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Critical success factors influencing the performance of development projects: An empirical study of Constituency Development Fund projects in Kenya

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Abstract The present work attempts to identify critical success factors (CSFs) influencing the performance of development projects based on their key performance indicators (KPIs). It has considered the case of Constituency Development Fund (CDF) projects constructed between 2003 and 2011 in Kenya and secured the perceptions of 175 respondents comprising clients, consultants and contractors involved in the implementation of CDF projects on 30 success variables. Findings reveal that individual items constituting these six factors represent six CSFs namely *project-related, client-related, consultant-related, contractor-related, supply chain-related,* and *external environment-related factor*. The findings are also relevant to development projects undertaken in other developing countries.

Introduction

Development projects, unlike large construction projects, are essentially community-driven in nature and aim at redistributing national resources to the community to bring facilities and services closer to people in order to alleviate poverty, create employment, and eventually raise people's standard of living through better schools, healthcare facilities and the like. While large construction projects are concerned with developing the infrastructure and backbone of an economy, development projects attempt to directly improve the socio-economic condition of people in a developing nation through various types of projects. Large infrastructure projects are usually funded by international financial institutions for which stringent conditions are imposed on the borrowing nation. Therefore, the Government of the borrowing country puts in efforts to complete infrastructure projects on time, meeting budgetary constraints and conforming to quality standards. This suggests that the performance of infrastructure

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projects needs to be evaluated on the traditional criteria of time, cost and quality. The traditional criteria of performance evaluation of projects, popularly known as the "iron triangle" (Atkinson, 1999), are mainly based on the economic dimension.

However, development projects are also expected to fulfil social and environmental goals in addition to the economic one. Funds for such projects are mobilised by the national Government mostly for the purpose of addressing the socio-economic needs of its citizens and at the same time, minimising the adverse environmental impact on the surrounding region. Thus if the same traditional criteria of time, cost and quality are utilised to evaluate the performance of development projects, they would merely capture the economic aspects of development projects and would fail to account for relevant social and environmental dimensions.

In view of this shortcoming of traditional criteria, the Organisation for Economic Co-operation and Development's (OECD) Development Assistance Committee (DAC) introduced innovative performance evaluation criteria, popularly known as the five pillars of development projects (Beck, 2006; Chianca, 2008; Ika, Diallo, & Thuiller, 2012). Though these criteria seem to capture both economic and social aspects of development projects, they do not adequately address the environmental elements that are considered quite important in development projects. Further, DAC has not suggested any objective measure upon which the five pillars can be operationalised. Ngacho and Das (2014) have proposed a performance evaluation framework for development projects based on relevant measures of performance, namely time, cost, quality, safety, site disputes, and environmental impact. These measures are known as key performance indicators (KPIs). However, the Ngacho and Das (2014) study has not formulated the facilitating factors that can help project managers achieve success on the KPIs identified. The identification of these factors, also known as critical success factors (CSFs), is very important to ensure the success of any project because it enables project managers to commit resources on specific factors.

The current study is an attempt to identify the CSFs of development projects based on the KPIs identified in the study findings of Ngacho and Das (2014). The applicability of this approach has been demonstrated with the help of data collected from the development projects financed through the Constituency Development Fund (CDF) in Western Province, Kenya, between 2003 and 2011. The study has identified the CSFs by initially carrying out exploratory factor analysis (EFA) on the items on which responses have been elicited from the respondents comprising clients, consultants and contractors involved in the implementation of CDF projects. Subsequently, confirmatory factor analysis (CFA) has been performed on the factors identified at the EFA stage. These factors have finally been rigorously tested and validated in terms of their reliability and validity.

The remainder of the paper is organised in the following manner. The second section presents a review of the literature on KPIs and CSFs affecting both large construction projects and development projects. The third section briefly describes the nature of CDF construction projects. Section 4 discusses research method in detail. The fifth section deals with the data analysis and interpretation of results while section 6 presents a discussion on CSFs that are determined in the preceding section. The paper is concluded with a brief summary, its contribution, managerial implications, limitations, and future research directions.

Literature review

Key performance indicators (KPIs) of large construction projects

As mentioned earlier, economic criteria have, by and large, guided project managers in evaluating the performance of large construction projects. Literature on performance evaluation of construction projects reveals that these projects have mostly been evaluated on the traditional criteria of time, cost and quality (Ahadzie, Proverbs, & Olomolaiye, 2008; Atkinson, 1999; Kaliba, Muya, & Mumba, 2009; Kamrul & Indra, 2010; Zou, Zhang, & Wang, 2007). The use of these three dimensions is still considered a good practice for some projects, while for others it could undermine some important project outcomes. Critics of these criteria have indicated that they do not adequately cover all aspects of performance measurement (Gardiner, 2000), are related to each other (Shenhar, Asher, Dov, Stanislav, & Thomas, 2002), are rigid in their performance evaluation of projects (Bassioni, Price, & Hassan, 2004) and have short term focus (Shenhar, 2001). Thus in order to overcome the limitations of the traditional performance evaluation criteria, Barclay and Osei-Bryson (2010) argued that project performance measurement criteria of construction projects should consider diversity, and both technical and social needs of the project. Yun, Choi, de Oliveira, and Mulva (2015) recommended the use of project performance metrics tailored to phase-based benchmarking under the categories of cost, schedule, efficiency, staffing, procurement, and safety performance. Safety of the project site was also recommended by a few other researchers (Abudayyeh et al., 2006; Billy, Cameron, & Duff, 2006; Haslam et al., 2005; Zou et al., 2007). A few additional measures of performance were suggested by several other researchers. These include site disputes (David, 2009; Tabish & Jha, 2011), environmental impact (Chen, Okudan, & Riley, 2010; Eriksson & Westerberg, 2011; Medineckiene, Turskis, & Zavadskas, 2010; Tan, Shen, & Yao, 2011; Tsoulfas & Pappis, 2008) and community satisfaction (Ali & Rahmat, 2010; Chan & Chan, 2004; Shao & