A PERFORMANCE EVALUATION FRAMEWORK
FOR CONSTITUENCY DEVELOPMENT FUND
CONSTRUCTION PROJECTS IN KENYA

Makori, R. J.¹, Aduda, J.², Ngacho, C.³

ABSTRACT

Performance criteria and measures among construction projects reflect the value of the project stakeholders on how they would be viewing the projects they undertake. From the literature review, it was established that one of the challenges facing public construction projects is the lack of sufficient and formal approaches on which to evaluate project performance. It is against this background that the present work attempts to develop a theoretical framework of the performance evaluation of construction projects based on six key performance indicators (KPIs) namely time, cost, quality, safety, minimum site disputes and environmental impact. In so doing, the paper considers the perceptions of 160 stakeholders in construction projects comprising of clients, consultants and contractors on recently completed Constituency Development Fund (CDF) projects in Kakamega, Vihiga Bungoma and Busia Counties. We have identified the Key Performance Indicators (KPIs) in public construction projects through exploratory factor analysis and demonstrated the relationship between KPIs and overall project performance with the help of a conceptual diagram. The diagram reveals how performance of a public construction project can be assessed in terms of the above six performance indicators. We have concluded by highlighting the contribution of the paper to the existing body of project management literature and providing recommendations for future research.

Key Words: Evaluation Framework; Project Performance; Performance Criteria.
1. Introduction

Decentralisation, as a system of government’s involvement in grassroots projects and community development, has evolved over time. National governments in several countries, including India, Pakistan, Bhutan, Jamaica, Papua New Guinea, Uganda, Tanzania and Kenya, continue to disburse development expenditure through policies such as the Constituency Development Fund (CDF), in order to realize equitable development in all regions. These regions are based on political boundaries and the spending is influenced by elected members of parliament. Previous studies undertaken in the construction industry of such countries have indicated that construction activity forms an important component of a country’s economic development in terms of its contribution to Gross Domestic Product (GDP) and total employment and provision of a market for materials and products produced by other sectors of the economy (ILO, 2000, www.globalconstruction2020.com). Generally, in 2011, the economy of Kenya grew by between 3% and 4% with the construction sector registering the highest growth in employment.

The government of Kenya has made deliberate efforts to decentralise some of its development projects since attaining independence in 1963. Among the decentralisation programmes formulated were the District Development Grant Program (1966), the Special Rural Development Program (1969/1970), District Development Planning (1971), the District Focus for Rural Development (1983 - 84) and the Rural Trade and Production Centre (1988-89). Though the aim of these programmes was to attain development in all parts of the country, they failed due to the problem of funding. It is from this background that in 2003, the Constituency Development Fund (CDF) was created, through an act of parliament with the aim of ironing out regional imbalances brought about by patronage politics. CDF was designed to provide funds to parliamentary jurisdictions (constituencies) to fight poverty. Recently, the Government has embarked on projects aimed at meeting the Millennium Development Goals (MDGs). More precisely, in the year 2007-2008 budgetary allocations, more than Kshs 58 billions was allocated to devolved structures. One of the devolved funds earmarked to benefit from the funding during this period was the Constituency Development Fund.
Performance of public construction projects implemented by CDF is a matter of interest to the public which benefits from the projects and the government of Kenya. Since these projects require huge capital investments, there is need to put measures in place to prevent poor management and loss of public funds. Different stakeholders have criticised the manner in which CDF projects are conceptualised, managed and implemented. This has necessitated various studies at both national and international levels mainly focusing on composition of CDF committees, the role of CDF in poverty reduction (through provision of employment and wealth creation), participation of women in CDF activities, distribution of CDF projects in the constituency and the overall manner in which CDF funds are distributed, managed and accounted for. The local organizations in Kenya that have undertaken studies in this area include: the Women’s Political Alliance-Kenya (WPA-K), the Institute for Policy Analysis and Research (IPAR), the Kenya Institute of Public Research and Analysis (KIPRA), the Institute of Economic Affairs (IEA), the University of Nairobi (UoN) School of Business, the Parliamentary Select Committee on CDF, the National Tax Payers Association (NTA) and the mainstream media. The international community has also shown interest through organisations such as the Society for International Development (SID), the European Union (EU), the World Bank (WB) and Abantu for Development.

Based on these studies, relevant watchdog organizations including the National Taxpayers Association (NTA) and the CDF monitoring unit have been able to classify constituencies as either good performers or poor performers. Good performing constituencies have witnessed significant improvement in people’s lives, whereas in poor performers, the constituents have suffered. In some cases, mismanagement has led to the freezing of fund accounts by the National Management Committee on CDF. It is, however, not clear what performance criteria these agencies have used in classifying the CDF projects as either performing or non performing. It is on the basis of this background that the current study seeks to identify the key performance indicators among CDF construction projects in Kakamega, Vihiga Bungoma and Busia Counties. This work, therefore, differs from previous works in terms of its scope. It focuses mainly on one form of devolved fund, CDF, and the projects implemented under
it during the period 2003-2011. The present work is also important as it develops a framework for project performance measurement of CDF projects in line with similar frameworks for other types of projects developed in different countries.

