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The research methodology for the development of a kaizen costing framework suitable for indigenous construction firms in Lagos, Nigeria.

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Abstract

The need for a cost management paradigm shift in the construction industry is imperative because of the prevailing challenges of managing construction cost during construction. Small and medium scale construction firms in Nigeria are faced with the challenges of competition from foreign firm, cost overrun, project delays and unsatisfied clients. This challenge may be handled with kaizen principles and kaizen costing. This paper utilized literatures related to research methodology in the built environment to create a research framework for the study. This focused on the research philosophical stands, approaches and strategy related to the built environment. The research onion model was adopted for the framework development and the sample size of two hundred and fifty (250) respondents was selected based on theoretical sampling for quantitative data collection using questionnaires. Twenty (20) interviews would be conducted within the sample size for the questionnaire. This will involve Likert scale format questionnaires and semi-structured interviews.

Keyword: kaizen costing, research, research philosophy, framework.

Introduction

Research is a well-coordinated activity aiming to contribute more knowledge to the existing body of knowledge (Fellows and Liu, 2008). The process of creating new knowledge is expected to follow a systematic sequence and order which will lead to the eventual results (Collins and Hussey, 2003). Therefore, a research would follow a specific method of inquiry which would solve an existing problem. The research methodology is a structure containing approaches, strategies and techniques needed for the conduct of a complete research (Collins and Hussey, 2003). Research methodology is therefore based on the researcher, the background of the research topic, the research aim and objectives. A framework for a research can only be designed if the nature of the study is well defined with an established research aim and objectives are set out.

Background of the study

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 UK, techniques used in post-contract

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cost control include earned value analysis, cost and schedule performance, cost ratio and fixed budget system (Dikko 2002, Sanni and Hashim 2013). The main cost management techniques include target costing, life cycle costing, activity based costing and kaizen costing (Everaert et al., 2006; Jong No & Kleiner, 1997; Kaur & Kaur, 2013). These methods and techniques have been employed in many construction industries around the world.

The Nigerian construction industry also makes use of target and life cylce costing, however activity based costing and kaizen costing are rearely used. Construction firms and cost managers employ normal techniques such as cost coding, monitaoring of labour, material and plant cost et al. (Sanni & Durodola, 2012), nonethelss the use of the conventional methods for controlling cost during construction may have led to cost overruns and project delays in may construction projects in Nigeria. According to Odediran et al (2012) Nigerian local construction firms are small and medium scale in nautre and they experience the challenge of competing with multinational constructuion firms due to project emanating from project delivery such as cost overruns, project delays, constant litigation, poor management structure and client satisfaction. Considering the myriads of problems SME construction firms in Nigeria experience, kaizen costing may play a major role in curbing the challenges facing SME construction firms in Nigeria.

Kaizen costing is derived from kaizen which is a japanese word for continuous improvement (Granja, Picchi, & Robert, 2005). Kaizen costing has been used in the Japanese construction industry since the 1960s to reduce product manufacturing cost, improve quality and also client satrisfaction (Granja et al., 2005; Everaert et al., 2006). This process has been applied in the construction industry in other parts of the world but it has not been applied in Nigerian construction industry eventhough it is in use in Nigeria manufacturing sector (Olabisi, Sokenfun, & Oginni, 2012). The benefits of this cost management method can be used to improve the performance of construction firms in Nigeria through a strategic framework for the Nigerian construction environment.

The aim of this study is to create a new structure for conducting post-contract cost control in Nigerian indigenous construction firm in Lagos state based on kaizen costing. The objectives of this research are to:

a) To identify and evaluate the post-contract cost control techniques used in the construction industry.
b) To identify and evaluate the techniques used in post-contract cost control management in indigenous construction firms in Lagos, Nigeria.
c) To assess the understanding of kaizen philosophy in indigenous construction organizations in Lagos, Nigeria.

d) To identify and evaluate the critical success factors of adopting kaizen costing in indigenous construction firms in Lagos, Nigeria.

e) To evaluate the possible integration of activity based costing system with kaizen costing.

f) To develop a Kaizen costing framework which can be integrated into the post-contract cost control practices in indigenous construction firms in Lagos, Nigeria.

