APPRAISING EFFECTIVENESS OF KEY PERFORMANCE INDICATORS USED BY NIGERIAN CONSTRUCTION FIRMS.

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ABSTRACT

Key Performance Indicators are tools used by organizations to define, measure, monitor, and track its performance over time toward the attainment of its stated organizational goals. This paper reports finding of a research that aimed at determining the effectiveness or otherwise of each KPIs used by the Nigerian construction companies. A total of 120 questionnaires were administered in the four major cities of Nigeria, out of which 86 were fully returned. The statistical analysis of the collected data provides basis for the determination of the effectiveness of each KPIs. Four indicators were chosen as the common set of indicators for Nigerian Construction firms, the four indicators in order of frequencies were; Quality control, On time completion, Cost and Unit/day. Using likert scale analysis 9 indicators were identified as Effective Key Performance Indicators in Nigeria. The identified indicators in order of effectiveness are;- (1) Quality control(2) Cost (3) On time completion(4) Client satisfaction(5) Earned value reporting(6) Resource management(7) Unit/Day(8) and Safety(9).

KEY WORDS; KPI, Organisational Goals, Productivity, Performance and Nigeria

INTRODUCTION

Performance indicators or Key Performance Indicators (KPIs) are an industry jargon for a type of performance measurement. (Tylor and Gibbon, 1999). An organization may use KPIs to evaluate its success, or to evaluate the success of a particular activity in which it is engaged. KPIs are tools that may be used by an organization to define, measure, monitor, and track its performance over time toward the attainment of its stated organizational goals. Accordingly, choosing the right KPIs relies upon a good understanding of what is important to the organization. 'What is important' often depends on the department measuring the performance (Gallof 2009). TheFreeDictionary.com defines Key Performance Indicators as "a set of quantifiable measures that a company or industry uses to gauge or compare performance in terms of meeting their strategic and operational goals". Cox, Raja and Ahrens (2003) also define KPIs as the compilation of data measure used to access the performance of a construction operation. Furthermore, John (2011) explains that Key performance indicators help an organization defined and measure progress towards organizational goals. In addition, Wikipedia explains that KPIs are commonly used by an organization to evaluate its success or the success of a particular activity in which it is engaged.

Prior to 1980s project performance was narrowly defined as meeting the cost and time objectives and adhering to product specifications (Ikediashi, et. al, 2012) and (Bryde, 2003). But research during 1980s and 1990s leads to a common agreement that project success is

multidimensional and that different people measure project success or performance in different ways and at different times (Ugwu and Haupt, 2007).

Sir John Egons challenge industries to measure its performance over a range of its activities and to meet a set of ambitious targets (Egons 1998) Egon identifies a number of drivers for change and set a number of ambitious targets against which this improvement should be measured, which we still recognized today as "Headline" performance measurement.

Despite the importance of performance measurement, information on the performance of construction industry as a whole is relatively scarce (Formoso and Lantelme 2000). Cox et al (2003) conducted a survey in the United State *"Management perception of key performance indicator for construction"*. Their study reveals that difference in KPIs exist among different level of management and the number of years of experience. However, their study did not attempt to evaluate the effectiveness of the performance measures. Thus, suggesting further research in the area. In his case study of Bauchi State, Idris (2008) identifies five indicators to be highly significant and suggest that they may be used as a foundation for reporting performance. In addition, Chan and Chan (2004) developed KPIs through literature review and subjected them to validity testing using three case studies and conclude that KPIs in general are good indicators of performance of construction project. Ikediashi et al (2012) developed key performance indicators for measuring Design and Build projects in Nigeria, and provide unambiguous methodology for measuring performance of Design and Build project. This research work is based on the limitations identified on the previous research Cox et al (2003). It aims to determine the effectiveness of KPIs used by Nigerian construction companies. This research will be of good contribution to knowledge as a means of reference. It will also be useful in helping the Nigerian construction companies to choosing which of the KPIs will more effectively provide adequate performance information.

OBJECTIVES OF THE STUDY

The objective of this paper was to determine (from theory and practice) the common KPIs used by construction companies. And investigate the effectiveness or otherwise of each KPI.

RESEARCH HYPOTHESES

The hypothesis developed for the purpose of this research are;-

a) H_0:   The Nigerian construction companies do not have common KPIs

    H_1:   The Nigerian construction companies have a common set of KPIs

b) H_0:   KPIs used by Nigerian construction companies were not effective in measuring the organizational goals.