Project management professionals have provided project performance measurement criteria on three dimensions namely, time, cost and quality (Ahadzie et al., 2008; Chan, et al., 2001; Atkinson, 1999). This conventional criteria (popularly referred to as “the iron triangle”), has been hailed for having provided a basis for evaluating the extent of success across projects (Cao and Hoffman, 2011). The criteria for success includes a project being simple (Toor and Ogunlana, 2010), easy and timely to measure (Willard, 2005) and the ability to capture the quantitative (tangible) benefits of a project (Litsikakis, 2009). Whereas the use of these three dimensions is still a good practice for some projects, for others it could undermine some project outcomes. In order to improve a project evaluation system, one has to consider differences in project characteristics and appropriateness of project goals. A project performance measurement criterion should consider changing project stakeholder composition and interests, nature of the project funding, integration of different cultures, shifting functions of the constructed facilities, advances in construction technology, changing demands of the users and the ever-evolving environmental regulations.

Shenhar et al. (2002) argued that the traditional criteria (i.e. cost, time and quality) are essentially not mutually exclusive, rather they are related to each other but they do not provide an adequate vision of the potential for improvement. The proponents of additional measures of performance have considered safety of the project site as an important aspect of construction project performance (Billy et al., 2006; Haslam et al., 2005; Ortega, 2000). They also contend that construction site should have minimum disputes if the objectives are to be realised (Tabish and Jha, 2011). In addition, construction projects have irreversible impact on the local environment because construction process not only consume huge energy but also create the most waste, use large quantity of non-energy related resources and are responsible for the most pollution (Eriksson and Westerberg, 2011). The foregoing discussion seems to suggest that both the traditional measures (time, cost and quality), along with the contemporary ones (safety, no-dispute
and environmental impact) need to be considered together for proper evaluation of performance in public construction projects. Accordingly, the present work has considered both traditional and contemporary measures as key performance indicators of construction projects funded through the constituency development fund in Kakamega, Vihiga Bungoma and Busia Counties.

Sections, 2 below represent an account of literature review on the performance measurement among public construction projects and more specifically, performance of CDF projects. This is followed by a description of the research methodology employed in this study in terms of research design, respondent identification, sampling frame, survey instrument design, pilot survey and eventual data collection. Section 4 deals with the discussion of findings which is considered to be the heart of this paper. The authors present the results of the exploratory data analysis conducted on the 160 respondents surveyed through a combination of mail, telephone, fax and face to face interviews in Kakamega, Vihiga Bungoma and Busia Counties. The section also presents a theoretical framework of performance evaluation of construction projects depicting conceptually the measurement of overall performance of a project in terms of time, cost, quality, safety, no-dispute and environmental impact which, in turn, results in community satisfaction. In section 5, the researchers seek to validate the measurement instrument developed while section 6 provides the contributions of this research to project management practice and research. The concluding part, section 7, summarizes the present work and reveals its limitations while giving future research directions.

2. Literature Review

2.1 Performance of Public Construction projects.

Performance of construction projects has primarily been evaluated on the basis of the famous “iron triangle” comprising of cost, time and quality criteria (Chan, et al., 2001). These traditional criteria have faced criticism due to their inadequate coverage of performance measurement (Gardiner, 2000); the perceived relationship among themselves (Shenhar et al., 2002) and their short term focus (Shenhar, 2001).
In view of these criticisms, a number of researchers have advocated for a wider focus in relation to construction project performance to cover aspects of project safety, construction contract management, environmental impact and community satisfaction. The construction industry is said to be one of the most unsafe because of its high rate of fatalities (Patrick, 2011). Several researchers, (Billy et al., 2006, Haslam et al., 2005, Ortega, 2000), therefore, consider safety of the project site as an important aspect of construction project performance. Other researchers (David, 2009; Tabish and Jha, 2011) consider the absence of disputes to be a major reason for the smooth progress of a construction project because the progress of the construction project can be severely affected by controversies and disputes. David (2009) explains that public sector construction projects require management of all stakeholders as this will provide an opportunity for dispute resolution.

Similarly, Tsoulfas and Pappis (2008), Chen et al., (2010), Medineckiene et al., (2010), and Tan et al., (2011) have advocated the inclusion of environmental impact into the performance matrix of construction project performance. Factors such as high energy prices, increased costs of building materials, and regulatory incentives are pushing organizations to adopt environmentally friendly construction methods. Each organization should, therefore, develop the capability of delivering sustainable projects within acceptable cost constraints. Shao and Muller (2011) reported that community satisfaction is the ultimate goal of every construction project, hence it must be considered while evaluating construction project performance. The most significant impact is likely to result from the displacement of residents, businesses and community services which has an adverse impact on community satisfaction for those who remain in the vicinity of the project site (Wang and Huang, 2006).

Literature review reveals that the additional dimensions, namely, community satisfaction, safety, no-dispute and environmental impact need to be incorporated into the overall performance evaluation framework of construction projects. Below is a summary of research on the key performance indicators.
Table 1: Previous contributions to the study of Key Performance Indicators (KPIs).

