.	Design issues	0.573
43.	Type of work/activity	0.536
44.	Clarity of details specified	0.573
45.	Work overtime	0.564
46.	Increasing no of labours in order to accelerate the work	0.591
47.	Poor communication	0.636
48.	Instruction time / unclear instruction	0.6

**C. Top factors affecting productivity**

Table III- Top factors affecting productivity

FACTOR	RII	RANK
Work Area Restrictions	0.736	1
Inspection Delays	0.7	2
Construction method	0.682	3
Poor soil condition	0.682	3
Unavailability of Experienced Labours	0.673	4
Delays In Decision Making	0.655	5
High Quality of Required Works	0.655	5
Lack of Training	0.655	5

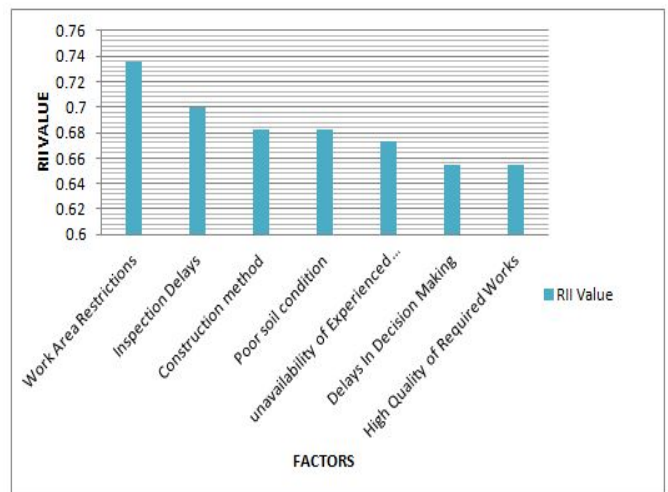


Fig 4.1 Top factors

D. Recommendations for improving the labour productivity

- Systematic planning of funds in advance
- On time payment to the workers
- Employ new technologies
- Proper, clear & in time supervision
- Commitment to productivity improvement should be there at all management levels.
- Pre monsoon plan to avoid work stop.
- Various external and natural factor risks should be considered in the budget estimation to minimize delays.
- Extra attention is required for quality of construction materials and tools used in their projects because using suitable materials and tools reduces both the time taken to finish the work and wastage of materials.
- Advance equipment planning
- Suitable equipment which are products of recent construction technology, should be introduced in the construction process. This can help to simplify the construction process and increase the productivity of labour in the construction process. Improving safety and environmental health conditions in the construction industry.
- Formal preplanning of the on-site construction activities
- Purchased material should be stored at appropriate locations and should be easily accessible and close to constructed site to avoid wasting labor time.
- Properly and in advance material procurement and management
- Proper training to the labour
- Motivation for workers towards project completion
- A nearby supervision should be adopted to minimize rework problem due to construction errors.
- Recruiting manager and project managers should recruit appropriate candidates to particular tasks.

V. CONCLUSION

In general productivity of the labour plays a major role in the civil industry. Out of this my thesis is about the factors affecting the productivity of the labours in road construction. This study is to sort out the top factor which reduces the productivity of labours in road construction. Based on relative importance index method analysis the top most factors were listed as work area restriction, inspection delays, construction method, poor soil condition, unavailability of experienced labours, delays in decision making, high quality of required works and lack of training.

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