IMPROVE THE FACTORS AFFECTING LABOUR PRODUCTIVITY IN INDIAN CONSTRUCTION INDUSTRY

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Abstract: The most challenging problem in the construction industry is to improve the efficiency of production. India is a growing economy. It is estimated to be the third largest economy by 2050. The growth of infrastructure is the starting point for a stable and productive society, which offers unique challenges, but also provides opportunities for the public and private sectors to the construction industry. The development engineers, supervisors and craftsmen in India, to identify the factors that affect the productivity of construction workers. Construction will lead to a massive construction and there will be a positive growth in the industries related to construction. Reports also indicate that these sectors have seen an upward trend. The objective of this paper is to identify the factors that affect labor productivity in construction projects. Review of the literature and factors recommended by experts to classify and analyze factors. This study presents the results of a survey to project managers, site engineer projects suffer technical and complex factors, such as labor, cost, time, quality and safety. The construction sector is diverse, with contractors, consultants, designers, owners and others. Productivity is a problem in many countries and one of the most important factors that affect the overall performance of any small, medium or large construction industry. This paper explains that the factors that affect labor productivity in the construction industry in India through many investigations and analyzes offer a proposal to improve productivity and justify the most influential factors.

Keywords- *Construction Industry, Construction Projects, Productivity, Construction Workers.*

1. Introduction

Labor productivity is a measure of the production of workers employed in both the business sector and the economy in general. The little work profitability as a methods for defending little managers and cost expanding generation. To get the most from the workers, the employer must invest in his company and establish long-term health facilities for the company. Later agriculture, the development business is the second biggest industry in India. The business represents 8 percent of India's total national output (GDP). It is the largest direct and indirect employer employing about 40 million people and creating more jobs each year. The residential and commercial buildings in the industry real estate industry, three major industries can be divided; including road infrastructure, railways, airports, energy etc. Industrial, which include refineries, textiles, pipes, Real estate creation plays a crucial role in making the industry grow and succeed. But because of the protracted slowdown in real estate, the construction industry seems to have been slow. The slowdown has also led to increased stocks across India.

1.1 Importance of labors and its productivity

Determining the productivity of their company's workforce can help reduce revenue and improve profits. Lower labor productivity compared to the hours of your employees may indicate that they are paying large amounts of work or that they have a large number of employees working at the same time. Manpower rationalization can help your company increase the productivity of as few employees as possible. This increases profits and can help your company to provide enough capital to start growing. Not improving your business productivity can capture all their profits, hinder compliance with financial commitments, or just remain the spotlight.

1.2 Factors Affecting Labor Productivity

The accelerometer is called "productivity". It's a productive relationship that needs to be created. Production measurement is described as a unit amount of total input. In buildings, weighs typically appear in weight, length or volume, and input resources are generally labor costs or hours of work. There are numerous measures in the construction industry that can be utilized by contractual workers to evaluate development costs. The estimations of these norms are extraordinary, yet most are the equivalent in the rule. There are numerous components that can influence the generation of development ventures. These are some of the most famous factors affecting labor productivity in the industry.

Overtime

Scheduling on a working day or more, based on standard 40-hours working days or week after week work results, execution and great effectiveness execution and because of result decrease.

- **Morale and Attitude**

The life- force work based on work, confidence, discipline, and joy worker can reduce due to various issues, including rising disputes, conflict, high risk, additional examination, multi-contract change, work barrier, Poor field conditions, and absence are included. Dirty work, etc.

- **Fatigue**

Fatigue can occur due to a long or unusual physical exertion.

- **Stacking of Trades**

This is when operating in space is actually limited by other contractors, which can be used to dig things, fail to use the tools, or easily find, maximize device loss, additional security risks, more Prevent visitors and best sizes.

- **Joint Occupancy**

This occurs when work is scheduled using the same installation or work area that must be shared or filled by more than one ship, and is not expected in the original offer or plan.

- **Beneficial Occupancy**

This is the result of work in or around or near other ships, owners or production equipment, which may cause noise, dust, or other serious hazard restrictions. It prevents or causes access restrictions.

- **Concurrent Operations**

This process has the effect of submitting any connection in any regard that you have scheduled, without the need to implement and monitor any other process.

