

LABOUR PRODUCTIVITY ANALYSIS

¹Prof. Gaurav Desai, ²Yash Bhupesh Deshaware

¹Assistant Professor, ²PG Student
School of Engineering and Technology
Sandip University, Nashik, India

Abstract: As the construction industry undertakes complex and innovative projects, improving the labour productivity that helps accomplish the triple bottom line dimensions (time, schedule and performance) assumes greater importance. It is of even greater importance in developing countries like India where most of building construction takes place on a manual basis. In response, the purpose of this paper is to develop an evaluation framework for assessing the labour productivity in the construction industry.

Poor productivity of construction workers is one of the causes of cost and time overruns in construction projects. As construction is a labour-intensive industry, this paper focuses on labour productivity in the construction industry. It covers the construction labour productivity definitions, aspects, factors affecting it. The main outcome from the literature is that there is no standard definition of productivity. This study provides a guidelines for necessary steps required to improve construction labour productivity. The productivity of labour is particularly important especially in developing countries, where most of the building construction work is still on manual basis.

I. INTRODUCTION

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

Productivity is the one of the most important factor that affect overall performance of any small or medium or large construction industry. There are number of factors that directly affects the productivity of labour, thus it is important for any organization to study and identify those factors and take an appropriate action for improving the labour productivity. At the micro level, if we improved productivity, ultimately it reduces or decreases the unit cost of project and gives overall best performance of project. There are number of activities involved in the construction industry. Thus the effective use and proper management regarding labour is very important in construction operations without which those activities may not be possible

The cost of labour in the building industry is in the region of 25 - 40 % of the cost of building. Hence the cost of labour is quite high and yet it is the main cause of variability in construction costs. The time used by workers on daily basis on productive activities averages about 30% of the total time available for construction work. The remainder of the time, i.e. about 70% is wasted on non-productive activities, delays and added activities. For a company in the building industry to remain competitive, it must try to improve the productivity of its labour. This paper reviews the literature on labour productivity in the building industry. It looks at the definitions, measurement, use, factors affecting and theories on improvement of labour productivity in the building industry. It is noted in the industry lacks generally agreed strategies for improvement of labour productivity.

DATA COLLECTION

Primary data: This data will be collected from the site engineer who deals with the daily activity of the respected construction site. This data collection will involve a questionnaire survey with the site engineers and this will explore their own standards of labour related activities.

Secondary data: This data will be collected from the labours involved in daily activities. This will be a collection of observations of labours performing their work respected of their work, time scale and skills. This will also involve a questionnaire survey with these labours, this data will be helpful to calculate the work done by the labours in a day.

DATA ANALYSIS

- The data collection will give necessary units of work done by labours in a day. These units will then be compared with the units of work which must be completed by the labour in day on other site which had better productivity.
- This data will help to discover the factors which encourage labour productivity and will give good output and optimum quality work within time scale.
- This study will also explore factors affecting labour productivity.

II. LABOUR PRODUCTIVITY.

Productivity can be defined in many ways. In construction, productivity is usually taken to mean labour productivity, that is, units of work placed or produced per man-hour. The inverse of labour productivity, man hours per unit (unit rate), is also commonly used. Productivity is the ratio of output to all or some of the resources used to produce that output. Output can be homogenous or heterogeneous. Resources comprise: labour, capital, energy, raw materials, etc. A popular concept in the USA, and increasingly in the UK, is the concept of earned hours. It relies on the establishment of a set of standard outputs or norms for each unit operation. Thus, a number of man hours are associated with each unit of work completed. Productivity may then be defined as the ratio of earned to actual hours. The problem with this concept is in establishing reliable norms, for setting standards. It also depends on the method used to measure productivity, and on the extent to which account is taken of all the factors which affect it. At the project site, contractors are often interested in labour productivity. It can be defined in one of the following ways:-

- **Labour Productivity = Output /Labour cost Or Labour Productivity = Output /Work hour**

There is no standard definition of productivity and some contractors use the inverse of above, In general, productivity signifies the measurement of how well an individual entity uses its resources to produce outputs from inputs. Moving beyond this general notion, a glance at the productivity literature and its various applications quickly reveals that there is neither a consensus as to the meaning nor a universally accepted measure of productivity. Attempts at productivity measurement have focused on the individual, the firm, selected industrial sectors, and even entire economies. The intensity of debate over appropriate measurement methods appears to increase with the complexity of the economic organization under analysis. There are however, a number of different productivity measures that are commonly used. Choosing between them usually depends on the purpose of the productivity measurement and the availability of data. Productivity measures can broadly be placed into two categories. Single factor, or partial, productivity measures relate a particular measure of output to a single measure of input, such as labour or capital. Multi-factor or total productivity measures (MFP) relate a particular measure of output to a group of inputs, or total inputs used. Productivity measures can also be distinguished by whether they rely on a particular measure of gross output or on a value-added concept that attempts to capture the movement of output. Of the most frequently used MFP measures, capital-labour MFP relies on a value-added concept of output while capital labour- energy materials MFP relies on a particular measure of gross output.

