AUTHOR(S):

TITLE:

YEAR:

Publisher citation:

OpenAIR citation:

A GEMBA KAIZEN MODEL BASED ON BPMN FOR SMALL- AND MEDIUM-SCALE CONSTRUCTION BUSINESSES IN NIGERIA

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ABSTRACT

This article presents a demonstration of how gemba kaizen, which is continuous improvement in the workplace, can be implemented using business process modelling and notation (BPMN). The scope of the study is construction businesses in Nigeria. In developing the BPMN model for construction businesses in Nigeria, the modus operandi regarding decision making and managing challenges which may be transferred to the cost planning was identified. The mixed-method approach was used to develop this model from the qualitative and quantitative findings. The survey strategy was employed for the analysis, covering eleven interviews and one hundred and thirty-five questionnaires from contractorsand cost and project managers in small- and medium-scale companies in Lagos, Nigeria. NVIVO 10 and descriptive statistics were used to assess the results. The findings of the study focused on the perception towards change, post-project reviews, openness to new ideas, and innovation. The study observed post-project reviews as the only significant indicator of continuous improvement in Nigerian small- and medium-scale construction companies. This result is not enough to indicate that there is continuous improvement. Therefore, the model design focused on continuous improvement activities for the companies. The creation of a BPM model elucidated the continuous improvement functions, stages and processes. This study may be implemented in construction companies in developing economies for improving the competitive advantage of small- and medium-scale construction companies.

Keywords: construction companies; gemba; kaizen; small- and medium-scale; workplace

INTRODUCTION

Small- and medium-scale enterprises (SMEs) are the drivers of any economy (Holatova and Brezinova, 2013). Between the years 2014 and 2015, the United Kingdom (UK) government spent over £4.5 billion on SMEs (The Comptroller and Auditor General, 2016). This spending is part of the UK government's decision to improve the growth of the economy. Furthermore, small business accounted for 99.3% of privately owned businesses in the UK. The UK government has also increased its spending on SMEs after 2015 (Woods and Dennis, 2009; The Comptroller and Auditor General, 2016). Governments' spending on SMEs varies, based on the country and economy. The construction industry is part of the SMEs, and the business processes are unique. Allocation of funds for SMEs by the government has not always translated to improvement in these companies (The Comptroller and Auditor General, 2016; Simpson et al., 2006; Rostami et al., 2015; Kuivalainen et al., 2012). These companies have challenges related to management functions within the organisation, business development and strategy, risk identification and mitigation, and improving the competitive advantage (Simpson et al., 2006; Rostami et al., 2015; Binks et al., 1990).

There are SME construction companies in the UK construction industry faced with the problem of improving their competitive advantage. Construction companies are businesses, and they have the sole aim of making a profit in a competitive industry. This is also the same for the construction sector. Small- and medium-scale construction businesses (SMSCBs) around the world face many challenges. These problems have limited their competitiveness in the construction sector. There are various peculiarities in the construction sector which retard the growth of SMSCBs; these are related to the type of economy and government regulations. Staff strength is used for determining SMSCB in the UK. In Nigeria, a team strength below 50 is considered small, while figures above 50 are medium scale. The amount of fund and annual turnover also decides whether the company will be small or medium scale. Different countries having individual metrics for judging the size of a company makes it difficult to address the organisational culture and improvement processes in these enterprises.

Eniola (2014) as cited by Eniola et al. (2015) noted that there is no accurate definition for small- and medium-scale enterprises (SMEs). This is because the parameters, which include the size of the fixed assets, personnel, technology, production, output, system or management or capital, are subjective, according to various analysts. Therefore, the definition of small- and medium-scale enterprises depends on the economic judgement of the country in which the company is situated. Eniola et al. (2015) further noted that the Central Bank of Nigeria (CBN) defines an SME as a company with fewer than 50 and 100 staff for small- and medium-scale enterprises respectively.

The asset criterion is between one (1) million naira (£3,293.98) and one hundred

and fifty (150) million naira (£494,096.92) for small- and medium-scale enterprises respectively. These values are used in this study to categorise small- and medium-scale construction companies.

The competitive advantage of an SMSCB depends on funding, management, and organisational culture. Funding may be a major problem with SMSCBs, but other factors have to be taken into consideration as well. These are corporate culture and waste management policies.

ORGANISATIONAL CULTURE OF SMSCB

The concept of organisational culture has been a primary focus in this research study conducted in the built environment and other management disciplines. Organisational culture describes the opinions of the owners of the company, and it binds the stakeholders within the company together (Issa and Haddad, 2008). Organisational culture is a collection of internal and external factors that lead to the establishment of beliefs, customs morals, knowledge and policies. Therefore, the formation of culture within an organisation depends on several factors, and it is a process leading to the formation of policies. These factors are peculiar to the nature of the environment in which the company is situated, government policies, the nature of the economy, the makeup of the company (the type of company), and other internal influences (Alashwal and Abdul-Rahman, 2014; Ribeiro, 2009; Norma et al., 2010; Kransdorff, 1996). This is also related to the main purpose of improving the organisation for competitiveness and growth.