<table>
<thead>
<tr>
<th>S/No</th>
<th>KPIs</th>
<th>A brief description of the KPI.</th>
<th>Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time</td>
<td>• construction time&lt;br&gt;• speed of construction and&lt;br&gt;• time variation</td>
<td>Kamrul and Indra, (2010); Ahadzie et al., (2008); Iyer et al., (2008); Zuo et al., (2007); Assaf and Al Hejjii (2006); Bryde and Robinson, (2005); Kerzner, (2006); Williams, (2003); Frimpong et al., (2003); Atkinson, (1999).</td>
</tr>
<tr>
<td>2</td>
<td>Cost</td>
<td>• tender sum,&lt;br&gt;• construction costs,&lt;br&gt;• costs due to variations and modifications</td>
<td>Ali and Rahmat, (2010); Patanakul and Milosevic, (2009); Kaliba et al., (2008); Ahadzie et al., (2008); Zuo et al., (2007); Bryde and Robinson, (2005); Chan and Chan, (2004); Kerzner, (2006); Chan and Tam, (2000); Atkinson, (1999).</td>
</tr>
<tr>
<td>4</td>
<td>Health and Safety</td>
<td>• fatalities,&lt;br&gt;• accidents&lt;br&gt;• injuries</td>
<td>Patrick, (2011); Zuo et al., (2007); Billy et al., (2006); Haslam et al., (2005); Chan and Chan, (2004); Ortega, (2000).</td>
</tr>
<tr>
<td>5</td>
<td>Minimum site disputes</td>
<td>• Court cases&lt;br&gt;• Legal claims</td>
<td>Tan et al. (2011); Tabish and Jha, (2011); Chen et al. (2010); Medineckiene et al. (2010), and Iyer et al., (2008); Tsoulfas and Pappis (2008); Abidin, (2007); David, (2009);</td>
</tr>
<tr>
<td>6</td>
<td>Environmental impact</td>
<td>• air emissions,&lt;br&gt;• noise,&lt;br&gt;• solid waste and&lt;br&gt;• Water discharge.</td>
<td>Gangolells et al., (2011); Ahadzie et al., (2008); Zuo et al., (2007); Chen et al. (2010); Chan and Chan, (2004); Shen et al., (2010); Chen et al. (2010).</td>
</tr>
<tr>
<td>7</td>
<td>Community satisfaction</td>
<td>• community’s infrastructure,&lt;br&gt;• provision of job opportunities&lt;br&gt;• and the overall improvement of life</td>
<td>Shao and Müller (2011); Wang and Huang, (2006); Filkins et al., (2000); Torbica and Stroh, (2001); Sadeh et al, (2000), Liu and Walker, (1998).</td>
</tr>
</tbody>
</table>
2.2 Performance of CDF projects.

Projects undertaken under CDF are usually identified by the community and seek to benefit a cross section of the people residing in a particular area. Funding is usually for a complete project or for an identifiable face of the project that could include acquisition of land. The target projects include educational facilities, health facilities, light industries and agricultural markets for the widespread impact in the community. The educational projects aim at upgrading several primary schools, secondary schools and youth polytechnics as a way of infrastructural improvement to facilitate proper learning in these institutions. The public health and sanitation projects focus on rolling out a comprehensive policy of healthcare through infrastructure development, preventive healthcare and management of facilities. In the agricultural sector, the aim is to support the commercialization of agricultural produce by increasing the per capita number and access to wholesale and fresh produce markets and increasing efficiency in marketing and trade of agricultural produce. Through industrialization, the government aims at constructing and equipping “jua kali” shades (light industries) to facilitate participation of youth as artisans and entrepreneurs.

In spite of the remarkable level of funding to CDF, no work has specifically considered the performance measures of the projects implemented. Studies on the CDF system of funding in Kenya have largely considered the operations of the fund in passing without making the projects, a focus of their attention. Other studies have focused on a general review of the CDF projects in North rift (Barasa, 2009), CDF as tools of decentralised development (Bagaka, 2008), the use of informal labour in construction sector (Mitulla and Wachira, 2003), modelling of construction activity as a system (Mbiti et al., 2011), management of multicultural teams in project construction (Ochieng and Price, 2009) and construction sector statistics as a whole (K’Akumu, 2009). The main shortcoming of these studies has been their inability to aptly come up with an empirical measurement system that cuts across different categories of projects funded through CDF.

The CDF projects mainly have the following objectives:

- Improve provision of services within the community and undertake planning and implementation of development activities based on local needs and conditions,
• Improve coordination between various government agencies involved in development at regional or local level,

• Reduce delays in decision making thereby increasing flexibility in the administration of development activities,

• Mobilise local resources, including finance and human capital, for purposes of development in the community and

• Increase the level of commitment to the development of the community.

From the foregoing objectives, CDF projects can be said to entail both economic and political objectives that are sometimes conflicting in nature.

The major challenge facing CDF projects can be said to be the balance of the trade-off between political and managerial objectives. Politically, the issues revolve around CDF as a measure of effectiveness among Members of Parliament (MPs). This is characterised by poor management of transition during elections, too many small projects thinly spread with little impact, and non-adherence to laid down government procedures, rules and regulations regarding tendering. On the management front, the challenges are: low utilization of completed facilities, poor community participation and contribution to projects, weak capacity to identify viable projects, low technical capacity to implement development projects and low utilization of technical officers in the implementation of projects (Wanjiru, 2009; Kimani et al., 2009).

3. Research Methodology

In this study, we adopted the quantitative approach because it enabled us to gather evidence that answered the key empirical questions of ‘how much’ or ‘how many?’ The key research questions involved in the study necessitated a survey research in order to collect information from groups of people (population) with a purpose of establishing the prevalence, the distribution, and/or the interrelationships between variables within these groups (Polit and Hungler, 1999). Therefore, this study enabled the researchers to explore a wide range of issues since several variables were involved. More specifically, a cross-sectional survey was adopted since the questionnaire sort to solicit information from a cross-section of
participants involved in construction of CDF projects regarding their perceptions on key performance indicators.

