

Identifying Determinants of Construction Worker Performance on Construction Sites: A Literature Review

Chioma S. Okoro, Innocent Musonda, and Justus Agumba

Abstract—The construction industry in many developed and developing countries suffers from delays and cost overruns due to poor labour productivity. This paper aims to identify determinants of construction workers' performance on construction sites in terms of ratio of output to input (productivity). A literature review of relevant literature was conducted from journals and conference proceedings and theses, based on international and South African context. The study identified that wages/salary, working time, financial initiatives, communication, nutrition, fatigue and health, adequacy of plans and specifications, availability of consumables, education and training on the job, management dynamics, safety measures and proper work planning determine construction workers' performance on construction sites. The findings of the present study could help constitution managers and supervisors in taking measures to improve their workers' productivity.

Index Terms—Construction workers, performance, productivity.

I. INTRODUCTION

Construction is a key activity within any economy, given its contribution to the gross national product of any economy and employment prospects [1], [2]. The construction industry, however, faces a problem of declining rates of productivity and lack of productivity standards due to poor performance of construction workers [3]. Improving the status quo regarding labour productivity has been a challenge in the construction industry over the years [4]. Construction labourers are the human input in the construction process and as such are the most dynamic elements of the construction industry [5]. Construction workers make up 30-50% of the overall production cost, which is a fairly good portion of the total cost of a project [6]. Since construction workers constitute this large part, their performance or maximum productivity is an important factor contributing to the successful completion of a given project.

Performance is a measure of productivity and is defined as a ratio of estimated unit rate to the actual unit rate produced [3].

Ref. [7] argued that construction productivity is mainly dependent on human effort and performance. Performance can be defined as the amount of output produced by a worker given a certain input, during an activity or process [8]. Since construction site workers are the major players

executing the processes and activities in construction, they have a significant influence on labour productivity and it is important to know what they need and what affects their performance [9]. Continuous attention to the determinants of construction workers' performance is vital if maximal productivity in the industry is desired.

Research has been conducted on the determinants of labour productivity. Ref. [10] used a Health and Labour Questionnaire and a Quantity and Quality instrument to measure the effect of health status of workers (including industrial and construction workers). Reference [11] explored project managers' perceptions (in Uganda) on the labour productivity factors in relation to time, cost and quality only. Ref. [8] focused on the role of health on productivity; specifically, physiological conditions (such as body temperature, heart rate, oxygen consumption) and job-site physical environmental stressors (i.e., physical elements which affect the human metabolism such as temperature, humidity, vibration, noise, lightning, airflow and ventilation). Ref. [6] conducted a quantitative study among construction managers, supervisors and administrative personnel on measures of labour productivity, while Ref. [9] investigated the perceptions of craft workers themselves. Ref. [12] studied the influence of work-life conflict issues on performance of construction workers. The current paper reviews and identifies a more comprehensive list of determinants of productivity of workers in the construction industry.

Therefore, the objective of the study is to identify determinants of construction worker performance. This objective was achieved by a search of online databases including Ebscohost, Science Direct, Academic Search Complete, UJoogle, Emerald Insight and Google, using key words and phrases including "construction worker", "productivity determinants", "performance determinants", "factors influencing construction labour productivity". Journals and conference proceedings were consulted. The succeeding sections present the findings of the study and conclusions.

II. DETERMINANTS OF WORKER PERFORMANCE

According to [6]-[8], the productivity of workers is affected by many factors and is chiefly linked to performance in terms of:

- 1) Time (based on the project duration): the extent to which workers accomplish work goals within a minimum amount of time and effort or completion of a given work within a reasonable time limit;
- 2) Cost (based on the project financial expenditure);
- 3) Safety measures (based on the amount and significance

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of accidents, damages and injuries during the process), relates to the extent to which the worker practices rules of safety to protect self and others; and

- 4) Quality: determined by, inter alia, the accuracy (extent to which the work is free from errors/omissions), thoroughness (completion of work with all details covered, conformity to plans and specifications, and avoiding the necessity of performing further work or rework to complete it); and neatness (the extent to which the finished work meets the standard for cleanliness and orderliness).

References [13] and [14] opined that the success of a project primarily depends on the above-mentioned performance parameters, which are interrelated. For instance, quality failures may result in time and cost overruns; the control of time cannot be addressed in isolation from resources and cost. If projects are not completed within the given time frame, additional costs may be incurred, workers may rush to complete the tasks and make mistakes. When workers are put on severe time crunches, they are more likely to take short cuts and safety is compromised. Quality is also compromised as defects occur and reworks increase, resulting in budget increases [14]. However, Ref. [6], [15] argued that the above criteria could be expanded to include resourcefulness and initiative work habit (the extent to which a worker practices rules of safety to protect self and others and the extent to which a worker accomplishes work goals with a minimum amount of time and effort); job skills and ability (including, inter alia, the physical condition of the worker, i.e., the extent to which the worker is physically capable of performing strenuous aspects of the job and do it within a specified time, teamwork and co-operation); and quantity of work (measured by the amount/volume of work produced in relation to the amount of work requiring completion or attention at the time); completion of work on schedule (the extent to which a worker completes work in a given or reasonable time limits); efficiency (completion of tasks in an effective and timely manner and adhering to policies for attendance and punctuality); health and safety (including factors such as reportable accident rates and assurance rates); worker attributes; client satisfaction; and environmental impact.

The above-stated criteria moderate the determinants as discussed in the following section.