    H_1:   KPIs used by Nigerian construction companies were effective in measuring the organizational goals.

REVIEW OF CONCEPTS

According to Neely (2005) performance measurement is the process of quantifying the efficiency and effectiveness of actions. With the increased interest in performance measurement, a systematic shift of emphasis from financial performance measures to non-financial measures of performance has emerged quite significantly (Langston 2013). Traditional accounting and financially-oriented performance measurement systems are no longer adequate to evaluate the firm's performance. Busi and Bititci (2006) observed that performance measurement has developed into a relatively broad body of literature to cover both financial and non-financial measures. This,

therefore, gave rise to different ways of measuring project performance. Bassioni et al (2004) reviewed the main performance frame works and their application by U.K. construction firms, the main performance frame works identified were KPIs, Balance score card and European foundation for quality Management (EFQM). He further identifies additional gap in knowledge and practice that applies across construction industries. Among others were the implementation of contemporary performance measurements frame works, measuring of specific areas and design of measures specific to construction.

PRODUCTIVITY AND PERFORMANCE MEASUREMENT

Langston (2011) asserts that Performance and productivity are often used interchangeably in the literature, because ratios of output over input are typically involved in both cases. Cox et al (2003) on the other hand gives a brief highlight of productivity and performance and vindicates that performance measurement involves the collection of information about various activities (specifically, work in place and the corresponding work-hours) over a given period of time, and conclude that productivity is just one part of performance. (Cox et al 2003)

BENCHMARKING

Benchmarking aims at comparing the performance of firms relative to each other, allowing these firms to recognize their weaknesses and strengths and by finding examples of superior performance, can adjust their policies and practices to improve their performance (Mohammad et al. 2007). This is also applicable to projects and a base line can be compilations of years of historical data collected on previous projects or a quick measurement of current production prior to initiating a change for improvement. Liao et al. (2012) stated that the benchmarking of engineering productivity can assist in the identification of inefficiencies and thus can be critical to cost control. Their study developed a standardized approach using 'z-scores' to aggregate engineering productivity measurement from data collected from 112 actual projects, and resulted in a metric incorporating a project level view of engineering productivity. The metric enabled benchmarking of heavy industrial project productivity as a basis for comparison of individual project performance. Mohamed (1996) earlier urged organizations to be actively involved in project benchmarking to assess their performance, measure their productivity rates and validate their cost-estimation databases. Companies that engage in benchmarking do so for two basic reasons.

PERFORMANCE MEASUREMENT

Mbugua et al. (1999) and Love et al. (2000) have identified a distinction between performance indicators, performance measures and performance measurement. According to Mbugua et al. (1999), performance indicators specify the measurable evidence necessary to prove that a planned effort has achieved the desired result. In other words, when indicators can be measured with some degree of precision and without ambiguity they are called measures. However, when it is not possible to obtain a precise measurement, it is usual to refer to performance indicators. Performance measures are the numerical or quantitative indicators (Sinclair and Zairi, (1995). On the other hand, performance measurement is a systematic way of evaluating the inputs and outputs in manufacturing operations or construction activity and acts as a tool for continuous improvements (Sinclair and Zairi, 1995; Mbugua et al. 1999). In response to calls for continuous improvement in performance, many performance measurements have emerged in management literature. Following the works of Egon (1999) KPI comes among these performance measures.

KEY PERFORMANCE INDICATORS

Basically, KPIs are tools that may be used by an organization to define, measure, monitor, and track its performance over time toward the attainment of its stated organizational goals. TheFreeDictionary.com defines Key Performance Indicators as "a set of quantifiable measures that a company or industry uses to gauge or compare performance in terms of meeting their strategic and operational goals". Key Performance Indicators (KPIs) help organisations understand how well they are performing in relation to their strategic goals and objectives. In the broadest sense, a KPI can be defined as providing the most important performance information that enables organisations or their stakeholders to understand whether the organisation is on track or not (Bernard, 2014). According to Cox et al, Key performance indicators are compilation of data measure used to access the performance of a construction operation. KPIs when properly developed should provide all staff with clear goals and objective couple with the understanding of how the relates to the overall success of an organization. (Cox et al 2003).