There are aspects of organisational culture that are very visible based on the behaviour of the organisation. Some organisations have behaviours that are latent (Issa and Haddad, 2008; Anumba et al., 2008; Anumba et al., 2002). Therefore, there is a need to investigate the behaviour of organisations regarding a perspective. This point of view may relate to the style of communication in the workplace or response to change. In examining communication in organisations, there are various approaches. There is nonverbal communication, meetings, memos, a top-down approach and a bottom-up approach, among others (Hoogervorst et al., 2004; Larson and Kleiner, 2004; Dawson-Shepherd, 1997). Furthermore, communication within organisations may be regarded as implicit or explicit communication. Implicit interfaces aim to transfer knowledge to the employees, while specific behaviours may intentionally move information to change the conduct of the employees (Hoogervorst et al., 2004). This may be about the quality of communication and ways of improving it.

In the case of continuous improvement, the purpose is explicit, and it has to be able to transfer information to change the attitude of the employees. If employees are performing well, the organisation will perform well. This fact is well-known for organisational culture. Organisations structure buildings on the organisational culture. The organisational structure depends on the type of country, and the types of

communication in these structures vary.

Organisational culture also develops into corporate learning. However, this is only when the organisation decides to make use of what they have learned over the years. This may be carried out via a post-project review. A post-project review is a form of organisation learning whereby the organisation decides to improve the present conditions. In the construction industry, some of the valuable lessons which should have been learnt during the project are compiled as a form of knowledge management for future use (Kululanga and Kuotcha, 2008; Singhvi, 1986). Post-project reviews lead to the improvement of organisations if they are executed and evaluated for further reviews.

The challenge with the construction industry in Nigeria and SMSCCs in the country is business ethics. Business ethics here are characterised by corruption and the quality of cost information, or, in other words, a lack of professionalism.

Making a case for gemba kaizen in Nigerian SMSCB

Issa (2013) noted that waste, which is referred to as *muda* in Japanese, might be in the form of duration, production, transportation, stock at hand, processing, movement, and producing faulty products. The concept of waste in lean construction may be viewed from the perspective of Al-Aomar (2012), and Issa (2013) who define it according to the overall activities of the organization, which involve the production aspect.

Gemba kaizen is related to kaizen in the workplace (Imai, 1997; Chukwubuikem et al., 2013; Singh and Singh, 2012; Isa, 2013). This concept may be viewed in the simplest term as reducing any form of waste within the office. It is a product of the lean production principles. Waste management practices in kaizen costing are reviewed from the perspective of production residues. However, the overall concept of kaizen also perceives waste from the administrative aspect. The idea of kaizen which is a continuous improvement during production is one of the derivatives of lean production.

Singh and Singh (2012) reviewed the history, evolution, and the concept of continuous improvement in organisations over the years. The findings show that continuous improvement, otherwise known as kaizen, has been used to improve an organisation's performance over the decades. Kaizen focuses more on reducing waste before and during construction. The concept of kaizen costing is a method used in reducing waste during construction (Chukwubuikem et al., 2013). This approach has been used principally in the manufacturing industry in many countries around the world. The concept is relatively new in the construction sector.The managerial situation of most small- and medium-scale construction firms may be an indication of the unavailability of gemba kaizen for waste reduction in the workplace.

The management function of waste reduction depends on the existing policies. If there is no current policy on waste reduction, then it will take several months or

years for the organisation to attain this stage. This is a research gap in this investigation. Building up a continuous improvement process within the existing organisational structure of SMSCB depends on various indicators. These indicators are the potential presence of kaizen, the perception towards change, waste management policies, and post-project reviews for organisational learning. Communication within the organisation as discussed in section 2.0 drives the overall process of continuous improvement of the SMSCB in Nigeria.

These indicators lead to the method of data collection, analysis, and business model development to enhance the existing process.

The aim of this study was to analyse the extent to which gemba kaizen can be adopted for construction business using business process modelling and notation (BPMN). Therefore in the next section, the research methodology and analysis are discussed   and a BPMN model is   designed.

RESEARCH METHODOLOGY

The survey strategy was adopted for this study because it covers a broader population compared to other research strategies. De Vaus (2002) stated that a survey approach is used to obtain data for a large population with the aid of techniques such as questionnaires and in-depth interviews. According to Sapsford and Jupp (2006), a survey is meticulous and can be quantified. It also gives details about a population. Surveys target a larger population compared to focus groups and case studies. Therefore, the survey covered the areas of quantitative and qualitative data collection. The first phase of this investigation covered survey interviews. Survey questions were used to gather data from small- and medium-scale construction companies in Lagos, Nigeria.