- **Absenteeism and Turnover**

There is a lot of wasted time and money associated with high turnover and absenteeism in projects. Constructions projects limited jobs and high-demand demand, some structured projects in the areas are often more influenced by others. Necklace weather conditions (such as extreme heat or cold) increase attendance and change. Elective specialists are generally uninformed of the activity or region and require experienced laborers to quit working and show what they ought to do. The effect can be done for four workers for four days.

- **Mobilize/Demobilize**

This includes the dynamic project resources and their direction due to changes or delay, which may be due to prevention of work. When a worker goes away from one area or another, production decreases due to lost time.

- **Errors and Omissions**

Increases in errors and omissions have an impact on labor productivity because changes are generally made in an out-of-sequence way, resulting in reduced supervision or other negative impact.

- **Start/Stop**

This is due to interruption or work prevention, resulting in a table break, which usually starts at the start / end of work activities. Emergency companies will affect productivity and project costs. The job is fixed or re-distributed during holidays, including Thanksgiving, Christmas, and New Year etc. Workers tend to discuss leisure time and lose previous momentum with low productivity before returning to routine.

- **Reassignment of Manpower**

When workers are re-distributed, they face unexpected or maximum changes, causing damage, repositioning, and other problems caused by transport or transportation.

- **Late Crew Build-up**

This happens when the arrangement changes the weight and asset weight of the venture, and bit by bit improves the assets of assets, because of absence of assets or because of the assets of the asset. The impact can be over 10%.

- **Crew Size Inefficiency**

This is to change the staff's best size by including or expelling individuals from the staff. At the point when laborers are included from the group or wiped out, the exertion and mood of the first group is hindered and efficiency is lost.

- **Site Access**

It is the result of planning to enter intervention or work area. This may be due to ladders, roads, lanes, inadequate person lifts, or overcrowded workplaces.

- **Logistics**

Handling of insufficient or incomplete materials, owner material, procurement practices, or lack of controls can cause problems with purchase or delivery, as well as other problems. This prevents, delays or interrupts the normal flow of material into the work area, warehouse or storage area. It may also be a result of a change in a contract, resulting in disruption or delays which result in alternative or additional material changes.

- **Security Check**

This may occur because workers enter or leave the area, "beating" inside and outside, checking the toolbox, transporting workers to the safe area, etc.

- **Learning Curve**

When the rotation of the crew causes the addition of new workers to the crew or if additional staff are required within the crew, the guidance period occurs to identify the new conditions. They must then
know the scope of the work, the location of the tools, the work procedures, etc.

- **Hazardous Work Area**

This occurs when working in an area classified as hazardous and requires special safety equipment and clothing. Constraints can limit the time and exposure of workers to the region, reducing the use of tools in the region.

- **Holidays**

If workers work during the holiday, they will not only create factors for the expense of holiday salaries, but they will also reduce productivity. It can be treated as a moral factor because workers are far from families and work instead of enjoying holidays, or they can be considered separate. In both cases, there is usually loss of productivity in mind.

- **Shorter Daylight Hours**

Delays can delay work from one time to another, which may include seasonal changes. Various districts and areas around the globe likewise contain various measures of sunshine hours via season.

- **Weather and Season Changes**

Working in seasonal changes, temperature zones or climate changes can cause heat, cold, rain, dust, or other temperature or seasonal changes that can be affect workers outside usual situations.

- **Rain, Dust**

Most jobs do not work in the rain or dust, but many do not work, especially those living in humid areas or bad weather conditions in the country and must work or risk losing a lot of wages. It can happen, it happens, in the rain, but not without efficiency due to rain, vision, safety, morals, discomfort, hazards and other problems.

- **Shift Work**

This is when work is done at any time other than the first shift or work shift on the working day. Working in the second and third moves is less productive and can be founded on a shorter working period. Reducing the hours of light and the problems of trying to continue where the last shift has stopped means low productivity.

- **Working in Operating Area**

Efficiencies can occur when work is near operating units, such as boiler heat, emissions smoke, blast zones, etc. This may result in the interruption of work or the need for protective clothing, work permits or other requirements.

- **Tool and Equipment Shortage**

This happens when there is not enough quantity or quality of tools and equipment to meet the needs of the project.

- **Area Practices**

It may be due to a lot of breaks, personal or personal events, or other modes in addition to business, property, country, project location or other construction area.

