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Information Technology as a Viable Strategy for Improving Material Management Practices in SME Construction Projects Performance

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Abstract:

Success of any construction projects is related to its timely projects completion within budget, time and quality. Traditional materials management practice has been identified as a major issue in small and medium enterprises (SME) construction companies in most developing countries. Understandably, a key issue identified in the traditional practices is the lack of IT adoption in materials management practices. It is on this note, the paper seeks to explore factors affecting IT adoption for effective materials management in the Nigerian SME construction companies. Secondary sources such as past projects, journals and internet are the main source of data for this study. Data thus collected were studied and evaluated with the aim of articulating existing knowledge on how the materials management practice is carried out in SME construction projects. The significant findings of this study provides a generic overview of IT adoption within the context of SME and can assist SME and policy makers to towards formulating legislation for enhancing IT adoption in SME for an improvement of materials management practices towards sustainable projects performance and established profitable relationship with client's and create competitive advantage.

Keywords: SMEs, Materials Management, IT Adoption

1. Introduction

Literature revealed that, small and medium enterprises (SME) in the construction industry are not very innovative when compared with large-sized construction enterprises (Donyavi, 2009). This is evident in the case of adoption and diffusion of innovation associated with information technologies (IT). However, SME in the Nigeria construction industries continues to occupy an important position in the nation's economy. For this reason, the industry is often described as the counter balance-force of the economic growth. However, the ineffective materials management practices of the sector during construction projects created bad image for the sector project performance. Obviously, for any project to be successful there is need for effective and efficient management of materials on construction projects. Efficient and effective materials management represents a key role in the successful completion of a project. Therefore, materials management is the system for planning and controlling to ensure that, the right quantity and quality of materials are purchased in a timely manner (Donyari and Flanagan, 2009). In this digital age, IT adoption and utilisation is having the most profound impact upon organisational performance, thus SME can adopt and use IT as an enabler for integration, collaboration, knowledge management, procurement, site management, and process improvement (Davenport, 2013). However, in reference to SME construction firms in the North-eastern region of Nigeria, the adoption and utilisation of IT is too low despite the apparent advantages IT offers, and also there is no empirical evidence relative to IT adoption and utilisation. This revealed the ineffective performance of SME's in materials management, which constituted many problems during construction projects.

Furthermore, low IT adoption is amongst the most frequently reported shortcomings of SME in many developing countries including Nigeria (Adeola, 2014; Apulu *et al.*, 2013). SME construction firms in North eastern region are quite attached to their traditional methods. This tendency can be observed from the few firms that have the websites where sites are usually static sites, which only provide information about the firm, rather than dynamic sites that allow business transactions. This is evidence from study of Blili and Raymond (1993) that, electronic document management (EDM) system, geographic positioning system (GPS), extranets and radio frequency identification were not used in the materials management. Effective materials management on construction project is the valuable use of resources (both materials and human) before, during and after completion of a project. This effort requires a serious plan to delineate the sequence of activities and special attention should be placed in dealing with these activities. Therefore, an adoption and use information technology is important strategy for improving the management of materials consequently resulting in effective project performance. Thus, this paper will provide a review on the existing issues in Nigerian SME materials management

practices on construction projects with a view to showcasing the need for effective and sustainable materials management on construction projects.

