Labour Productivity in the building industry

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Abstract

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. The paper further reviews the paradigms of innovation, benchmarking, and industrialization among the theories aimed at improving the productivity of labour in the building industry.

Key words: Labour Productivity, Building Industry.

1. Introduction

1.1 Background

The construction sector has a strategic role in all developing and developed countries. The construction industry is the single largest industrial employer in Europe employing more than 7% of the labor force (Proverbs, Holt and Olomolaiye[1]). According to Uganda's Ministry of Finance in Uganda [2], the construction industry contributes 12% of the Gross Domestic Product (GDP) and employs 5% of the registered workforce in Uganda.
In most developing countries, labor-intensive production is still in use in the construction sector and this situation will remain for a couple of years to come.

According to Buchan, Fleming and Kelly [3], Zakeri, et al [4] and Kaming et al [5], Gillear J. [6] labor cost is somewhere between 20% and 50% of the total project cost. Hence the reduction of labor and therefore construction costs can be best carried out by labor productivity improvement. Productivity is the key to greater competitiveness, as it is critical to the profitability of most construction projects.

The time used by workers on daily basis on productive work averages about 30% of the total time available for construction work (Jenkins, [7]). At the same time, low productivity has led to high labour costs in comparison to the construction costs.

As pointed out by Yates and Guhathakurta [8], labor productivity is becoming an increasingly important topic to members of the construction industry. The problem of low and decreasing labour productivity appears in many other countries. For example, Teicholz [9] found out that labour productivity in the United States has continued to slowly decline (with a few exceptions) over the past 25 – 30 years. The important topic addressed in the Emerson report (1962), the Latham report [10] and the Egan report [11] is the issue of productivity in the construction industry.

1.2 Definitions

Different people have been using the word productivity to mean different things. Productivity is defined by Calvert el at [12] as the ratio of outputs to inputs. Labour productivity is one of the partial factors of productivity. It has been defined as the ratio of the total output to the labor input (Gilleard, [6]). Noor ([13]) defines it by the following equation

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\text{Labour productivity} = \frac{\text{unit output}}{\text{labour manhours}}
\]

The determination of output is a relatively simple task, as they can be physically measured. As pointed out by Noor [13], the determination of labour workhours associated with measured output is a more contentious issue because it can be a measure of different input times. Different measurements of input times will give rise to different productivity measurements.

Labour productivity measured in terms of the paid time provides useful information to contractors for scheduling and estimating purposes on future projects. On the other hand, labour productivity measurements based on time available for work help to provide the basis for analyzing the effects of adverse weather conditions on labour productivity. Labour productivity
measures that are based on productive time help in determining the effect of various factors on productivity such as constructability and delays due to lack of materials and equipment.

The measurement of output suffers from the non-standardization of the construction industry. For example, even concreting which can be measured in cubic meters has several factors influencing its productive time. The quantification of quality and increased use of prefabrication complicates the quantification of labor inputs also. There is need for the industry to agree on the way to measure the inputs.

2. Use of labour productivity

Productivity is one of the key measures of construction performance. Latham [10] and Egan [11] clearly addressed the importance of raising productivity in the construction industry in UK. The studies and the recommendations made for the UK construction industry are relevant worldwide. It was observed by Kaming and Olomolaiye [14] that poor productivity of construction craftsmen is one of the most daunting human resource problems in developing countries.

As pointed out by Kaming et al [5], the success of a construction company in today’s competitive environment largely depends on accurate estimation of productivity.

Labour productivity rates are used as indicators of the construction time performance. They are used in planning and scheduling of construction, controlling of the cost and worker performance, estimating and accounting.

If a company wishes to reduce risk, increase profits, or gain market share, there is direct need within the firm to have accuracy data on and use of labor productivity (Gilleard [6]).

Although studies have been made in a number of countries, most of the data available is not directly relevant to all countries because of the differences in materials used, techniques employed and working environment. Construction workers too have differences in the work culture.

3. Methods of obtaining labour productivity

Before productivity can be increased, there is need to measure and quantify the existing situation. Lord Kelvin’s dictum ‘to know properly you must measure it’ is sound advice to anybody interested in measuring productivity. The measure of construction productivity is thus a very important issue.
There are two different methods of generating data on productivity – accountancy based and engineering based methods.

Accountancy based standards rely on the analysis of historical accounting data to establish work-hour requirements for specific types of work. Engineering based standards involve breaking down complex work processes into small manageable parts and analyzing these parts for the length of time required to complete these processes. The accountancy-based data are relatively easy to follow but they do not capture the varying working conditions.

The engineering methods of measuring labor productivity include work measurement, work sampling, time and motion analysis, and modeling.

