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Productivity Improvement in Construction Project Delivery

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Abstract
Productivity is a complex phenomenon at all levels be it individual, organised private sector or government the world over and in all spheres of human endeavour particularly in construction project delivery. Low productivity in the construction industry is as a result of diverse identifiable reasons such as; high reduction in skill level of construction workers, shift work, shortages of materials and equipment, change orders, labour shortages, weathers, low level of monitoring and control of projects etc. key factors that leads to productivity improvement in construction project delivery were analysed. These comprise of project planning, productivity measurement, avoidance of construction site congestion, motivation of workforce and good communication among others. It was therefore recommended that time management, application of project management tools like pert master, precedence diagram, research and development, provision of new equipment, plant and machinery to replace the old ones, simplifying the product variety, increasing the overall effectiveness of the workforce through motivation and paying attention to details of the current best practices in the industry will no doubt lead to productivity improvement in construction project delivery.
Keywords: Productivity, Improvement, Construction, Improved Organisation, Motivation, Time management

1.0 Introduction

The overriding purpose of construction industry is to build, and every building is done by workers of different skills onsite/offsite. Productivity improvement in construction projects takes place at the jobsite or at the field of construction. Notwithstanding the relevance of productivity concept in measuring and determining the success of business in an industry, the improvement in the construction industry has been on a backsliding scale when compared to other sectors such as retail, manufacturing etc.

"Poor management practices that lead to poor performance such as changes in scope, errors in design and omissions of details, lack of adequate planning and scheduling, poor management of tools", etc. have been identified by Goodrum and Haas (2002) as some of the factors that impact on productivity. Effective and efficient integration of modern production management tools, innovative technology etc. can greatly improve productivity in an industry.

2.0 Literature Review

Productivity remains one of the main issues in construction projects as well as other businesses. It is a significant area that requires adequate consideration right from initiation to a project closure because resources are scarce, so minimising their impact is central to business. OECD (1996) describes productivity as "the ratio of volume measure of output to a volume of input". Also, Thomas *et al* (1972) sees Productivity as a ratio relating output (goods and services) to one of the inputs (labour, capital, etc.), which are associated with the output. Similarly, Orczyk*et al* (1990) stated that productivity is "a relative measure of labour efficiency, when compared to an established base as determined from an area of great experience". Essentially, it is the measure of how well a given organisation converts input into output.

Low productivity in construction industry as observed by Allen (1985) was due to "high reduction in skill level of construction workers", consequently he pointed that 'labour' is a major driver of productivity. Adrian (1987) on the other hand observed that shift work has impact on productivity and suggested that more difficult tasks should be done in the morning rather than afternoons so that such tasks are performed while workers strength last. A study carried out on 'plant project', by Borcherding (1987) revealed that the workforce rated "material and equipment shortages, change orders, weather, labour shortages, and turnover among the topmost factors affecting the productivity of project. In the same way, Goodrum and Haas (2002) noted that "equipment technology is a key factor in long-term improvement in productivity". This suggests that equipping the workforce with relevant skills and tools will boost productivity in the industry. It is on this note that Rojas and Aramvareekul (2003) noted that management skill is one of the most influential drivers of productivity.

Monitoring and control of project is essential in order to measure its level of productivity and improve on it. Chan and Kaka (2003), in a survey of UK contractors observed that "some contractors do not monitor productivity levels at their project" which results to their inability to improve on it. However, Investors in People (2001) argued that small percentage of organisations used "formal and informal techniques to measure productivity". Research has shown that the process of formalising on-site measurements will deliver project improvement. Noor (1998) stated that productivity measurement technique can be categorised into "observational such as work study, direct observation and intermittent observation such as audio-visual", surveys

etc.

Application of Information Processing Equipment (IPE) in an industry has been observed as a tremendous means of improving productivity. This consist of communications equipment such as internet, telephone etc., scientific and engineering instruments, photocopiers and related equipment. When discussing productivity in a project, IPE must be considered as it has an overwhelming impact on the productivity of any given project. Brynjolfsson and Yang (1996), noted that "IT has helped to shape projects". Computers and other IT facilities could influence project productivity through effective communication and information management.

3.0 Analysis of The Pertinent Issue

Studies have shown that productivity is a complex issue all over the World, be it in a public sector, organised private sector or at individual business levels. This is more noticeable in the construction industry due to the high degree of influencing factors such as labour, capital, material and equipment as identified by Jergeas (2009). Lack of proper coordination and efficient integration of man, money and materials has the potential of disrupting construction operations thereby resulting to reduced productivity.

Planning of project is very critical among the project stakeholders because it makes the manager of the project to conceptualise all possible activities and make selection among the listed alternatives. Planning is not just beneficial when it guides in selecting a strategy but more so when the planning react accordingly to solve a problem when it rises. Planning help in minimising waste of resources such as time, labour, material and so on.

Brayton (1983) observed that "productivity measurement is important to business". This is because productivity measurement shows the growth of an industry thereby observing if it is meeting its obligations to the people who are connected to the business and if not a strategy will be formulated to improve it so as to remain in the market.