2. Small and Medium Enterprises Construction Firms

Small and Medium Enterprises (SME) play an important role in the development of entrepreneurial skills, creation of employments and recovery of economies in the wake of dwindling economic (Ayanda and Laraba, 2016). The construction industry in Nigeria consist majority of small and medium enterprises and few large construction enterprises. The SME construction firms do not only contribute significantly to improved living conditions, but also bring about substantial local capital formation and achieve high level of productivity resulting in generating employment to teeming unemployed youth. Interestingly, small and medium construction firms are recognised as the principal actor for achieving equitable and sustainable viable economy (Udechukwu, 2003). Any policy that seeks to target poverty reductions, social problems and industrialisation as well as mitigate rural-urban migration must be hinged on the development of SME construction firms. Therefore, SME role to national wealth creation and jobs creation is facilitated by successful projects executions. Hence, SME construction firms are development component as well as an agent of social change. They serve as the ligaments that the economy requires to create new jobs for the teeming unemployed youth for better living conditions. Despite the role play by SME in nation building, improper management of materials adversely affects the performance of SME in the construction industry. This is as a result of manual-oriented approach which resulted in slow practices and much time taking, subsequently resulting in infrequent and incomplete of management of materials. Current practice shows that manual approach is not an approach which satisfies the requirements for today's projects (Ergen *et al.*, 2007; Yoon *et al.*, 2011). The data and information are not then transferred to the SME and the delivery system fails to help the SME to manage materials on-site. Wahab and Lawal (2011) states that, the ineffective management of materials in SME construction projects leads to disruption in the project progress, which decreased efficiency and performance baseline. Kumar *et al.*, (2016) further identified common causes of poor project performance as lack of effective management skills and manual approach to materials management, and evaluation of proposals driven by price rather than price and quality. SME tend to undertake little detailed planning of project activities; they work to milestone dates which mean materials management is not properly scheduled with sufficient lead times for delivery. As a result, the problems of materials management in SME construction companies is rampant in both developed and developing countries however this problem is more severe in developing countries where materials management is mostly practice manually due to the inability of SME to respond to rapid technological change. And in this digital age, no project can thrive without better use of materials. Better materials management practices could increase efficiency in operations leading to a successful project completion within target time, quality and budget.

3. Materials Management

Materials management is a management practice that is applied to materials during construction projects from project inception to completion for the purpose of controlling time, cost and quality. In construction sector materials management is very critical to the successful execution and completion of any project. Labour, materials, tools, equipment and cash are the main parts of any construction projects and the use of technology systems can reduce waste of materials and provide better site productivity. Obviously, for any project to be successful there is need for effective and efficient management of materials. Thus, materials management is an important function that provides timely and accurate flow of materials in order to improve productivity in construction projects. According to Okorocho (2013) and Safa *et al.*, (2014), materials are the bedrock and life of any construction industry. This is because performance of any construction industry will be shaky in the case materials are not properly managed and this will lead to poor execution of the project. Therefore, effective performance and significant savings could be made by construction industries with the better management of materials through more efficient management of materials resulting in lower wastage.

Materials management on construction project is regarded as the efficient use of tools and equipment before, during and after completion of a project. This effort requires a serious plan to delineate the sequence of activities hence special attention should be placed in dealing with these activities. This is true in view of the fact that poor materials management on projects has the potential to affect the continuity of such project and can ruin the project particularly SME's projects. Hence, there is need for better management of materials for a successful project performance. Okorocho (2013) further stated that a good management of materials will lead to benefits for construction. The goal of materials management is to ensure that the materials are available at their point of use when needed hence, effective management of materials represents a key role in the successful projects completion. Thus, materials management is critical for the fulfillment of the project objectives. Related studies upholds that, adopting information technology for materials management can improved communication, closer relationships, improved information flow, greater management control and getting geographically dispersed groups to work together (Love *et al* 2002; Ahuja *et al.*, 2009).

4. Nigerian SME Materials Management Practices

Nigerian small and medium construction industry plays a major role in the nation's economy, contributing about 61% of the gross domestic product (GDP) of the country and also provides up to 20% of the labour force (Jimoh, 2012; Wahab and Lawal, 2011). Therefore, SME construction firms can be considered as one of the major value adding source to the development process of a nation's economy. This is achieved through the job opportunities it creates directly or indirectly to unskilled, semi-skilled and skilled labour. However, ANIVS and FNIVS (2010) stated that any constraint to the success of the construction sector will have an overall effect on the growth of the economy of a nation. In this regards, the Nigerian SME construction companies continue to be relevance in the nation economy. Indeed, the importance of the SME in the construction industry to the task of counter balance force particularly in

the face of dwindling economy is obvious because the economic stability of the Nigerian economy pivot to a considerable extent on the effectiveness of the SME (Olateju *et al.*, 2011). Consequently, the contribution of SME, especially SME construction firms to national economic growth necessitates the improvement of its performance particularly in materials management practices as materials constitutes the major part of on construction projects.

