

A Thesis on

# **IMPROVEMENT OF LABOUR PRODUCTIVITY IN CONSTRUCTION INDUSTRY**

Submitted for partial fulfillment of award of

**MASTER OF TECHNOLOGY**

Degree in

**CONSTRUCTION TECHNOLOGY & MANAGEMENT**

By

**WAQQAS AHMAD**

**Roll No.:1801103023**

Under the Supervision of

**Mr. Sarthak Singh Rajput**

Assistant Professor

Integral university



*Inspiring Existence*

**Department of Civil Engineering**

**Integral University, Lucknow–**

**226026(U.P.)**

**2019-20**

## **DECLARATION**

I declare that the research thesis entitled “**IMPROVEMENT OF LABOUR PRODUCTIVITY IN CONSTRUCTION INDUSTRY**” is the bonafide research work carried out by me, under the guidance of **Mr.Sarthak Singh Rajput, Assistant Professor, Department of Civil Engineering, Integral University, Lucknow**. Further I declare that this has not previously formed the basis of award of any degree, diploma, associate-ship or other similar degrees or diplomas, and has not been submitted anywhereelse.

Date:

Place: Lucknow

WAQQAS AHMAD  
1801103023  
Department of Civil Engineering  
Integral University

## **CERTIFICATE**

*Certified that the thesis entitled “**Improvement of labour productivity in construction industry**” is being submitted by **Mr.Waqqas Ahmad (Roll no.1801103023)** in partial fulfillment of the requirement for the award of degree of **Master of Technology (CTM)** of **Integral University, Lucknow** , is a record of candidate’s own work carried out by him/her under my supervision and guidance.*

*The results presented in this thesis have not been submitted to any other university or institute for the award of any other degree or diploma.*

**Mr.Sarthak Singh Rajput**  
Assistant Professor  
Department of Civil Engineering  
Integral University, Luckno

## **ACKNOWLEDGEMENT**

First, I wish to express my sincere gratitude to my supervisor **Mr. Sarthak Singh Rajput** for his enthusiasm, patience, insight comments, helpful information and practical advice that has helped me in completing my research “**Improvement of labour productivity in construction industry**” successfully.

I would also like to thank to **Dr. Syed Aqeel Ahmad, Professor and Head of Department Civil Engineering** for his encouragement during the Project. I would also like to thank to all the faculty staff of Civil Engineering department.

WAQQAS AHMAD

1801103023

Department of Civil Engineering

Integral University

## **TABLE OF CONTENT**

<b>Content</b>	<b>Page No</b>
<b>Title Page .....</b>	<b>(i)</b>
<b>Declaration .....</b>	<b>(ii)</b>
<b>Certificate.....</b>	<b>(iii)</b>
<b>Acknowledgement.....</b>	<b>(iv)</b>
<b>List of tables .....</b>	<b>(vii)</b>
<b>List of Figures .....</b>	<b>(viii)</b>
<b>List of abbreviations and symbols.....</b>	<b>(ix)</b>
<b>CHAPTER-1 INTRODUCTION .....</b>	<b>1-10</b>
<b>1. Background .....</b>	<b>1-2</b>
<b>1.1 Labour productivity problems .....</b>	<b>2-3</b>
<b>1.2 Various Factors affecting labour productivity .....</b>	<b>3-5</b>
<b>1.2.1 Manpower Factors Affecting Labor Productivity.....</b>	<b>4</b>
<b>1.2.2 Resource Factors Affecting Labor Productivity .....</b>	<b>2.3</b>
<b>1.2.3 Miscellaneous Factors Affecting Labor Productivity .....</b>	<b>5</b>
<b>1.3 Defining productivity .....</b>	<b>5-6</b>
<b>1.4 How Does Productivity Relate to the Construction Industry?.....</b>	<b>6</b>
<b>1.5 Top 5 Most critical factors affecting labour productivity n Lucknow region.....</b>	<b>6</b>
<b>1.5.1 Unskilled Labor .....</b>	<b>6</b>
<b>1.5.2 Unavailability of material .....</b>	<b>6</b>
<b>1.5.3 Shortage/Breakdown of tools and equipments.....</b>	<b>6</b>

1.5.4 Frequent absenteeism of labours .....	6-7
1.5.5 Delay in payment/wages .....	7
1.6 Problem Statement .....	8
1.7 Objective of the study .....	9
1.8 Scope of the study.....	10
<b>CHAPTER-2 LITERATURE REVIEWS AND INFERENCE .....</b>	<b>11-31</b>
2.1 Literature Reviews .....	11-24
2.2 Inference of literature reviews.....	25-31
<b>CHAPTER-3 RESEARCH METHODOLOGY .....</b>	<b>32-42</b>
3.1 Research Flow Chart.....	32
3.2 Questionnaire survey Form .....	33-36
3.3 Data Collection Using RII method .....	37-42
<b>CHAPTER-4 ANALYSIS, RESULTS AND DISCUSSION .....</b>	<b>43-51</b>
4.1.SPSS Analysis.....	43
4.1.1Frequencies Statistic .....	43-45
4.1.2 Pie- Chart analysis .....	45-48
4.1.3 Histogram analysis.....	48-51
4.2 Discussion.....	51
<b>CHAPTER-5 RECOMMENDATION AND CONCLUSION .....</b>	<b>52-60</b>
5.1 Conclusion .....	52-53
5.2 Recommendations .....	53-56
References.....	57-59

## **LIST OF TABLES –**

<b>Table 1.1 Manpower factors affecting labour productivity .....</b>	<b>4</b>
<b>Table 1.2 Resource factors affecting Labour Productivity .....</b>	<b>4-5</b>
<b>Table 1.3 Miscellaneous factors affecting Labour productivity.....</b>	<b>5</b>
<b>Table 2 Inference Table .....</b>	<b>25-31</b>
<b>Table 3.1 Questionnaire Survey Table .....</b>	<b>33-36</b>
<b>Table 3.2 Data Collection Relative Importance Index Table .....</b>	<b>37-42</b>
<b>Table 4.1 Frequency Statistics .....</b>	<b>43</b>
<b>Table 4.2 Frequency table of unskilled labour .....</b>	<b>44</b>
<b>Table 4.3 Frequency table unavailability of material .....</b>	<b>44</b>
<b>Table 4.4 Frequency table shortage of tools and equipments .....</b>	<b>44</b>
<b>Table 4.5 Frequency table of frequent absenteeism of labour .....</b>	<b>45</b>
<b>Table 4.5 Frequency table of Delay of Payment .....</b>	<b>45</b>

**LIST OF FIGURES-**

**FIG1.1 Labour productivity index for US construction industry .....3**

**FIG4.1 Pie Chart of Unskilled labour affecting productivity ..... 46**

**FIG4.2 Pie Chart of Unavailability of material affecting productivity ..... 46**

**FIG4.3 Pie Chart of Shortage of tools and equipments affecting productivity..47**

**FIG4.4 Pie Chart of Frequent absenteeism of labour affecting productivity....47**

**FIG4.5 Pie Chart of Delay in payment/wages of labour affecting productivity .48**

**FIG4.6 Histogram of Unskilled labour affecting productivity .....49**

**FIG4.7 Histogram of Unavailability of material affecting productivity ..... 49**

**FIG4.8 Histogram of Shortage of tools and equipments affecting productivity ....50**

**FIG4.9 Histogram of Frequent absenteeism of labour affecting productivity ..... .50**

**FIG4.10 Histogram of Delay in payment/wages of labour affecting productivity. . 51**

**FIG 5. Dial time recorder ..... 55**



## CHAPTER – 01

### INTRODUCTION

#### 1. Background

Productivity is that the foremost mentioned topic among the construction industry. Productivity is that the relation of output to any or all or any or variety of the resources won't to show out that output. Resources comprise labour, capital, time, energy, material etc. Productivity interprets directly into value savings and profit.

$$\text{Productivity} = \text{output} / (\text{resource used})$$

Construction is labour oriented business. Most of the event laborers shift to cities square measure from poor families and square measure illiterate. Their lack of education and talent produce their selections very restricted. when they come back to large cities, they have to face numbers of problems due to the dearth of expertise and lack of ability.

There square measure quite twenty 5 million of construction workers in Republic of Asian nation. Performance of labour in building construction is littered with such loads of things and is often connected to the performance of it slow, value and Quality. Therefore, it is vital to evaluate factors touching labour productivity in building construction. Construction is that the world's largest and most tough business. Human resource today incorporates a strategic role for productivity increase of any organization, and this makes it superior among the commercial competition. With the effective and optimum uses of it, all the advantages provided by the productivity growth are going to be obtained. Construction could also be a key sector of the economic system for countries all around the world, as traditionally it took up a huge portion in nation's total employment and its important contribution to a nation's revenue as a whole. However, until today, construction industries square measure still facing sort of problems regarding the low productivity, poor safety and keep quality. Productivity is that the one in each of the foremost important issue that have an impression on overall performance of any little or medium or huge construction industry. There are unit sort of things that directly affects the productivity of labour, so it is vital for associate organization to visualize and establish those factors and take an appropriate action for rising the labour productivity. At the little level, if we tend to tend to improved productivity , ultimately it reduces or decreases the price of project and provides overall best performance of project.

There square measure sort of activities involved among the construction industry. so the effective use and proper management regarding labour is improbably important in construction operations whereas not that those activities may not be achievable. Labor productivity is one in every of the smallest amount studied areas among the development trade. Productivity improvement succeed high value production with minimum investment. Considering the very fact that profit margins square measure tiny on construction comes, value savings related to productivity square measure crucial. The chief obstacle to up labor productivity is mensuration labor productivity. Poor productivity of construction employees is one in every of the causes of value and time overruns in construction project. This paper focuses on improvement of labour productivity within the industry. It covers the development labour productivity definitions, aspects, factors moving and strategies to boost it. This study provides a pointers for necessary steps needed to boost construction labour productivity. The productivity of labour particularly} necessary especially in developing countries, wherever most of the building construction work continues to be on manual basis. The implementation depends to varied

extents on property demands at the worldwide, national, regional, local, company and individual level.

up the assembly potency is that the most difficult issue in each developed and developing countries.

### **1.1-Labour productivity problems-**

Construction needs in depth manual labour. Human performance and productivity are dependent on each other. Therefore, the foremost normally used live of productivity is that the constant contract bucks of latest construction work per work hour (Hendrickson 1998). A study by Teicholtz (2004) unconcealed that over forty years (1964-2003) the development trade lags compared to any or all alternative non-farm industries in developing and applying labor saving techniques and work instrumentality for labor. Figure 2-1 depicts construction labor productivity changes as against all non-farm industries from 1964-2003.

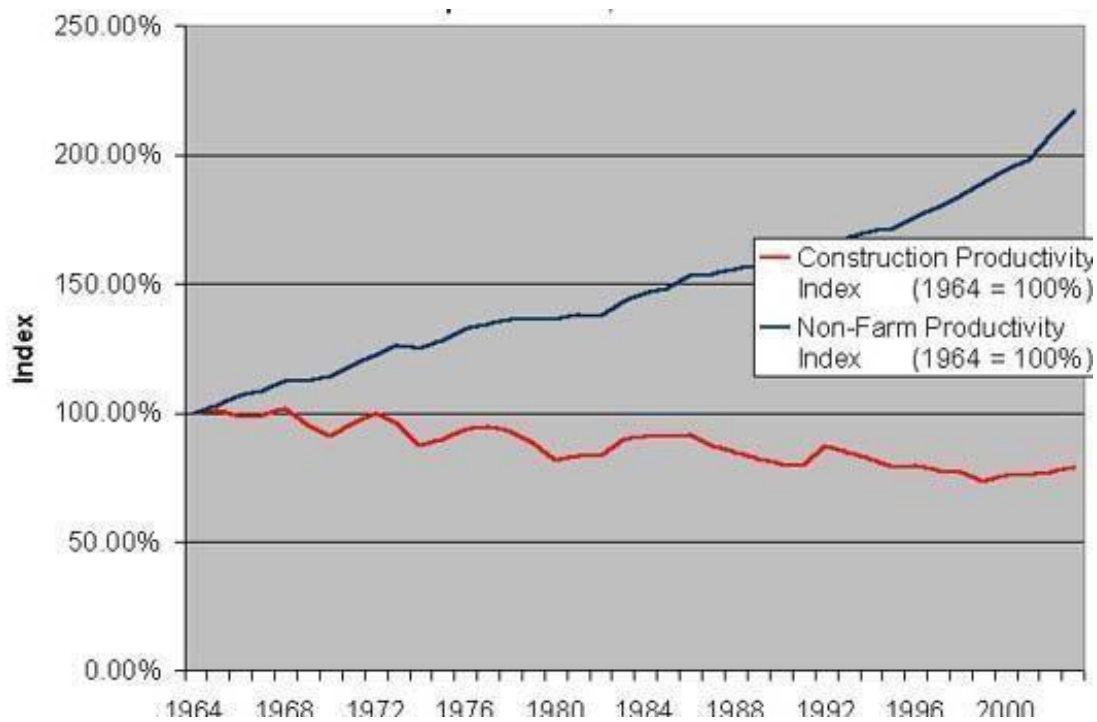


Figure 1-1 Labor productivity index for US construction industry and all non-farm industries from 1964 through 2003 (U.S. Bureau of Labor Statistics 2004).