The survey questions were designed in a semi-structured manner based on literature related to kaizen in the workplace. The literature review process informed the questions used for the interviews. The questions were based on the central tenets of continuous improvement in the workplace: this deals with process improvement, waste reduction policy, financial and time management, organisational policies, the mission statement and post-project reviews. These areas are related to the concept of gemba kaizen. The details of what gemba kaizen means were included in the participant information sheet for the interviewees. The data collection involved eleven (11) highly qualified project and cost managers in eight (8) small- and medium-scale construction businesses. This sampling technique is purposive sampling, targeting the right population with the necessary experience (Saunders et al., 2012). The interviewees have between 15 to 29 years of experience in the construction industry. The respondents also have qualifications ranging from BSc degrees to MSc degrees in quantity surveying and construction or project management. The interviewees' backgrounds are summarised in the table below.

Table 1: Interviewees'demographic details

Profession	Code	Job role	Years of experience	Highest qualification	Project type
Quantity surveyor	CM1	Managing Director	15	MSc	Building and civil engineering
Project manager/ Architect	PM1	Managing Director	20	BSc	Building and civil engineering construction
Project manager/ Architect	PM2	General Manager	21	BSc	Building construction
Project manager	PM3	Managing Director	15	MSc	Building and airport construction
Quantity surveyor	CM2	Principal partner	17	BSc	Building construction
Project manager	PM4	Contractor/Director	25	BSc	Residential housing
Quantity surveyor	CM3	Principal partner	23	BSc	Building construction
Quantity surveyor	CM4	Chairman	29	BSc	Building construction
Project manager	PM5	General manager	19	MSc	Building and residential housing
Quantity surveyor	CM5	Assistant Director	17	MSc	Building and civil engineering
Quantity surveyor	CM6	Director	23	BSc	Building and civil engineering

(Source: Authors)

A theoretical sampling approach was adopted for the semi-structured interviews. The years of experience for each of the respondents are paramount. Theoretical sampling enables the researcher to obtain the required knowledge from the experts. This does not depend on the random larger population but on a few experts with in-depth knowledge of the subject. Fifteen years of experience in the construction industry is the least amount of experience , and the combined experience for all the

respondents is 224 years. The unit of analysis of this study is business operations.

The respondents in Table 1 are top executives and principal partners in construction and quantity surveying firms. Some of quantity surveying firms in Nigeria work alongside the contractors. Therefore, the primary partners have been interviewed as part of this study. Quantitative data were obtained from 135 respondents. The findings were triangulated with the interview responses. The development of the model from the qualitative and quantitative data analysis made use of the business process model and notation. This model is explained in the next section.

Business process model and notation (BPMN)
The business process model and notation (BPMN) utilises standard business process diagrams (BPDs) to represent the processes involved in business. The BPMN was developed by an industry association known as BPMN. Org (Recker, 2010). This group is only a collection of annotations without an end-user. (Johannsen et al., 2014, Recker, 2010). BPMN is used for improving business processes (Johannsen et al., 2014). The process diagrams are represented as graphical notations similar to the function flowchart procedure. BPMN identifies not only the processes involved in the business but also the stakeholders. BPMN is a modelling tool available on Microsoft Vision: although there is specialised software for BPMN, the core concept of modelling the business process is the same. It provides execution languages and graphics for business administrators. This modelling technique used by business developers can also be applied to SMSCBs in Nigeria. The first step is to address the interview findings and analyse the themes.

Interview findings
The semi-structured interviews were conducted via telephone. The conversations were recorded directly on a voice recording application installed on the phone. After transcribing the interviews, seven (7) themes were identified using the NVIVO 10 software. These themes are highlighted below.

Mission statement and core values
According to interviewee CM5, the mission statement and core values of their organisation are:

> "…to perform our services to the highest level of professionalism and the satisfaction of our clients. Our core values are honesty and integrity, teamwork, innovation and commitment to safe operation and sound ethics…" (Transcribed interview, 2015).

The key words here are 'professionalism', 'honesty', 'integrity', 'teamwork', 'innovation' and 'client satisfaction'. Nevertheless, some respondents had different mission statements and core values which are not related to innovation, teamwork or

professionalism. An example of this is respondent PM3 who stated that:

> "*…to become the leading Engineering and Construction firm in Nigeria and Africa, while delivering projects that consistently meet international standards...*" (Transcribed, interview, 2015).

Respondent PM3's organisation is aimed at becoming a top engineering and construction organisation in Nigeria and Africa. There was no indication of innovation and improvement of the company, client satisfaction, or teamwork. This may not indicate the present status of small- and medium-scale organisations because only two respondents gave this type of response. This may depend on the complexity or the organisational structure as well as other factors. Three (3) respondents mentioned innovation and teamwork, while six (6) respondents referred to the quality of service. These keywords or sub-themes are related to kaizen.

Organisational structure complexity

The organisational structure was distinguished as simple or complex. All eleven respondents categorised their organisational structure as simple. From a director CM6 of a small- and medium-scale construction company in Lagos:

> "*…It depends on the communication between the staff and the temporary staff, but our structure is simple...*" (Transcribed interview, 2015).