This paper addresses the research methodology which is required to create a kaizen costing framework based on the research aim and objectives accordingly, the first methodological aspect related to the study is disscussed as a whole,while the struture of the research methodology is sebsequently discussed. This involves the research philosophy, approach, strategy, sampling and data analysis. The research methodology adopted for this investigation will determine the path to take in achieving the final objective in this study.

The research methodology

In built environment research the major frameworks available for research methodology are the nested method and the research onion (Kaglioglou et al., 1998; Saunders, Lewis and Thornhill, 2012). These two models contain the same steps required for effective research; however the research onion contains more information compared to the nested model, these models are illustrated below.

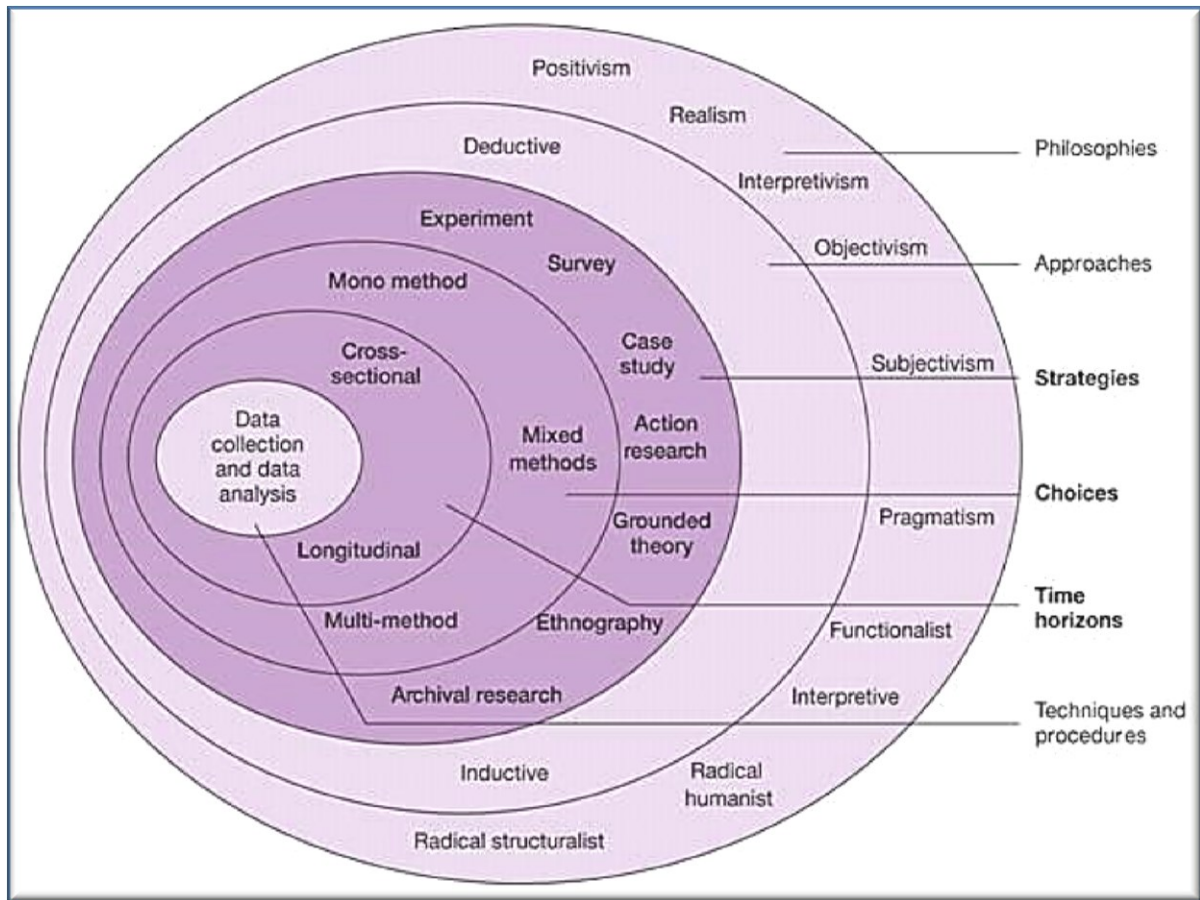**Figure 1: The nested model (Kaglioglou et al., 1998)**