3.1 Research Design

The study was preceded by the following activities:

3.1.1 Literature review

We conducted literature review at two levels - evaluation of the performance of the construction projects, in general, and the performance of CDF projects in Kenya. This was necessary so as to gather existing information on performance evaluation and specifically performance evaluation of CDF projects. The information gathered provided background information on evaluation of public construction projects as well as what could be considered when evaluating performance among CDF projects in Kenya. This enhanced the understanding of project evaluation as well as the environment within which CDF projects are implemented. It gave the direction of the research as it facilitated a list of key performance indicators and critical success factors to be assessed in the study.

3.1.2 Review of the literature review findings

The list of KPIs derived from the literature review were shown to 5 experts comprising 2 academicians, 2 practitioners and 1 consultant in order to secure their viewpoints regarding their suitability as the measurement of the performance of construction projects in developing countries. The two academicians are university professors, specialising in the area of project planning at the University of Nairobi and Kenyatta University, Kenya. They were selected because they had over 10 years' in teaching and consulting for many government projects. Due to their rich experience, they were thought to be familiar with economic, socio-cultural and political environment surrounding various projects earmarked for this study. They also understood resource and expertise requirements for various projects. The practitioners were chairmen of two regional associations of contractors drawn from Busia and Kakamega counties. The choice of these practicing managers was based on their constant interaction with other contractors in their respective regions. They are also expected to intervene in solving disputes
that arise between contractors and any other stakeholder in project construction. The fifth expert was a regional public works officer in charge of all construction projects funded by the Government in Busia County. This officer was chosen because he has been the regional officer since 2003 when the Government of Kenya started funding projects through CDF.

3.1.3 Development of data collection tools

The literature review along with the feedback received from experts on variables constituting KPIs enabled us to design a preliminary questionnaire on the relationship between KPIs and overall performance of public construction projects. The questionnaire was presented to the same experts once again with a view to seeking their expert opinion on the adequate and appropriate coverage of all the items affecting the performance of construction projects and also the framing of each question. The respondents indicated that the six KPIs (time, cost, quality, safety, no-dispute and environmental impact) are very much relevant to the construction industry in developing countries. However, despite community satisfaction having been considered a project performance criterion (Shao and Müller, 2011) in the literature review, the experts felt that it should be excluded because it was thought to be a consequence of performance and cannot, therefore, be used to measure performance. They reiterated that the exclusion of community satisfaction from performance matrix could help in the exploration of the remaining key performance indicators. This viewpoint is supported by the work of Liu and Walker, (1998) who argued that satisfaction should be considered as an attribute of success and that of Torbich and Stroh (2001) who believed that if end-users were satisfied, then the project could be considered to be successful. They stated that some of the questions need to be rephrased for ease of understanding given the varying level of education of the prospective respondents. They also indicated that the classification of items into various factor groupings was necessary in order to appropriately address the individual performance indicators.

3.1.4 Review of the draft data collection tools

To strengthen the data collection tools, a pilot survey was carried out through personal interview among 5 contractors (including 2 sub-contractors), 4
consultants and 21 clients, who were working on ongoing construction projects. Sekaran (2000) suggests that 30 representative participants from the population of interest is a reasonable minimum recommendation for a pilot study where the purpose is preliminary survey or scale development. The sample used in this survey was drawn primarily from a database of contractors/builders, consultants and CDF committees in Kakamega, Vihiga, Bungoma and Busia Counties maintained by the CDF offices. These respondents were found to have over 7 years' experience in the construction industry and had been involved in the construction of CDF projects for at least 3 years. Further, they handled over four (4) CDF projects per year in various constituencies. They played different roles during project construction depending on their respective positions. The projects identified were educational, health, industrial estates and agricultural markets. This is evidence that these respondents are capable of providing the information requested in the questionnaire.

From the feedback provided by respondents, the average time taken to complete a questionnaire was approximately 15 minutes. It was, therefore, considered unnecessary to reduce the overall number of questions in the questionnaire to make it shorter. All the respondents felt the need for improvement in the efficiency of implementation of construction projects. This feedback informed the design of the final questionnaire that was subdivided into two sections. In section A of the questionnaire, respondents were asked to provide their demographic information as well as the descriptions of the projects they had worked on. They were then requested to indicate their perceptions on each of the 35 identified KPIs according to a five point Likert scale (1 = Strongly Disagree, 2 = Disagree 3 = Indifference, 4 = Agree and 5 = Strongly Agree) with reference to a particular project they had been involved in.

3.1.5 Reliability and Validity of the survey instrument

The standard deviations and the inter-quartile range were inspected to assess variability among the measurement items. The standard deviations were all found to be greater than 1 except in 3 variable: “disputes were observed due to the frequent changes in the design of the current project”, “no changes were introduced in the designs of the current project during project execution” and
“all stakeholders associated with the current project supervised the quality of the project in all its phases”. Whereas the first two variables had relatively low inter-quartile range as well and seemed to measure the same concept of design changes, the two variables were not deleted because of their theoretical significance. The last variable had a low standard deviation but a relatively high inter-quartile range, a basis upon which it was retained for further analysis.

Scale reliability (internal consistency) was checked using Cronbach coefficient alpha. A scale is said to be reliable if it produces a coefficient alpha of at least 0.7 (Hair et al. 2006; Pallant 2001). In this study, the Cronbach’s coefficient alpha for the entire scale, consisting of 35 measurement variables was 0.831 with relatively high corrected item-total correlations indicating the presence of high internal consistency in the measurement scale. Investigation of each of the five individual variables revealed that a clear plan was formulated and an efficient planning and control system was designed to keep the current project up-to-date”, “this project has led to the increased release of toxic material”, “no delays were experienced in securing funds during project implementation”, “the right material was used for the construction work” and “proper medical facilities were available for people working on the project”, will improve the value of Cronbach alpha. However, the improvement that will be achieved was relatively insignificant to necessitate their deletion.