Owing to the small number of personnel of some of the construction companies, some of these organisations do not have supervisors. The staff report directly to the owner of the enterprise. However, in medium-scale construction organisations there is a supervisor in the hierarchy between the owner (prime contractor) and other employees.

Communication approach

The style of communication may be very useful in identifying the presence of kaizen in small- and medium-scale construction firms in Nigeria. Shang and Pheng (2013) state that effective communication is essential for kaizen; in this case, gemba kaizen. The communication approach may be top-down or bottom-up or non-specific. Eleven respondents noted that the top-down approach is the primary communication approach in their organisations. According to respondent CM4 who is a chairman of the company:

> "*...communication within our company is very easy and fluid, but at times it depends on the communication between the staff and the temporary staff, but our structure is simple…*" (Transcribed interview, 2015).

In this response, the respondent CM4 also indicated that communication between the staff and other employees who are temporary workers in the office and on the site is essential although the management of the company may be involved in daily communication via memos as indicated by respondent CM1:

> *"…We send out notes and organise meetings with the staff. There is no particular pattern of communication..."* (Transcribed transcript, 2015).

Regular meetings in the office and memos are a means of communication. Respondent CM1 indicated that there is no particular approach within his organisation. In this instance, it may not be adequate to identify and eliminate specific problemswithin the organisation. Waste elimination will be difficult if there is poor communication between workers and management. Four (4) respondents who are employees in an organisation noted that memos are sent to staff on a regular basis. Three interviewees pointed out that new ideas could easily be communicated within the organisation. Kaizen may thrive latently within an organisation that embraces innovation and openness to new ideas.

Waste reduction policy

Waste reduction is an evidence of continuous improvement. Singh and Singh (2015) and Smadi (2009) identified waste reduction as an essential element of gemba kaizen for improving competitiveness in the workplace. Therefore, having a waste reduction policy is related to gemba kaizen. Respondent PM2 noted that:

> *"…there is no policy on time management, but we have a documented plan on material waste reduction."* (Transcribed interview, 2015).

All the three (3) respondents review their companies' waste reduction policies regularly. The concept of a waste decrease in an establishment is an element of kaizen. This is related to the employee-employer relationship. In investigating the presence of kaizen within small- and medium-scale construction firms in Nigeria, identifying waste reduction policies is an indication of how the management function addresses continuous improvement. Reviewing existing policies on waste reduction provides a clearer understanding of how the system behaves towards cost reduction. In total eight (8) directorsinterviewed do not have any documented policy on reducing waste in their firms.

Heard about kaizen or continuous improvement

For instance, respondent, CM2 noted that:

> "…*I have not heard of kaizen, but I have listened of [sic] continuous improvement in a conference.*" (Transcribed interview, 2015).

The terminology *kaizen* is Japanese, and this term may not be used by the management consultants who train various employees in Nigeria. Therefore, 'continuous improvement' is a more familiar word compared to 'kaizen' in Nigeria. The idea of kaizen is also related to manufacturing and not construction. This is indicated in the comments of respondent PM1:

> *"…I have heard about kaizen, but it is only used in production…"* (Transcribed interview, 2015).

Implementing kaizen in small- and medium-scale construction organisations

in Lagos, Nigeria may face a challenge because of the understanding that it is used in the manufacturing sector (Please refer to section 2.6.3). However, some manufacturing principles are now used in construction. Some of these are off-site construction, lean construction, and modular buildings.

New to kaizen or continuous improvement

Respondent CM3 noted that:

"…*From my knowledge continuous improvement is broad, and it can be used in any area. It is related to waste reduction and time management, in fact, it is used to reduce non-productive activities."* (Transcribed interview, 2015).

From the findings, only one respondent provided detailed information relating to what he knows about kaizen or continuous improvement. Although this interviewee's understanding of kaizen has to do with waste reduction and time management, it may also be applied to construction activities. The use of kaizen during construction has been investigated in the quantitative data collection (questionnaires). The finding was triangulated with openness to new ideas and innovation.

Post-project reviews

Post-project reviews are meetings and studies carried out after the completion of any project. Post-project reviews also involve key performance indicators for performance and productivity measurement after a project (Holt and Graves, 2001,;Yang et al., 2010). Hence, continuous improvement may be achieved in the workplace. Respondent PM3 agreed that:

"*...Yes, we do organise after-project meetings to analyse our performance, and we have been improving on it."* (Transcribed interview, 2015).

The transcribed interview of respondent PM3 highlights the fact that the performance of the company has been improving over the years based on post-project reviews. Other respondents such as CM2 also stated that:

"*...post-project reviews have a positive impact on our projects, and it [sic] gives us the opportunity to identify our mistakes and improve our project delivery."* (Transcribed interview, 2015).