Figure 2: The research onion (Saunders et al., 2012)

The nested model contains information about the research philosophies at the first stage, the research approach at the second stage and also the research techniques at the final stage in the inner core. The research onion breaks the research philosophy down into the more detailed phases from the philosophy to the time horizon and the techniques and procedures. The choice of a research methodology model depends on the researcher and the research objectives. This study will adopt the research onion because of the detailed structure.

The research philosophy

Research philosophy is regarded as the bedrock of any research, the core stands of research philosophy guides the researcher in making the right decisions about the approach, strategy, data collection techniques and procedures on how to answer the research questions. William and Mays (2002) stated that research is based on philosophical values which define various disciplines. These philosophies are mainly divided into ontology, epistemology and axiology.

Ontology attempts to know if knowledge is a product of the mind or it exists, in this instance it suggests *realism* and *idealism* (Morgan and Smircich 1980, Lawson 2004, Krauss 2005, Carr 2006, Khin and Heng 2012). Reality may be seen may be viewed in this paper as being within the social phenomenon in some of the objectives and outside the social phenomenon. In this case some literature may be reviewed to get some data about post-contract cost control techniques, while the evaluation of kaizen philosophy will have to be evaluated based on the existing structure of organizations.

Epistemology is the philosophy which relates to how knowledge can be recognized, developed or acknowledged (Schuh and Barab 2007, Mack 2010, Mkansi and Acheampong 2012). Epistemology considers alternative ways of approaching research (Hill 1984, Khin and Heng 2012). Eriksson and Kovalainen (2008) explained that epistemology may be objective or subjective; objective epistemology recognizes the outside world which is hypothetical impartial, while the subjective epistemology suggests that the outside world is in the realm of clarifications from reflection. The two sides of epistemology are positivism and interpretivism.

The positivist handles research using the quantitative method involving surveys, experiments, simulations et al (Holden & Lynch, 2004).   The intrepretivist or social constructionism aims to increase the general understanding of reality, therefore the experience of the researcher is included as part of the study, includes the opinion of stakeholders. The epistemological views of positivism may be applicable to some research objectives in this study, while intrepretivism may be used for other objectives. However, this can be combined in some objectives.

This is explained in table 1 below. According to Saunders et al. (2012) a researcher may decide to add his own personal experiences to the values of a research or may decide to be unbiased about the concept of value in a research. Axiology pertains to the judgement of value by a researcher. Therefore the two positions of axiology will include value- neutral and value-laden. These two sides value are related to positivism (value-neutral) and social constructionism (value-laden).   Some research objectives in this study may adopt the combination of value-laden and value-free, this is based on the nature of the objectives. This is further explained in table1.

Table 1: Justification of the research philosophical stands adopted for each objective