Content validity was achieved through extensive literature review and an in-depth discussion with experts. The dimensions of variables were identified from construction project literature available in internationally refereed journals and previous academic researches. The experts included 2 university professors, 2 practicing contractors and 1 regional consultant based at the ministry of Public works.

3.1.6 Identification and recruitment of field assistants

The researcher recruited 24 field assistants, one for each of the 24 in Kakamega, Vihiga, Bungoma and Busia Counties. These were students in the Faculty of Commerce at the Kisii University College. The field assistants were expected to administer questionnaires to the general respondents, namely clients, consultants, contractors and the community. The researcher mobilized the target respondents
in particular constituencies and prepared the research schedule before the actual field research commenced.

3.1.7 *Training of the constituency field assistants*

To ensure that the field assistants clearly understood the study and the data collection exercise, a one-day training for them was organized and executed. The training revolved around different stakeholders' responsive methodologies, sampling and mobilization techniques. They were also taken through the data collection tools to familiarize themselves with the instruments they would use in the data collection exercise.

3.2 *Identifying potential Survey Participants*

The target population for this research consisted of individuals who took part in construction of CDF projects. To recognize the difficulties that could arise in the sampling frame, the target population was redefined (Kassim 2001) to consist of the clients, consultants and contractors who were involved in the construction of CDF projects between 2003/2004 and 2010/2011 financial years. In each year, several projects are undertaken in each constituency. Inspection of the list of projects in each constituency revealed that there were over 4,000 projects undertaken between 2003 and 2011. However, only 586 construction projects involved educational facilities, health facilities, light industries and agricultural markets, a criterion used in the selection of projects.

3.3 *Sampling Design*

3.3.1 *Sampling frame*

The sampling frame adopted comprised of three sources as clients, consultants and contractors. The clients were sampled from a list of all construction projects undertaken and completed since 2003 in the four categories specified above. Project Management Committees (PMCs) of these projects, numbering 586 constituted the sampling frame for clients. A list compiled by AAK county offices of the four counties of Bungoma, Busia, Kakamega and Vihiga, provided the frame for sampling of consultants, whereas the contractors were selected from
a list of contractors provided by the regional Ministry of Public Works and was corroborated with the list obtained from contractors' associations at the regional offices. A total of 124 consultant organizations and 212 contractor organizations were found to be registered by AAK and KAC respectively.

3.3.2 Sampling procedure.

First the target population was stratified into three groups, clients, consultants and contractors. Then simple random sampling was done within each stakeholder group.

3.3.3 Sample Size.

Based on Cochran’s formula of sample size determination:

\[
ss = \frac{Z^2 \times p \times (1 - p)}{c^2}
\]

A minimum sample of 464 respondents was required comprising of 234 clients, 93 consultants and 137 contractors. This minimum sample size for sub-samples was adjusted using Cochran’s (1977) correction formula, because it exceeds 5% of the population (Bartlett et al., 2001). Assuming a 60% response rate as is the norm in social science research (Huston, 1996), this process resulted in a minimum sample size of 509 (280 clients, 90 consultants and 139 contractors).

3.4 Data collection

A total of 480 questionnaires were printed and distributed equally to 24 research assistants representing the 24 constituencies for purposes of data collection, with clear instructions on the modalities for their administration. The survey was conducted through face to face interviews with systematic respondents willing to participate in the study. At the end of four weeks, the research assistants submitted 181 completed questionnaires for purposes of data analysis, indicating a response rate of 37.7%. Through initial inspection, 21 questionnaires were found to be improperly filled as some had a large proportion of missing data. They were omitted for this study leaving 160 questionnaires for the analysis.
4. Discussion of Key Findings

This section discusses the demographic profiles of the project and respondents, descriptive statistics, and the results of exploratory factor analysis. Table 2 shows that majority of the projects surveyed were educational and health, each constituting 33.8% of the sample. The procurement method used was mainly negotiated general contract followed by the competitive bid while design/build was the least used. Whereas the majority of projects experienced delays in schedule ranging from 6 months to over a year, only 47% of the projects exceeded the original cost. Stakeholders’ impact on projects was evenly spread except that the consultants seemed to have the lowest impact during construction. Further most projects had between 10 and 199 employees during their construction.

