Dilemmas of Performance in the Sudanese Construction Industry

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Abstract—**There is a general discontent from construction stakeholders with the performance of the Sudanese Construction Industry Projects (SCIP). However, improving performance of the SCIP can be acquired by adopting methods and techniques that enhance performance and set standards to compare and benchmark the progress of the construction projects. Of these methods is setting performance management systems which is widely recognized as a mechanism whereby business performance can be enhanced. Additionally, since the construction industry is one of the most important and basic industries, being growth-dependent and growth-initiating in the same time, increases the pressure to exert more effort. This paper aims at finding a comprehensive definition and measure of performance and thus appraising the SCIP performance problems using several types of measures which key performance are outcomes (KPO), key performance indicators (KPI) and perception measures (PM). Literature review of performance definitions and measures were used to develop a theoretical framework to guide the collection of data by survey method. A questionnaire was developed and e-mailed to 200 practitioners and academics and researchers working in the SCIP. KPI were assessed using a selected rating scale and the data showed a large dissatisfaction with the overall performance of the SCIP projects.**

Index Terms—**Performance evaluation, key performance indicators, construction industry projects.**

I. INTRODUCTION

The construction industry has been accused of being, at its worst, wasteful, inefficient and ineffective. The construction industry has long been recognized as having problems in its different aspects, particularly with fragmentation that has inhibited its performance [1]. Omran *et al.* in [2] stressed that in the development of any country, the construction industry plays vital roles in transforming the aspirations and the needs of its people into reality by implementing various physical structures. The Sudan like most other developing countries suffers from the same problems of the construction industry (CI) due to the similar economic conditions [3]. According to [4], the construction industry in Sudan faces a variety of problems relating to human resource efficiency which in turn affect the entire productivity in the industry. Additionally, Bannaga in [5] concluded in a comprehensive review that the major problems in the Sudanese construction industry (SCI) are as follows: slack working environment; unsystematic work procedures; deficiency of regulatory framework; absence of a comprehensive policy of human resources development for various levels in the profession; missing

financing or lending norms of banks; few financial institutions for the construction sector; shortage of mechanized and modern methods of working; lack of standardized uniform code of business and professional practices; ambiguity in working procedures.

Omran *et al.* in [2] further delineated that lack of commitment was the major cause in the increase of cost for most of the projects in the city of Khartoum (Sudan), as there is a shortage in budget performance for construction projects. The key factors that have great influence on the performance of construction projects as determined in [2] are: project team leader experience; planning effort; adequacy of design and specification; adequacy of design and specification; cost monitoring, and leadership skills of project leader.

A recent study in [6], made a correlation between the output of the construction sector and the output of other sectors of the economy. The results stressed that the construction industry is growth-dependent and not growth-initiating which implies that the aggregate economy leads construction flows. In view of these, Thwala *et al.* in [4] emphasized that the construction industry in the Sudan has become one of the most dynamic sectors in the country and has experienced real growth over the past few decades. However, the activities of the sector became more intense as a result of the discovery of crude oil in the country which explains the reasons behind the booming of the SCIP after the petrol era in the Sudan and the expected deterioration after the Southern Sudan had its independence from the Sudan.

According to [7] considerable progress was made in leading sectors of the Sudanese economy during 2009 which is the economy is set to record growth in 2009 but at a slower pace than in 2008 largely as a result of international economic factors, a new report shows. Bank Audi in its Sudan Economic Report (2012), published in just before the new year, cites figures from the International Monetary Fund showing that real GDP growth will remain positive at 4% in 2009, falling from nearly 7% recorded in the previous year. The report points to the important impact of factors such as the sluggish global environment and the relative decline in average oil prices as bearing responsibility for negatively impacting on economic growth [2].