Work measurement is the determination of the time required for an average operative to carry out a particular task in accordance with a specified method and standard of performance (Calvert, [12]). Work sampling involves observing individual pieces of the work process and classifying the results as either productive or non-productive. It is useful for recording productivity levels for comparative purposes. Harris and McCaffer [15]) describe its use. Thomas [16] roundly condemned activity sampling as being unsuitable for measuring productivity in construction activities.

Time and motion studies are said to be the most accurate methods for generating productivity standards. Factor based modeling is arguably the most applicable engineering-based technique to the construction industry and has the potential to produce useful data. The factor model technique has been recommended by a number of authors (Gilleard, [6]) although it is yet to be accepted internationally.

4. Factors affecting labour productivity

Factors influencing productivity of construction workers in many countries have been explored (Borcherding, [17]). Gilleard [6] acknowledges that labor productivity figures are highly variable, affected by such factors as the mode of employment, overall task duration, and length of the workday.

Identifying and evaluating the factors that influence productivity are critical issues faced by construction managers (Motwani et al [18]).

Most of these factors have been arrived at by asking the workmen directly and the project managers. Borcherding [19] recognized that the best means of acquiring information about production problems is by asking the workmen themselves.
The common factors influencing construction productivity have been listed by Yates and Guhathakurta [8], Keone [20].

According to Keohn [20], productivity is related in part to the following variables: management (proper planning, realistic scheduling, adequate coordination, and suitable control); labour (union agreements, restrictive work practices, absenteeism, turnover, delays, availability, level of skilled artisans, and the use of equipment); government (regulations, social characteristics, environmental rules, climate and political ramifications); contracts (fixed price, unit cost, and cost plus fixed fee); owner characteristics; and financing.

The factors affecting labour productivity can be summarized under the categories of design, manpower, management, environment, and others.

Design issues including: design complexity, design changes, and quality.

Manpower issues including: worker motivation, skills of the workers, recruitment of workers, recruitment of supervisors, absenteeism, labour turnover, communication problems, labour disruptions, alcoholism, stoppages because of work being rejected by consultants, stoppages because of disputes with owners/consultants, stoppages because of insolvency, labor composition, overcrowding.

Management issues including: material shortages, delays in materials delivered to site, disruption of power/water services, stop-work orders because of accidents, site congestion, site layout/access, construction method.

Environment including harsh working conditions and others including construction volume, regulatory requirements, economic conditions, social factors

According to Burton [21], companies should only track the important activities. Rosefielde and Mills [22] argued that any measure of construction productivity that does not account for the changes in design and quality would lead to low, if not negative, measures of construction productivity.

5. Current theories for improvement of labour productivity

The current thinking that will improve construction productivity hinges on the theories of innovation and knowledge transfer, benchmarking and industrialization. Motwani, Kumar and
Novakoski [18] however pointed out that theories of improving productivity vary from business to business and because of the variety of uncontrollable productivity influence factors it is hard to have one plan.

5.1 Innovation

The performance of the construction industry in terms of productivity, quality and product functionality has been low in comparison to other industries, and a low rate of innovation has been provided as the major explanation to this situation (Winch [23], Gann [24]). As stated by Winch [25], construction is commonly characterized as a backward industry, one that fails to innovate in comparison to other sectors. While the other sectors modernized through the introduction of interchangeable parts, then assembly lines, and then automation, construction retained its craft method of operation and fell further and further behind the rest of the manufacturing industry in terms of productivity, quality and hence value for money.

Innovation is a process of gaining and using new and existing knowledge to enhance either a product or process (Dodgson and Bessant [26]). Freeman [27] defines innovation as the actual use of a nontrivial change and improvement in a process, product or system that is novel to the institution developing the change. Innovation as defined by Barret and Sexton [28] is the effective generation and implementation of a new idea which enhances overall organizational performance. The main factors for innovation include: reward for innovation; opportunity for innovators to communicate their knowledge directly by presentation of events; funding and support the industry Research and Development (R&D). The adaptation of new procurement methods and the new organizational structures are seen to improve the ability to provide more integrated and innovative solutions.

The industry requires radical changes if improvements in quality, productivity and performance are to be achieved. The construction industry is increasingly being challenged to successfully innovate in order to satisfy better aspirations and needs of society and clients, and improve competitiveness (Latham[10] and Egan [11]).

As pointed out by Motwani, Kumar and Novakoski [18], improving communication skills, preplanning and stricter management could help to raise the individual productivity rate from an average of 32 per cent productive time per hour to almost 60 per cent per hour.

It is important that the Construction Industry adopts TQM if it is to improve productivity since TQM is about changing attitude and skills so that the culture of the organization becomes one of preventing failure and doing things right first time all the time (ISO [29]).
A framework for improvement of productivity would address innovation of remedial measures such as recruiting and training a younger generation to have necessary skills, process improvement, standardization, and transfer of knowledge within the industry. The focus should be on continuous upgrading the management and technical skills of supervisory staff.