Research objectives	Ontology	Epistemology	Axiology
1.To identify and evaluate the post-contract cost control techniques used in the construction industry	Knowledge is derived from the existing social phenomenon, therefore idealism will be adopted. The objective can be resolved using existing literature	Since this objective can be resolved using literature, stakeholders' opinions will be involved. Intrepretivism will be adopted in this case.	This objective will be value-laden because the researcher's experience will be included.
2. To identify and evaluate the post-contract cost control management used in indigenous construction firms in Lagos, Nigeria	This objective will adopt realism and idealism because some of the techniques exist in literature will other will be gathers from outside the social phenomenon	This objective will make use of positivism and intrepretivism because some of the techniques can be identified in the academic milieu while some have to be collected from the outside world	The objective will be value-free and value –laden because of the researcher will involve his experience in the research in some case but not all.
3. To assess the understanding of kaizen philosophy in indigenous construction firms in Lagos, Nigeria.	The opinion of construction professionals are required in this objective and it will involve idealism only.	Intrepretivism is required in this objective because the opinion of the construction professions is necessary.	Value-biased is necessary because it is opinion based
4. To identify and evaluate the critical success factors of adopting kazien costing in indigenous construction firms in Lagos, Nigeria	Some of the knowledge exist within the social phenomenon and in the outside world, therefore it will be partly realism and partly idealism.	The positivist stand in this objective involves the unit of analysis, while the intrepretivism stand seeks to add more to the existing knowledge. Positivism and intrepretivism is required because the unit of analysis has to be evaluated and the stakeholder's opinions are required.	The independence of the researcher makes it value-free while the value-laden aspect adds the researcher's experience.
5. To evaluate the possible integration of activity based costing system with kaizen costing	Realism and idealism are necessary for the objective because some knowledge will be gathered from the outside world and also from the social phenomenon.		The researcher would need to add his experience in the value-laden aspect of gathering opinions, but it will also be value-neutral
6. To develop a kaizen costing framework which can be integrated into the post contract cost control practices of indigenous construction firms in Lagos, Nigeria.	Realism is required alone because the framework development will involve knowledge from outside the social phenomenon	Large amount of data, simplified unit of analysis are required. The positivist stand will be adopted	This objective is totally value-free because no bias is required for the creation of the framework

Table 1above maps out the research objectives to the appropriate philosophical stand for the study. This will defined the type of research approach to adopt. The next section discusses the research approach which will be formed based on the research philosophies for each of the objectives. The overall research approach may determine the research strategy to utilize for the investigation and also the sample size and method of analysis.

The research approach

Mixed method research is a combination of qualitative and quantitative research methods. Amaratunga, Baldry et al. (2002) opined that mixed method allows the weaknesses of each method (qualitative and quantitative) to be complemented by the strengths of the other. (Amaratunga, Baldry et al. 2002) further added that mixed method which is also known as the broad approach is imperative for having an introspective overview of a research. The research approach may be ***deductive*** or ***inductive***. The inductive approach is based on intrepretivism while the deductive approach is more or positivism when considered from the epistemological grounds. The deductive approach views a research from a broader perspective to the main specific unit of investigation. Losee (1993) noted that the method of reasoning in deductive approach involves the creation of concepts or theories which are then tested via observation. Inductive approach is the direct opposite of deductive approach. This study will make use of both deductive and inductive approaches, this is combination is known as the abductive (Levin-Rozalis, 2004). The abductive approach is necessary based on the research objectives.

The research strategy

According to Wisker (2008) research strategy may be in form of case study, surveys, ethnography, field experiments, simulations, laboratory experiments, action research, archival analysis, role playing and so on. The suitability of these methods depends on the research objectives and the philosophy which has been adopted for the investigation. Table 2 below compares the research strategies and their suitability to the research objectives.

Table 2: Displays the suitability of the various possible research strategies for this study

Research strategy	Philosophical stand	Suitability for the research
Action research	Subjective/idealism/value-laden	Action research involves experiments which are out of the laboratory or a controlled environment; they are practical forms of research will involve a lot of field work. Action research involves the use of controlled group for data collection (Saunders et al., 2012). This method will not suit any of the research objectives because the study has to be carried out with a group. This will be difficult to use in this research.
Surveys	Positivism/Realism/ value-free	Surveys are used to collect data from a large population. Survey is not only a data collection technique but involves questionnaires and in-depth interviews, content analysis, observation and so on (De Vaus, 2002). This will be suitable for this study because of some objectives which will require gathering large amount of data which cut across various professions. The surveys will be quantitative and qualitative.
Case study	Intrepretivism/Realism or idealism/value-laden	Case study research may be quantitative or qualitative in nature. This form of research seeks to generate answers to questions such as 'what', 'why' and 'how' (Yin, 2009). This research strategy will suitable for some of the research questions and objectives, however, this part will be conducted using survey interviews for simplicity. Case study research may be longitudinal or cross sectional making using of interviews as research instruments.
Experiments	positivism/realism/ value-free	Experiments will have to be carried out in a controlled environment with a controlled group. This study will not make use of experiments because the researches objectives involve are a form of social science research. Experiments are usually used for pure sciences.
Content analysis	Intrepretivism/ idealism/value-laden	Literature review as a form of research strategy could be content analysis, word, count, narrative analysis, taxonomy analysis, qualitative comparative analysis and so on (Onwuegbuzie, Leech et al. 2012) . Some of the research objectives will be resolved from the content of the literature review in this study.