II. DEFINING PERFORMANCE

Looking at the term performance from different perspectives it can certainly be seen that it reflects different definitions and carries diverse meanings. Omran *et al.* in [2] cited that successful construction project performance is achieved, when stakeholders meet their requirements, individually and collectively. In its very general meaning,

Mahmoud in [8] cited that performance either refers to an action (obtaining performance) or an event (result) or could refer simultaneously to action, the result of an action to the success of the result compared to some benchmark. Other authors as cited by [8] claimed that performance can be examined at any level of analysis – individual, group, department or organization. At the organizational level, performance is described as reflecting a set of behaviors that are relevant to the goals of an organization and can be measured in terms of the level of contribution to goals that is presented by a particular action, while at the individuals' level, as related to their jobs, performance can be identified as the degree to which that individual helps the organization to reach its goals as cited in [8]. This way, performance is considered as positive or negative for organizational or individual effectiveness which draws a line between performance and result of performance. The above definitions of performance imply that performance can be defined by comparing the input to the output of organizational processes which reflects level of efficiency and to achieving goals set by organizations or individuals which refers to effectiveness. Thus, performance can be defined and measured by examining efficiency and effectiveness at activity, project, organizational or industry level. Performance measures are thus developed to assess effectiveness and efficiency. Thwala *et al.* in [4] suggested that the quality of work delivered by small firms is low because the engage in cutting corners, making use of low-quality materials, diverting construction materials and equipment, engage in side-jobs to make extra cash into their personal accounts.

III. PERFORMANCE MEASUREMENT

Traditionally businesses have measured their performance in financial terms, profit, turnover, etc. These financial measures of performance have been the sole measures of a company success. Performance measurement that has been based around financial measures has been deemed to be out of step with recent changes in industry, particularly relating to new technologies and increased competition. According to Beatham *et al.* in [1] most authors agree that managers measure for two main reasons: either they want to know where they stand compared to competitors in the CI field and what they have to improve; or they want to improve their subordinate's performance. The results in [9] stated that "in the United Kingdom the first Key Performance Indicators (KPIs) were published in 1999 in response to the Rethinking Construction report by [10]. These KPIs had three objectives, namely: to provide companies and projects with a simple method of establishing a performance measurement system; to provide organizations with a straightforward method of benchmarking their performance against others in the construction industry; and to track long term trends in performance, and specifically, to demonstrate whether the construction industry was achieving the targets set out in Rethinking Construction Report Egan [10] cost, time and quality are the three basic and most important performance indicators in construction projects followed by others such as safety, functionality and satisfaction Based on the Egan report

the, Movement for Innovation and Construction Best Practice Programme (CBPP) was formed and is now recognized as a leading organization involved in the production of KPIs within the industry [1], [11]. The KPIs launched by the CBPP are: client satisfaction, product and service, profitability, productivity, defects, safety, construction time and construction cost. These KPIs were benchmarked within the construction industry and have been very successful in introducing many companies to the subject of performance measurement. Thus, performance indicators are developed as measurable characteristics of products, services, processes and operations [12].

Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of an action, thus determining how successful organizations or individuals have been in attaining their objectives and strategies cited in [12]. Performance measurement can be defined also as the information system which is at the heart of the performance management process and of critical importance to the effective and efficient functioning of the performance management system [13]. NOHSC [14], [15] cited that performance indicators are a statistic or other unit of information which reflects directly or indirectly, the extent to which an anticipated outcome is achieved, or the quality of processes leading to that outcome. Therefore, performance measurement must be part of a system, which reviews performance, decides on actions and changes the way in which the business operates. It is widely recognized as a mechanism whereby business performance can be enhanced by developing and implementing a balanced set of measures. It is the translation of results into action that is crucial to achieving improved performance. Beatham *et al.* in [1] identified three specific types of measures:

A. Key Performance Outcomes (KPO)

These are results of a completed action or process [11]. These results can be used to make decisions to change how the next processes are carried out. This provides an opportunity to change and to take the appropriate corrective action. KPO consist of eighteen measures of: defects, predictability, time, cost, profitability, productivity, environment, integration of design to supply chain, risk, reuse of design, understanding client needs, design process, mobilization, final account, change, and extension of time [1].

B. Key Performance Indicators (KPI)

These are measures that are indicative of performance of associated processes. If this measure is used as a leading indicator [11], then it can be used to give an early warning, identify a potential problem and highlight the need for further investigation. Thus, KPI include eleven measures of safety, training, qualifications, communications, teamwork, innovation, staff turnover, investors in people, pay, travelling, working, diversity [1].

C. Perception Measures (PM)

They can be used at any stage. They require direct feedback on past performance. They can be leading or lagging measures. PM embrace client satisfaction and employee satisfaction [1].