Literature Review

Many studies have been explored in labor productivity researchers in the construction industry. The researcher has tried to present a brief review of the literature available, which is published in the articles related to research articles and published in technical journals published in magazines, magazines and websites. Literature is reviewed in the current study to create a logical analysis done by dimension and factor affecting the labour productivity. This study is designed to analyze labour productivity and its influential factor in NCR region. **Karthik & Rao (2019)** studied and determined the impact of human parameters on LP construction. The introduction of human parameters in the construction industry helps to assess the LP of labor-intensive activities. In addition, the methods, results and recommendations further studied in the direction of this research will not only facilitate the development of LP evaluations, but will also facilitate the development of LPs and result in higher quality work results. This study provides a new construction companies with services to estimate the LP and manage the required labor, taking into account the artificial parameters that help to assess the LP. **Karthik & Rao(2019)** The purpose of this paper is to identify the underlying factors that affect the loss of labor productivity (LP) in India and to identify these factors using natural observation methods in construction projects. From past studies, factors affecting LP were selected for investigation and statistical analysis to form an identified set of factors. Construction personnel can use this method to measure loss of LP using data obtained by survey methods, and also for construction personnel to improve LP of various activities at construction project site help to make timely decisions. **Dixit *et al.*(2019)** The authors try to summarize the development of production output (CP) research from an article published in Systematic Literature Review (SLR) from 2006 to 2017. Utilizing the catchphrase "Building creation or watchwords in ", eight chose articles and 101 articles were chosen for the SLR. In the result of the survey, CP research focuses on seven major areas: industry level research, factor/attribute research, measurement technology, simulation and model, equipment and technology, CP related problems and issues, and improved technology to make the proposed framework. **Venkatesh & PS (2019)** Study of the major construction projects are completed with a large amount of human resources and equipment resources. Compelling utilization of these assets is basic to the accomplishment of these tasks. Project profitability and effectiveness are the result of better management of human and equipment resources. To improve productivity management, measure actual productivity, compare it to benchmarks, identify factors that affect productivity, and implement management tools to improve productivity. People and equipment productivity should be reviewed at the project level. Especially in construction work, human and equipment productivity is declining around the world. **Durdyev *et. al* (2019)** study to Off-site manufacturing (OSM) is considered another way to improve building productivity. In any case, OSM has gotten restricted consideration from analysts and industry partners, particularly in creating nations. The review of 75 development experts solicited respondents to evaluate the effect from 30 OSM-related limitations. These results may be useful for building professionals who want to increase construction production through the use of OSM as alternative technology in developed countries. **Palikhe *et al.* (2019)** Low labor productivity generation in the construction industry is a major problem in the construction industry because it leads directly to the price and schedule growth. Despite extensive research on labor productivity factors, few studies have studied the productivity of construction labor in developing countries. The perceived labor productivity factors are interrelated and modeled using random and feedback loops, and four standard qualitative models are proposed to help quantify labor productivity. Therefore, the major factors identified in this study can create a road map in the future to increase productive constraints. **KV & Bhat (2019)** (1) in this paper investigated the causes of delays in India and found that financial related causes are the most significant causes of delays in Indian projects. (2)This study determines the reasons for the delay, the main factors of which depend on the type of project. (3) Power outages, labor shortages and low productivity are the main causes of power project delays. (4) Water resources project is delayed by land acquisition and public interruption.(5) In this research, we identified the causes of delays in the DB project and the DBB project, and compared the causes of delays

between the two contract types.