Construction site congestion lowers the rate of productivity as identified by Aduagyei, F. and Ruwanpura, J.Y. (2008). This includes "improper activity sequencing, excessive on-site prefabrication and storage of material in the work area and improper planning of the activities with regards to movement of resources in the work area with the progression of the work". An un-organised construction site will hinder the free flow of human, vehicle and equipment around the job site.

Motivation is an important issue that can improve productivity and as such the management need to consider it seriously in order to improve the productivity of a project. The workforce can be motivated through goal setting, incentives, engagement, positive re-enforcement etc. This will boost workers moral hence improving the overall productivity of the industry.

Good communication among the project team and the stakeholders is an essential issue that related to project productivity. This is because the interfaces that exist in a project work environment provide the need for each participant to know exactly what his or her roles are in the job. In this way productivity will be improved as there will be no confusion and wasting of time.

4.0 Impact Of The Issue On Construction Businesses

These days in construction organisations, it has been observed that many of the supervisors who supervise construction work on site are not qualified, rather they got to the level of site supervision through the 'traditional path' starting from the level of craftsman such as painter, mason, joiner etc. and as such lack adequate training in construction planning and site management, which are key issues in project productivity. The absence of requisite technical knowledge on jobsite management has great effect on productivity. This is more pronounced in the third world countries such as Nigeria, where construction organisations in a bid to save cost and maximise profits compromise on quality standard by elevating craftsmen to the status of on-site supervisors which has often resulted to an overbearing consequences on site activities such as overlooking certain elements that are vital in projects – hence low productivity.

Human factors are of immense importance to project productivity in that; it has the potential to increase or lower the level of productivity in an industry. Factors such as attitude, motivation, experience, skills, team spirit, absenteeism etc. have direct bearing to the level of organisational performance. For instance, Workers who are motivated will be more committed, more diligent and more effective in the discharge of their duties as opposed to others who are not. Therefore issues like motivation, reward or just a pat at the back can increase productivity, while issues like absenteeism, lack of team spirit and ill health could lower productivity.

In construction project, events such as adverse weather condition, natural disaster, size of project etc. can impact negatively on productivity of an industry. During severe bad weather as the case in Scotland sometimes, construction workers will be out of the site resulting to lower productivity.

Improved technology as opposed to old methods of project planning and execution has positively impacted on the overall productivity of projects. Machines and equipment has replaced human labour resulting in quicker and higher productivity. Jobs that will take ten human efforts 10 days to accomplish will take 2 men 3 days to finish resulting to time and cost savings.

Information and communication as has been identified are important factors that influence productivity in the construction industry. Scott et al (2003), noted that the availability of efficient data collection facility to manage schedules, policies etc. which are accessed and shared by all the stakeholders will improve information passage" The facility allows easy access, storage, manipulation and retrieval of data. Information stored in the facility is error free and can be transmitted through an internet system such as e-mail or fax with minimum delay.

Zhou (2006), posited when "motivation is combined with work experience and education it becomes an important factor in improving performance". This makes workers motivation an indispensable factor in increasing industry's productivity.

5.0 Recommendation and Conclusion

Recommendation On Improving "Time Element"

"Project duration is often determined by the client" Malone (2006). To improve the time element the project manager must be flexible in time management. The flexibility is determined by prioritising the time element in order to accomplish the project on schedule.

The following steps according to Method123 (no date) will improve the time element of a project which will enhance its overall productivity.

- Putting in place a good process for recording time within each segment of projects;
- Using Timesheets to record and monitor the time spent by staff on a particular shift;
- Quickly Identify, measure and resolve time management issues that relates to the project;
- Keep your Project Plan up-to-date at all times.

Conclusion

As has been noted from the literature, it will not be an overstatement to say that productivity of a project is directly related to a wide range of factors that influences its operations. An improved organisation will result to an increased productivity and vice versa. Projects consist of several factors that control its operations and continual existence. These factors may be broadly classified and grouped to include project workforce, project organisation, job planning, motivation, and material availability. These factors impact on project productivity thus making improvement inevitable. Issues such as lack of trade skill, poor planning and scheduling, delay of material delivery to site, design changes, and slowness in making decision are noted to cause low productivity in projects.

The effective application of workers skills and experience, coordinated planning of job, workers motivation, timely provision of materials, and good site management are suggested factors that drive productivity in a construction project. The issue of experience and skills of the workforce according to Mojahed and Aghazadeh (2008) are found to be a peculiar problem that project organisations have to contend with. This implies that inadequate skilled and experience workforce in an organisation such as construction industry would lead to low productivity or/and loss of productivity.

Looking at projects of different dimensions, sizes and nomenclature, it shows that the factors influencing productivity varies with geographical location of the project, size of the project and organisational structure of the project. Genarally, project productivity improvement is possible through the collective will of the entire project team through the adjustment of the existing work practices and paying attention to details of the current best practice.

Satisfying the client's business objectives in terms of high productivity is not an easy task as there are several contending issues such technology etc. These challenges require effective and efficient application of project management tools and techniques such as pert master, precedence diagram etc. to overcome. Consequently, for project to be productive it requires that existing practices be improved through research and development, provision of new equipment, plant and machinery to replace the old ones, simplifying the product variety, and increasing the overall effectiveness of the workforce through motivation.

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