The following key performance indicators relating to construction were obtained www.kpizone.com. The website gives access to KPIs for economic, social and environmental performance as well as those for the construction sectors, thus enabling the user to choose relevant KPIs and store and retrieve data to help benchmark effectively. These KPIs are;

Project KPIs

Client satisfaction –Product, Client satisfaction –Services, Defect, Construction cost, and Construction Time

Company KPIs

Profitability, Productivity and Safety among others

Key Performance Indicators can either be quantitative results of a construction process or by qualitative measures such as workers' behavior on the job (Cox et al. 2003). While the former are the most commonly accepted performance indicators that can be physically measured in terms of naira equivalent (cost) and man-hours (time). The later are not commonly accepted as reliable performance evaluation technique due to their perceived difficulty and/or inability to be measured and its subjective approach. (Ikediashi 2012). According to Cox et al (2003), The KPIs can be summarized as shown in table 1.

Table 1. Quantitative and Qualitative Performance indicators

Quantitative Performance Indicators	Qualitative Performance Indicators
Units/Man-hour:	Safety
$/Unit	Turnover
Cost	Absenteeism
On-Time Completion	Motivation:
Resource Management	
Quality Control/Rework	
Percent Complete	
Earned Man-Hours	
Lost Time Accounting	
Punch List	

Source; Generated from Cox et al 2003

REVIEW OF RESEARCH WORKS

Chan and Chan (2004) developed a set of Key Performance Indicators (KPI) through a literature review and then subjected them to validity test using a set of three case studies. Findings from the study revealed that the KPIs in general are good indicators of the performance of construction projects and provide a useful framework for measuring and comparing project performance.

Cox et al. (2003), focused on the managements' perception of KPIs for construction activities. A set of quantitative and qualitative performance indicators were generated through a literature survey, these were subjected to the views of Project managers and construction executives. The findings revealed a substantial difference between construction executives and project managers' perceptions on KPIs.

Ikediash et al (2012) developed a set of key performance indicators for measuring Design and Build projects in Nigeria. The importance of these indicators on performance outcomes of Design-Build projects was examined and the degree of agreement among the key stakeholders on the indicators was also ascertained. In the study, a set of key performance indicators were identified from a literature search and subjected to the views and opinions of respondents, eight most important Key Performance Indicators were identified to be relevant. They include among others, Health and Safety, Quality of Work, Cost per Unit, job cost reporting, time performance and quality of work among others.

Ikediashi et al (2012) further indicate that there was no significant difference in the rankings of time performance, Turnover, Rework and Quality of work, while there was significant difference in the rankings of cost per/unit, job cost reporting, and health and safety.

METHODOLOGY

In order to determine the effectiveness of each KPI in measuring project performance, a survey was conducted through administering questionnaire to construction project managers in various construction companies in Nigeria. A total of 120 surveys were administered nationwide, 48 surveys were self administered in the federal capital territory Abuja, this represent 40% of the survey. Abuja being the federal capital and hosting a large proportion of public projects (Izam, 2010). The remaining 60 was also self administered to three major cities of Kaduna (North), Lagos (West) and Enugu (South). These cities were also selected for the survey because of their strategic importance in terms of volume of construction activities and population (Dada, 2005). Out of the 120 questionnaires distributed, a total of 86 were successfully recovered. This gives justifiable return rate of over 70% Dodo et al. (2013). Table 2, shows the respond rating of the questionnaire.

Table 2: Respondents percentage.

	Abuja	Kaduna	Lagos	Enugu	Total
Sent	48	24	24	24	120
Received	36	18	16	16	86
Response%	75	75	67	67	72

Source: Field survey 2013

RESULTS

The academic qualifications of respondents for the survey are shown in Table 3. The table clearly vindicates that 53.5 percent of the respondents are postgraduates.

Table 3. The academic qualification of the respondents.

	Frequency	Percent	Cumulative Percent
PhD	4	4.7	4.7
MSc/MTech	20	23.3	27.9
Pgd	22	25.6	53.5
BSs/BTech	26	30.2	83.7
HND	14	16.3	100.0
Total	86	100.0	

Source: Field Study 2013

The working experience of the respondents is shown in Table 4, The Table gives a cumulative percentage of 88.4 having at least five years working experience. And, only 11.6 have less than five years working experience.

