

A Study of Various Factors Affecting Labour Productivity and Methods to Improve It.

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ABSTRACT: 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. 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. Respondents were required to rate using their experience how all factors affect productivity with respect to time, cost and quality. The survey was carried out by a questionnaire and responses. The ten most significant factors affecting labour productivity for small, medium and large companies are identified.

1. 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.

2. WHAT IS 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.

$$\text{Productivity} = \frac{\text{Output}}{\text{Labour cost}}$$

Horner and **Talhouni** stated "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 „earned“ 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 labor productivity. It can be defined in one of the

following ways –

$$\text{Labour Productivity} = \frac{\text{Output}}{\text{Labour cost}}$$

Or

$$\text{Labour Productivity} = \frac{\text{Output}}{\text{Work hour}}$$

There is no standard definition of productivity and some contractors use the inverse of above ,

$$\text{Labour Productivity} = \frac{\text{Labour cost / work hour}}{\text{Output}}$$

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-labor MFP relies on a value-added concept of output while capital-labor- energy-materials MFP relies on a particular measure of gross output.

The five most widely used productivity concepts are

1. *Labour productivity, based on gross output.* This productivity measurement traces the labour requirement per unit of output. It reflects the change in the input coefficient of labour by industry and is useful for the analysis of specific industry labour requirements. Its main advantage as a productivity measure is its ease of measurement and readability; particularly, the gross output measure requires only price indices on gross output. However, since labour productivity is a partial productivity measure, output typically reflects the joint influence of many different factors.

2. *Labour productivity, based on value-added.* Value-added based labor productivity is useful for the analysis of micro-macro links, such as an individual industry's contribution to economy-wide labour productivity and economic growth. From a policy perspective, it is important as a reference statistic in wage bargaining. Its main advantage as a productivity measure is its ease of measurement and readability, though it does require price indices on intermediate inputs, as well as to gross output data. In addition to its limitations as a partial productivity measure, value-added labour productivity have several theoretical and practical drawbacks including the potential for double counting production of benefits and double deflation.

3. *Capital-labor MFP, based on value-added.* This productivity measurement is useful for the analysis of micro-macro links, such as the industry contribution to economy-wide MFP growth and living standards, as well as, for analysis of structural change. Its main advantage as a productivity measure is the ease of aggregation across industries. The data for this measurement is also directly available from national accounts. The main drawback to the value-added based capital-labor MFP is that it is not a good measure of technology shifts at the industry or firm level. It also suffers the disadvantage of other value-added measures that have been double deflated with a fixed weight Laspeyres quantity index.

4. *Capital productivity, based on value-added.* Changes in capital productivity denote the degree to which output growth can be achieved with lower welfare costs in the form of foregone consumption. Its main advantage as a productivity measure is its ease of readability but capital productivity suffers the same limitations as other partial productivity measurements.

5. *KLEMS Multi-factor productivity.* KLEMS-MFP is used in the analysis of industry-level and sectoral technical change. It is the most appropriate tool to measure technical change by industry because it fully

acknowledges the role of intermediate inputs in production. Domar's aggregation of KLEMS-MFP across industries renders an accurate assessment of the contributions of industries to aggregate MFP change. The major drawback to KLEMS MFP is its significant data requirements, in particular timely availability of input-output tables that are consistent with national accounts. It is also more difficult to communicate inter industry links and aggregation across industries using KLEMS-MFP than in the case of value-added based MFP measures.

3. 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

3.1 The top ten factors that affect the small and medium 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 absenteeism 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 absenteeism and far away from location of material storage, and
- 10) Bad leadership

3.2 The top ten factors that affect large companies

- 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 absenteeism 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.

3.3 Factors that affect in general all

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.

4. 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 mismeasurement 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 affect 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

5. 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 of work
- 11 Systematic planning of funds in advance
- 12 Premonsoon plan to avoid work stop
- 13 Maximum use of machinery and automation system
- 14 Advance equipment planning.

6. 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 craftsmen- Studies of Uganda.” *Journal of Civil Engineering and Management* . 2007, 13; 169-176.
- 5) Khaled M. El-Gohary, Mostafa E. Shehata, (2011) “ Towards improving construction labour productivity and projects performance.” *Alexandria Engineering Journal* . 2011, 50; 321-330.