Table 2: Demographic profile of the projects

<table>
<thead>
<tr>
<th>Item</th>
<th>No</th>
<th>%</th>
<th>Item</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational</td>
<td>54</td>
<td>33.8</td>
<td>None</td>
<td>24</td>
<td>15.0</td>
</tr>
<tr>
<td>Health</td>
<td>54</td>
<td>33.8</td>
<td>Less than 6 months</td>
<td>98</td>
<td>61.3</td>
</tr>
<tr>
<td>Industrial Estate</td>
<td>23</td>
<td>14.4</td>
<td>6-12 months</td>
<td>26</td>
<td>16.3</td>
</tr>
<tr>
<td>Agricultural Market</td>
<td>29</td>
<td>18.1</td>
<td>over 12 months</td>
<td>12</td>
<td>7.5</td>
</tr>
<tr>
<td>Project classification</td>
<td></td>
<td></td>
<td>Project Delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design/Bid</td>
<td>11</td>
<td>6.9</td>
<td>Low</td>
<td>46</td>
<td>28.8</td>
</tr>
<tr>
<td>Competitive bid</td>
<td>54</td>
<td>33.8</td>
<td>Medium</td>
<td>55</td>
<td>34.4</td>
</tr>
<tr>
<td>Negotiated general contract</td>
<td>95</td>
<td>59.4</td>
<td>High</td>
<td>47</td>
<td>29.4</td>
</tr>
<tr>
<td>Procurement approach used</td>
<td></td>
<td></td>
<td>Very High</td>
<td>12</td>
<td>7.5</td>
</tr>
<tr>
<td>None</td>
<td>85</td>
<td>53.1</td>
<td>Very Low</td>
<td>10</td>
<td>6.3</td>
</tr>
<tr>
<td>Less than Ksh.100,000</td>
<td>50</td>
<td>31.3</td>
<td>Low</td>
<td>80</td>
<td>50.0</td>
</tr>
<tr>
<td>Ksh.100,000 - Ksh.300,000</td>
<td>20</td>
<td>12.5</td>
<td>Medium</td>
<td>39</td>
<td>24.4</td>
</tr>
<tr>
<td>ksh. 300,001- Ksh 500,000</td>
<td>5</td>
<td>3.1</td>
<td>High</td>
<td>31</td>
<td>19.4</td>
</tr>
<tr>
<td>Cost overrun</td>
<td></td>
<td></td>
<td>Consultant impact on the project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>85</td>
<td>53.1</td>
<td>Very Low</td>
<td>10</td>
<td>6.3</td>
</tr>
<tr>
<td>Less than Ksh.100,000</td>
<td>50</td>
<td>31.3</td>
<td>Low</td>
<td>80</td>
<td>50.0</td>
</tr>
<tr>
<td>Ksh.100,000 - Ksh.300,000</td>
<td>20</td>
<td>12.5</td>
<td>Medium</td>
<td>39</td>
<td>24.4</td>
</tr>
<tr>
<td>ksh. 300,001- Ksh 500,000</td>
<td>5</td>
<td>3.1</td>
<td>High</td>
<td>31</td>
<td>19.4</td>
</tr>
<tr>
<td>Number of Employees on the project</td>
<td></td>
<td></td>
<td>Contractor impact on the project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10</td>
<td>1</td>
<td>0.6</td>
<td>Low</td>
<td>26</td>
<td>16.3</td>
</tr>
<tr>
<td>10-29</td>
<td>68</td>
<td>42.5</td>
<td>Medium</td>
<td>22</td>
<td>13.8</td>
</tr>
<tr>
<td>30-199</td>
<td>89</td>
<td>55.6</td>
<td>High</td>
<td>69</td>
<td>43.1</td>
</tr>
<tr>
<td>200-999</td>
<td>2</td>
<td>1.3</td>
<td>Very High</td>
<td>43</td>
<td>26.9</td>
</tr>
</tbody>
</table>
4.1 Demographic profile of the respondents

The respondents were asked to indicate their experience in the construction industry in general and in CDF projects, in particular. Table 2 summarises the responses. It can be noticed that the majority of respondents were actually clients followed by contractors and then consultants. The organizations that these respondents worked for were fairly experienced with majority having over three years’ experience.

Whereas 91.2% of the respondents had over 3 years in the construction industry, only 76.9% had been involved in the construction of CDF projects for over three years. Most stakeholders had worked on more than 4 projects per year whose value was below kshs. 10 million, an indication that CDF funds small projects. Finally, 63.1% had had previous work relationships with each other in an almost equal proportion.

Table 3: Demographic profile of the respondents

<table>
<thead>
<tr>
<th>Item</th>
<th>No</th>
<th>%</th>
<th>Item</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent position on the project</td>
<td></td>
<td></td>
<td>Respondent involvement in CDF Projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Client</td>
<td>76</td>
<td>47.5</td>
<td>Below 3 years</td>
<td>54</td>
<td>33.8</td>
</tr>
<tr>
<td>Consultant</td>
<td>36</td>
<td>22.5</td>
<td>3-6 years</td>
<td>84</td>
<td>52.5</td>
</tr>
<tr>
<td>Contractor</td>
<td>48</td>
<td>30.0</td>
<td>over 6 years</td>
<td>22</td>
<td>13.8</td>
</tr>
<tr>
<td>Organizational Experience in construction</td>
<td></td>
<td></td>
<td>Previously worked with one another</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 3 years</td>
<td>14</td>
<td>8.8</td>
<td>Yes</td>
<td>101</td>
<td>63.1</td>
</tr>
<tr>
<td>3-6 years</td>
<td>63</td>
<td>39.4</td>
<td>No</td>
<td>59</td>
<td>36.9</td>
</tr>
<tr>
<td>7-10 years</td>
<td>64</td>
<td>40.0</td>
<td>none</td>
<td>59</td>
<td>36.9</td>
</tr>
<tr>
<td>11-14 years</td>
<td>19</td>
<td>11.9</td>
<td>With Client</td>
<td>31</td>
<td>19.4</td>
</tr>
<tr>
<td>Respondent Experience in Construction</td>
<td></td>
<td></td>
<td>With Consultant</td>
<td>34</td>
<td>21.3</td>
</tr>
<tr>
<td>Below 3 years</td>
<td>37</td>
<td>23.1</td>
<td>With Contractor</td>
<td>36</td>
<td>22.5</td>
</tr>
<tr>
<td>3-6 years</td>
<td>75</td>
<td>46.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-10 years</td>
<td>48</td>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of CDF projects worked on in the last 3 years</td>
<td></td>
<td></td>
<td>Average quantity of projects involved in per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over ksh. 15m</td>
<td>29</td>
<td>18.1</td>
<td>Upton 3 projects</td>
<td>30</td>
<td>18.8</td>
</tr>
<tr>
<td>10m-15m</td>
<td>47</td>
<td>29.4</td>
<td>4-6 projects</td>
<td>99</td>
<td>61.9</td>
</tr>
<tr>
<td></td>
<td>84</td>
<td>52.5</td>
<td>7-9 projects</td>
<td>31</td>
<td>19.4</td>
</tr>
</tbody>
</table>
4.2 Descriptive statistics of performance measures.