Hendrickson (1998) addressed the time utilization of the typical craftsman. solely forty you look after a employees

time is taken into account to be productive, with fifty five nada unproductive time, and five to non-public time.

**1.2-Factors affects labour productivity** A study terribly like our study was conducted in North American nation referred to as the “Productivity enhancements on Canadian province Major Construction comes.” among this, a study conducted within the uk was cited. The employees were asked to rank a general list of common issues on their construction website and additionally they were asked to estimate the respective).lost time per downside space (McTague 2002).

## Manpower Factors Affecting Labor Productivity

Table 1.1 presents the ranking of the various factors in the manpower group

Factors	Rank
Lack of experience	1
Absenteeism	2
Age	3
Misunderstanding among labours	4
Accidents	5
Personal Problem	6

## Resource Factors Affecting Labor Productivity

Table 1. 2 presents the ranking for factors of the resource group

Factors	Rank
Lack of required construction material	1
Lack of required construction tools/equipment	2

Poor site condition	3
Increase in the price of the material	4

## □ Miscellaneous Factors Affecting Labor Productivity

Table 1.3 presents the ranking factors for the miscellaneous group

Factors	Rank
Payment Delay	1
Working Overtime	2
Weather condition	3
Insufficient lighting	4
Shortage of Water	5

### **Defining Productivity**

Many definitions of the word “productivity” exist. For the premise of this study the Merriam-Webster definition are going to be used. Merriam-Webster defines productivity because the quality or state of being productive. Labor productivity is usually measured as output per employee or output per labor-hour. though there are endless definitions for productivity, all of them talk over with productivity as a comparison of input versus output. Productivity = Output/ Input. hyperbolic productivity happens once either

- Output is constant, whereas input is reduced, and/or

- Input is constant, whereas either the number or quality of output has been hyperbolic or increased.

### **How Does Productivity Relate to the Construction Industry?**

Productivity is a supply of competitive advantage. Increasing productivity can increase output or the standard of output and if at a quicker rate than competition, edges are going to be achieved through the added through the merchandise (McTague 2002).

### **Top 5 Most critical factors affecting labour productivity in Lucknow region**

**Unskilled labour** –Unskilled labour will have adverse effects on the development comes, attributable to their lack of technical talent and skill they will price immense loss of cash..

**Unavailability of material**-Shortage and delay in materials provide is argued to be one among the foremost vital factors that result in delay in construction project delivery globally. The foremost powerful explanation for delay in material provide was found to be poor materials procural and inventory management system, that has different underlying reasons like late identification of the kind of materials required.

**Shortage/breakdown of equipment and tools**- Breakdown and damages to the plant and equipment is very affected to the worker's productivity. as a result of once staff are playacting well in a very specific work if the machinery breaks down they may not continue with their work meaning the worker's productivity decreases

Management ought to offer the acceptable and quality instrumentation unless staff have to be compelled to perform with caliber tools which will consume longer.

**Frequent absenteeism of labour**-There ought to be enough labour within the worksite to proceed the work. once the relevant employee is absent it's to interchange another employee to it position then he take your time to urge aware of the work thanks to that employee productivity decreases

Replacement staff are sometimes not aware of the work or space, and need experienced staff to prevent work and show them what to try and do. The impact will be up to a few days of lost work for every employee.

**Delay in payment/wages-** Most of the staff within the construction sites haven't higher economic background. Monthly wage is that the main financial gain of their family thus late payments might cause issues to them which will lead to loss of productivity.

Delays might occur as a result of income originating from the shopper, the contractor, or by poor planning/management of funds on the project. However, the laborers mustn't suffer from those problems caused within the high level.

## **Problem statement**

Labor productivity is one among the smallest amount studied areas at intervals the development trade. Productivity sweetening reach high price production with minimum investment. during this study {we will|we'll|we ar going to} establish and analyse the factors that are poignant labour productivity in housing industry.

Performance of labour in building construction is laid low with such a big amount of factors and is sometimes joined to the performance of your time, price and Quality

we'll counsel a hunt methodology within which we'll use SPSS software package for the applied mathematics analysis of things poignant labour productivity. For information assortment we'll use Relative Importance Index technique (RII).



## **Objective**

- To study the vital factors affecting labour productivity
- Analyze and calculate the vital of these factors poignant laobour productivity.
- To create correct tips ,and vital recommendations to attain the utmost labour productivity in construction industry.

## **Scope of the study**

In housing industry, hyperbolic in labour productivity brings higher profit and chance for investment.

Labour productivity drives economic process meaning we have a tendency to are ready to:-

- Produce a lot of or service with the assistance of restricted quantity of resource.
- Increased productivity leads to higher profit.
- For labour, enhanced productivity will results into higher wages and higher operating condition.

## CHAPTER-02

### LITERATURE REVIEW

#### **1. JOURNAL OF THE CONSTRUCTION DIVISION, VOLUME-102, ISSUE- 4, 2000**

##### ***“Rising Productivity in Industrial construction by John D. Borchering”***

This paper hierarchical productivity, labor, union restriction, and overtime at the highest of the last of ten issues areas wherever major improvement were required. within the antecedently researched paper, the producing organization that were sweet-faced with similar productivity issues indicate that half-hour to hr improvement is accomplishable by correct management of human resources. during this paper, attitudes of workmen, supervisors and managers on ten0000000 to a billion three time period to 10 time period comes area unit compared to those of people on abundant smaller business building comes.

#### **2. Labour productivity within the industry by Anthea Savidis and Anthony Mills.**

This paper discusses the distinctive nature of the development business, concentration on the employment of labour productivity. Comparisons and parallels between construction and alternative sectors of the economy area unit highlighted. additionally, the Australian {construction business| housing industry|} is compared to the industry within the USA and UK.

Various ways of activity construction productivity area unit mentioned, including, operating links between employment levels within the industry expenditure are examined conditions, incentives and their relationship with labour productivity.

**3. CONSTRUCTION MANAGEMENT AND ECONOMICS,VOLUME- 18, ISSUE- 1,2000 “Trends in productivity improvement within the North American country industry by David Arditi and Krtishna Mochtar 2000”**

Surveys of the highest four hundred North American country contractors were conducted in 1979, 1983, 1993 to spot the areas with potential for productivity improvement within the industry. The trends within the findings of those surveys area unit determined and taken. The results indicate that price management, scheduling, style practices, labour coaching. And internal control area unit their functions that systematically over the years area unit perceived as having respectable area for productivity improvement

**4. STRUCTURAL SURVEY, VOLUME- 23,2005 “Factors moving construction labour productivity for Malaysian residential comes by M.R. Abdul Kadir, W.P. Lee, M.S. Jaafar, S.M. Sapuan and A.A.A. Ali 2005”**

This paper evaluates and ranks the importance, frequency and severity of project delay factors that have an effect on the development labour productivity for Malaysian residential comes a complete of one hundred respondents consisting of seventy contractors, eleven developers and nineteen consultants participated during this study. The respondents were asked to point how important every item of an inventory of fifty project connected factors was to construction labour productivity. the info were then subjected to the calculation of importat indices that enabled the factors to be hierarchical The 5 most vital factors known by them were: material shortage at web site}; non-payment to suppliers inflicting the stoppage of fabric delivery to site; modification order by consultants; late provision of construction drawing by consultants; and incapability of contractors’ site management to organise site activities. On the opposite hand, the 5 most frequent factors were: material shortage at project site; non-payment to suppliers inflicting the stoppage of fabric delivery to site; late provision of progress payment by the consumer to main contractor; lack of foreign and native employees within the market; and coordination downside between the most contractor and contractor

**5. PERSONAL REVIEW, 12 JUNE 2007 “ *Activity productivity within the industry by Paul Crawford and Claude Bernard Vogl 2006*”**

The paper provides an summary of ways accustomed live productivity within the industry. the benefits and drawbacks of average labour productivity and total issue productivity measures area unit mentioned intimately, and also the relationship between these 2 measures is established each in theory ANd in an application at the business level. it's steered that by establishing a sturdy mensuration framework information potency is outlined simply. steering on areas wherever improvement is needed provided.

**6. “*Productivity improvements: understand the workforce perceptions of productivity first by Chan, Paul and Kaka, Ammar (2007)*”**

This study extends previous analysis efforts by establishing the perceptions of white-collar managers and blue-collar workers with regard to the factors that have an effect on construction labour productivity. A questionnaire survey was administered to a purposive sample of four hundred project managers and a convenience sample of 152 construction employees, eliciting distinct variations between the 2 teams, with professional managers being a lot of involved with resource designing problems and therefore the blue-collar employees putting a lot of price on the use of resources. moreover, the observations exhibited that integration these variations through worker involvement LED to productivity enhancements current trends of their perceptions of fifty nine factors that were extracted from an intensive literature review and preliminary study. This was followed by the identification of excellent observe examples from worksite observations across 2 project sites .

**7. DIVISION OF CONSTRUCTION MANAGEMENT LUND INSTITUTE OF TECHNOLOGY, LUND UNIVERSITY, “*Improvement of Labour Performance and Productivity in Uganda’s Building Industry by Henry Alinaitwe, 2008*”**

The objective of this analysis was to search out the present state of efficiency of building craftsmen, the factors that have an effect on labour productivity and ways that of rising labour

productivity. Activity sampling performed on the most important activities among building craftsmen shows that craftsmen use concerning forty % of obtainable time on productive activities and of this solely concerning twenty % is employed for creating buildings grow. It more shows that building craftsmen pay concerning thirty three % of the time on non-value adding activities. Results from a form survey indicate that 10 of the foremost important issues affecting labour productivity in Uganda are incompetent supervisors;-

1. Lack of skills of the workers
2. Rework; lack of tools/equipment
3. Poor construction methods
4. Poor communication
5. Inaccurate drawings;
6. Stoppages as a result of work rejected by consultants
7. Insecurity; tools/equipment breakdown and harsh climatic conditions

**8. JOURNAL OF CIVIL ENGINEERING AND MANAGEMENT, VOLUME- 14, 2008**

***“Effect of basic motivational factors on construction workforce productivity in turkey by Aynur Kazaz , Ekrem Manisali & Serdar Ulubeyli 2008”***

Human resource these days contains a strategic role for productivity increase of any organization, and this makes it superior among the industrial competition. With the effective and optimum usage of it, all the benefits provided by the productivity growth is obtained. This usage is simply getable by establishing clear and intelligible criteria for the factors moving labour. Hence , it's aimed throughout this analysis that the factors poignant construction labour productivity in Turkey ar determined, defined, and examined all. A survey was applied to eighty two companies to urge needed information. According bto results, the foremost effective factors cluster is structure factors.

**9. JOURNAL OF CIVIL ENGINEERING AND MANAGEMENT,2009 “Factors affecting the performance of construction projects in the Gaza strip by Adnan Enshassi , Sherif Mohamed & Saleh Abushaban 2009”**

Construction comes set among the nation, Palestine suffer from many problems and complex issues. Consequently, the target of this paper is to identify the factors moving the performance of native construction projects; and to elicit perceptions of their relative importance. A comprehensive literature review was deployed to urge a gaggle of things believed to possess a control on project performance. a whole of 1 hundred and twenty questionnaires were distributed to several key groups of project participants;

namely homeowners, consultants and contractors. The survey findings indicate that every one 3 groups agree that the foremost necessary factors moving project performance are: delays as a results of borders/roads closure leading to materials shortage; inconvenience of resources; low level of project leadership skills; increase of material prices; inconvenience of terribly previous and qualified personnel; and poor quality of accessible instrumentality and raw materials. supported these findings, the paper recommends that: 1) project homeowners got to work collaboratively with contractors and facilitate regular payments thus on beat delays, disputes and claims; 2) project participants have to be compelled to actively have their input among the strategy of decision- making; and 3) continuous coordination and relationship between project participants are required through the project life cycle thus on resolve problems and develop project performance.

