



AUTHOR(S):

TITLE:

YEAR:

Publisher citation:

OpenAIR citation:

Publisher copyright statement:

This is the _____ version of proceedings originally published by _____
and presented at _____
(ISBN _____; eISBN _____; ISSN _____).

OpenAIR takedown statement:

Section 6 of the “Repository policy for OpenAIR @ RGU” (available from <http://www.rgu.ac.uk/staff-and-current-students/library/library-policies/repository-policies>) provides guidance on the criteria under which RGU will consider withdrawing material from OpenAIR. If you believe that this item is subject to any of these criteria, or for any other reason should not be held on OpenAIR, then please contact openair-help@rgu.ac.uk with the details of the item and the nature of your complaint.

This publication is distributed under a CC _____ license.

ID 045

The need for Kaizen costing in Indigenous Nigerian construction firms

T. Omotayo¹ and U. Kulatunga²

University of Salford, UK.

Email: T.omotayo@edu.salford.ac.uk

Abstract

The application of adequate cost management methods and techniques before and during construction activities is a major determinant of project success. Construction cost management methods such as target costing, life cycle costing, activity based costing and kaizen costing are some of the ways in which a project cost can be effectively managed.

Kaizen is a Japanese word for continuous improvement and it has been used in the Japanese manufacturing sector since the 1960s. This method employs techniques for incremental cost reduction and it is based on Kaizen philosophy and principles. Kaizen costing is a very useful method for post-contract cost control because it is applied during the manufacturing or production stage of a product. This cost control method creates more profit for the manufacturer, provides better quality products and improves customer satisfaction. Kaizen costing is a post-contract cost management method which can be used to increase the competitiveness of a company. This approach can be combined with target costing and other cost management methods for more effectiveness.

This paper focuses on how kaizen costing can be used as a means of overcoming the challenges facing the Nigerian construction firms in terms of cost overrun; project delays and abandonment; inadequate cost control management and improving competitiveness of indigenous construction firms. Based on existing literature, this paper illustrates how kaizen costing can effectively contain the challenge of cost and time overrun during construction. The process of using kaizen costing during the construction phase is addressed in detail

Keywords:

Construction, construction firms, Kaizen, Kaizen costing, Nigeria,

1. Introduction

Infrastructural development is an integral part of any economy. Construction industries around the world have a major contribution to the gross domestic product (GDP) and economic growth. In the UK, the construction industry contributed about 6.3 percent and to the GDP in 2014 (Rhodes, 2014). The construction industry in Nigeria only contributes less than 2 percent to the GDP and it was 1.4 percent in 2012 (Odediran, Adeyinka, Opatunji, & Morakinyo, 2012). This may be due to a number of factors emanating from government policy. The construction industry in Nigeria is dominated by foreign construction firms, having a larger share of government construction projects.

At the moment the construction industry in Nigeria is dominated by multinational construction contractors, these companies have huge capital bases, the required equipment, structured equipment, technical expertise and the required network to execute any project (Bala, Bello,

Kolo, & Bustani, 2009; Saka & Ajayi, 2010). The Indigenous (local) construction firms in Nigeria are *small and medium scale* in structure undertake projects which end up with the problems of cost and time overruns; project abandonment (as a result of litigation and poor construction cost management); poor workmanship; poor project management; poor financial management; poor planning, inadequate mechanization and regular litigation (Odediran et al., 2012). This challenge experienced by indigenous contractors in Nigeria has led to the bankruptcy of many indigenous construction companies. Sanni and Hashim, (2013) & Mansfield, Ugwu and Doran (1994) have identified some lapses in the cost control methods used by indigenous construction companies in Nigeria, which has led to cost overruns and poor project performance in many projects handled by these companies.

This paper focuses on the effect of cost overrun on indigenous construction firms in the Nigerian construction industry, cost management methods and techniques used in managing cost overruns during construction and how it is used in Nigeria. The new methods used in construction cost management in other parts of the world would be highlighted for possible implementation in the Nigerian milieu.