The post-project review is evidence of continuous improvement within a construction organisation. This aspect creates a channel to implement the tenets of gemba kaizen within a construction establishment.
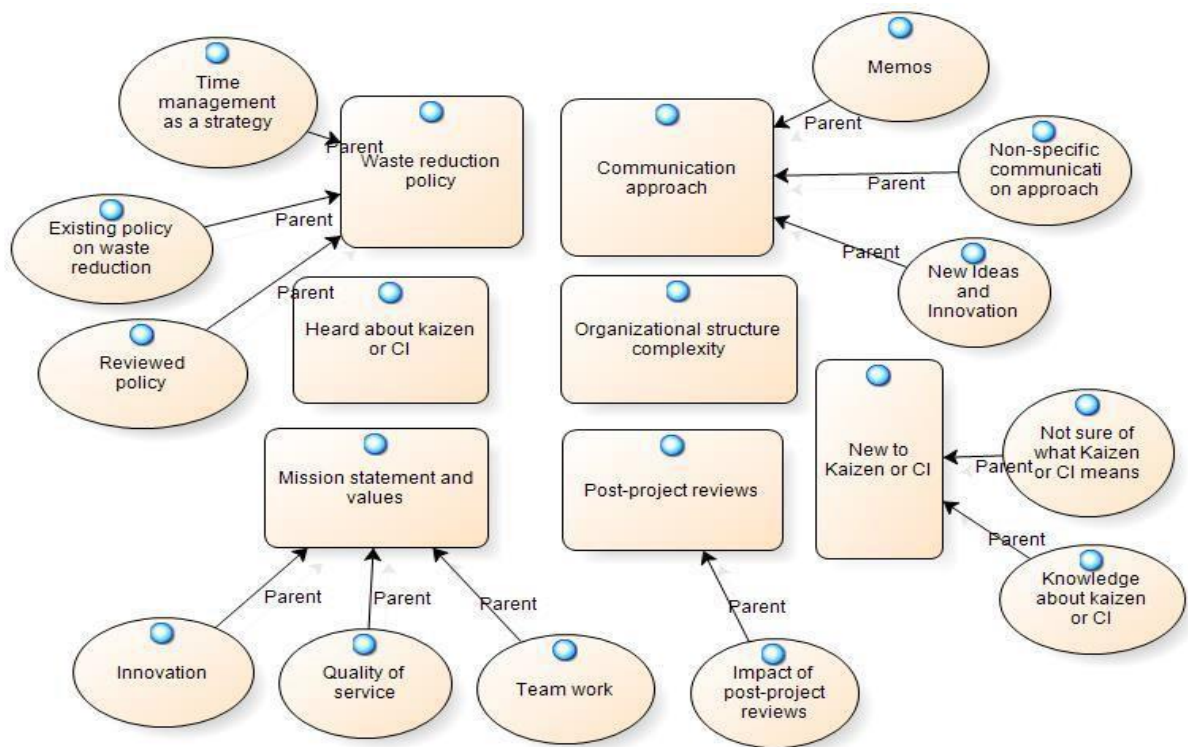
Figure 1: Model for the themes (Source: Authors)

In Figure 4, the organisational structure complexity in small- and medium-scale construction organisations can be seen to play a significant role in determining communication, waste reduction policy, mission statement and other themes. This is why it is sited in the middle of the model. Having identified the qualitative themes for gemba kaizen from the interviews, the quantitative aspect involves the category of the organisation and also the openness of these firms to continuous improvement in the workplace.

Quantitative data collection and analysis

Cost and project managers in small- and medium-scale construction companies in Nigeria were involved in the data collection process. Based on the literature review findings, 250 questionnaires were distributed to 84 small- and medium-scale construction firms in Nigeria. However, only 135 questionnaires were returned. The questionnaire included details of what gemba kaizen is and how it may improve their organisation. This was introduced to the participants as continuous improvement in the workplace. Sixty-six point seven per cent (66.7%) of the respondents have a staff strength below 50. Therefore, the majority of the respondents to the questionnaire are involved in small-scale construction organisations.
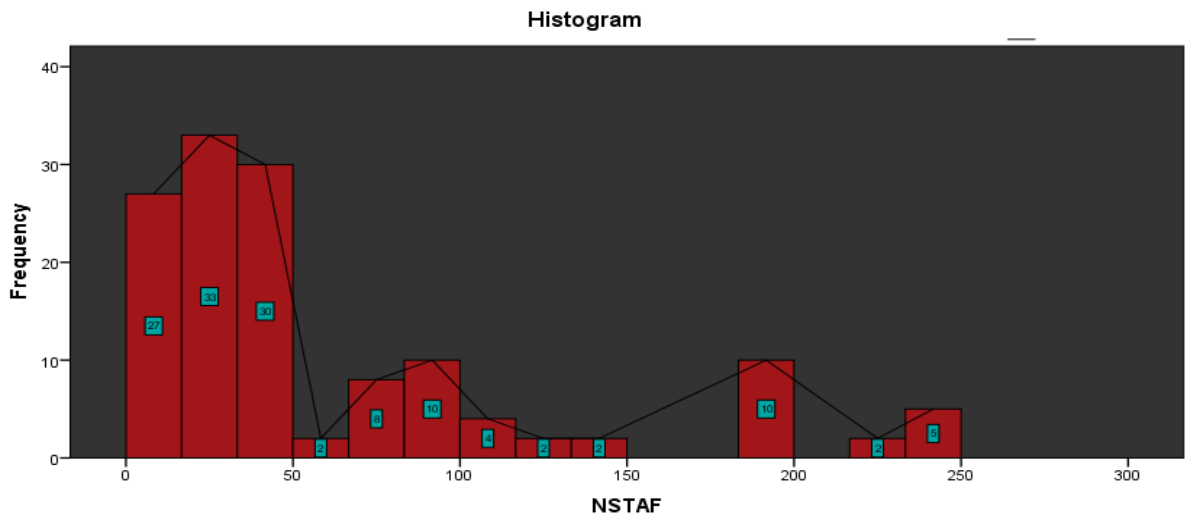
Figure 2:   Distribution of   numbers of staff

