

# FACTORS AFFECTING LABOUR PRODUCTIVITY IN ROAD CONSTRUCTION

Mr. D.Sukumar<sup>1</sup>, Mr. S.Saravanan<sup>2</sup>

Assistant Prof, Dept of Civil Engineering, Erode Sengunthar Engineering College, Thudupathi-638057, India<sup>1</sup>

Assistant Prof, Dept of Civil Engineering, Erode Sengunthar Engineering College, Thudupathi-638057, India<sup>2</sup>

**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**

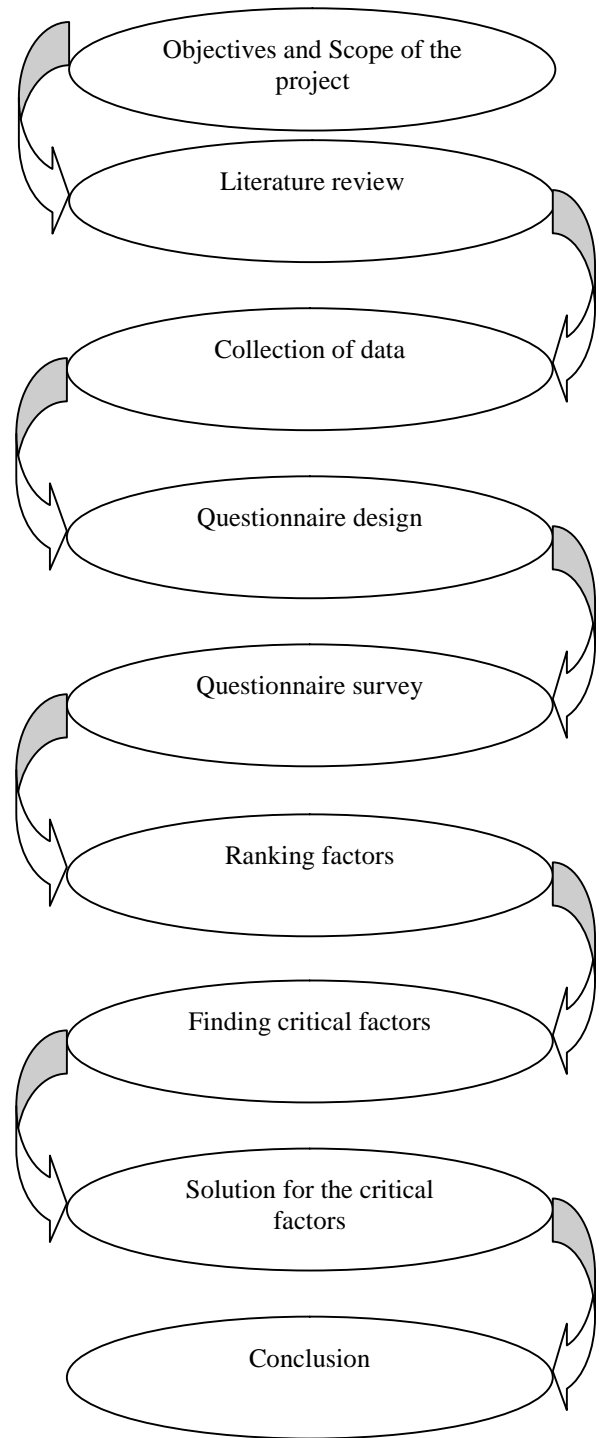


Fig 1.1 Methodology flowchart

**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

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

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    |

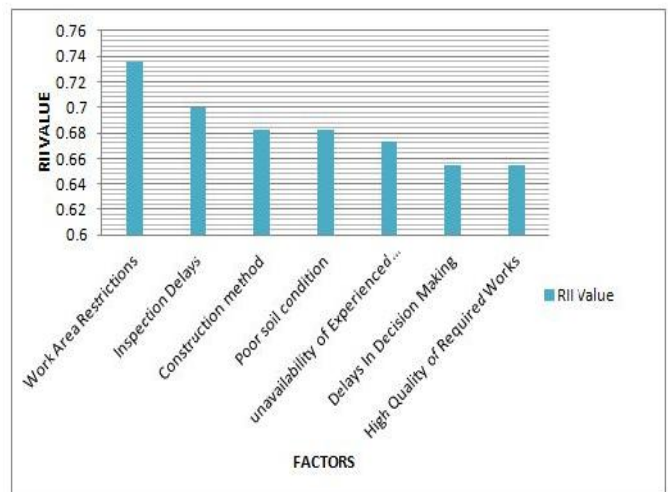


Fig 4.1 Top factors

**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.

#### REFERENCES

- [1] A. Alhomidan, "factors affecting cost overrun in road construction projects in Saudi Arabia," *International Journal of Civil & Environmental Engineering, IJEE-IJENS*, vol. 13, 2010.
- [2] A. Attar, A. Gupta, and D. Desai, "A study of various factors affecting labour productivity and methods to improve it," *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, vol. 1, pp. 11-14, 2012.
- [3] R. Navon, "Automated productivity control of labor and road construction," in *25th International Symposium on Automation and Robotics in Construction, Vilnius, Lithuania, 2008*, pp. 27-29.
- [4] N. C. Parikh and R. Samson, "BOT Road Infrastructure Projects: Process, Problems, and Suggestions," *Vikalpa*, vol. 24, pp. 3-12, 1999.
- [5] S. D. Anderson, D. J. Fisher, and S. P. Rahman, "Constructibility issues for highway projects," *Journal of Management in Engineering*, vol. 15, pp. 60-68, 1999.
- [6] C. Hendrickson and T. Au, *Project management for construction: Fundamental concepts for owners, engineers, architects, and builders*: Chris Hendrickson, 1989.
- [7] Abu Bakar Muzamil and, Bilal Khurshi, " Analysis of labour productivity of road construction in pakistan," in *International Journal of Engineering and Advanced Technology (IJEAT)*, vol. 3, pp. 153-159, 2014.
- [8] S.S.Janagan and K.Thirumalairaja, "Comparative study of local and migrant labours for productivity enhancement in construction field," in *International Conference on Engineering Technology and Science (ICETS)*, vol. 3, Special Issue 1, 2014.