VARIOUS FACTORS AFFECTING LABOUR PRODUCTIVITY

Identification and evaluation of factors affecting labour construction productivity have become a critical issue facing project managers for a long time in order to increase productivity in construction. Understanding critical factors affecting productivity of both positive and negative can be used to prepare a strategy to reduce inefficiencies and to improve the effectiveness of project performance. Knowledge and understanding of the various factors affecting construction labour productivity is needed to determine the focus of the necessary steps in an effort to reduce project cost overrun and project completion delay, thereby increasing productivity and overall project performance. Based on the study & survey, Factors affecting construction labour productivity have been identified and are grouped into 15 categories according to their characteristics, namely 1) Design factors 2) Execution plan factors 3) Material factors 4) Equipment factors 5) Labour factors 6) Health and safety factors 7) Supervision factors 8) Working time factors 9) Project factors 10) Quality factors 11) Financial factors 12) Leadership and coordination factors 13) Organization factors 14) Owner/consultant factors 15) External factors

The top ten factors that affect the small and medium construction company:-

- 1) Lack of material
- 2) Labour strikes
- 3) Delay in arrival of materials
- 4) Financial difficulties of the owner
- 5) Unclear instruction to labourer and high absent rate of labours
- 6) Bad weather (e.g. rain, heat, etc.)
- 7) Non discipline labour and use of alcohol and drugs
- 8) No supervision method, design changes, repairs and repetition of work, and bad resources management
- 9) Bad supervisors absent rate and far away from location of material storage, and
- 10) Bad leadership

The top ten factors that affect large construction company:

- 1) Unclear instruction to labourer
- 2) Delay in arrival of materials
- 3) Lack of material and financial difficulties of the owner
- 4) There is no definite schedule
- 5) Low supervisor's capability/incompetence supervisors
- 6) No supervision method, lack of equipment, and high absent rate of labours
- 7) Supervisors absenteeism, frequent damage of equipments, and labour strikes
- 8) Design changes
- 9) Incomplete drawing and inspection delay
- 10) Poor communication in site and inaccurate design.

Factors that affect in general :- Lack of material , Delay in arrival of materials , Unclear instruction to labourer, Labour strikes, Financial difficulties of the owner, High absenteeism of labours, No supervision method, Supervisors absenteeism, Lack of equipment and design changes, There is no definite schedule, Poor management, Unproductive time (internal delay, extra break, waiting & relaxation), Lack of skill, Supervision delay, Lack of tools & equipment, Poor instructions, Poor quality of labour, Supervision factor, Material factor, Execution plan factor, Health & safety factors, Labour shortages, Working time factor, Accidents, Organization factors, Improper training, Bad weather , Use of alcohol & drug.



Fig 1: Construction of flat slabs



fig 2 : Addition of skilled labours

Fig (1,2) Source : Joshi Deshaware construction firm.



Fig 3 : Safety for labours – helmats, gloves



fig 4 : Construction of EPS panels for internal walls

Fig (3,4) source : Ghorpade constructions.

BARRIERS TO IMPROVING LABOUR PRODUCTIVITY

The countries economy has become increasingly more dynamic and complex. As a result, economic measurement and analysis, particularly relating to productivity, have become more difficult and complicated. The main problem involves properly defining units of measurement, evaluating qualitative changes and obtaining reliable data for both inputs and outputs. This process is further complicated by the need to price - deflate this data in order to evaluate changes in productivity in real terms. Measurement of inputs is problematic. Variations in the rate of input utilization are at best partially picked up in data series

In particular, the rate of capital equipment utilization, i.e. the measurement of machine hours, is rarely accomplished. Labour input, if measured by hours actually worked, is better suited to reflect the changing rate of manpower utilization, but remains an imperfect measure. The increasing prominence of the service sector within the national economy has generated increased mis measurement of labour hours. Information technology may aggravate this measurement error by allowing increased work flexibility and longer effective workdays that are not properly captured by the official statistics. There has been much work identifying the factor that affects productivity. Ineffective management has been cited as a primary cause of low productivity rather than other factors. Apart from that there are also some barriers to improve the productivity and these barriers are as follows:

- 1 .Lack of alignment of goal
2. Contractual conflict
3. Difficulties in measuring productivity
4. Weak commitment to continuous improvement
5. Lack of labour force focus.

GUIDELINES FOR IMPROVING THE LABOUR PRODUCTIVITY

1. Properly training to the labourers
2. Motivation to workers towards project completion
3. Properly and in advance material procurement and management
4. On time payment to the workers
5. Systematic flow of work
6. Properly , clearly & in time supervision
7. Advance site layout
8. Maintain work discipline
9. Facilities to the labourers
10. Clearance of legal documents before starting.
11. Systematic planning of funds in advance
12. Pre monsoon plan to avoid work stop
13. Maximum use of machinery and automation system
14. Advance equipment planning.