2. Cost management methods and techniques in the construction industry

The construction industry is a very important industry in any nation. The UK construction industry has one of the largest construction industries in the world with varying projects such as tunnelling, highway schemes, civil engineering and building projects, which utilized detailed estimating cost control and planning (Potts, 2008). Within the construction industry in UK, techniques used in post-contract cost control include earned value analysis, cost and schedule performance, cost ratio and fixed budget system (Dikko, 2002; Mansfield, Ugwu, & Doran, 1994; Sanni & Hashim, 2013). Furthermore, multi-discriminant analysis, elemental, approximates and computer aided analysis are also identified as cost control methods and tools in the UK (Kern & Formoso, 2004; Olawale & Sun, 2010). Successful management of the construction industry depends on the cost control techniques, notwithstanding the fact that different methods and techniques are used in different parts of the world.

Cost management in construction begins with preliminary cost estimate, taking off and preparation of bill of quantities. This process is a conventional process which leads to the preparation of a cost analysis during the cost planning process. Cost planning is at the pre-contract phase this may include elemental cost analysis; size related estimating which is based on ground floor area; functional or performance-related estimating (Potts, 2008). The choice of an estimating process depends on the nature of the procurement, construction project and methods of construction. The cost management process at this phase is at the pre-contract stage, however most changes occur during the post-contract phase of construction which may negatively influence project delivery.

3. Post-contract cost control

Post-contract cost control starts from the initial budget which has been planned followed by interim valuation at the construction stage. Contractor or client's cash flow is prepared to monitor the project finances to ensure profitability (Sanni & Hashim, 2013). Other techniques used in monitoring construction cost during execution are earned value analysis (Hunter, Fitzgerald, & Barlow, 2014); new techniques involving intranet-based cost controlling system has also be proposed by Abudayyeh, Temel, Al-Tabtabai, and Hurley (2001); measuring work on site may also involve methods such as cost ratio calculation; incremental milestone; units completed and weighted units (CII, 2000). Managing cost during construction involves making

the right decisions at the right time and ensuring the cost of each activity does not go beyond the projected cost.

Cost control of any project starts from the inception and ends at the completion with the issuing of final certificates (Ashworth, 2010). Ashworth, (2010) also noted that the post-contract stage of a project begins from when the contract is signed to the final account and certificate. The process of controlling cost in the post contract stage according to Ashworth (2010) is detailed as being:

- a) *“Interim valuations and payment certificate*
- b) *Cash flow and forecasts through budgetary control*
- c) *Financial statements showing the current and expected final cost for the project*
- d) *Final account, the agreement of final certificate and the settlement of claims”*

The choice of a method in controlling the cost of a project during the post-contract stage will depend on the contractor’s selection method; price determination method for tender and final account; client or contractor control; and the duties of the Quantity Surveyor in managing the budget and account (Ashworth, 2010). The four main stages highlighted above may vary depending on the type of construction project. Every construction project and the teams involved in any construction project are unique. Therefore the method used in controlling cost during a project will also be exclusive.

In the UK, the cost control practice during construction projects was evaluated by Olawale and Sun (2010). Their findings show that design changes, project complexities and performance of sub-contractors are some of the inhibiting factors leading to cost overrun in projects. Olawale and Sun (2010) also noted that the inaccurate evaluation of project duration, conflict between project parties, errors in contract, risk and uncertainty associated with projects are the main inhibitors of projects success during the post-contract stage. This implies that the available software and tools used in the UK such as Microsoft project professional, earned value analysis calculation, cost record keeping, work programming, material scheduling, variation management, re-measuring of work on site, adjustment of prime cost sums management of inflation, day work accounting and management of claims (Ashworth, 2010; Olawale & Sun, 2010; Potts, 2008), have not been sufficient in managing cost overrun. The available expertise in the construction industry in the UK has not led to better post-contract cost control practices. Therefore, there is a need for innovation in managing post-contract cost. These construction post contract cost control methods and techniques are also used in Nigeria. However, these approaches of managing post-contract construction cost have not improved the competitive advantage of indigenous construction firms in Nigeria. These firms have also been experiencing cost and time overruns. The next section will address the challenges indigenous construction firms face when using the traditional post-contract cost control system.