**10. INTERNATIONAL JOURNAL OF PROJECT MANAGEMENT, VOLUME**

**30. “Analysing factors affecting delays in Indian construction projects by Hemanta Doloi, Anil Sawhney, K.C. Iyer, Sameer Rentala 2012**

Construction comes in Republic of country are experiencing widespread delays. Because of a dramatic shift among the potential and volume of the Indian construction sector over the last decade, the necessity of a scientific analysis of the reasons of delays and developing a clear understanding among the trade professionals are terribly crucial. employing a specific set of 45 attributes, this analysis initial legendary the key factors impacting delay in Indian construction industry thus established the affiliation between the specified attributes for developing prognostication models for evaluating the impacts of these factors on delay. A google sort and personal interviews have formed the thought of this analysis. method and regression modeling were accustomed examine the importance of the delay factors. From the method, most significant factors of construction delay were referred to as (1) lack of commitment; (2) inefficient worksite } management; (3) poor computing device coordination; (4) improper

planning; (5) absence of clarity in project scope; (6) lack of communication; and (7) substandard contract. Regression model indicates slow decision from owner, poor labour productivity, architects' reluctance for modification and work on thanks to mistakes in construction are the reasons that have a control on the delay of the project significant ly

**11. CJASR,ISSN:2251-9114,2012 “Factor influence labour productivity and the impact on construction industry by siti hafizan Hassan. 2012”**

The study is concentrated on seasoned company that is concerned in construction and listed in Pusat Khidmat Kontraktor (PKK). the tactic adopted was by distributing a hundred set of form to respondents from contractor category A till category C that is listed in PKK and there have been solely thirty seven responses received. The analysis done showed that project management talent was the foremost vital issue that affects the labour productivity. The positive impact influenced by labour was technology exploration meantime project delay is that the negative impacts influenced by productivity of labour in industry. By characteristic the factors influencing labour productivity and therefore the impacts in construction, this could facilitate the development players to enhance the productivity and project performance



**12. IOSR JOURNAL OF MECHANICAL AND CIVIL ENGINEERING,2012**  
**“A Study of Various Factors Affecting Labour Productivity and Methods to Improve It by Mr.A .A. Attar, Prof. A.K. Gupta,Prof.D.B.Desai 2012”**

Poor productivity of construction staff is one in all the causes of price and time overruns in construction comes. As construction may be a labor-intensive business, this paper focuses on labour productivity within the industry. It covers the development labour productivity definitions, aspects, factors touching it. the most outcome from the literature is that there's no normal definition of productivity. This study provides a pointers for necessary steps needed to enhance construction labour productivity. The productivity of labour is {especially} vital especially in developing countries, wherever most of the building construction work continues to be on manual basis. This paper reports on a survey created on project managers and seasoned engineers of building comes in Sangli , Kolhapur & Pune districts, wherever a rise in productivity is being wanted. Respondents were needed to rate exploitation their expertise however all factors have an effect on productivity with relevance time, price and quality. The survey was disbursed by a form and responses. The 10 most vital factors touching labour productivity for tiny, medium and enormous firms ar known.

**13. INTERNATIONAL JOURNAL OF CONSTRUCTION MANAGEMENT,**  
**VOLUME 13,2013. “Critical Analysis of the Key Factors Affecting**  
**Construction Labour Productivity –An Indian Perspective by Anu V Thomas**  
**2013”**

Construction labour productivity is influenced by a large number of things. there has not any research been conducted which addressed productivity problems in Republic of India. A form survey was conducted, within the state of Kerala in Republic of India, to spot the factors impacting construction labour productivity and their underlying relationships. Among the forty four factors thought-about, material inconvenience was known because the most important issue impacting construction productivity. correlational analysis utilized to grasp the underlying relationships among the factors, categorised the factors into 10 teams, namely,

(1) tool and instrumentality issues; (2) poor labour motivation; (3) improper supervision; (4) poor material planning; (5) poor worksite management; (6) improper drawing management; (7) project management incompetency; (8) craftsmen issues; (9) lack of conferences and (10) lack of communication. The analysis findings can offer higher insights to construction practitioners into productivity problems in Republic of India and guide their efforts to attain productivity improvement

**14. PROCEEDING ENGINEERING, VOLUME- 63, 2013 “Productivity in Construction and Industrial Maintenance” Loeraa I., Espinosab G., Enríquezc C., Rodríguezb J. (2013)”**

**Loeraa et al. (2013):** developed methodology to assess the labour productivity of business maintenance comes. during this methodology they projected the work sampling tool so as to spot the most factors affecting labor productivity yet as they projected apply lean thinking to improvement labor productivity. The analysis focuses on the event of a technique to assess the labour productivity of the development maintenance comes. In the methodology we have a tendency to proposes the utilization of a piece sampling tool so as to spot the most issue that effects labour productivity {as we have a tendency toll|also|additionally|further|furthermore|in addition|likewise|moreover|similarly|still|yet} as we propose apply lean producing tools to improvement of labour productivity

**15. INTERNATIONAL JOURNAL OF ENGINEERING AND ADVANCED TECHNOLOGY,ISS:2249-8958,VOLUME -2, ISSUE- 4, APRIL 2013 “Critical FactorsAffecting Labour Productivity InConstruction Projects: Case Study Of South Gujarat Region Of India by Mistry Soham, Bhatt Rajiv, April 2013”**

Labour productivity is one of the least studied areas at intervals the construction trade. Productivity enhancements reach higher value savings with tokenish investment. Due to the actual fact that profit margins area unit tiny on construction comes, value savings

associated with productivity are crucial to turning into a productive contractor. The chief natural event to rising labor productivity is measured labor productivity. The main objective of this study is to notice crucial factors poignant labour productivity. A survey was conducted in south Gujarat region cities on civil contractors. Total 51 feedbacks were conducted and analysed by using Analytic hierarchy process(AHP) and Relative Importance Index(RII) techniques. 5 most crucial factors in drizzling order from RII Technique are Delay in payments, talent Of Labour, Clarity Of Technical Specification, Shortage Of Materials, and Motivation of Labour. According to AHP Technique 1st five crucial factors in drizzling order are High/Low Temperature, Rain, High Wind, Motivation of Labour, and Physical Fatigue. Contractors shall act on these factors to improve labour productivity in construction comes.

**16. JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT, VOLUME- 139, ISSUE-8, AUG- 2013 “Effect of Workers social learning:- focusing on absence behavior by S.Ahn, S.h Lee, Robert P. Steel 2013”**

Many construction comes still suffers from the productivity loss originating from employees absence. To modify this drawback, construction managers have chiefly used formal controls (penalties) targeting those people UN agency presents excessive absence. Therefore, this paper studies the system level result of employees social learning exploitation experimental analysis with simulation so as to increase the information of the social aspects in employees absence behavior

**17. INTERNATIONAL JOURNAL, 25 FEB 2014 “ADOPTION OF QUALITY MANAGEMENT PRACTICES:- An investigation of its relationship with labor productivity for labor-intensive manufacturing companies by Josu Takala Daryl J. Powell Fentahun Moges Kasie 2014”**

The purpose of this paper is to analyze the link between quality management apply and labor productivity in effortful producing corporations during a developing nation and benchmark with the globe average Primary and secondary information were collected from thirty four selected firms. the first information were obtained employing a form survey to work out the standard management adoption level of every company exploitation the ecu Business Excellence Model.

Secondary information conjointly collected so as to work out labor productivity of every organization and benchmark with international norms. during this analysis, labor productivity is measured by revenues per worker and total assets per worker and located that adopting quality management has robust relationships with revenue per worker not like total quality per worker that's weakly connected

**18. INTERNATIONAL JOURNAL EMERGING TECHNOLOGY AND ADVANCEDENGINEERING, VOLUME-4,ISSUE-5, MAY 2014 “ANALYSIS of Key Factors Affecting the Variation of Labour Productivity in Construction Projects by Dr. Sutapa Hazara2014”**

Productivity plays a very important role within the construction sector. It helps construction industries to be competitive, to attain goals and to satisfy the neutral and price propositions. The objectives of this analysis are; one, distinguishing the key factors poignant the variation of labour productivity within the construction comes in metropolis, India, second, assessing the impact of the influenced factors on the variation of labour productivity and finally, providing recommendations to cut back the variation of labour productivity. The higher than objectives are achieved through the analysis of fifty three questionnaires and also the results of this analysis shows that, there are unit six main factor that have important impact on the labour productivity variation within the construction comes.

**19. INTERNATIONAL JOURNAL OF SCIENTIFIC AND ENGINEERING RESEARCH, VOLUME- 6, ISSUE-9 “Study on Labours Productivity Management in Construction Industry” by Dharani K (2015)**

found that construction laborers are migratory in nature and so geographically sorting out employment. therefore their employers persevere dynamic and it's not possible for each the parties to develop long relationships and loyalty to their employers. He found most of the development labour is additionally engaged in another profession like farms,factory, domestic servant etc. and therefore they are doing not provide full importanceto construction work and have a tendency to figure informally. because of this labour cultivates informality, and Informality lowers productivity growth. During this paper, two differing types of projects (Residential building and Industrial building) in two completely different places (Thanjavur

and Chennai) are taken. it's found, supported the Schedule of Rates 2015 that labour productivity is lesser than expected in labour intensive works (e.g., Excavation) and it's relatively higher in works wherever general standardization is introduced (e.g., Formwork).

**20. IJRET EISSN:2319-1163|PISSN:2321-7308, JULY 2016 “Importance of measurement of labour productivity in construction by Prachi R. Ghate, Prof. Pravin R. Minde 2016”**

Productivity is a very important side of housing industry which will be used as associate degree index for potency of production. economical management of construction resources will lead to higher RII technique. measuring of labour productivity is completed exploitation time-motion study technique. RII technique discovered prime 10 hierarchic factors that have an effect on labour productivity. the information assortment is completed by time-motion study technique shows mean labour as extremely vital issue moving labour productivity. From the analysis of information collected it's ascertained that activity of labour productivity is useful in saving the time of the project further as value of project while not hampering the standard of labor. productivity that will facilitate to reach value and time saving. Construction is labour destined trade. It heavily depends on the talents of its hands. The labour is industry's most valuable quality. it's vital to boost potency of production by rising productivity of labour. Decreasing productivity of project has invariably been major concern for housing industry. the aim of this project is to check the importance of measuring of labour productivity in construction trade around metropolitan sector when finding the factors poignant labour productivity..

**21. PERSPECTIVES OF CRAFT WORKERS, VOLUME- 164, 2016**  
**“Factors Affecting Labor Productivity: Perspectives of Craft Workers” by Kazaz Aynur, Ulubeyli Serdar, Acikara Turgut, ER Bayram (2016)”**

**Kazaz et al. (2016)** known thirty seven factors and categorised beneath four teams like structure, economical, physical, and socio-physiological factors. Analyze the dispersion of the factors at intervals cluster gaggle bunch} and also the compactness of every factors group. and also the results discovered that structure factors cluster has the very best weighted mean

and lowest variance values. So, factors beneath structure factors cluster are perceived as equal vital by craft employees. And in economical and physical factors were additionally perceived equal vital by craft employees. Only, factors categorised beneath socio-psychological factors group had completely different importance degrees consistent with craft employees analysis

**22. INTERNATIONAL JOURNAL OF CONSTRUCTIVE RESEARCH IN CIVIL ENGINEERING, VOLUME- 3, ISSUE-4.2017 “A Critical Literature Review of Labour Productivity in Building Construction Biren Patel, Prof J. J. Bhavsar, Dr. Jayeshkumar Pitroda\ 2017”**

There are 2 measures of construction productivity: (1) total issue productivity, wherever outputs and all inputs were considered; and (2) partial issue productivity, wherever outputs and single or chosen inputs are thought-about. In construction, productivity is sometimes taken to mean labour productivity, that is, units of labor created per man-hour. So, here productivity is that the magnitude relation of output to labour price or output to figure hour. rising the assembly efficiency is that the most difficult issue in each developed and developing countries. Building construction comes are littered with several issues like price, time, quality, safety etc. currently a day’s competitive setting of building construction forces construction firms to extend their labour productivity values so as to stay their position within the trade.