In exploring the performance indicators, all the standard deviations are found to be above 1 except two, V34- “all stakeholders associated with the current project supervised the quality of the project in all its phases” and V27- “the project contractors were often called back during the Defects Liability Period to repair defects”, whose values are however close to 1. This is an indication that the scale measures variations among the performance indicators. The means vary from of 2.50-3.85 indicating that surveyed respondents consider all the 35 items relevant for measurement of performance among public construction projects. The highest ranking was all stakeholders supervised the project quality throughout with a mean of (3.85), an implication that according to respondents, an extremely important measure of performance among public construction projects. The other measures among the top five were: workers were provided with proper medical facilities (3.78 ), adversely affected the quality of groundwater level ( 3.68 ), no delays were experienced in securing funds (3.50 ) and no financial claims at handover (3.47 ). The three least important measures were; the work utilised environmentally friendly technology (2.66), no additional costs due to variations (2.60) and fatalities did occur on this project during construction (2.50).

4.3 Identifying the factor structure of the KPIs construct.

The researchers conducted exploratory factor analysis to further explore the factor structure of the 35-item instrument. The value of Kaiser-Meyer-Olkin (KMO) measures of the sampling adequacy is 0.578 indicating that factor analysis can proceed (0.578>0.50) since the sample size is large enough. Bartlett’s sphericity test obtained a chi-square value of 6461.540 and significance level of 0.000 suggesting that the correlation matrix is not an identity matrix, that is, the intercorrelation matrix contains sufficient common variance to make factor analysis worthwhile. Principal component analysis extraction method and varimax factor rotation method were used to examine the sample data of 160 responses. While identifying factors underlying the KPIs construct, the process was subjected to four conditions; a) fixed number of factors to six, b) items whose loadings are less than 0.4 or cross loadings of greater than 0.5 be deleted, c) retain only factors with at least two items and d) that the number of factors extracted
should account for at least 60% of the variance (Malhotra and Das, 2011; Hair et al., 2006; Field, 2005; Kassim, 2001).

Factor analysis was iteratively repeated and items deleted sequentially resulting in a final instrument of 31 items represented in six factors, accounting for 71.37% of the variance in the data set. The variance explained by each factor was factor 1-16.53%, factor 2-14.96% factor 3-11.60%, factor 4-9.83%, factor 5-9.68% and factor 6-8.77%. Inspection of the variables identified cross loading on six items: “disputes due to the frequent changes”, “the work utilised environmentally friendly technology”, “at handover there were no apparent defects”, “contractors were often called back to rework”, “utilised reusable and recyclable materials in construction” and “employees had requisite skills and experience”. Whereas the differences in the cross loading of five items were fairly large, and the items cross loaded on the theoretically appropriate variables, the item, “at handover there were no apparent defects” had very small differences in cross loading (0.558 versus 0.530). The item was, therefore, assigned to factor 5 despite relatively lower loading due to its characteristic features. In this study factors were named based on the measures that load highly on specific factors as indicated in Table 4.
Table 4: Identification of performance measurement items.

<table>
<thead>
<tr>
<th>Factor 1: Cost Performance</th>
<th>Factor 2: Time performance measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>CX₁ = No increase in cost of materials</td>
<td>TX₁ = Timely delivery of project resources.</td>
</tr>
<tr>
<td>CX₂ = Resources matched plan budget</td>
<td>TX₂ = A clear plan was formulated and followed</td>
</tr>
<tr>
<td>CX₃ = Equipment at pre budgeted rates.</td>
<td>TX₃ = No delays were experienced in securing funds.</td>
</tr>
<tr>
<td>CX₄ = Stability in Labour costs</td>
<td>TX₄ = Harmonious relationship between labour and management.</td>
</tr>
<tr>
<td>CX₅ = No additional costs due to variations</td>
<td>TX₅ = Weather and climatic conditions delayed the project.</td>
</tr>
<tr>
<td>CX₆ = No incidences of fraud</td>
<td>TX₆ = No design changes were introduced.</td>
</tr>
<tr>
<td>CX₇ = Utilised reusable and recyclable materials in construction.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor 3: Minimum dispute measure.</th>
<th>Factor 4: Quality performance measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX₁ = No trade unions agitation</td>
<td>QX₁ = All stakeholders supervised the project quality throughout.</td>
</tr>
<tr>
<td>DX₂ = No serious dispute between the client and contractor.</td>
<td>QX₂ = A sound quality management system was strictly adhered to.</td>
</tr>
<tr>
<td>DX₃ = Dispute resolution meetings were often held.</td>
<td>QX₃ = Contractors were often called back to rework.</td>
</tr>
<tr>
<td>DX₄ = No financial claims at handover.</td>
<td>QX₄ = Workers were trained on positive attitude and methods.</td>
</tr>
<tr>
<td>DX₅ = Disputes due to the frequent changes.</td>
<td>QX₅ = Employees had requisite skills and experience.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor 5: Health and safety measures</th>
<th>Factor 6: Minimum environmental impact factors.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SX₁ = Near misses occurred quite often during construction.</td>
<td>EX₁ = Project has led depletion of the natural and mineral resources.</td>
</tr>
<tr>
<td>SX₂ = Fatalities did occur on this project during construction.</td>
<td>EX₂ = This project has led to air pollution in the adjoining areas.</td>
</tr>
<tr>
<td>SX₃ = Accidents were often reported during project construction.</td>
<td>EX₃ = Increase in solid waste due to the project construction.</td>
</tr>
<tr>
<td></td>
<td>EX₄ = The work utilised environmentally friendly technology.</td>
</tr>
</tbody>
</table>
From the factor relationships in the above table, we were able to develop a theoretical framework of construction project performance. This framework (figure 1) demonstrates that project performance can be described in terms of cost variables ($CX_1$, $CX_2$, ..., $CX_j$), Time variables ($TX_1$, ..., $TX_j$), Quality variables ($QX_1$, $QX_2$, ..., $QX_j$), Health and Safety variables ($SX_1$, $SX_2$, ..., $SX_j$), Minimum disputes ($DX_1$, ..., $DX_j$) and minimum environmental impact ($EX_1$, $EX_2$, ..., $EX_j$).