4. Challenges of post-contract cost control in Nigerian construction firms

The role of Quantity Surveyors in construction organizations in Nigeria have always been related to the financial probity of every project. The quantity Surveyor has the duty to ensure that construction cost stays within budget with an excellent profit margin for the contractor and delivery of the final product to the client at a reasonable cost. According to Sanni and Durodola (2012) some techniques used in Nigeria as being monitoring labour, equipment and material cost; overhead monitoring; taking corrective action; identifying cost overruns; analysing cost reports; keeping and using historical data; analysing cost variance, forecasting cost of completion; summarizing profit and loss. The post-contract cost control process needs to

improve with the new trends in construction cost management such as lean construction and other modern methods. Also, the demand for improved infrastructure with varying complexities necessitates new techniques of managing construction cost.

The traditional cost controlling system in the post-contract phase has always been used in Nigeria (Olawale & Sun, 2010; Olusegun & Alabi, 2011; Sanni & Hashim, 2013). However the drawback of the traditional cost controlling system in Nigeria has been affected by inflation, interest rates, import duties and fluctuating exchange rates (Dikko, 2002). These negative factors have led to project abandonment and cost overruns in the construction industry. The inhibiting factors affecting cost control in the UK are also very similar to the Nigerian situation. This calls for a more systematic and comprehensive approach in managing modern complex projects in Nigeria.

New methods now being used for managing post-contract cost include activity-based costing and kaizen costing. These methods are discussed in the subsequent sections and also compared in terms of their strengths and weaknesses.

5. The use of activity based costing in the construction industry

Activity-based costing (ABC) has been in use since after the World War II. However, this system of accounting came into prominence in the 1990s as a technique for making costing decisions in many corporations (Harrison and Sullivan 1995, cited by Lin, Collins, & Su, 2001). Activity-based costing is defined as a system of “*calculating the cost of individual activities and assigning these costs to cost objects such as products and services on the basis of activities undertaken to produce each product or service*” (Horngren et al., 2001 cited by Lin et al. 2001). ABC is very different from the traditional costing system because of the cost tracers used in identifying the cost drivers such as overheads (Jong No & Kleiner, 1997). This process is not only based on costing products and services but it is also integrated with supply chain management.

According to Lin et al. (2001) the cost of the supply chain has to be measured for the supply chain management to attain its goals. Therefore, the cost of the supplier has also been identified as a significant cost in ABC. However many projects have not been able to implement ABC because of lack of identification and implementation of activity based costing (Jaya, 2013). Moreover, ABC cannot be effective alone, it has to adopt some cost management tools in the post-contract cost control phase (Jong No & Kleiner, 1997). This may involve milestone setting and interim valuations.

This system of managing post-contract cost may be very effective if combined with the traditional method of managing construction cost or with kaizen costing. Kaizen costing is highlighted in the next section.

6. Kaizen and kaizen costing in the construction industry

The word “continuous improvement” has become common in many organizations in the world. Continuous improvement is not only relevant to performance management but also production management in large corporations and also in small and medium enterprises (SMEs). Lean thinking and continuous improvement has become a subject which many organizations have harnessed as a tool for improved performances in all divisions. Koskela and Ballard (2012) argued that failure to harness the concept of product in management has led to a lot of challenges in the field of management science for half a century. The use of techniques such as lean production in construction has been a major subject of discussion in the academia. The concept of lean production has greatly improved the cost, quality, client satisfaction and construction

project delivery (Sacks, Koskela, Dave, & Owen, 2010). Although most organizations use Kaizen method for business process mapping for improved output, client satisfaction and increased profit without the main use of the word “kaizen”, the costing aspect has been used in many construction and engineering firms around the world.