2. Methodology

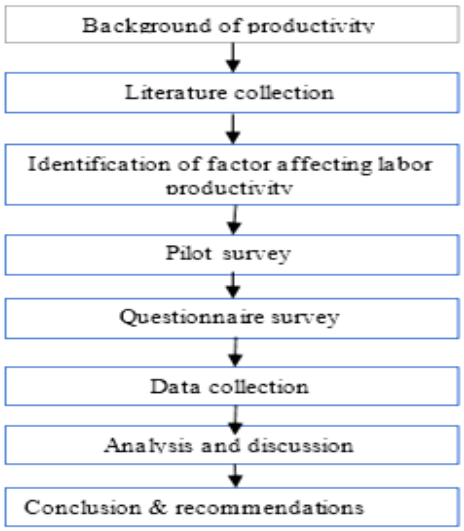


Fig 1. Methodology

3. Data Collection and Analysis

Productivity has been generally defined as the ratio of outputs to inputs. In the construction industry, profitability is normally taken as mean labour productivity, that is, units of work set or delivered per man-hour. The backwards of labour productivity, worker hours per (unit rate), is additionally normally utilized. Productivity is defined as the ratio of earned to actual hours. The issue with this idea is in building up dependable standards, for setting gauges. It likewise relies upon the technique used to gauge profitability, and on the degree to which record is taken of the considerable number of elements which influence it.

Labour Productivity = Output / Work hour

3.1 Data Collection

The questionnaire consists of different elements that affect labour productivity. More than 45 members were sent and sent, and 35 surveys were obtained. Surveying these surveys helped us determine the relative importance index and the significance index for each term. The questionnaire consists of different elements that affect labour productivity. More than 50 members were sent and sent, and 35 surveys were obtained. The study of these surveys helped us determine the relative importance index and the significance index for each chapter.

The information gathered to identify the strongest business management factors for the task was conducted through a survey of participants associated with the daily training of developers in different regions of Delhi, India. The survey was designed to enable respondents to categorize their responses according to their assessment. The examination of the information was completed using two strategies to be a specific technique (index of relative importance) and technical (importance index).

The investigation information was gathered through a customary poll. Based on previous studies on labour productivity and the contribution of experts, professionals and professionals from local industry, 30 factors affecting labour productivity in construction were identified in Delhi, NCR.

The target population included civil engineering and construction contractors classified by contractors. The survey was the target population only of the region Delhi, NCR. To get a sample size that represents the population of the population, use the following equations:

$$n = \frac{m}{1 + \frac{(m-1)}{N}}$$

Where n, m and N = Sample size of limited population, Sample size of unlimited population, sample size of available population The following formula is estimated by:

$$m = \frac{z^2 * p * (1-p)}{e^2}$$

Where z= data usage level is used, such as confidence levels are 95% and 90% for 1.96 and 1.645
P = value of estimated population, e = guessed sample error. Because the value of p is unknown, **sincich et al. (2002)** refers to a value of 0.50 for use in sample size.

$$\mathrm{m} = \frac{1.645^2 * 0.50(1-0.50)}{(0.05)^2} = 271$$

Here the level of confidence is taken at 90%. According to the total number of classified contractors, the sample size is 152. Here 344 is total sample which is consider for the total number of registered or classified contractor present in the survey location.

$$\mathrm{n} = \frac{271}{1 + \frac{(271-1)}{344}} = 152$$

The examination got a sum of 45 reactions, which is 30% of the example size required. The 30 factors covered in the survey are in four groups: (1) technology, (2) human / workers, (3) administration and (4) external.

3.2 Primary Data

The present study is more focused on primary data. Primary data is data collected again through questionnaires, interviews, observations, experiences, etc. Of the participants are selected specifically for the study. The primaries represent a collection of new information to achieve the objective of the investigation. This method is used in research to convert data into knowledge and information. Primary data play an important role in all types of research because they provide clear information about any observation and experience.

3.3 Factors of Productivity Improvements

There are several factors that affect productivity, whether positive or negative, as shown in Table 1, some factors can be controlled due to natural constraints.

Table: 1 Factors of Productivity Improvement

S. No.	Factor.
1	Capital Investments In Production
2	Capital Investments In Technology
3	Capital Investments In Equipment
4	Capital Investments In Facilities
5	Economies Of Scale
6	Workforce Knowledge And Skill Resulting From Training And Experience
7	Technological Changes
8	Work Methods
9	Procedures
10	Systems
11	Quality Of Products
12	Quality Of Processes
13	Quality Of Management
14	Legislative And Regulatory Environment
15	General Levels Of Education
16	Social Environment
17	geographic factors

3.4 Construction Productivity Measurement Techniques

- Input/ Output
- Experience-based models
- Measuring productivity using project milestones

- Activity model (Work sampling)
- Factor Models
- Cost reporting method

4. Preparation of Questionnaire and Analysis of Result

Questions in the respondent profile were created to collect information such as job position, the experience of the respondent, the locations of the current and/or previous works and contact information. The next questions were targeting the factors affecting labor productivity in the three different groups. It included factors affecting labor productivity.