The frequency distribution of the size of the respondents' firms also reveals the total number between zero (0) and fifty (50) staff in the businesses as the highest number of respondents.

Openness of the construction firms to gemba kaizen as a new idea

The openness to gemba kaizen as new ideas and innovation such as kaizen was the focus of the survey. Openness to the new idea within these organisations was investigated. The responses are based on the perspective of the employees rather than management. This provided more suitable answers compared to those of management, because in many instances, the organisation may want to protect itself by offering positive responses. Nonetheless, it was gathered that nine (9) organisations out of the 135 responses were not open to new ideas or innovation from the employees. Sixty-five (65) respondents noted that their company was slightly open to new ideas. This implies that not all ideas are welcome and the respondents find it difficult to communicate suggestions to upper management. Forty-six (46) respondents highlighted that their organisations are open to new ideas whenever they are presented to them. In this instance, the employees (respondents) find it very easy to communicate their suggestions and ideas to upper management and   management acts on these   to improve.
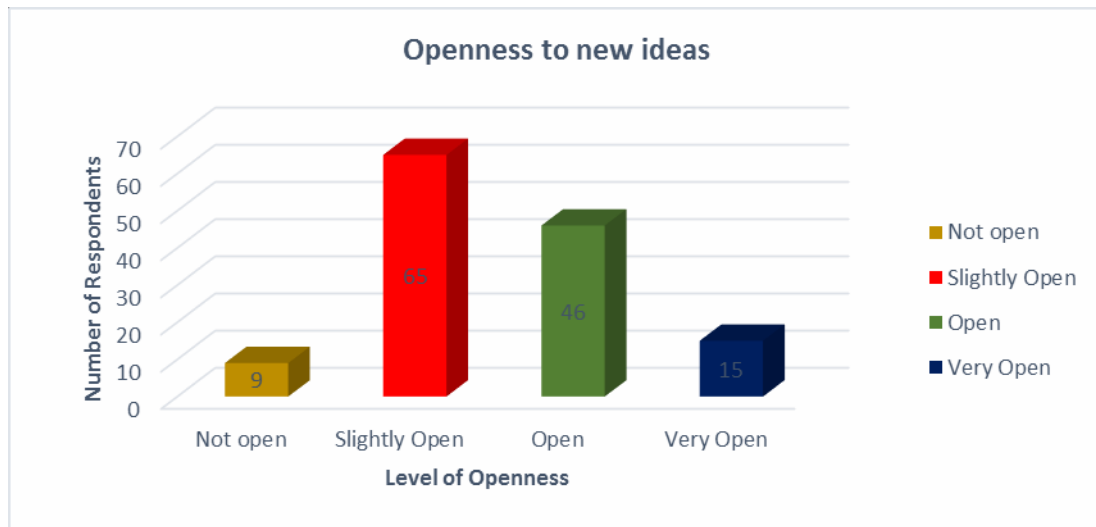
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Figure 3: Level of openness to gemba kaizen as a new idea

The "very open" category was answered by only 15 respondents. This group of respondents indicated that their organisations made excellent use of their ideas to improve and innovate quickly. In such organisations, the management may have research teams. From the findings, very few small- and medium-scale construction organisations respond to new ideas, while the larger population of the respondents believe that their organisations are slightly open to new ideas and innovation.

DISCUSSION

The triangulation process for the findings ensures content validity and corroborates the qualitative findings with the quantitative. Although it would be difficult to identify the presence of kaizen accurately in small- and medium-scale construction organisations in Lagos, Nigeria, the method of data collection and analysis provided much information about the nature of these organisations. Eleven (11) top executives from small- and medium- scale construction firms in Lagos were interviewed, and 135 questionnaires were retrieved. The semi-structured interviews which were transcribed were analysed using NVIVO 10. Nine themes were identified, namely staff; mission statement and core values; organisation structure complexity; communication approach; waste reduction policy; heard about kaizen or continuous improvement; new to kaizen or continuous improvement; post-contract cost control process; and post-project reviews. These nine themes were analysed along with the various sub-themes.