The application of kaizen costing in the construction industry has not been well documented as there are few articles on this topic. Some of the research and literature review on kaizen costing in the construction industry is based on Granja et al (2005) analysis of target and kaizen costing in the construction industry. Granja et al. (2005) noted that continuous cost improvement is necessary at the construction stage not only to maintain the cost of the project but also to target more profit and eliminate waste.

The case studies conducted in a metal industry, a large construction and concrete company by Savolainen (1999), the paper discussed the understanding and adoption of kaizen processes empirically. The findings reveal that kaizen adoption process is iterative and the speed of implementation differs in these two companies. Kaizen involves continual incremental improvement of the product cost and waste reduction during the execution stage (Kaur & Kaur, 2013). Singh and Singh (2012), documented a comprehensive literature of how and where kaizen has been studied and utilized. The collage comprises of case studies, surveys and key components of kaizen in the manufacturing and construction sectors in various countries. Singh and Singh (2012) also noted that kaizen costing focuses on the profit and value a product will give at the manufacturing stage. This process should be part of the management function aimed at improving the product and service delivery. In this case, kaizen costing process involves the employees and employers inputs in improving their organization’s performance and handling of financial and non-financial aspects of manufacturing. Kaizen costing is aimed at reducing cost and creating greater valuable products with the influence of every stakeholder.

The use of kaizen costing in these organizations studied by Ellram (2006) is not only limited to the manufacturing process but also the supply chain. Cost reduction in the supply chain also reduces unit cost of the product. Therefore, kaizen costing management is not only within the organization but also with other external factors or stakeholders who have to be managed along with the performance of the company in reducing cost. Cheser (1994) stated that Kaizen costing has been implemented in organization where the product cost has been monitored and reduced to improve the companies’ profit. Also the continuous improvement of the number of working hours in an organization along with the budget of the organization has created more profits in organizations. (Budugan, & Georgescu, 2009). This involves elimination of non-productive activities which may increase during the working hours. Employee productivity has been improved using kaizen costing. Utari (2011) studied the use of kaizen costing in Coca-Cola Bottling Indonesia-Central, Sumatera; the findings shows that eliminated rejected products using kaizen costing significantly increased the profit of the company. This process involves identifying what the consumers want and disregarding any component or product which do not add value.

Table 1: The merits of kaizen costing

S/N	Merits of Kaizen costing	References
1	Incremental waste reduction during the construction process	Kaur and Kaur (2013)
2	Cost reduction can be established with sub-contractors and suppliers	Ellram (2006)
3	Incremental cost improvement during construction for higher profit	Singh and Singh (2012)
4	Possible integration with a company's budgeting system and reduce non-productive working hours. Improved employee-employer relationship.	Cheser (1994) and Utari (2011)
5	Improved product quality, client satisfaction and competitive advantage	Budugan, & Georgescu (2009)

Table 1 above enumerates the benefits of kaizen costing. These benefits have been studied by analysts over the years in areas where kaizen costing has been used. This is mostly in the manufacturing sectors. Based on the proven benefits identified by Ellram (2006) and Singh and Singh (2012) in manufacturing industries, there is a need for more adequate research in the application of kaizen costing in construction. This method of cost reduction during manufacturing has also been expressed as a strategy for cost control during the same phase. This can be translated into the construction industry.

Table 2: Strengths and weaknesses of activity based costing and kaizen costing

Post-contract cost management technique	Strength	References	Weakness	References
Activity based costing	Overheads are identified and minimized	Jong No & Kleiner, 1997;	Has to be combined with other methods	Jong No & Kleiner, 1997;
	Units costs are calculated in terms of activity	Lin et al. 2001;	Critical success factors has to be identified before it can be used	Jaya, 2013.
Kaizen costing	Has been combined with target costing and it is flexible for use	Granja et al., 2005;	Can only be used during the post-contract phase	Granja et al., 2005;
	Based on profit, value and improvement	Singh and Singh, 2012.	lengthy implementation process	Savolainen, 1999.