So as to encourage the investigation, after the writing audit and the center meetings, an arrangement was figured for gathering field data and making an assessment procedure and numerical qualities Ranking of the different elements as indicated by their criticalness, and ascertaining their Relative Importance Index (RII). The Relative Importance Index (RII) was utilized to choose different expert's assessments of the RII in development ventures. RII is

$$RII = \Sigma W/(A \times N).$$

W is the weight given to each factor by the respondents and extents from 1 to 5.

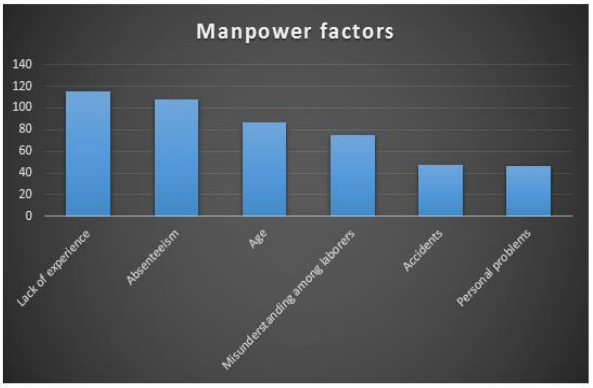
W ranges =1-very less, 2- less, 3-Moderate, 4- High, 5-Highest

A is the highest weight = 5.

N is the total number of responders.

4.1 Manpower Factors Affecting Labor Productivity

It is clarifies the positioning of the different factors in the labor gathering. A lack of labor experience was ranked first in the manpower group; with a Rank value 1. Lack of labor experience has a great influence on productivity.



Truancy with rank 2, Age with rank 3, Misunderstanding among workers with rank 4, Accidents with rank 5, Personal issues with rank 6 has effect on profitability as indicated by rank.

Fig 2. Manpower factors

Resource Factors Affecting Labor Productivity

It presents the ranking for factors of the resource group. For example violation of safety laws with rank 1 has a great influence on productivity and Quality of required work with rank 2, Differing site conditions from the plan with rank 3, Increase in the price of the material with rank 4, Poor access within construction site with rank 5, Poor site condition with rank 6, Lack of required construction material with rank 7, Lack of required construction tools/equipment with rank 8 has accordingly influence on productivity.

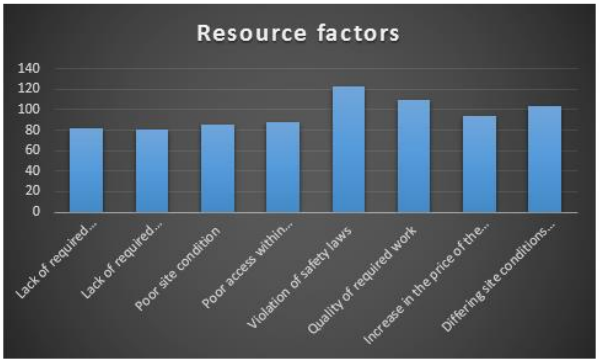


Fig 3. Resource factors

5. Conclusion and Future Work

In today's world the construction industry is rated as one of the key industry. It helps in creating and accomplishing the objective of society. Earlier information of work efficiency during development can set aside cash and time. Ventures for these tasks are extremely high and on account of the multifaceted nature in development, different variables can very influence generally speaking profitability, hence the undertaking can wind up including considerably additional time and cash so as to be finished.

- Exhaust of material supply, and crew were sent to another project.
- The lack of materials interrupted the normal pattern of the crew and resulted in the crew stretching the work.
- Little or no work available which slows down the work.
- Absenteeism, Lack of experience and Lack of materials
- Poor site condition
- Material storage location
- Poor access within construction site
- Violation of safety laws

Improving factors to achieve higher labour productivity :

a. Don't blame your employees on low labour productivity.

b. Set goals to the employees & gives reward according to their problem.

c. Use advanced technology

d. Manage efficient use of overtime hours.

Training courses should be conducted in any projects to improve productivity. Companies should also conduct productivity studies of previous data so as to improve accuracy of cost estimation and improve labour productivity.

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