**23. INTERNATIONAL JOURNAL OF ENGINEERING TECHNOLOGY SCIENCE AND RESEARCH, VOLUME-4, ISSUE-11, NOV-2017 “A Review on productivity improvement in construction industry” by Shinde V.J, Hedao M 2017**

This paper includes systematic literature review on productivity in industry the paper provides an review on totally different ways that are used for menstruation of construction productivity like labour issue, management factors and external factors, the paper additional reviews on the various innovations that are created for improvement in labour productivity in industry. From this study it absolutely was over that there are several ways of accelerating labour productivity that consists of material following, healthy and safe operating condition and effectivemanagement system

**24. TECHNOLOGIES AND MANAGEMENT RESEARCH, VOL-5, ISSUE-2, FEB  
2018 “Study on Factors affecting Labour Productivity In Residential  
Buildings In Indian Scenario By PomalarV, Aravindraaj, Nandhini K 2018”**

In this review INTERNATIONAL JOURNAL OF ENGINEERING paper the highest thirty five factors were known that are additional classified into 3 teams mistreatment SPSS tools, that use for applied math analysis. SPSS is most generally used software package used program for statistical analysis of science. In further to applied math analysis, information management, the factors were analyzed and hierarchal according their corresponding relative importance index were calculated. The paper conclude with the issue touching labour productivity loss in Residential Building

## **INFERENCE**

<b>S.No</b>	<b>Researcher</b>	<b>Topic</b>	<b>Research Work</b>
<b>1</b>	<b>John borcherding</b>	Improving Productivity in Industrial construction	In this paper, attitudes of workmen, supervisors and managers on 100000000 to 1000000000 3 yr to 10 yr projects are compared to those of individuals on much smaller commercial building projects
<b>2.</b>	<b>David Arditi and Krtishna Mochtar</b>	Trends in productivity improvement in the US construction industry	The results indicate that cost control, scheduling, design practices, labour training. And quality control are their functions that consistently over the years are perceived as having considerable room for productivity improvement
<b>3.</b>	<b>M.R. Abdul Kadir, W.P. Lee, M.S. Jaafar, S.M. Sapuan and A.A.A. Ali</b>	Factors affecting construction labour productivity for Malaysian residential projects	the five most frequent factors were: material shortage at project site; non-payment to suppliers causing the stoppage of material delivery to site; late issuance of progress payment by the client to main contractor; lack of foreign and local workers in the market; and coordination problem between the main contractor and subcontractor.
<b>4.</b>	<b>Paul Crawford and Bernard Vogl</b>	Measuring productivity in the construction industry	The paper provides an overview of methods used to measure productivity in the construction industry. The advantages and disadvantages of average labour productivity and total



			factor productivity measures are discussed in details.
5.	<b>Chan, Paul and Kaka, Ammar</b>	Productivity improvements:underst and the workforce perceptions of productivity first.	This study extends previous research efforts by establishing the perceptions of white-collar managers and blue-collar workers with respect to the factors that affect construction labour productivity. A questionnaire survey was administered to a purposive sample of 400 project managers and a convenience sample of 152 construction workers
6.	<b>Henry Alinaitwe,</b>	Improvement of Labour Performance and Productivity in Uganda's Building Industry	Results from a questionnaire survey indicate that ten of the most significant problems affecting labour productivity in Uganda are incompetent supervisors; lack of skills of the workers; rework; lack of tools/equipment; poor construction methods; poor communication; inaccurate drawings; stoppages because of work rejected by consultants; insecurity; tools/equipment breakdown; and harsh weather conditions
7.	<b>Aynur Kazaz , Ekrem Manisali &amp; Serdar Ulubeyli</b>	Effect of basic motivational factors on construction workforce productivity in turkey	A survey was applied to 82 firms to obtain required data. According bto results, the most effective factors group is organizational factors
8.	<b>Adnan Enshass,</b>	Factors affecting the	. The survey findings indicate that all 3

	<b>Sherif Mohamed &amp; Saleh Abushaban</b>	performance of construction projects in the Gaza strip	groups agree that the most important factors affecting project performance are: delays because of borders/roads closure leading to materials shortage; unavailability of resources; low level of project leadership skills; escalation of material prices; unavailability of highly experienced and qualified personnel; and poor quality of available equipment and raw materials
9.	<b>Hemanta Doloi, Anil Sawhney, K.C. Iyer, Sameer Rentala</b>	Analysing factors affecting delays in Indian construction projects	From the factor analysis, most critical factors of construction delay were identified as (1) lack of commitment; (2) inefficient site management; (3) poor site coordination; (4) improper planning; (5) lack of clarity in project scope; (6) lack of communication; and (7) substandard contract
10.	<b>Mr.A .A. Attar, Prof. A.K. Gupta,Prof.D.B.Desai</b>	A Study of Various Factors Affecting Labour Productivity and Methods to Improve It	. This paper reports on a survey made on project managers and experienced engineers of building projects in Sangli , Kolhapur & Pune districts, where an increase in productivity is being sought
11.	<b>Anu V Thomas</b>	Critical Analysis of the Key Factors Affecting Construction Labour Productivity	Factor analysis employed to understand the underlying relationships among the factors, categorized the factors into ten groups, namely, (1) tool and equipment issues; (2) poor labour motivation; (3) improper supervision; (4) poor material planning; (5) poor site management; (6)

			improper drawing management; (7) project management incompetency; (8) craftsmen issues; (9) lack of meetings and (10) lack of communication
<b>12.</b>	<b>Loeraa I.</b>	Productivity in Construction and Industrial Maintenance”,	In this methodology they proposed the work sampling tool in order to identify the main factors that affecting labor productivity as well as they proposed apply lean thinking to improvement labor productivity.
<b>13.</b>	<b>Mistry Soham, Bhatt Rajiv</b>	Critical Factors Affecting Labour Productivity In Construction Projects: Case Study Of South Gujarat Region Of India	Total 51 feedbacks were analyzed through the Analytic hierarchy process(AHP) and Relative Importance Index(RII) techniques. Five most crucial factors in descending order from RII Technique are Delay in payments, Skill Of Labour, Clarity Of Technical Specification, Shortage Of Materials, and Motivation of Labour.
<b>14.</b>	<b>S.Ahn, S.h Lee, Robert P. Steel</b>	Effect of Workers social learning:- focusing on absence behavior	this paper studies the system level effect of workers social learning using experimental analysis with simulation in order to extend the knowledge of the social aspects in workers absence behavior
<b>15.</b>	<b>Josu Takala Daryl J. Powell Fentahun</b>	Adoption of quality management practices:- An	In this research, labor productivity is measured by revenues per employee and total assets per employee and

	<b>Moges Kasie</b>	investigation of its relationship with labor productivity for labor-intensive manufacturing companies	found that adopting quality management has strong relationships with revenue per employee unlike total asset per employee that is weakly related
16.	<b>Dr. Sutapa Hazara</b>	Analysis of Key Factors Affecting the Variation of Labour Productivity in Construction Projects	The above objectives have been achieved through the analysis of 53 questionnaires and the result of this analysis shows that, there are six main groups which have significant impact on the labour productivity variation in the construction projects
17.	<b>Dharani K</b>	“Study on Labours Productivity Management in Construction Industry”	found that construction laborers are migratory in nature and therefore geographically searching for employment. Thus their employers keep on changing and it is impossible for both the parties to develop long-term relationships and loyalty to their employers. He found most of the construction labour is also engaged in some other profession like farms, factory, domestic servant etc. and hence they do not give full importance to construction work and tend to work informally
18.	<b>Kazaz Aynur, Ulubeyli Serdar, Acikara Turgut, ER</b>	Factors Affecting Labor Productivity: Perspectives of Craft	<b>Kazaz et al. (2016)</b> identified 37 factors and categorized under four groups such as organizational,

	<b>Bayram</b>	Workers	economical, physical, and socio-physiological factors. Analyze the dispersion of the factors within a group and the compactness of each factors group. And the results revealed that organizational factors group has the highest weighted mean and lowest standard deviation values
<b>19.</b>	<b>Biren Patel, Prof J. J. Bhavsar, Dr. Jayeshkumar Pitroda</b>	A Critical Literature Review of Labour Productivity in Building Construction	Building construction projects are affected by many problems such as cost, time, quality, safety etc. Now a day's competitive environment of building construction forces construction companies to increase their labour productivity values in order to keep their position in the industry.
<b>20.</b>	<b>Shinde V.J, Hedaoo M</b>	A Review on productivity improvement in construction industry"	From this study it was concluded that there are many methods of increasing labour productivity which consists of material tracking, healthy and safe working condition and effective management systems
<b>21.</b>	<b>Anthea Savidis and Anthony Mills.</b>	Labour productivity in the construction industry	This paper discusses the unique nature of the construction industry, focussing on the use of labour productivity. Comparisons and parallels between construction and other sectors of the economy are highlighted. In addition, the Australian construction industry is

			compared to the industry in the USA and UK
<b>22.</b>	<b>Siti Hafizan Hassan</b>	Factor influence labour productivity and the impact on construction industry	The study is focused on experienced company which is involved in construction and listed in Pusat Khidmat Kontraktor (PKK). The analysis done showed that project management skill was the most important factor that affects the labour productivity
<b>23.</b>	<b>Prachi R. Ghate, Prof. Pravin R. Minde</b>	Importance of measurement of labour productivity in construction	The data collection is done by work study method shows skilled labour as highly important factor affecting labour productivity. From the analysis of data collected it is observed that measurement of labour productivity is helpful in saving the time of the project as well as cost of project without hampering the quality of work. productivity which can help to achieve cost and time saving.

## **CHAPTER-03**

# **RESEARCH METHODOLOGY**

## **METHODOLOGY**

Background of Productivity



Literature collection



Identification of factors affecting labour productivity



site selection



Questionnaire Survey



Using RII method to Rank the factors



Using SPSS software for analysis of the data



Analysis and discussion



Conclusion and recommendations

## Questionnaire Survey and Data Collection

### Questionnaire survey:-

S.NO	Questions	Practically ignored	Does not Effects	Moderately effects	Highly Effects
1	How much the unskilled labour affects the productivity ?				
2	How much the unrealistic work planning and scheduling in order to complete the project on time effects labour productivity ?				
3	How much the behavior of supervisor affects the performance of labour ?				
4	How much the location of the project (site out of the city area) affects labour productivity ?				
5	how much providing proper information about the work between site management and labor affects the productivity ?				
6	how much the unavailability of the material at site affects labour				



	productivity				
7	The co-ordination of supervisor with labour in terms of explaining work information or daily targets affects the labour productivity?				
8	Effect of poor site layout (unsafe and un-economical work flow of material and workers around the site) productivity ?				
9	Effect of inefficiency of equipments and tools on performance of labour ?				
10	Effect of lightning in night shifts on workers performance of labour ?				
11	How much the delay in payment affects the labour performance ?				
12	How much the shortage of tools and equipments effects the labour productivity				
13	How much the climatic condition ( High temp, frequent Rain, Storm) affects the labour productivity ?				
14	Effect of Safety condition( harness)				

	in High rise construction on labour performance ?				
15	How much the non-availability of drawing at the time of execution affects labour productivity ?				
16	How much it affects the labour productivity If the material storage area too far from the workplace ?				
17	Effect of not providing Incentives and compliments for good performance on labuor productivity ?				
18	How much the different language spoken on the construction site affects the labour productivity ?				
19	How much the difference between salaries paid through sub-contractor affects labour productivity ?				
20	How much the frequent absenteeism of labour affects labour productivity ?				
21	How much the site congestion among labours for same				

	work affects labour productivity ?				
22	How much the working overtime affects labour productivity ?				
23	Effect of incomplete drawing/missing details in drawing affects labour productivity ?				
24	Effect of on-site accidents/stop work due to accident on labour productivity ?				
25	Effect of delay in Inspection by Site Engineer/site management on labour productivity ?				