On the other hand, the construction industry does not distinguish between these three types of measures and refers to all of measures as Key Performance Indicators (KPI) [11]. Thus, this research paper aims at assessing the performance of the SCI using such measures. This is achieved the by using KPIs, KPOs and PM.

This study is meant to fulfil the objectives of: assessing the performance of the SCI using standardized system of evaluation using pre-defined measures; pinpointing certain drawbacks where the SCIP is lacking; identifying areas of potential problem through KPI; as well as locating areas of satisfactory performance.

IV. METHODOLOGY

In the first part of the study an extensive literature review is performed about performance measurement. This information is used as a framework to the collecting the collection of data from construction industry field through survey. Stratified random sampling is used for the purpose of interviewing 200 practioners and academics working in the SCI field. A survey was launched and a questionnaire was e-mailed to the different experts in SCI. the response rate was found to be 30% which is considered as satisfactory taking into account the fact that partnering is rather unfamiliar to the SCI . Data collected by desk study research is analyzed using the thematic analysis and content analysis methods. Respondents were asked to rate their satisfaction with general performance of the SCI. A numerical rating of five points with 1 for least satisfactory and 5 as most satisfactory was used for evaluation. By then multiplying the no of frequency of each score by the rating number picked by each respondent (1-5) and dividing the result by the number of responses a mean value can be calculated to the satisfaction of performance. A rating of 3and above is considered as satisfactory.

V. RESULTS AND DISCUSSION

A. General Performance of the SCIP

The overall mean value was found to be 2.28 out of 5 and a median of 2 which was classified as unsatisfactory. This comes in accordance with the findings of [4] about the performance of SCIP.

B. Performance of the SCIP in the View of Key Performance Outcomes (KPOs)

Then performance of the SCIP was then assessed by asking respondents to rate their satisfaction in the view of 16 KPOs. The 16 performance outcomes are: defects, predictability, time, cost, profitability, productivity, environment, integration of design to supply chain, risk, reuse of design, understanding client needs, design process, mobilization, final account, change, and extension of time.

Again, respondents were asked to give their views by rating their satisfaction on a scale of 1-5 where 1 is for least satisfactory and 5 for most satisfactory. The mean value for the overall weights of the different KPOs was found to be 2.43 and a median of 2 which was slightly higher than mean value for satisfaction with the general performance, but it is still
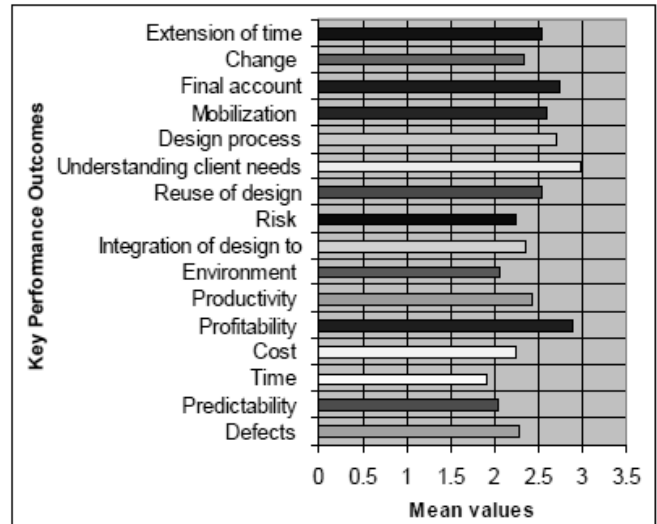
classified as unsatisfactory.

Fig. 1. SCIP performance in terms of key performance outcomes.

As shown in Fig. 1 KPO profitability, understanding clients' needs and final account were almost near the satisfactory rate of 3 on the rating scale. The least satisfactory KPOs are: predictability, time, and environment.

C. Performance of the SCIP in the Light of Key Performance Indicators (KPIs)

Then performance of the SCIP was evaluated by asking respondents to rate their satisfaction in the view of 12 KPIs. The 12 performance indicators are: safety, training, qualifications, communications, teamwork, innovation, staff turnover, investors in people, pay, travelling, working, diversity.