A. Managerial Dynamics

Productivity of workers improves with increased level of supervision and direction on the part of management [8]. Company policy and administration motivate workers and significantly influence productivity rates [16]. In [16], it was revealed that good management and high incentives coupled with longer working days increased productivity on earthwork tasks in India and Indonesia. Quality of work is influenced by management practices which increase employees' belief that managers are supportive of employees [12]. Ability to handle misunderstandings between labourers and supervisors, and provision of periodic meetings with workers are also indispensable in ensuring improved performance of workers [1].

B. Communication

Productivity is improved when information flows are increased and employees understand and identify with the company's goals and objectives [12]. Poor communication due to inaccurate instructions and inaccurate drawings lead to work stoppages as consultants reject work, rework and delays due to repetition of instructions [11]. Stressing the importance of information flow among team members on construction projects in South Africa, [17] contended that communication breakdowns, which can either be minor or major, threaten project performance in terms of errors, rework and delays.

C. Construction Materials and Methods

Proper work planning and adequacy of plans and specifications ensure that workers perform their designated tasks efficiently [8]. Poor construction methods due to lack of planning, poor sequencing of works, incompetence of supervisors and designs that are not easily buildable (that is, designs that do not account for availability of materials and appreciation of construction techniques) slows down the progress of work on construction sites [8], [11]. Unavailability of tools and constant breakdown of equipment also hinder productivity [1], [9], [11].

D. Workforce Education and Training

Ref. [16] opined that education and training increases the ability of labourers to gain more knowledge from practical on-the-job training sessions, which in turn increases productivity. Training and education of the workforce should be continuous and satisfactory [8].

E. Motivation

Employees are capable of performing at high levels when motivated to do so; and when workers are treated with respect, commitment to the organisation and trust in management are increased, leading to increased performance [12]. Job content and satisfaction, a sense of participation and/or responsibility, perceived status of workers and a sense of achievement motivate workers to perform at peak levels [1], [16]. Unavailability of transportation and payment delays negatively affect labourers' mood/morale and reduce productivity [1].

F. Financial Incentives/Compensation for Labour

Financial incentives, rewards and acceptable salary rates influence workers' performance [8], [16]. The effect of financial incentives was demonstrated on a road construction project in India whereby workers' productivity was increased by 50-75% because managers changed from time rates to piece or task rates [16]. Likewise, studies on road construction project in Nigeria and Tanzania conducted by the International Labour Organisation (ILO) indicated that workers' productivity improved when they were paid in a way that made them feel that they were working for themselves [16].

G. Safety Measures

According to Lingard *et al.* (2007), there is a correlation between performance levels and health and safety performance. Safety measures in place at a workplace enhance the workers' safety culture and productivity. High

reportable accident rates and assurance rates indicate poor performance [15]. Accidents lead to stoppage in works and absenteeism which lowers productivity [1].

H. Environmental/Working Conditions

Poor working conditions and non-provision of welfare facilities for eating and relaxation at worksites reduce workers' motivation and performance [1], [16], [18]. Poor site conditions and harsh weather also influence performance of construction workers [1], [11].

I. Workforce physical health

The health and productivity of construction workers is influenced by their nutrition [2], [19], [20] as well as stress, fatigue and job demand [12]. Inadequate nourishment can reduce productivity by up to 20%; good nutrition can raise production rates and prevent micronutrient deficiencies and chronic diseases and obesity, with modest investments that can be repaid in reduction of sick days and accidents [19]. In concurrence with these views, Ref. [8] and [11] contend that physical fatigue/general weakness and ill-health/sickness may lead to decreased productivity, motivation, inattentiveness, poor judgement, poor quality work, job dissatisfaction, accidents and injuries. Long work schedules sometimes lead to presenteeism and reduced productivity turnover [1], [12]. Obesity (due to poor nutrition and inadequate physical exercise) may affect performance and productivity by limiting effectiveness of personal protective equipment (PPE), and is also associated with absenteeism (measured as work loss days) [21].

J. Workforce Attributes

The behaviour and attributes of workers in terms of work habit, co-operation/teamwork, resourcefulness and initiative, job skills and ability, attendance to social factors, changing crews, misunderstandings among labourers, use of older-aged workers, labourer loyalty, *etcetera*, influence the quantity and quality of work produced [6], [11]. Lack of worker participation in quality circles and quality improvement teams negatively influence project success outcomes [17].

III. DISCUSSION AND CONCLUSION

Good management and high incentives improve productivity. Even with longer working hours and setting-in fatigue, workers may be motivated to perform assigned tasks. On the other hand, poor management, poor working conditions, and lack of financial incentives reduce the motivation of workers in which in turn results in lower productivity levels. Frequent maintenance and repair for tools and equipment as well as utilisation of competent and qualified personnel as managers and supervisors would improve performance of workers as they are constantly stimulated and clearly communicated as regards what is required of them at a given time/period.

Workers could be encouraged with financial rewards in the form of vouchers and non-delay in payment. With healthy food alternatives on construction sites, workers could also perform with optimal concentration levels. Continuous training of workers in the use of contemporary building techniques is also vital in improving productivity.

The study sought to assess and identify factors which influence construction worker performance. The objective was achieved. Focusing on the identified factors which moderate the performance of workers will improve productivity and inevitably help in eliminating time and cost overruns on construction projects. Further research is necessary to determine the extent of influence of the identified factors on construction workers' performance.

Although the current paper presents only a review, it provides information which would be useful to construction managers and stakeholders in improving productivity of their workers and achieving value for money from construction projects.

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