**Figure 1. Relationships between KPIs and overall project performance.**

5. Validation of the Key Performance Indicators.

5.1 Reliability

Reliability of the KPIs scale was established through internal consistency of the items retained in the scale under various factors by use of Cronbach’s alpha coefficient. The 31 item scale had a reliability of 0.806 well above 0.70 recommended for similar studies (Malhotra and Das, 2011; Hair et al., 2006). The Cronbach’s alpha coefficient for each factor was as follows: cost performance measures = 0.895, time performance measures = 0.880, minimum disputes measures = 0.723, quality performance measures = 0.862, health and safety measures = 0.752 and environmental impact measures = 0.814. All the 31 items had a corrected item-to-total correlation above 0.38.
5.2 Content validity

The content validity of the KPIs instrument was achieved through the procedure used in designing the instrument. Specifically, the final instrument was designed after extensive literature review as well as in-depth interviews with experts and discussions with practitioners.

5.3 Discriminant and convergent validity

Discriminant and convergent validity in order to assess convergent and discriminant validity of the 31 item scale, the researchers used the correlation matrix. The inter-item correlation of the scale had a mean of 0.118, an indication that they were large enough to warrant an assessment of discriminant validity. The smallest within-factor correlations are cost performance measures = 0.457, time performance measures = 0.437, minimum disputes measures = 0.486, quality performance measures = 0.160, health and safety measures = 0.400 and environmental impact measures = 0.423. These correlations are significantly greater than zero (p<0.000) and the existence of several cross-loading items necessitate examination of discriminant validity.

To assess discriminant validity, the reproduced correlation matrix was used. This matrix showed that correlations in the validity diagonal exceeded any other correlation in its row or column of each factor grouping. This provides support for the existence of discriminant validity in the measurement scale. Further, a factor correlation matrix using Promax rotation method indicates that the correlations between the six factors were low (below 0.300) demonstrating that the scales were sufficiently different from each other (Steine et al., 2001).

6. Managerial implications

Through exploratory factor analysis, the researchers developed a 6 factor, 31 item instrument with sound theoretical properties for the measurement of performance of public construction projects. This instrument provides a basis for effective assessment of performance among CDF construction projects. The economic, political, societal and ecological environment in which construction of CDF projects is undertaken is highly uncertain, making the task of project execution a
gigantic task in itself. There is need for all stakeholders to understand the interplay of different key performance indicators on the overall performance. In this study, we have been able to develop an empirically validated model of measuring performance of projects at all phases. The instrument was demonstrated to be highly reliable and it empirically supported the presence of content validity, convergent validity and discriminant validity. The cross-sectional aspect of the data considering the views of clients, consultants and contractors makes this instrument appropriate for performance measurement from the perspective of all stakeholders.

Apart from providing a framework for overall assessment of project performance, the developed measurement instrument can be used to compare performance of different types of projects at different phases on specific dimensions of performance. Even though a better way would have been to consider the level of performance derived from each KPI, this evaluation instrument will provide stakeholders in building construction with a fast and early feedback on project performance. The project stakeholders can use this measurement instrument to clarify their understanding of project performance during construction and be able to take corrective action in order to improve overall performance.

Even though the developed instrument will enhance decision making, it has several limitations. Given that data for the development of the measurement instrument was gathered in Kakamega, Vihiga, Bungoma and Busia Counties, there is need for a confirmatory analysis to establish the extent of its application. Further, the instrument ought to undergo cross-cultural validation using data gathered elsewhere in Kenya and the world as a whole to enhance item generalization. Similarly, there is need for evaluation of test-retest reliability of the instrument to ensure its stability over time.

7. Conclusion

This study concludes that project performance is a multi dimensional construct which goes beyond satisfaction. We recommend that those in practise in construction project performance utilise the proposed instrument in measuring performance of construction projects. The instruments can be used to investigate aspects of the project and overall assessment.


References


Sekaran, U (2000), Research method for business: A skill building approach, John Wiley and


A Performance Evaluation Framework For Constituency Development Fund