Table 2 above juxtaposes the strength and weaknesses of activity-based costing and kaizen costing. The weaknesses of each method can be complemented by their strengths if activity-based costing and kaizen costing is combined in a framework. Granja et al. (2005) developed a framework which combined target costing with kaizen costing.

Target costing is used during the cost planning phase. Target costing is not only relevant to the manufacturing sector but also the construction industry. Target costing is a Japanese word for “*Genka Kikaku*” (Everaert, Loosveld, Acker, Schollier, & Sarens, 2006). This technique has also been used in the Nigerian construction industry. However, it does not solve the challenged of cost overrun which many indigenous Nigerian construction firms are facing. However, there is a need to investigate the use of continuous improvement or kaizen costing within Nigerian construction firms.

7. How kaizen costing works during the construction phase

Kaizen costing is based on the philosophy of kaizen which is an arm of lean production. According to IFS (2010), Yashihuro Monden categorizes kaizen costing into two:

- “1. Asset and organization-specific Kaizen Costing activities planned according to the exigencies of each deal.
2. Product-model-specific costing activities carried out in special projects with added emphasis on value analysis (Monden has the automotive industry in mind)”.

IFS (2010) further explained that kaizen costing can be divided into *maintenance* and *improvement*. The maintenance aspect involves management function which would be narrowed down further to policy guiding waste reduction in the office, rules and regulations, guidelines and procedures for employee-employer relationship, elimination of waste. This managerial function is essential as a culture within the organization before the site activities. Reduction of waste which is also known as *Muda* in Japanese involves all non-value adding activities (IFS, 2010), therefore managing value during production is essential to the realisation of waste reduction during production.

Cost estimates must be established in a standardized calculating framework. This framework or system must be established within the organization for product cost monitoring for a lower cost than the normal cost and ensure products are within the budget or target cost. This process is subsequently repeated (IFS, 2010).

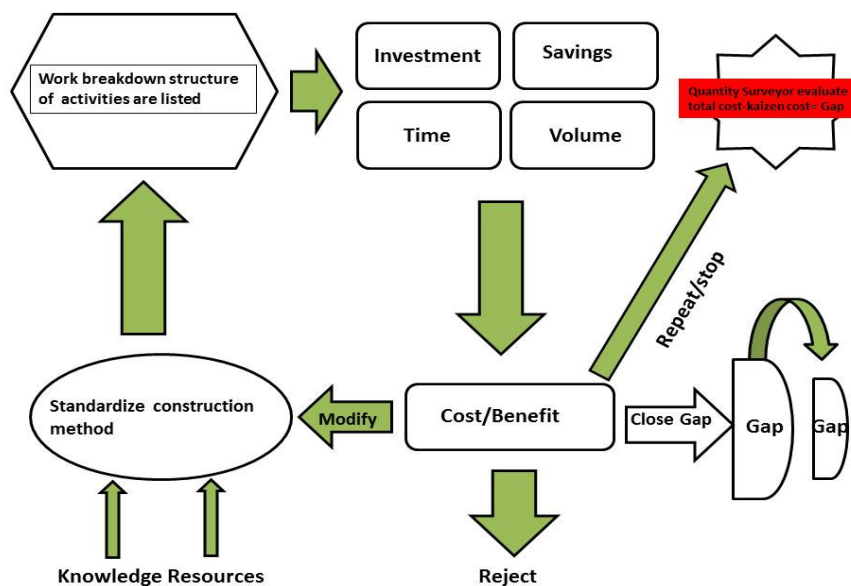


Figure 1: Kaizen costing process during construction (Modified from IFC? white paper, 2010)

Figure 1 above is an illustration showing how kaizen costing can be used in the construction industry. This is modified from IFS white paper on the development of an application for kaizen costing. This framework acknowledges the existence of a budget for construction work which has to be prepared before the construction phase. A standard construction method has to be established in addition to the program of works in form of a work breakdown structure (WBS). The work breakdown structure would allow the project manager and Quantity Surveyor to allocate finance, time, labour resources. The Quantity Surveyor would seek alternatives to these resources and cost saving mechanisms. This evaluation compares the current cost of construction to the target cost in the budget, therefore eliminating more waste. The wastes identified are reduced further and further to create more value and profit. This process involves closing the gap created by waste. The circle is repeated until the best quality is attained.