In construction project (CP), the three concerns are time, cost, and quality. Generally, projects delivered in time and within budget are regarded as successful. However, the unique nature of Nigerian SME construction industry led to well documented problems such as transport difficulties, improper handling of materials, inappropriate materials delivery and excessive paperwork all adversely affect construction project. These challenges faced by SME construction firms are prevalent due to traditional method of managing materials on construction projects. Hence, the rate at which materials are been squandered during construction project due to poor materials management is getting too rampant and if not addressed, it can jeopardise the future of the sector (Okorochoa, 2013). This revealed the ineffective performance of SMEs in the construction industry in Nigeria on construction projects, which constituted many problems during construction project. This is true in view of the fact that poor materials management on construction projects has the potential to affects the continuity of a project and can ruin the project.

Equally, Transport difficulties, improper handling of materials, misuse of materials, inappropriate materials delivery, theft and vandalism, over ordering or under ordering, poor and wrong storage of materials and excessive paperwork are all shortcomings of Nigerian SME materials management practices which adversely affects its projects performance. Literature reviewed revealed that, the reason for Nigerian small and medium in the construction industry poor projects performance has been attributed to its traditional materials management practices and IT adoption gap. Furthermore, the waste generated through poor management of materials on construction projects are major issues of concerned in the SMEs construction firms in Nigeria. Adewuyi *et al.*, (2014) stated that, improving materials management in the construction industry has been a long-debated issue. Whereas it is impossible to completely eliminate all issues concerning materials management, the concern should be on how to improve the practice in the local industry, especially in Nigeria where modern techniques (such as IT) have not been appreciably embraced by SME in Nigeria. Therefore, there is need for IT adoptions in SME materials management, so as to change the SME's from continue doing today's work with yesterday's methods in order to improve the management of materials which will lead to significant projects performance.

5. Nigerian SME Materials Management Problems

Inefficiencies associated with practices of manually materials management often cause problems with project performance (Equere *et al.*, 2012). Unfortunately, traditional method is mostly the practiced method in Nigeria SME materials management practices, and it is associated with various non-value adding activities "waste" (Balaet *et al.*, 2009; Bell and Stukhart, 1986), reducing the value of the project. Alwiet *et al.* (2002) affirmed that non value added activities are associated with the traditional method. According to Sangwon, SangHyun, Fard, and Pena-Mora (2007) traditional method has failed in dealing with the problems of non value adding activities especially in materials management. The multiplier effect of this is dearth of quality project delivery and projects closeout. Oladiran (2009) further highlighted that, the problem of Nigerian SME in the construction industry is their inability to adopt modern technologies (such as IT) to eliminate or minimize the non value added activities in materials management process and improve value of its projects performance. Hence, it could conceivably be hypothesised that there is a connection between failure rates of SME construction projects performance and poor method of managing materials.

Materials scheduling is carried out in advance of the commencement of work, due to the extensive length of time involved. This is done using more of manual deductions and calculations from the drawings. Similarly, the greatest challenge to the company's manual materials management practices is the human factor, thus prone to errors and mismanagement. With the highly manual method, the practice is highly prone to errors, yet the system is required to maintain high performance efficiency. Mistakes of manual entries, non-serial dispatch of materials from store, materials lost amongst others, are adversely inflict hitches to successful completion of project within time, cost and quality. This resulted in affecting the system through delays, losses and wastages. Patil (2013) stated that, traditional management method is paper-based system, is associated with many drawbacks, low accuracy, time consumption, and loss of data. Improper management of materials could result in loss of profit, and consequently resulting in cost overrun leading to ineffective projects performance.