## **Data collection:- Ranking formation Using Relative Importance**

### **Index method (RII):-**

S.N o	Questions	Practica lly ignored (1)	Does not affect s (2)	Moderat ely affects (3)	Highl y affect s (4)	weightin g	R.I Index	Ran k
1	How much the unskilled labour affects the productivity ?	2	3	9	31	159	0.883	1
2	How much the unavailability of the material at site affects labour productivity	2	3	11	29	157	0.877	2
3	How much the shortage/breakdown of tools and equipments effects the labour productivity	2	4	12	27	154	0.855	3
4	How much the frequent absenteeism of labour affects labour productivity?	1	5	14	25	153	0.850	4
5	How much the delay in payment affects the labour	1	4	17	23	152	0.844	5

	performance ?							
6	Effect of inefficiency of equipments and tools on performance of labour ?	3	3	15	24	150	0.833	6
7	How much the behavior of supervisor affects the performance of labour ?	3	2	19	21	148	0.822	7
8	Effect of lightning in night shifts on workers performance of labour ?	4	2	15	24	149	0.827	8
9	Effect of on-site accidents /stop work due to accident on labour productivity ?	4	2	16	23	147	0.816	9
10	Effect of Safety condition( harness) in High rise construction on labour performance ?	4	3	17	21	145	0.805	10
11	How much the working overtime affects labour productivity ?	4	4	18	19	142	0.788	11

12	Effect of delay in Inspection by Site Engineer/site management on labour productivity ?	3	4	21	17	142	0.788	12
13	The co-ordination of supervisor with labour in terms of explaining work information or daily targets affects the labour productivity?	3	5	20	17	141	0.783	13
14	How much the climatic condition ( High temp, frequent Rain, Storm) affects the labour productivity ?	4	4	21	16	139	0.772	14
15	How much the labour's personal problems ( alcoholism, relationship problems) affects the productivity ?	3	3	27	12	138	0.766	15
16	How much the unrealistic work planning and scheduling in order to	3	9	15	18	138	0.766	16

	complete the project on time effects labour productivity ?							
17	how much providing proper information about the work between site management and labor affects the productivity ?	5	4	20	16	137	0.761	17
18	How much the site congestion among labours for same work affects labour productivity ?	2	7	23	13	137	0.761	18
19	How much the non-availability of drawing at the time of execution affects labour productivity ?	5	6	18	16	135	0.750	19
20	Effect of not providing Incentives and compliments for good performance	6	6	23	10	127	0.705	20

	on labour productivity							
21	How much the difference between salaries paid through sub-contractor affects labour productivity ?	5	10	21	9	124	0.688	21
22	Effect of poor site layout (unsafe and un-economical work flow of material and workers around the site) productivity ?	9	7	20	9	119	0.611	22
23	How much the different language spoken on the construction site affects the labour productivity ?	9	10	16	10	117	0.650	23
24	Effect of incomplete drawing/missing details in drawing affects labour	10	10	17	9	117	0.650	24



	productivity ?							
25	How much the location of the project (worksite out of the city area) affects labour productivity ?	10	9	20	6	112	0.622	25

## **CHAPTER-04**

### **ANALYSIS & DISCUSSION**

#### **SPSS Analysis**

SPSS Statistics are software system package used for statistics analysis. SPSS is among the foremost wide used programs for statistics analysis in scientific discipline. it's additionally employed by market researchers, health researchers, survey firms, government, education researchers, selling organizations, and others. the initial SPSS manual has been represented in concert of "sociology's most influential books" for permitting normal researchers to try and do their own statistical analysis .In addition to statistical analysis, knowledge management

#### **□ Frequency Statistics :-**

The Frequencies procedure provides statistics and graphical displays that are helpful for describing many sorts of variables. to make a table of frequencies (number of occurrences of given categories), by analyzing by suggests that of descriptive Statistics, the frequency within the needed variables would be calculated. Figure shows concerning choose the variables to be pictured within the frequency table by moving them from the left- to the right-hand box. SPSS provides the user further choices, as well as statistics, charts, and format.

		<b>Statistics</b>				
		unskilled	unavailability	shortage	absenteeism	delay
N	Valid	45	45	45	45	45
	Missing	0	0	0	0	0

Table 4.1 Frequency table of factors labour affecting productivity

## Frequencies

### unskilled

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Practically ignored	2	4.4	4.4	4.4
	Does not affects	3	6.7	6.7	11.1
	Moderately affects	9	20.0	20.0	31.1
	Highly affects	31	68.9	68.9	100.0
	Total	45	100.0	100.0	

Table 4.2 Frequency table of unskilled labour affecting productivity

### unavailability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Practically ignored	2	4.4	4.4	4.4
	Does not affects	3	6.7	6.7	11.1
	Moderately affects	11	24.4	24.4	35.6
	Highly affects	29	64.4	64.4	100.0
	Total	45	100.0	100.0	

Table 4.3 Frequency table of unavailability of material affecting productivity

### shortage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Practically ignored	2	4.4	4.4	4.4
	Does not affects	4	8.9	8.9	13.3
	Moderately affects	12	26.7	26.7	40.0
	Highly affects	27	60.0	60.0	100.0
	Total	45	100.0	100.0	

Table 4.4 Frequency table of shortage of tools & equipments affecting productivity

**absenteeism**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Practically ignored	1	2.2	2.2	2.2
	Does not affects	5	11.1	11.1	13.3
	Moderately affects	14	31.1	31.1	44.4
	Highly affects	25	55.6	55.6	100.0
	Total	45	100.0	100.0	

Table 4.2 Frequency table of frequent absenteeism of labour affecting productivity

**delay**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Practically ignored	1	2.2	2.2	2.2
	Does not affects	4	8.9	8.9	11.1
	Moderately affects	17	37.8	37.8	48.9
	Highly affects	23	51.1	51.1	100.0
	Total	45	100.0	100.0	

Table 4.2 Frequency table of Delay in Payments/wages of labour affecting productivity

**Pie Chart-** A Pie Chart is a type of graph that displays data in a circular graph. The pieces of the graph are proportional to the fraction of the whole in each category. In other words, each slice of the pie is relative to the size of that category in the group as a whole. The entire “pie” represents 100 percent of a whole, while the pie “slices” represent portions of the whole. Pie charts are generally used to show percentage or proportional data and usually the percentage represented by each category is provided next to the corresponding slice of pie. Pie charts are good for displaying data for around 6 categories or fewer.