The mission statement and core values themes pertain to what the organisation stands for. Although most times these are merely words spelt out on paper, they show the orientation of the business. 'Integrity', 'innovation', 'teamwork', 'client satisfaction', and 'good business ethics' are some of the keywords from the mission

statement and core values themes. Small- and medium-scale businesses strive to be innovative in their activities, but this may not be possible with the present competitive level of small- and medium-scale construction firms in Nigeria. The number and type of staff employed by these companies reflect their mode of operation for continuous improvement and innovation. Unskilled or ad hoc staff may not be able to advise the management in certain areas compared to skilled staff. Therefore, there may be a low level of continuous improvement in such a workplace.

The organisational structure in small- and medium-scale construction firms in Nigeria shows that firms with a simple structure have very few staff. Thus it is easier to implement new ideas within the organisation. The communication approach within these organisations is top-down in nature, with communication tools such as memos and regular office meetings being dominant. Only three (3) respondents had a waste reduction policy within their company, and the companies of five (5) interviewees had a policy on time management. Waste reduction strategy in business may be evidence of latent kaizen. Notwithstanding, these policies are not sufficiently robust to cover the requirement for continuous improvement in the workplace.

The major challenge is the level of knowledge of kaizen within these companies. Therefore, the interviewees were asked whether they had heard about kaizen or continuous improvement. Based on the responses , it seems that kaizen was a new term to the respondents. Continuous improvement within small- and medium-scale construction businesses in Lagos, Nigeria was non-existent. Nonetheless, the general view of respondents in these construction companies was explored with the aid of the questionnaire. The questions asked were based on openness to new ideas and innovations. The findings revealed that 48% of the respondents believe that their organisations were slightly open to new ideas and innovation, while 34% of the interviewees indicated otherwise. Eleven per cent (11%) responded that their organisations were very open and just seven per cent of the respondents thought their organisations were not open. The overall findings of the questionnaire show that most small- and medium-scale construction firms are not very open to new ideas or innovation. If these companies are not open to new idea and changes such as gemba kaizen, then this indicates that the majority of the companies have little or no evidence of continuous improvement.

The post-project review is evidence of kaizen in business. This practice was identified in seven (7) small- and medium-scale businesses during the interviews process . Post-project reviews have had a positive impact on these firms. In a situation where the director of a construction company is familiar with post-project reviews, introducing continuous improvement to them would be easy compared to the remaining four (4) businesses that stated that they did not use post- project reviews.

From the findings, most employees of these construction firms thought that their

business would be slightly open to new ideas and innovation such as kaizen. This is based on their perception of their existing relationship with the top management. Even though some respondents practised *muda* elimination and had mission statements related to gemba kaizen, the activities of entrepreneurs of small- and medium-scale construction firms in Lagos, Nigeria did not pertain to what is expected of gemba kaizen.

Waste management in various construction industries has defined policies. In the UK the waste management policy is well implemented. The UK generates about 90 million tonnes of construction waste annually (Williams and Turner, 2010). It was further noted that waste produced comes from packaging; leftovers from building materials; design error or changes; poor storage; pilfering and handling of materials. These sources depend on the nature of the construction industry. In developing construction industries such as that of Nigeria, the general causes of construction waste on site include poor allocation of resources; poor recording keeping; vandalism; variation and rework; damage as a result of weather or mishandling; damage as a result of transportation; composite and design of building; material supplied and used on site; and site office waste (Wahab and Lawal, 2011). The materials which generate waste on a site may be concrete, wood, metals, plastic, tiles, insulation, paints, soil and stones, ceramics, glass, and bricks. Waste generation on a site may be avoided, but the effects may lead to cost and time overruns. In some cases, it may put an abrupt end to the project. The concept of kaizen costing in construction waste reduction for improved profitability, sustainable construction, enhanced value and client satisfaction through better quality depends on factors other than waste reduction.

Waste management practices in kaizen costing are viewed from the perspective of production residues. However, the overall concept of kaizen also perceives waste from the administrative aspect. The idea of kaizen which is a continuous improvement during production is one of the derivatives of lean production. Singh and Singh (2012) reviewed the history, evolution, and the concept of continuous improvement in organisations over the years. Their findings show that continuous improvement, otherwise known as kaizen, has been used to improve organisations' performance over the decades. Kaizen focuses more on reducing waste before and during construction. The concept of kaizen costing is a method used in reducing waste during construction (Chukwubuikem et al., 2013). This approach has been foremost in the manufacturing industry in many countries around the world: however, the concept is relatively new in the construction sector.

Post-project reviews which also include site meetings are carried out within seven (7) out of the eleven (11) construction firms. Also, the high level of openness of these respondents' companies to continuous improvement may be an indication of continuous improvement. Nonetheless, there is a need for further training in the area of gemba kaizen.