SIMPLE CALCULATION OF LABOUR PRODUCTIVITY:-

One can measure employee productivity with the labour productivity equation

Total output / total input. Let's say your company generated Rs.80,000 worth of goods or services (output) utilizing 1,500 labour hours (input). To calculate the company's labour productivity, divide 80,000 by 1,500 (8000/1500=53) which equals 53.

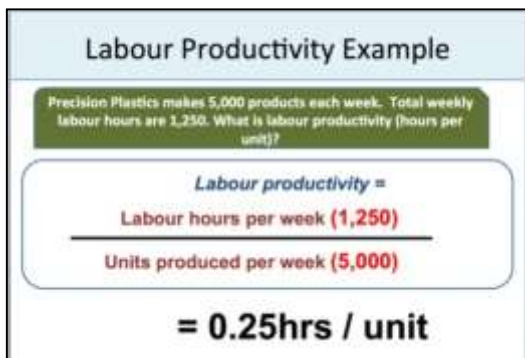


Fig 5 : Example of labour productivity calculation

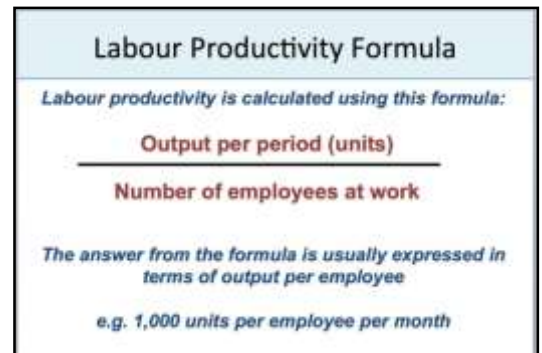


fig 6 : Labour productivity formula

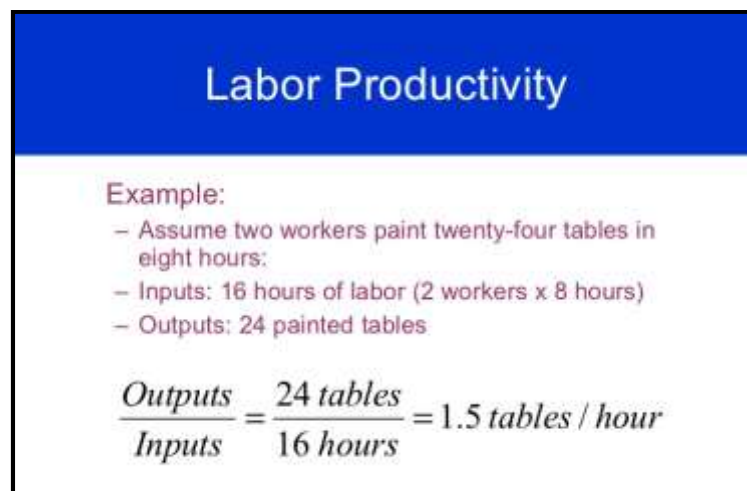


Fig 7 :Calculation of labour productivity in firms.

CONCLUSION

The groups of factors which are highly effective are: supervision, material, execution plan, and design. Moreover, for large companies, equipment factors have also highly effective. While in small and medium companies, owner/consultant factors also need special attention because it has high effect too.

Research findings also show that health and safety factors has not been a concern of small, medium companies and has some effect, while in large companies are better, although not as major concern and has average effect. Practically it is difficult task to all to improve labour productivity upto 100%. But if you have properly control on above factors , productivity can be improved upto large extent.

REFERENCES

- 1) Adnan Enshassi, Peter Eduard Mayer, Sherif Mohamed, Ziad Abu Mustafa (2007) “ Factors affecting labour productivity in building projects in the gaza strip.”Journal of Civil Engineering and Management. 2007, 13(4); 245-254
- 2) ASCE M , William Ibbs(2005) “ Impact of change” s timing on labour Productivity.”Journal of Construction Engineering and Management, 2005,131(11), 1219-1223
- 3) AynurKazaz, EkremManisali, SerdarUlubeyli(2008) “ Effect of basic motivational factors on construction workforce productivity in turkey.” Journal of Civil Engineering and Management.2008, 14(2); 95-106
- 4) BengtHansson, Henry MwanakiAlinaitwe, Jackson A. Mwakali (2007)“ Factors affecting the productivity of building craftsmenStudies of Uganda.” Journal of Civil Engineering and Management . 2007, 13; 169-176.\
- 5) Khaled M. EI-Gohary, Mostafa E. Shehata, (2011) “ Towards improving construction labour productivity and projects performance.” Alexandria Engineering Journal . 2011, 50; 321-330.