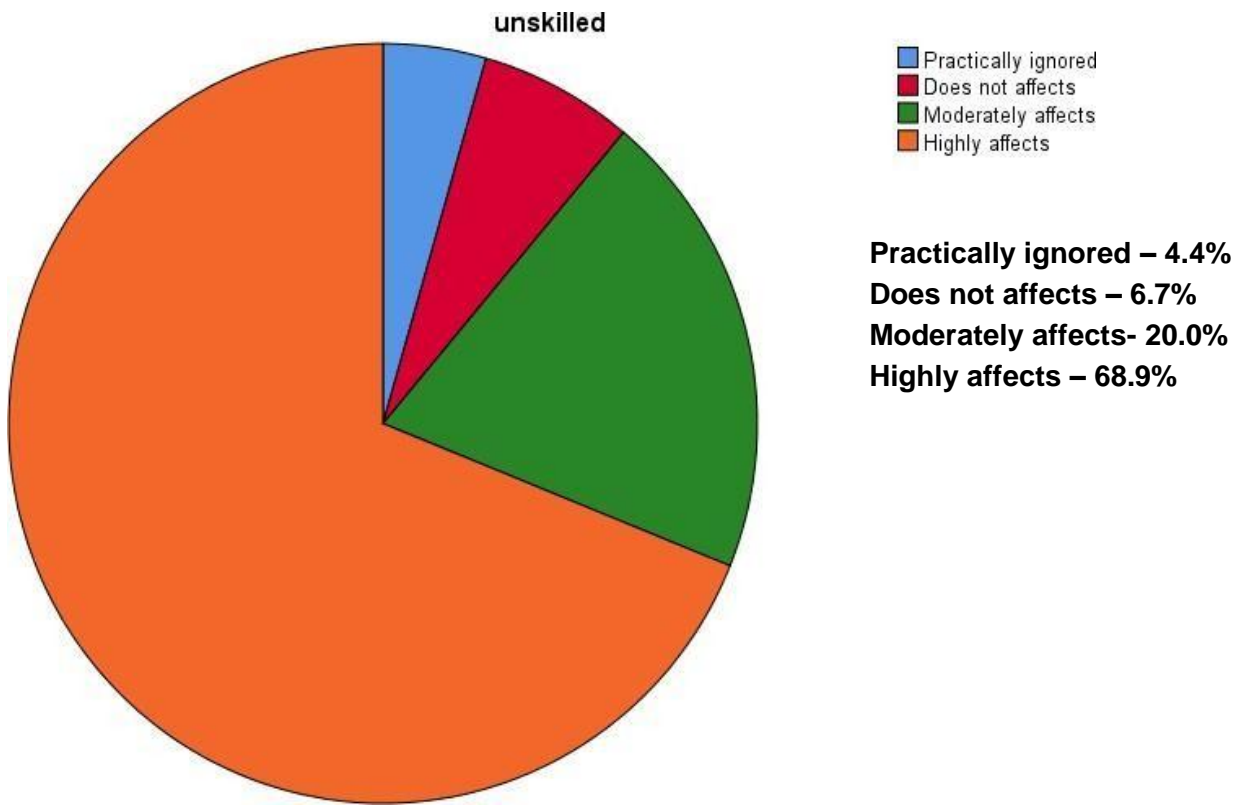


FIG 4.1 Pie Chart of unskilled labour affecting productivity

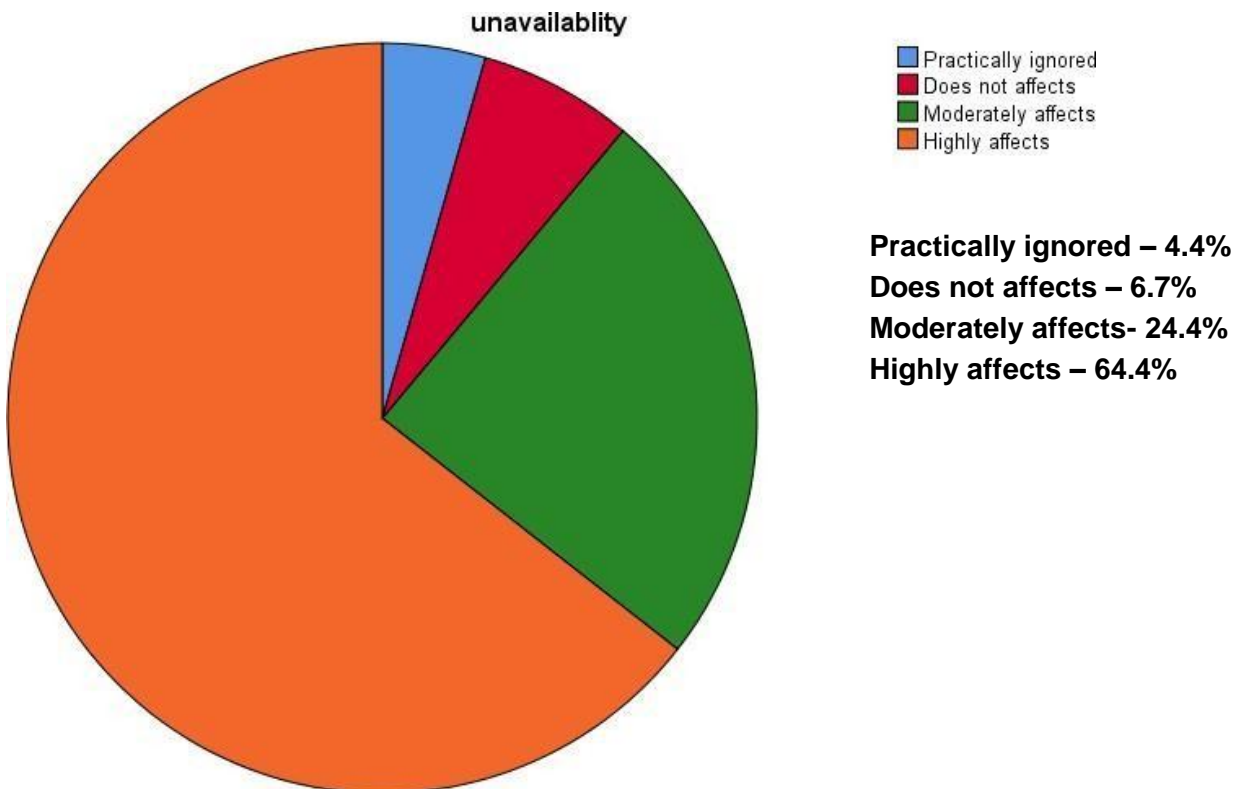


FIG 4.1 Pie Chart of unavailability of material affecting productivity

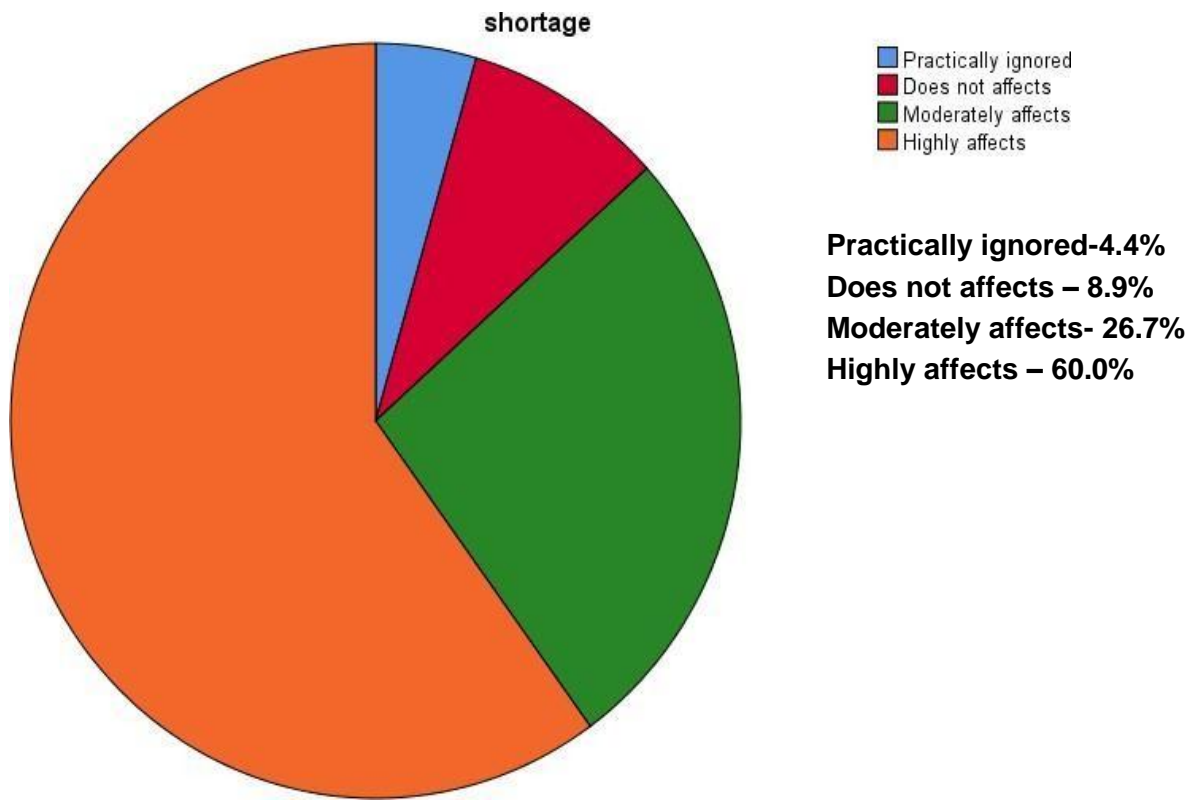


FIG 4.3 Pie Chart of Shortage of tools and equipments affecting productivity

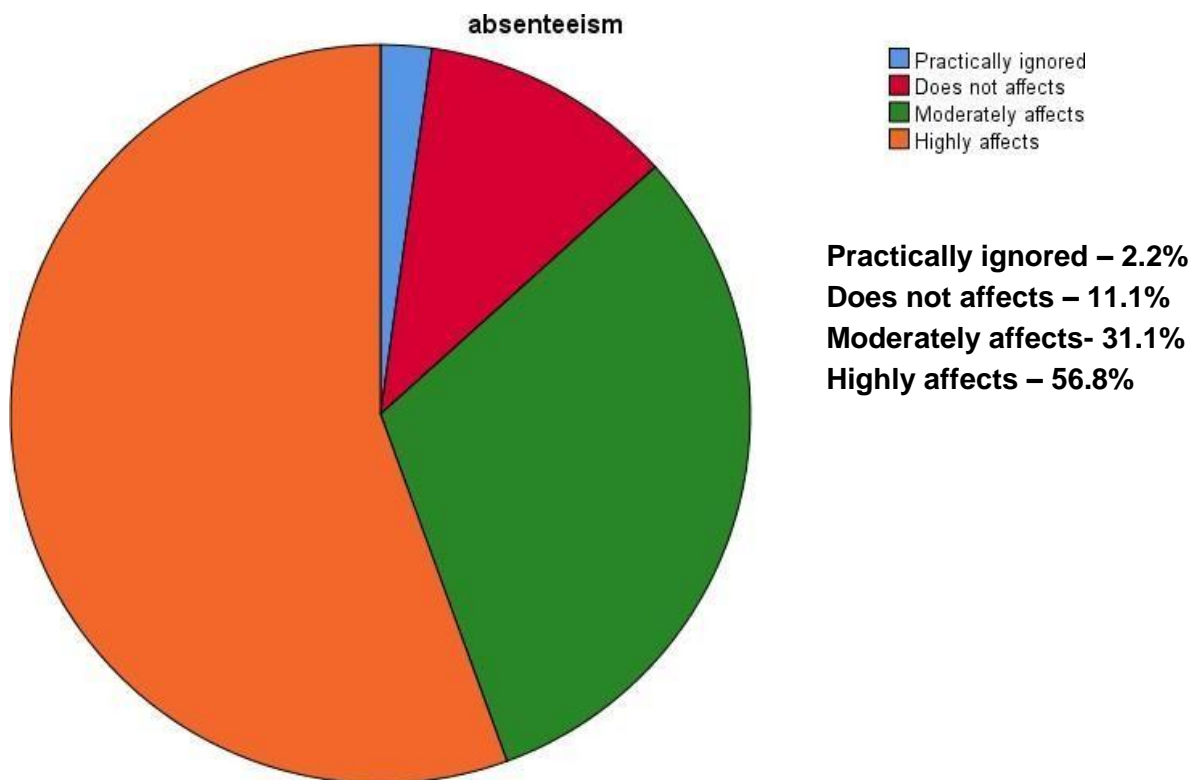


FIG 4.4 Pie Chart of Frequent absenteeism of labour affecting productivity

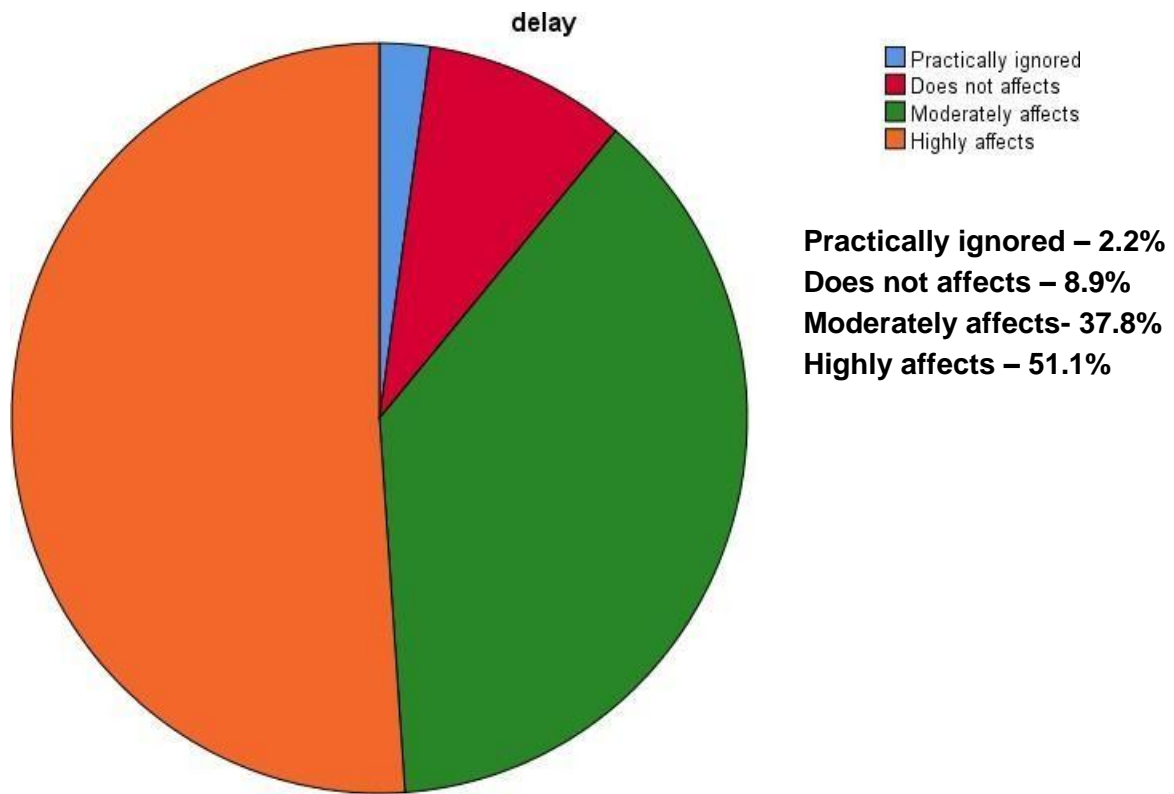


FIG 4.5 Pie Chart of Delay in payment/wages of labour affecting productivity

**Histogram** : It was introduced by Karl Pearson. A histogram is an appropriate representation of distribution of numerical data. A frequency distribution shows how often each different value in a set of data occurs. A histogram is the most commonly used graph to show the frequency distributions. It looks very much like a bar chart, but there are important difference between them

- On the vertical axis, place frequencies. Label this axis “ Frequency”
- On the horizontal axis, place the lower value of each interval.
- Draw a bar extending from the lower value of each interval to the lower value of the next interval