Developing the BPMN model

BPMN is used to improve the current state of the construction business and activities on the construction site. The BPMN process made use of the findings and discussions. In Figure 4, the functions boxes are management, supervisor or line manager and staff. The kaizen in the office (gemba kaizen) starts with identifying the problems that need improvement within the office. The management or any other employee may determine this issue. The identified problem may be stored in a file or computer system for record purposes, and delegated for resolution. This delegation may be sent as a memo or email within the office. A kaizen supervisor can tackle the problem by looking at the non-value added activities within the company. The decision-making process here will be to schedule activities for immediate review or have a brainstorming session with the employees in the next function. At this stage, more problems may be identified in the office for resolution. The problems may be some activities that take more time and have led to financial losses.
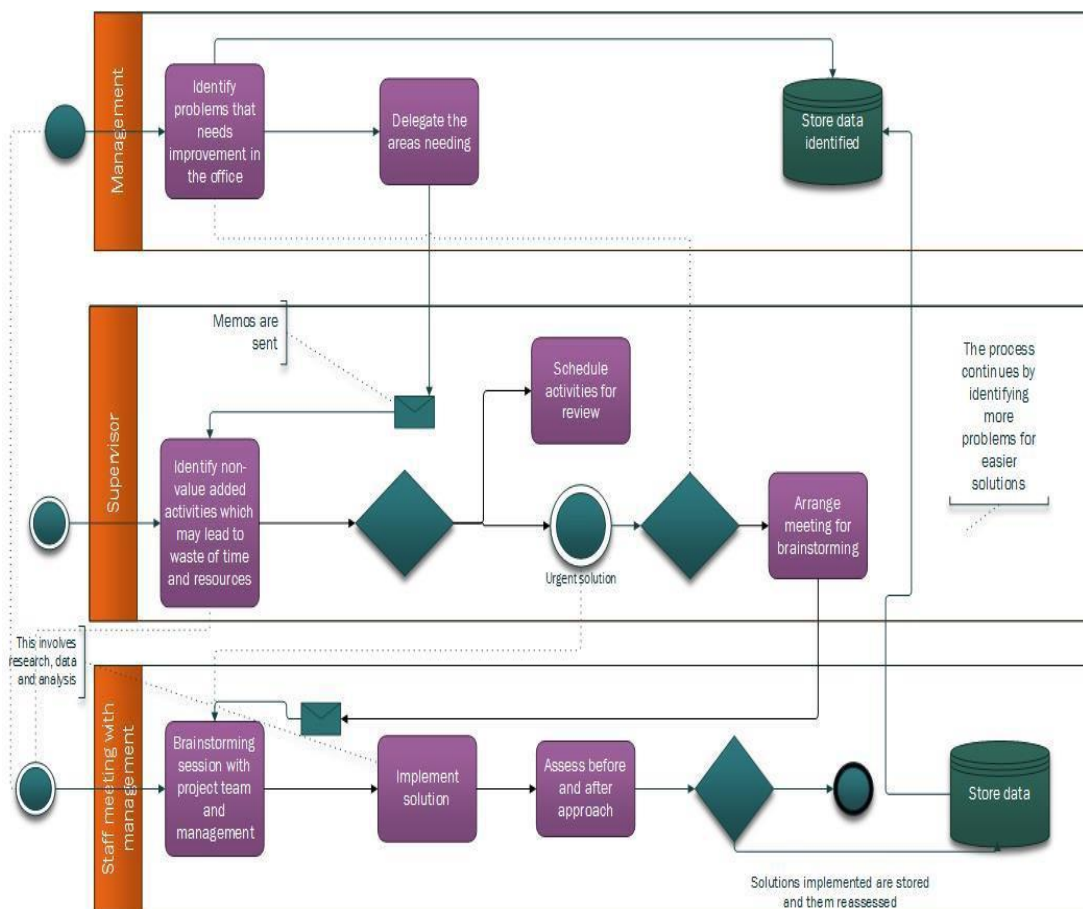

Figure 4: BPMN for kaizen process for a hypothetical SMSCB

Therefore, time management, resource allocation, financial management, and other waste-producing processes have to experience effective management. The management will need to be involved in this brainstorming meeting with the supervisors and other employees.

CONCLUSIONS

The presence of kaizen in SMSCCs in Nigeria is minimal, and there is a need for adequate training about the concept of continuous improvement in these SMSCBs before it can be implemented. The continuous improvement policies are similar to waste reduction policies mentioned earlier in the article. These SMSCBs have waste reduction policies, but they are not implemented or reviewed. The post-project review is a major indicator of kaizen in the workplace. Seven (7) interviewees out of eleven (11) noted that they conduct post-project review meetings. This an important basis for implementing kaizen and kaizen costing. Nonetheless, it is not enough to indicate that kaizen exists in SMSCBs. Waste reduction, innovation, and openness in SMSCBs proved that they have had to increase the involvement of stakeholders who are the construction professionals in waste reduction and maintenance of existing activities. In conclusion, the kaizen philosophy exists on a minimal level in Nigerian SMSCB.

The BPMN model developed in the article provides a simple approach for SMSCBs to enhance their operations within the construction industry. This will provide an opportunity for them to compete favourably with other smaller and medium-scale construction companies in Nigeria. Furthermore, this model may also be applied to SMSCBs in developing countries and beyond.

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