Table 4; Working experience of the respondents

	Frequency	Percent	Cumulative Percent
over 10	22	25.6	25.6
5 to10	54	62.8	88.4
under 5	10	11.6	100.0
Total	86	100.0	

Source: Field Study 2013

The qualifications and working experience of the respondents shows that they are deem fit to be counted on as the basis from which judgments can be made. Most of the respondents expressed that their organizations does not measure their goals (see Figure 1).
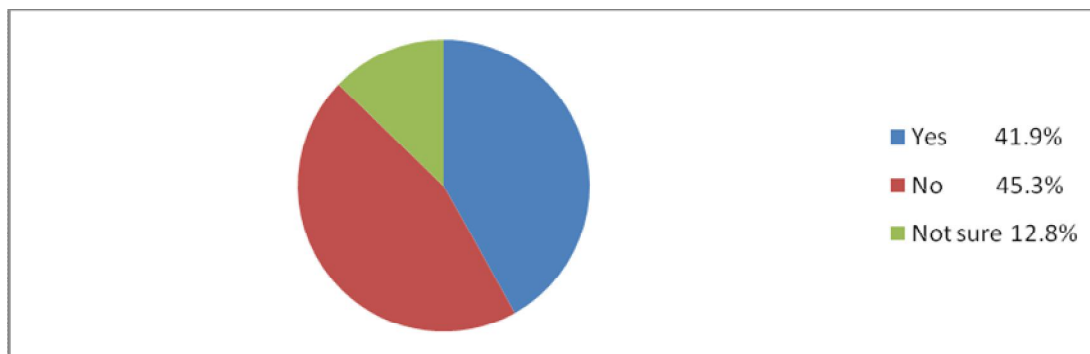

Figure 1   **Measurement of Organizational goal**   *Source: Field Study 2013*

Similarly, more than half of the respondents show that their organization is not using KPIs as shown in figure 2.
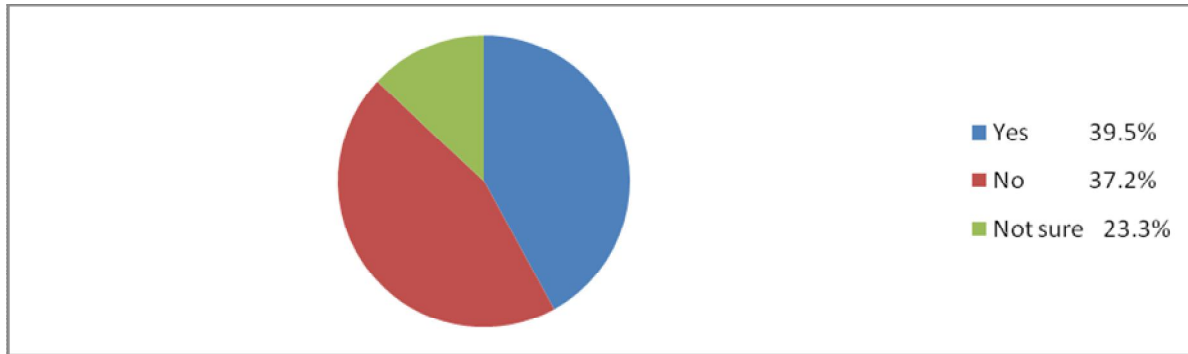

Figure 2: Use of KPIs by Organization to measure goals   *Source: Field Study 2013*

Although KPIs are not mostly been used by organizations, the construction managers has a relatively good and excellent opinion about them, this is shown in 3.
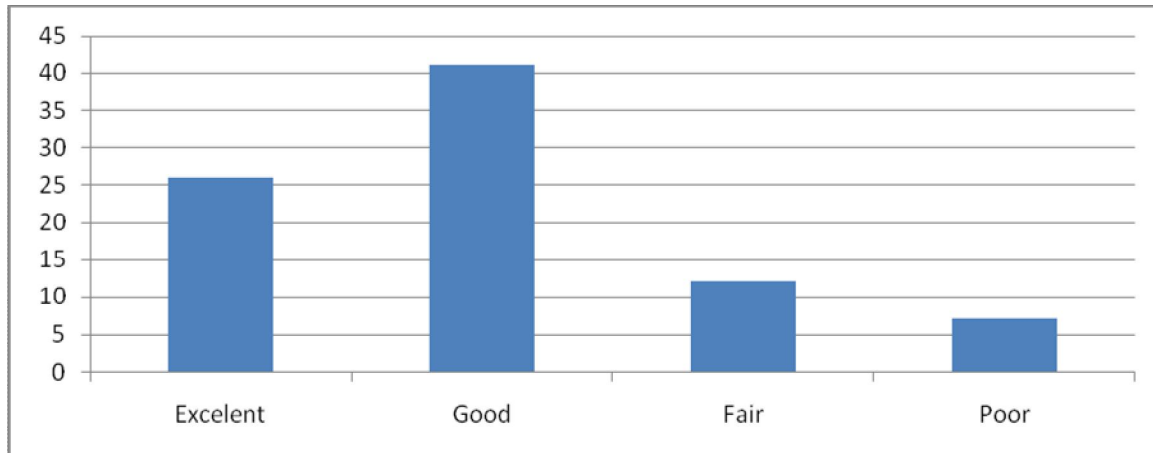