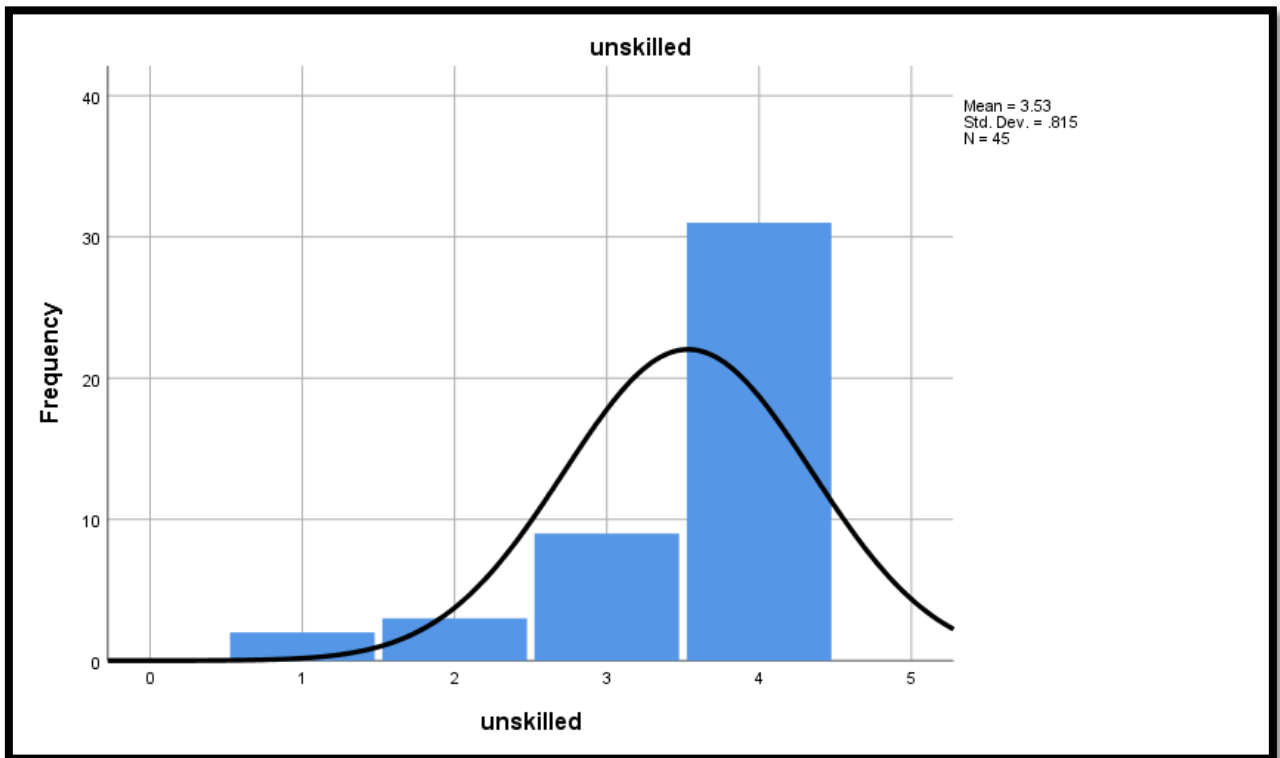


FIG 4.6 Histogram of unskilled labour affecting productivity

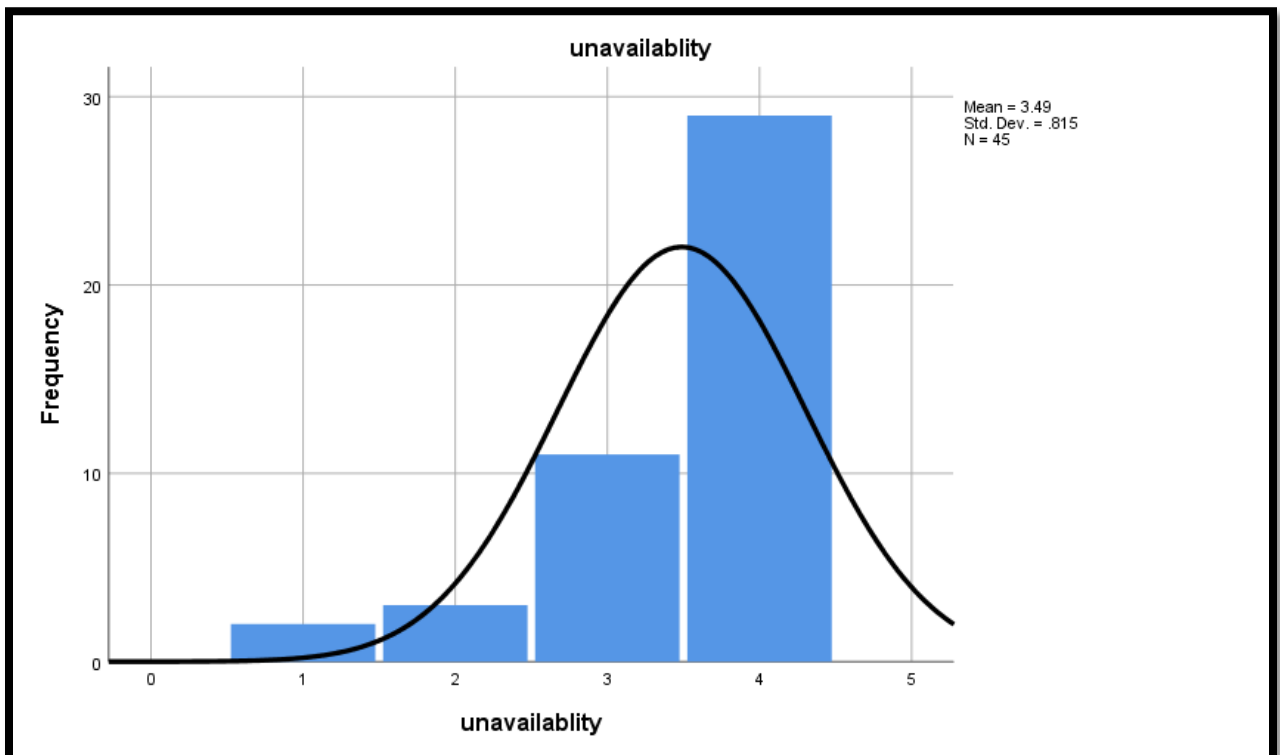


FIG 4.6 Histogram of unavailability of material affecting productivity



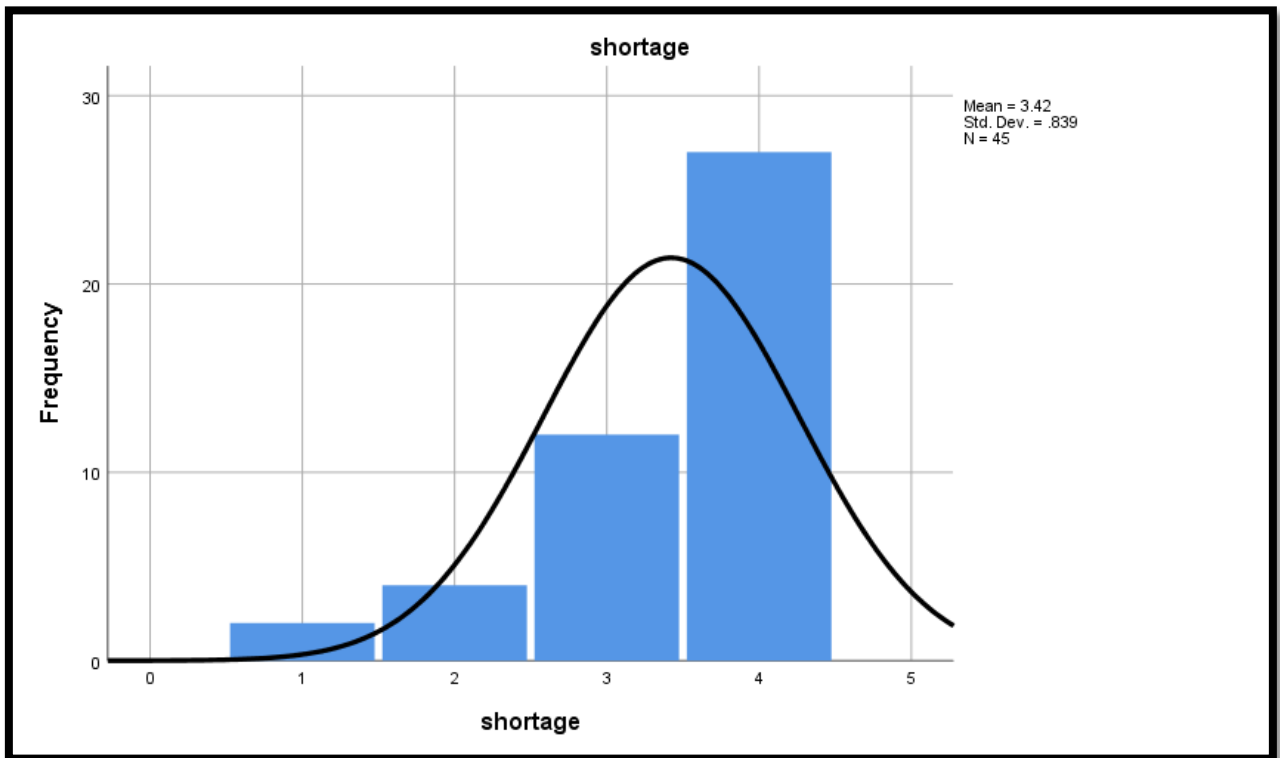


FIG 4.8 Histogram of Shortage of tools and equipments affecting productivity

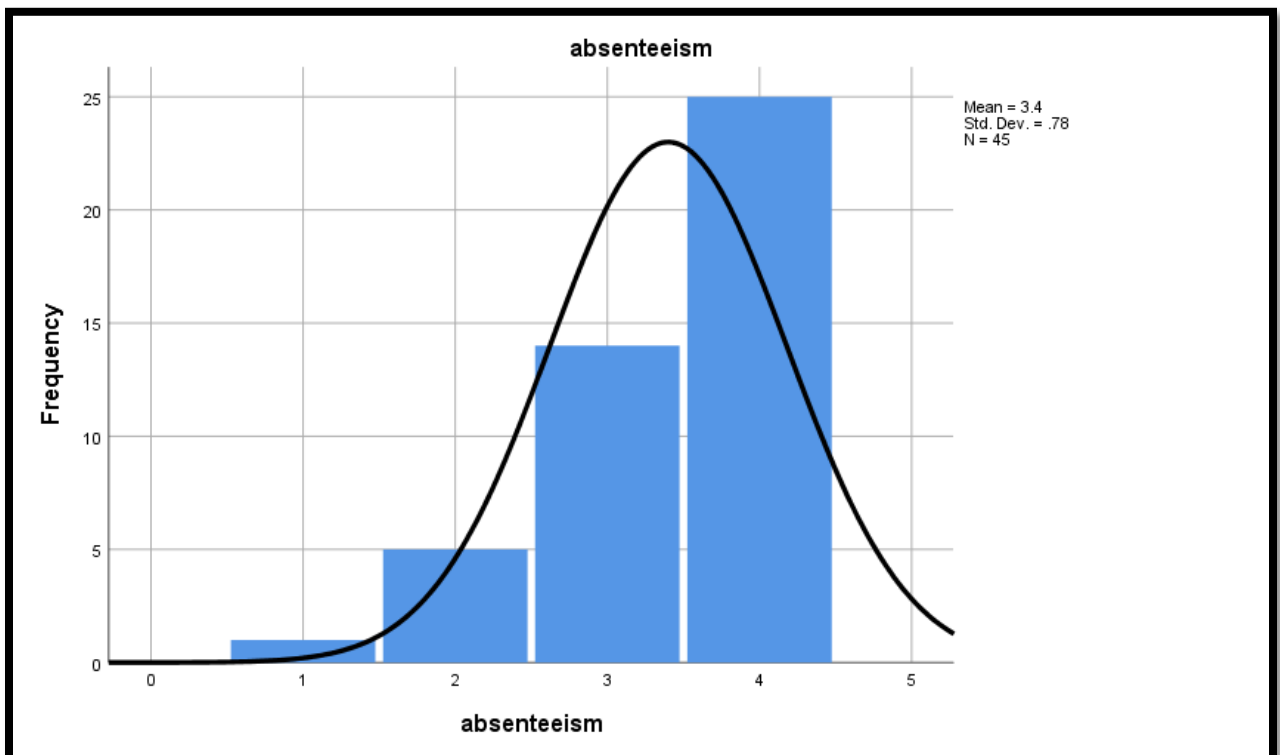


FIG 4.9 Histogram of frequent absenteeism of labour affecting productivity

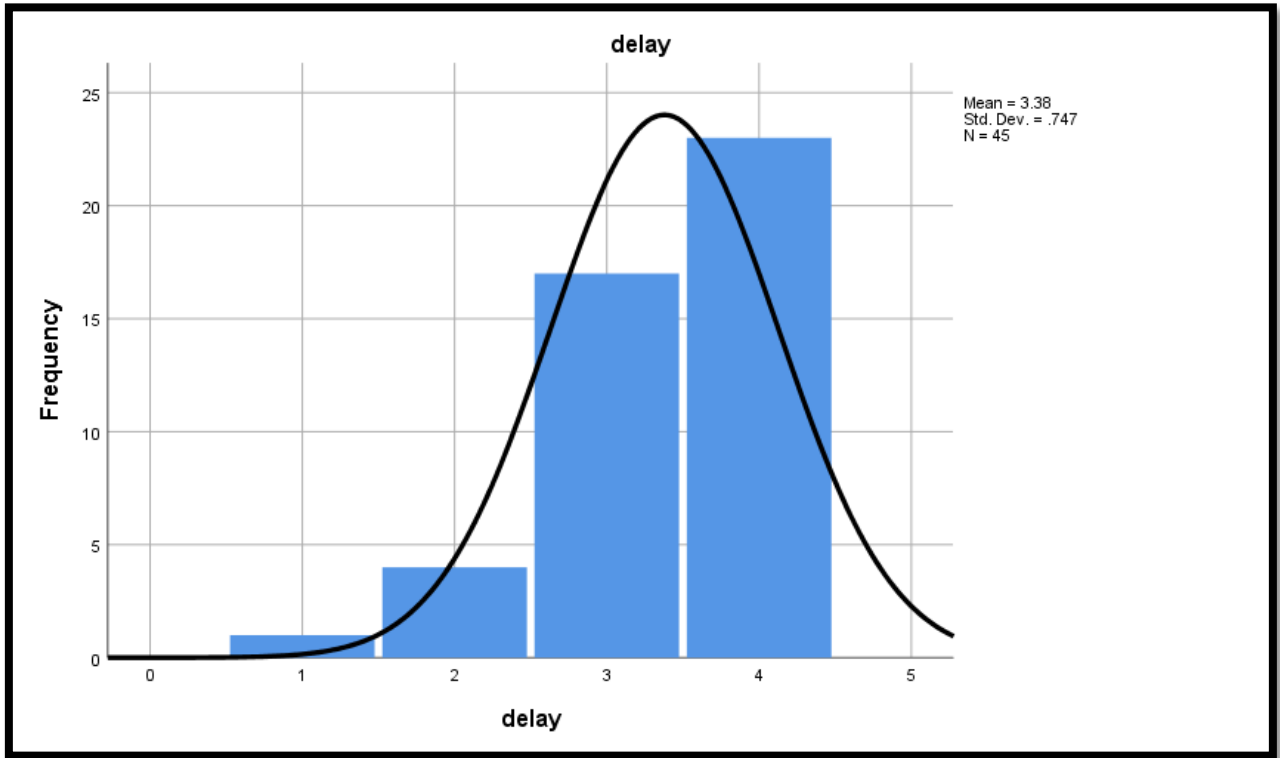


FIG 4.10 Histogram of Delay in payment/wages of labour affecting productivity

**Discussion** -According to this research we can conclude that following are the main factors that are affecting labour productivity:-