8. Kaizen costing in the Nigerian construction industry

Kaizen costing has been used in construction waste reduction, improved quality of the final product, improved profitability and competitiveness of a company (Kaur & Kaur, 2013). These key benefits have not been studied by analysts in Nigeria. The focus has only been on target costing and improved estimating techniques for reducing cost overrun and project abandonment (Frimpong, Oluwoye, & Crawford, 2003; Sanni & Hashim, 2013). More attention has been given to procurement and contract management in construction without considering new innovations in the corporate governance of indigenous small and medium construction companies in Nigeria.

9. Conclusion

The present challenges facing indigenous construction firms in Nigeria may not be totally resolved by adopting kaizen costing. Nonetheless, the proven benefits in the manufacturing sectors can be transferred to the construction industry via these firms. Although, there may be very little literature on the utilization of kaizen costing in the construction industry, some construction firms may term it to be continuous improvement during interim valuation. More studies are required to fully investigate the use of kaizen costing in the construction industry. The incremental reduction of waste during construction can create more profit for the construction firm and improve their competitive advantage in the Nigerian construction industry. Since most indigenous construction firms are small and medium scale in nature, the need for maintenance and improvement of construction cost is vital. This also depends on the management function of creating more guidelines for activity waste reduction. Further studies about kaizen costing combined with activity based costing and the supply chain in a unified framework would create a robust approach for post-contract cost control. Nonetheless, the framework designed in this paper has the potential to drive the profitability of indigenous contracting firm to the peak and deliver excellent products.

References:

- Ashworth, A. (2010). *Cost studies of buildings* (5th ed.). London and New York: Routledge.
- Abudayyeh, O., Temel, B., Al-Tabtabai, H., & Hurley, B. (2001). The intranet-based cost control system *Advances in engineering software*, 32(2001), 87-94.
- Bala, K., Bello, A., Kolo, B. A., & Bustani, S. A. (2009). *Factors inhibiting the growth of local construction firms in Nigeria*. Paper presented at the Procs 25th Annual ARCOM Conference, 7-9 September 2009, Nottingham, UK.
- Brunet, A. P., & New, S. (2003). Kaizen in Japan: an empirical study. *International Journal of Operations & Production Management*, 23(12), 1426-1446. doi: 10.1108/01443570310506704