Once more, respondents were asked to give their views by rating their satisfaction on a scale of 1-5 where 1 was for least satisfactory and 5 for most satisfactory. The mean value for the overall weights of the different KPIs came out to be 2.31 and a median of 2 which was slightly higher than mean value for satisfaction with the general performance and lower than satisfaction with KPOs, but it was still classified as unsatisfactory.
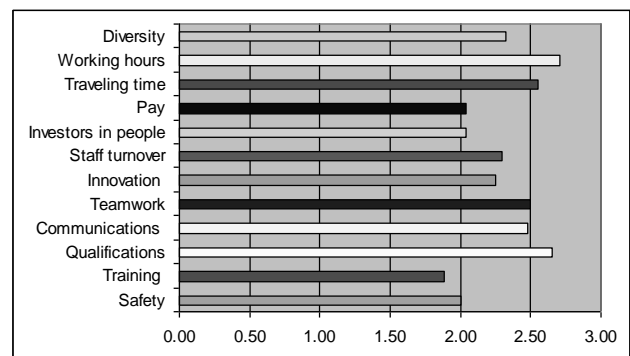

Fig. 2. SCIP performance in terms of key performance indicators.

As shown in Fig. 2, qualifications and working hours were almost near the satisfactory rate of 3 of the rating scale. The least satisfactory KPIs are: safety, training, investors in people, and pay as the least satisfactory performance measures.

D. *Performance of the SCIP According to Perception Measures (PMs)*

The satisfaction with performance of the SCIP was also assessed according to perception measures: client satisfaction and employee satisfaction. The mean value for the two measures were rated as 2.80, 2.36 consequently. Fig. 3 depicted that client's satisfaction was considered more satisfactory than employee satisfaction. This complies with the findings of Omran *et al,* in [2] that there is a fair client satisfaction in the SCIP.
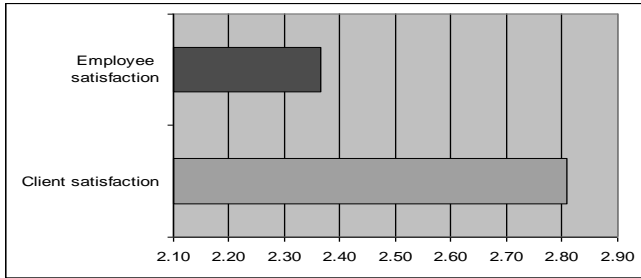

Fig. 3. SCIP performance in terms of perception measures.

The composite mean values for KPOs, KPIs and PMs were 2.43, 2.31 and 2.58 respectively. Figure (4) compared these mean values to the mean value of scores of satisfaction with general performance of the SCIP which was 2.28. The mean value scored by rating the general satisfaction with the performance of the SCIP was closer to KPIs because both measures were rather subjective in nature. As seen from figure (4) the satisfaction with performance was highest for PMs through KPO to KPIs to General Satisfaction.
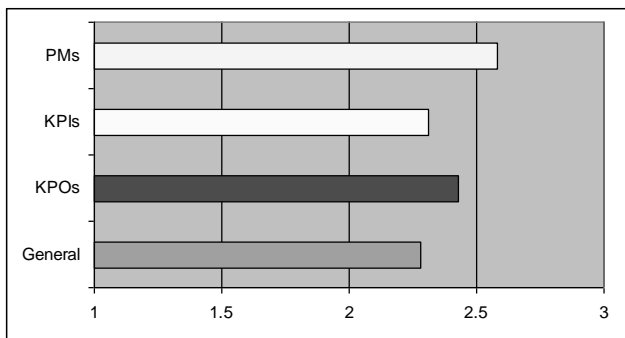

Fig. 4. Comparing the mean values of general rate of satisfaction with SCIP performance in terms of KPOs, KPIs and PMs.

Generally, the highest scores of satisfaction are given to KPOs of: profitability, understanding client needs, design process, mobilization, and final account. As for KPIs the highest scores are given to qualifications, communications, travelling time and working hours. On looking at the PMs the highest scoring is awarded to client satisfaction. Least satisfactory measures of performance are: time and training.

E. *Performance of the SCIP According to Different Construction Bodies*

Beatham *et al.* in [1] and [8] stated different construction bodies in the UK that use different sets of measures. As shown in table (1) the Construction Best Performance Program (CBPP), Association of Consulting Engineers (ACE), Construction Products Association (CPA), Respect for People (RFP), Construction Industry Research and Information Association (CIRIA), Major Contractors Group (MCG) and Satisfaction of Services (SOS) identified certain sets of performance measures as important to assess the performance of the CI from their perspectives. Table I showed these measures and gave the mean values for satisfaction on of performance for the SCIP.