- 1) Unskilled/unexperienced Labour
- 2) Unavailability of material at the time construction
- 3) Shortage/Breakdown of tools and equipments
- 4) Frequent absenteeism of labour
- 5) Delay in payments/wages of labour

## **CHAPTER-05**

### **CONCLUSION & RECOMMENDATION**

#### **CONCLUSION**

- A thorough literature review has been conducted during this analysis paper for the identification of the five main factors that are affecting labour productivity in construction industries so as to advocate the measure needed to enhance the labour productivity. The survey is predicated on the literature review solely and therefore, restricted to past analysis conducted on this specific topic and covers the recent journals accessible.
- A form survey was conducted with construction industries specialists to hunt their opinion on this matter. The conclusions often made up of the study are summarized below:-
- There are several challenges faced by construction industries however one among the foremost important issues is low labour productivity.
- The construction labour productivity influences the profit of the construction works. A critical issue that affects the labour productivity will facilitate to develop ways to scale back inefficiency and to a lot of effectively manage construction labour forces. This may not solely improve the project performance of construction firms however additionally create them a lot of competitive and consequently increase the possibilities of survival among this extremely competitive sector..
- The study known 5 factors namely:-
  - a. Unskilled labour
  - b. inaccessibility of materials
  - c. shortage/breakdown of tools and equipment
  - d. frequent absence of labour
  - e. Delay in payment
- Construction business is rated mutually of the key industries within the ever growing world.

Study and information of productivity are important as a result of low productivity causes losses to the governing agencies and additionally influence the economy of the construction business, which may any result in loss of the economy of the country.

- Prior information of labour productivity will save cash and time whereas the development method occurring. Investment created for the construction comes are quite high and since of this high quality in industry varied crucial factors will affect the productivity at a terribly high level that any ends up in demand of longer and extra money for the completion of the project.
- This analysis is aimed to spot and analyze the issue that are moving the labour productivity in industry.

## **Recommendations:-**

### **(1). Unskilled Labour:-**

Skill level may well be a vital issue on worker's productivity as a result of high masterly labours are performed above low skilled worker throughout same amount of your time amount.

- Construction firms produce a position referred to as a foothold productivity improvement officer (CPIO), to create construction firms additional systematic, property, and responsible
- The CPIO would be concerned in productivity improvement designing and in watching activities additionally to coordinating and liaising with project stakeholders
- Construction company leaders ought to address these problems and develop efficient and effective productivity improvement programs to boost their ability to execute comes per the construction company's business arrangement and project requirements
- Construction leaders got to style specific productivity improvement programs addressing project's locations and quality.
- The productivity improvement program ought to start with a stakeholder assessment of the causes of low productivity
- Regular joint reviews of the advance program are necessary to assess whether the productivity initiatives are credible

### **(2). Unavailability of material-**

• When there is no material there is no any construction. Material is crucial to the constructions. once the development works are happening there need to be an honest material offer. As associate example when we have a tendency to planned to place a concrete on a

block there need to be accessible needed amount of concrete on time.

□ Inventory optimization- having material scattered round the worksite, not properly protected, and not clearly accounted for manufacturers for several unproductive sessions by crew on a construction worksite. concern of running out of things creates over ordering. Partner with a strategic distributor World Health Organization will assist you to stay your material convenient to the increment that don't force you to prevent work too usually to receive it.

- Project manager ought to benchmark their labor productivity compared to alternative construction companies' labor productivity
- Benchmarking may be a tool that allows construction firms to live, compare, and improve the extent of productivity
- Store extra amount of potential materials among the situation.
- Try a computerized material ordering system
- When the situation is massive prepare some places to store materials with simple accessibility

### **(3).Shortage/breakdown of tools and equipments at construction site-**

- Breakdown and lack to the tools and equipment is extraordinarily affected to the worker's productivity. as a results of once employees are performing arts well in associate extremely specific work if the machinery breaks down they could not continue with their work that means the worker's productivity decreases.
- Never enable the operator to run equipment unless they're qualified to run those machines
- Give the coaching to some additional operators in purpose of exploitation, once the regular operators aren't offered Frequent
- Use Pump cars
- Attention ought to even be paid to the number of staff employing a specific tool to chop back the competition for resources.
- GPS to remain not off course on the road – facilitate to understand the availability vehicles and equipment are in massive comes
- Make accessible spare parts among the location.
- Keep records relating to the upkeep {of equipment of /kit of/ apparatus} and prepare an accurate listing to stay up the equipment.
- Dangerous or incomplete coaching/ improper operation-Need an accurate training to manage serious machines.

**(4). Frequent absenteeism of labour-** we have a tendency to are able to adopt the strategy the strategy keeping to record the group action of the labour on day to day to assess the productivity.

(i) Time Recording Clocks:- The time recording clock may well be a computer that automatically records the time of the workers. this system has been developed to obviate variety of the difficulties practiced simply just in case of manual ways and this system is useful once the number of staff is fairly massive. to a lower place the technique, each worker is given a Time Card generally of one week amount. Time cards are serially organized during a receptacle on the point of worksite plant gate and because the labour enters the gate, he picks up his card from the receptacle, puts it among the time recording clock that prints the precise time of arrival among the proper space against the particular day.

- This technique is continual I for recording time of departure for lunch, come from lunch and time of departure the construction plant among the evening. Late arrivals, early leavings and overtime are written in red to attract the attention of the management.

- A time card could provide such particulars as hourly rate, total gross wages less deductions and net gross wages due .

- The main advantage of this system is that there are no prospects of disputes arising in regard to recording of your time of labours as a results of time is recorded by the time recording clock and not by the time-keeper



FIG.5 Dial Time Recorder

- Check the explanations of absence and if will offer solutions.
- Providing honest wages and incentives for higher performance and minimize the absence..
- Take actions of diseases on the location - minimize absences and enhance the health of their staff
- Providing healthful operating condition.
- Adopting a progressive approach in managing their personal issues

### **(5). Delay in payment-**

•Most of the employees within the construction sites haven't higher economic background. Monthly regular payment is that the main financial gain of their family therefore late payments could cause issues to them..Delays could occur as a results of income originating from the consumer, the contractor, or by poor planning/management of funds on the project. however the labors shouldn't suffer from those problems caused within the high level.

- Provide the ability to urge associate advance if they required Frequent
- Think regarding - shut the gender pay gap, cut back unnecessary departmental pay , Correct regular payment outliers.
- Keep effective and economical repose relationship between internal units and officers
- Equal treatment towards all the labours.

## **References**

1. John D. Butcher:- Improving Productivity in Industrial construction, Journal of the construction Division, Volume-102, Issue- 4, 1976
2. Althea Savidis, Anthony Mills Labour productivity in the construction industry January 1999
3. David Ardit and Krtishna Mochtar:-Trends in productivity improvement in the US construction industry,Construction Management and Economics,Volume- 18, Issue- 1,2000
4. M.R. Abdul Kadir, W.PLee, M.S. Jaafar, S.M. Sapuan A.A.A. Ali :-Factors affecting construction labour productivity Malaysian residential project,Structural Survey, Volume-23,2005
5. Paul Crawford and Bernard Vogl:-Measuring productivity in the construction industry,Building Research and Information, Volume-34,Issue- 3, 2006
6. Chan, Paul and Kaka, Ammar (2007):- Productivity improvements: understand the workforce perceptions of productivity first,Personal Review, 12 June 2007
- 7.HM Alinaitwe:- Improvement of Labour Performance and Productivity in Uganda's Building, Division of Construction ManagementLund Institute of Technology, Lund University,2008
8. Aynur Kazaz , Ekrem Manisali & Serdar Ulubeyli Effect of basic motivational factors onconstruction workforce productivity in turkey , Journal of Civil Engineering and Management, Volume- 14, 2008
9. Adnan Enshassi , Sherif Mohamed & Saleh Abushaban:-Factors affecting the performance of construction projects in the Gaza strip, Journal of Civil Engineering and Management,2009
10. Hemanta Doloi, Anil Sawhney, K.C. Iyer, Sameer Rental:- Analysing factors affecting delays in Indian construction projects, International Journal of Project Management, Volum-30, May 2012



- 11.** Nurulzatushima Abdul Karim, SitiHafizan Hassan Factor influence labour productivity and the impact on construction industry CJASR,ISSN:2251-9114,2012
- 12.** Mr.A .A. Attar, 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,2012
- 13.** Anu V. Thomas:-Critical analysis of the key factors affecting construction labour productivity- An Indian Perspective,International Journal of Construction Management, Volume 13,2013.
- 14.** . Loeraa I., Espinosab G., Enríquezc C., Rodriguezb J.:- Productivity in Construction and Industrial Maintenance, Proceeding Engineering, Volume- 63, 2013
- 15.** Mistry Soham, Rajiv Bhatt:- Critical Factors Affecting Labour Productivity in construction: Project: Case study of South Gujarat Region of India,International journal of Engineering and Advanced Technology,ISS:2249-8958,Volume -2, Issue- 4, April 2013
- 16.** S.Ahn, S.h Lee, Robert P. Steel:- Effect of Workers social learning:- Focusing on absence behavior, Journal of Construction Engineering and Management, Volume- 139, Issue-8, Aug-2013
- 17.** Josu Takala Daryl J. Powell Fentahun Moges Kasie:-Adoption of quality management practices:- An investigation of its relationship with labor productivity for labor-intensivemanufacturing companies. International Journal, 25 Feb 2014
- 18.** Dr. Sutapa Hazara, Shashank K:- Analysis of Key Factors Affecting the Variation of Labour Productivity in Construction Projects, International Journal Emerging Technology and Advanced Engineering, Volume-4,Issue-5, May 2014
- 19.** Dharani K:-Study on Labours Productivity Management in Construction Industry, International Journal of Scientific and Engineering Research, Volume- 6, Issue-9, sep-2015

- 20.** Prachi R..Ghate, Prof.Pravin R. Minde Importance of measurement of labour productivity in construction IJRET Eissn:2319-1163|Pissn:2321-7308, July 2016
- 21.** Kazaz Aynur, Ulubeyli Serdar, Acikara Turgut, ER Bayram:- Factors Affecting Labor Productivity: Perspectives of Craft Workers , Volume- 164, 2016
- 22.** Biren Patel, Prof J. J. Bhavsar, Dr. Jayeshkumar Pitroda A Critical Literature Review of Labour Productivity in Building Construction , International Journal of Constructive Research in Civil Engineering, Volume- 3, Issue-4.2017
- 23.** Shinde V.J, Hedaoo M:- A Review on productivity improvement in construction industry, International Journal of Engineering Technology Science and Research,Volume-4,Issue-11, Nov-2017
- 24.** PonmalarV, Aravindraaj, Nandhini K :- Study On Factors Influencing Labour Productivity In Residential Buildings In Indian Scenario, International Journal of Engineering Technologies and Management Research, Vol-5, Issue-2, Feb 2018