Figure 9: Respondents opinion on KPIs   *Source: Field Study 2013*

DETERMINATION OF THE COMMON KPIs
It is important here to provide a brief review of the research objectives and hypothesis followed by the statistical analysis. The following objectives are needed to be achieved in this section.

- To determine (from theory and practice) the common KPIs used by construction companies.
- To investigate the effectiveness or otherwise of each KPI.

The first objective of the study is already achieved in the literature review. However, there is need for statistical analysis to test the first hypothesis which is in line with the first objectives.

H_0 *The Nigerian construction companies do not have a common set of KPIs*
H_1 *The Nigerian construction companies have a common set of KPIs*

To test this hypothesis a literature search was made to determine the common KPIs from theory and practice. This is in line with the first objective of the study. The identified KPIs were subjected to questionnaire, each respondent is asked to rank only top five (5) of the KPIs with the score of one (1) being the highest and five (5) being the fifth. Cox et al (2003).

The statistical analysis required a frequency distribution of the responses. Table 5 provides the frequency of the responses.

Table 5: Frequency distributions of the common KPIs

	Frequency	Percent	Cumulative Percent
Unit/day	12	14.0	14.0
Cost	23	26.7	40.7
On time completion	25	29.1	69.8
Quality control	26	30.2	100.0
Total	86	100.0	

Source: Field Study 2013

Four indicators were chosen as the common set of indicators for Nigerian Construction firms, the four indicators in order of frequencies were; Quality control, On time completion, Cost and Unit/day. Thus, the null hypothesis is rejected and the alternate hypothesis is accepted.

H_1 *The Nigerian construction companies have a common set of KPIs*

THE EFFECTIVENESS OF EACH KPI

In order determine the second objective, i.e. "to investigate the effectiveness or otherwise of each KPI". Which is also in line with the second hypothesis, KPIs that are already identified from theory and practice, were subjected to views of construction managers to rate the 13 indicators according to how effective they are in measuring organizational goals using a four point likert scale ranging from Not very effective (1) to very effective(4). Table 9, Shows the total response for the thirteen indicators.

Table 9: Effectiveness of KPIs

	Key Performance Indicator	1	2	3	4	Score
1.	Unit/Day:	16	15	37	18	2.66
2.	$/ Hour:	15	13	35	23	3.93
3.	Safety:	15	28	28	15	2.5
4.	Turnover	18	37	19	12	2.18
5.	Resource Mgt.:	14	14	36	22	2.77
6.	Cost	6	10	32	38	3.19
7.	On-time Completion:	10	7	33	36	3.11
8.	Absenteeism:	15	38	23	10	2.36
9.	Quality control:	3	4	41	38	3.33
10	Client Satisfaction	11	12	39	24	2.88
11	Earned Value Reporting:	10	20	31	25	2.86
12	Profitability:	21	22	25	18	2.47
13	Defect:	18	33	27	8	2.29
14	Others	0	0	3	2	0.2

Source: Field Study 2013

- Not very effective (1)
- Not effective (2)
- Effective (3)
- Very effective (4)

Using an average score of 2.5 ((1+2+3+4)/4 = 2.5) as benchmark for assessment, 9 indicators were identified as Effective Key Performance Indicators in Nigeria. The identified indicators in order of effectiveness are;- $/Hour(1) Quality control(2) Cost (3) On time completion(4) Client satisfaction(5) Earned value reporting(6) Resource management(7) Unit/Day(8) and Safety(9).

The other indicators were found to be non effective. The non effective KPIs in descending order are; Profitability, absenteeism, Defects and Turnover.

CONCLUSION

KPIs are used to measure organizational goals. But, based on the finding of this research, it is concluded that most of the construction companies in Nigeria are not measuring their goals either using KPIs or any other appropriate method.

Construction managers have identified some KPIs to be effective in measuring organization goals. The common KPIs were also determined, and they were found to be among the effective ones. Nigerian construction companies are strongly encouraged to measure their goals using the common effective KPIs which are; Unit per day, Cost, Quality control and on time completion.

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