From the research strategy synthesis above survey is the most appropriate method for this research and it includes qualitative and quantitative techniques of data collection. The choice of survey strategy for this research is based upon the simplicity, intended sample population and the method of ana-

lysing the data which would be collected. The justification for adopting survey strategy is further discussed in the next section.

Surveys research strategy

Survey strategy tends to asks questions such as what, who, where, how much or how many, it focuses on contemporary phenomena and does not require the control of behavioural events (Yin, 2009). According to De Vaus (2002) surveys may be inform of quantitative or qualitative method of data collection. This involves questionnaires and interviews. The description of survey strategy by (Yin (2009) reflects the category of approach to this study which involves answering questions about what type of post-contract cost control techniques are used, the number of techniques used and the evaluation of these techniques. The survey strategy is the most suitable for this kind of research. De Vaus (2002) also described the survey strategy to be quantitative, in this case involving interviews, this is aspect of surveys would be need for the final objective which involves the creation of a kaizen costing framework. The perception and opinion of some specific stakeholders in Nigeria construction industry would be need for the formulation of a new method of conducting post contract cost control in Nigeria. The interviews will be informs of semi-structures interviews. The questionnaires will be structured using the Likert scale format. This is necessary because of several opinion are required for the formation of kaizen costing framework.

The major time horizons for a research may be longitudinal or cross-sectional (Saunders et al. 2012). This investigation has adopted the cross-sectional time horizon because the final objective which involves a framework can easily be resolved within a shooter time. Longitudinal time horizon involves several months of data collection. The surveys method adopted also supports this selection.

Research Sampling

This study will make use of theoretical sampling because it needs the opinion of experienced professionals within a specific geographical location. Twenty (20) semi-structured interviews will be distributed alongside two hundred and fifty (250) questionnaires in construction firms in Lagos Nigeria. There are about 750 medium scale construction firms in Lagos, Nigeria according to the Lagos State Ministry of Housing (Sanni and Durodola 2012), also Nwanna (1981) as cited by Sanni and Durodola (2010) noted that 40% of the population size in its few hundreds will be enough as a sample population in a research.

Data analysis and presentation

Content analysis of the literature is an analysis method which can be used to categorize the themes is a systematic approach (Saunders et al., 2012). This approach will be used to select the post-contract cost control techniques and also the critical success factors from the literature review. The coding process also allows these identified critical success factors and post-contract cost control techniques to be narrowed down to the important one for the analysis. The analytical hierarchy process will be used to analyse the important critical success factors in the research. The NVIVO coding process makes use of nodes which allows themes to be filtered. The coding process in NVIVO is in an ascending manner, this process is can be used for deductive and inductive coding. Coding allows the researcher to makes noted which will invariably lead to theory (Richards, 2009). Coding will be the first approach for the data gathered using questionnaire and interviews. Relative importance index using mean score ranking would be used to rank and analyse the most important critical success factors and post-contract cost control techniques. Initials results would then be validated for error correction and reliability using fifteen expert interviews and three live projects.

Conclusion

Based on the research onion model, the framework for this research has been designed based on the available research objectives and related philosophies. The research philosophy led to the synthesis of the research strategy. The research approach is based on the combination of deductive and inductive approaches which is described as being abductive. The final structure of the research framework is illustrated in figure 2 below. Most studies about academics such as Granja, Picchi et al. (2005) and Kaur and Kaur (2013) on kaizen and kaizen costing has been literature based, while some authors involved in detailed analysis of kaizen costing concept in relation to management decisions and impact has adopted the survey and case study strategy (Olabisi, Sokenfun et al. 2012). The research framework designed for this study will adopt the survey strategy because this research intends to have an in-depth evaluation of the perception of continuous improvement on organization behaviour and cost reduction.