It is evident that Nigerian SME construction firms are still below the expected potentials on construction projects (Adeodu *et al.*, 2015). Indeed, various SME projects in Nigeria are in complete state of poor condition. In the words of Alkali (2014), SME's projects did not end up as great successes due to execution without requisite tools, technologies and generally accepted standard practice of managing materials. Equere (2012) further stated that, low technology and reluctance to adopt new technologies poses a challenge in the face of construction projects performance. This is true of developing nations like Nigeria with little or no technologies (such as IT) in materials management, especially SME's materials management. Thus, it is imperative for SME in the construction industry to adopt IT in materials management for better, faster and easier managing of materials with assiduously outcome on construction projects. Accordingly, adoption of IT could has the potentials to facilitate an effective and productive materials management practices by enabling more accurate documentations and hence resulting in good system where errors can be discovered early and problems can be avoided. However, most SMEs in the construction industry in North-Eastern Nigeria are slow in adopting and utilisation of IT in their materials management practices.

6. Information Technology Adoption

Information Technology (IT) has rapidly become an indispensable adjunct in the people life and has significantly impacted every facet of operations in organisations (Isaac *et al.*, 2017). Lack of IT adoption can lead to low performance and productivity (DeLone and McLean, 1992). IT has been recognised as a strategic tool for improving materials management practices amongst small and medium enterprises in the construction industry in Nigeria. According Eniola *et al.* (2015) organisations tend to perform well and create value when they adopt strategies that respond to current world of work needs. Therefore, information technology is a key strategy and driver to improve sustainable project performance. Kasimet *et al.* (2013) stated that, improving materials management towards sustainable project performance is a global crusade movement, which is a process rather than an end goal. Green (2011) further noted that this process requires constant analysis and evaluation of the emerging trends so as to take the issue of technology and sustainable development to the next level. IT has long been recognised as one of the most critical tool for organisations to increase their performances (Okwandu and Mba, 2010), and competitiveness (Kalkan *et al.*, 2011; Oliveira and Martins, 2011). With information technology, it is foreseen that SME in the construction industry can compete more effectively and efficiently in the world of work. In reference to this, the study addresses this gap by exploring the adverse effects of manual materials management practices and provides recommendations aimed at improving SME's performance through IT adoption.

7. Improving Materials Management Practices

The prevailing problems associated with SMEs materials management in the present disposition on project management need urgent addressing. The following recommendations are made from this paper for improving the materials management practices of Nigerian small and medium construction industry:

- i. Government should establish bodies that control materials management practices to improve standard;
- ii. Government should orient SMEs towards adoption and utilization of IT-based materials management in their operations;
- iii. Redefined management functions and control similar to that of bigger construction industries to minimise bossy influence of Owner manager;
- iv. Government should enact appropriate laws prohibiting noncertified SME from handling projects;
- v. Government should subsidise cost of software and reduce multiple levies and taxes for SMEs;
- vi. SMEs should ensure IT capacity building of their workers through training and retraining and;
- vii. Government should introduce policy that will address the prevailing challenges that hinder the adoption of IT by SMEs in Nigeria.

It can be contended that the state of any nation is reflected in its construction industry activities particularly it SME construction firm's performance. Therefore, an effective materials management practices is crucial for the existence, growth and development of small and medium enterprises in the construction industry for sustainable projects performance in the present era of information technology and serves as counter balance force in the current dwindling Nigeria economy resulting for the Nigerian economic development.

8. Conclusion

The findings of this paper revealed that Nigerian small and medium enterprises in the construction industry have a long way to go in this era of resources optimisation through effective materials management. However, this can be achieved largely through the adoption of new innovative methods of managing materials (such as IT) in materials management. Therefore, government as key umpire in construction project activities and for Nigeria to be among the twenty leading economies by the year 2020, Nigerian small and medium construction firms must accept to adopt IT for better materials management practices resulting in effective projects performance consequently counter-balance force in dwindling economy for sustainable development of the Nigeria economy.

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