Barret and Sexton [28] acknowledge that although construction firms have always demonstrated an ability to innovate, construction practitioners are now very much getting to grips with the need for and management of innovation as an explicit endeavor.

### 5.2 Benchmarking

Before productivity can be increased, there is need to measure and quantify the existing situation. The point made is that a construction company should have a measurement procedure in place such that it can determine how it is doing relative to the benchmark. As pointed out by Adrian [30], by measuring the company’s performance relative to the benchmark and by implementing improved processes and procedures, the construction industry can work towards improvement.

Benchmarking is the search for the best practices that will lead to superior performance of an organization (Camp [31]). Houston in a document titled Planning, Organizing and Managing Benchmarking: Users Guide, defines benchmarking as a systematic and continuous measurement process of 1992; a process of continuously measuring and comparing an organization’s business process against business leaders anywhere in the world to gain information which will help the organization to take action to improve its performance.

As early as in the 1800’s, Fredrick Taylor’s work on the application of the scientific method of business had encouraged the comparison of work processes. This was within the concept of benchmarking.

As Lema and Price [32] point out, there is need to explore the potentials of benchmarking for performance improvement in the construction industry. The construction industry can learn from the wealth of experiences available throughout the manufacturing industry. A common understanding of benchmarking has to be reached, and a conceptual framework that would cater for the industry’s primary objectives at various levels has to be developed.

Lema and Price [32] point out that benchmarking is seen as a perfect vehicle to ensure that the customer gets the best quality under competitive conditions that ensure lowest prices. The three key roles of benchmarking are: to widen the competition base by exposing internal organizational processes to external market forces; accelerate the TQM process and therefore increase efficiency by providing the opportunity to learn from others, adopt and improve; and act as a tool
for cooperation to improve overall industry performance. The preconditions for successful applications include: the need for performance improvement; the recognition and acceptance that there are lessons to be drawn from others that can lead to improved performance; the willingness and capability to change for better performance; and the accessibility to the best practices. The problem with the construction industry is the lack of initiative to make full use of benchmarking to create change.

5.3 Industrialization of construction

Increasing heavy demands for the products of the building industry were made in the years following the end of the Second World War during the reconstruction programmes. Since the Second World War, the world population has more than doubled. Currently, the demand on housing is very high and the number of homeless people has been growing. There is also a big number of huge construction projects, which are being undertaken notably in Eastern Asia and China. While the increase in demand of construction products is happening, there is growing shortage of skilled manpower. Shortage of manpower is unlikely to improve to any significant extent (Foster [33]).

Industrialization of construction is needed to increase the productivity of the industry generally while at the same time reducing the amount of site labour involved. Industrialization involves the rationalization of the whole process of building (which includes the process of design, the forms of construction used and the methods of building adopted).

Foster [33] defines industrialization as essentially an organizational process – continuity of production implying a steady flow of demand; standardization; integration of the different stages of the whole production process; a high degree of organization of work; mechanization to replace human labour wherever possible; research and organized experimentation integrated with production.

There is need to industrial all sectors of the construction industry if we are to satisfy the current demands. Ideally housing would be easier to provide for using industrialization in construction because most of the spaces and products can be standardized as exemplified by the precast concrete box units (Hansson [34]). Variations would only cater for special cases. The industry requires radical changes if improvements in quality, productivity and performance are to be achieved (Latham[10] and Egan[11]). Currently the industry is fragmented and has many stakeholders who are not well coordinated. Product and process industrialization would help to improve the situation.

Since the second world war, the idea of industrialization has received much attention both in Europe, North America and elsewhere. However, in spite of a great number of attempts, there has been a relative lack of success of industrialized building methods (Warzawski [35]). The
share of prefabricated components has risen, and there are examples of advanced industrialization, notably the Japanese house producers (Gann [24]) and the American metal building providers (Ellifritt and LaBoude[36]) but a wider breakthrough for industrialized construction has still not occurred. According to Warzawski, the main problem of prefabrication of today in the lack of a system approach to its deployment on the part of the various parties involved.

The building construction industry still lacks in being rational. This is manifested by poor labour productivity due to lack of integration of design, poor supply chain management, on site fabrication and assembly with many inefficient processes.

6. Conclusions

It is has been noted that the industry lacks generally agreed ways of measuring and strategies for improvement of labour productivity.

It can be concluded that there are many factors that affect labour productivity and their effects vary from one industry to another. There is need to quantify the effects that those factors have on labour productivity so that remedial measures are sought. Although a few have been explored in specific industries, there are still many gaps to be filled in this area.

Although the literature indicates that the theories on innovation and knowledge transfer, benchmarking, industrialization in construction can be used to improve on labour productivity, there is still need to develop strategies on how they can be used. There are gaps on the relevance and application of the theories to improve labour productivity.

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References

29. ISO 9000 International Standards Organization