Following a systematic approach from the research philosophies to the research approach, strategy, and techniques, a suitable research framework has been designed for this study. This is illustrated in the diagram below.
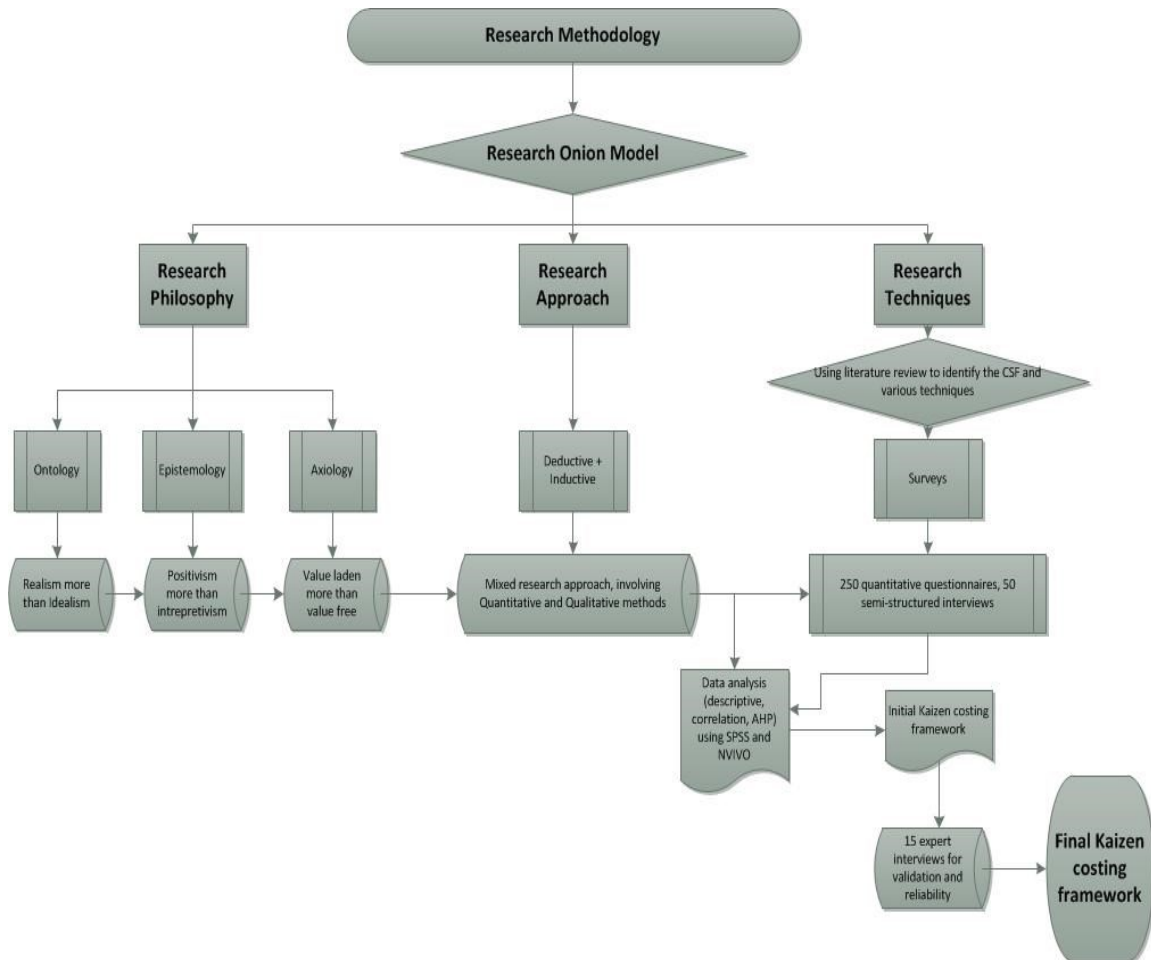
Figure 3: Conceptual research methodology framework for the development of a kaizen costing framework

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