TABLE I: ASSESSMENT OF PERFORMANCE OF SCIP ACCORDING TO THE SELECTED MEASURES BY DIFFERENT PERFORMANCE MEASURES SETS

	Construction Body	Set of Performance Measure	Composite Mean
1.	CBPP	Defects, client satisfaction, predictability, time, cost, profitability, productivity, safety	2.32
2.	ASC	Client satisfaction, profitability, productivity, training.	2.50
3.	CPA	Environment, training, qualifications	2.17
4.	RFP	Employee satisfaction, safety, training, staff turnover, investors in people, pay, traveling time, working hours, diversity.	2.45
5.	CIRIA	Integration of design to supply, client satisfaction, time, cost, risk, reuse of design, understanding clients needs, design process, innovation	2.66
6.	MCG	Defects, predictability, time, cost, mobilization, final account, change, extension of time, safety	2.05
7.	SOS	Client satisfaction, predictability, time, cost, environment, safety, communications, teamwork, innovation	2.25

Thus, performance of the SCIP can be assessed in terms of different sets of performance measures. According to Construction Best Performance Program (CBPP) performance of the SCIP can be rated as 2.23, Association of Consulting Engineers (ACE) as 2.5, Construction Products Association (CPA) as 2.17, Respect for People (RFP) as 2.45, Construction Industry Research and Information Association (CIRIA) as 2.66, Major Contractors Group (MCG) as 2.05, Satisfaction of Services (SOS) as 2.25. These rating values indicate that the performance of SCIP has the highest mean value according to the performance measures set of CIRIA (2.66) and lowest according to the measures of MCG (2.04). This comparison is depicted in Fig. 5.
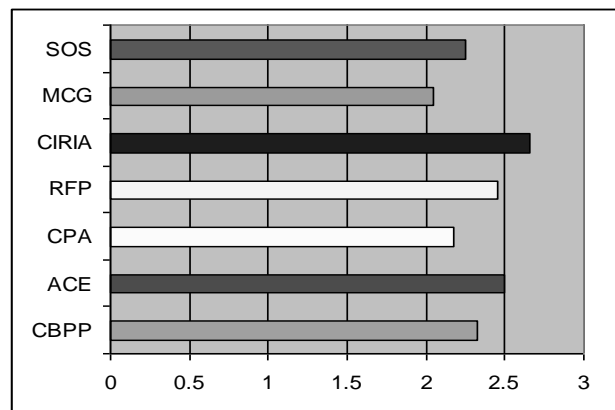

Fig. 5. Comparing the satisfaction with SCIP performance in terms of CBPP, ACE, CPA, RFP, CIRIA, MCG and SOS.

VI. CONCLUSIONS

The conclusions presented in this section arose from discussion and analysis of the survey and were all related to the main objectives of the research.

Performance measurement is important to evaluate satisfaction with the financial perspective, internal business process perspective and customer perspective. Thus, the assessment of the effectiveness and efficiency of the Sudanese construction industry projects (SCIP) achieved through using indicators that can appraise such perspectives.

Taking satisfaction into account, the results showed that there was a broad dissatisfaction with the overall performance of the SCIP projects. On breaking down performance into KPO, KPI and PM to give a more specific and objective assessment of SCIP performance. All mean values of performance measures are less than the central value of 3 of the rating scale which affirms the claim the SCIP is totally criticized for deficient performance.

Nonetheless SCIP performance is comparatively better in terms of PM and worst in terms of KPI. As for KPO the highest and worst rates are given to (understanding client needs) and (time) respectively. The measure of (working hours) receives the highest score of KPI and (training) is the least. (Client satisfaction) is assessed to be highest compared to (employee satisfaction). As the KPI of (understanding client need) necessarily leads to the PM of (client satisfaction).

Different construction bodies look at the performance of the CI from different perspectives, thus, developing different sets of measures. According to these sets of measures the SCIP is at relatively performing better regarding the Construction Industry Research and Information Association (CIRIA) and worse in terms of Major Contractors Group (MCG) set of measures.

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