- Budugan, D. & Georgescu, I. (2009). Cost reduction by using budgeting via the kaizen method. *Analele Stiintifice Ale University*.
- Cheser, R. (1994). Kaizen is more than continuous improvement. *Quality Progress*, Vol. 27, pp. 23-25.
- CII. (2000). *Project control for construction*. USA: The construction industry institute.
- Dikko, H. A. (2002). *Cost Control Models for Housing and Infrastructure Development*. Paper presented at the FIG XXII International Congress, Washington, D.C. USA.
- Ellram, L. M. (2006). The implementation of target costing in the United States: theory versus practice. *The Journal of Supply Chain Management*, Vol. Winter.
- Everaert, P., Loosveld, S., Acker, T. V., Schollier, M., & Sarens, G. (2006). Characteristics of target costing: theoretical and field study perspectives. *Qualitative Research in Accounting & Management*, 3(3), 236-263. doi: 10.1108/11766090610705425
- Frimpong, Y., Oluwoye, J., & Crawford, L. (2003). Causes of delay and cost overruns in construction of groundwater projects in a developing countries; Ghana as a case study. *International Journal of Project Management*, 21(5), 321-326. doi: 10.1016/s0263-7863(02)00055-8
- Granja, A. D., Picchi, F. A., & Robert, G. T. (2005). *Target and kaizen costing in construction* Paper presented at the Proceedings IGLC-13, Sydney, Australia.
- Hunter, H., Fitzgerald, R., & Barlow, D. (2014). Improved cost monitoring and control through the Earned Value Management System. *Acta Astronautica*, 93, 497-500. doi: 10.1016/j.actaastro.2012.09.010
- IFS. (2010). Kaizen costing and value analysis. IFS World.
- Jong No, J., & Kleiner, B. H. (1997). How to implement activity-based costing. *Logistics Information Management*, 10(2), 68-72. doi: doi:10.1108/09576059710815725
- Kaur, M., & Kaur, R. (2013). Kaizen costing technique- a literature review. *International journal of research in commerce and management*, 4(11), pp. 84-87.
- Kern, A. P., & Formoso, C. T. (2004). Guidelines for improving cost management in fast, complex and uncertain construction projects. Federal University of Rio Grande do Sul.
- Koskela, L.J. & Ballard, G. (2012). Is production outside management? *Building research and information*, 40(6), pp. 724-737.
- Lin, B., Collins, J., & Su, R. K. (2001). Supply chain costing: an activity-based perspective. *International Journal of Physical Distribution & Logistics Management*, 31(10), 702-713. doi: doi:10.1108/EUM00000000006286
- Mansfield, N. R., Ugwu, O. O., & Doran, T. (1994). Causes of delay and cost overruns in Nigerian construction projects. *International Journal of Project Management*, 12(4), 254-260.
- Olawale, Y., & Sun, M. (2010). Cost and time control of construction projects: Inhibiting factors and mitigating measures in practice. *Construction management and economics*, 28(5), 509 – 526.
- Odediran, S. J., Adeyinka, B. F., Opatunji, O. A., & Morakinyo, K. O. (2012). Business Structure of Indigenous Firms in the Nigerian Construction Industry. *International Journal of Business Research & Management (IJBRM)*, 3(5), 255-264.
- Olusegun, A. E., & Alabi, O. M. (2011). Abandonment of Construction Projects in Nigeria: Causes and Effects. *Journal of Emerging Trends in Economics and Management Sciences (JETEMS)*, 2(2), 142-145.
- Potts, K. (2008). *Construction cost management* New York: Taylor & Francis.
- Rhodes, C. (2014). The construction industry: statistics and policy. Economic Policy and Statistics. House of Commons Library.
- Sacks, R., Koskela, L., Dave, B. A., & Owen, R. (2010). Interaction of Lean and Building Information Modeling in Construction. *Journal of Construction Engineering & Management*, 136(9), 968-980. doi: 10.1061/(ASCE)CO.1943-7862.0000203

- Saka, N., & Ajayi, O. M. (2010). A comparative assessment of incentive scheme between indigenous contractors and multinational construction contractors in Nigeria. Paper presented at the Procs 26th Annual ARCOM Conference, 6-8 September 2010, Leeds, UK.
- Sanni, A. O., & Durodola, O. D. (2012). Assessment of contractors' cost control practices in Metropolitan Lagos. In S. Laryea, Agyepong, S.A., Leiringer, R. and Hughes, W. (Ed.), *4th West Africa Built Environment Research (WABER) Conference, 24-26 July, 2012 Abuja, Nigeria* (pp. 125-132).
- Sanni, A. O., & Hashim, M. (2013). Assessing the challenges of cost control practices in the Nigerian construction industry. *Interdisciplinary journal of contemporary research in business*, 4(9), 366-374.
- Singh, J., & Singh, H. (2012). Continuous improvement approach: state-of-art review and future implications. *International Journal of Lean Six Sigma*, 3(2), 88-111. doi: 10.1108/20401461211243694
- Savolainen, T. I. (1999). Cycles of Continuous Improvement: Realizing Competitive Advantage through Quality. *International Journal of Operation and Production Management*, 19(11), pp. 1203-1222.
- Utari, W. (2011). Application of kaizen costing as a tool of efficiency in cost of production at Coca Cola Bottling Indonesia. Central Sumatra, Indonesia Andalas University Padang.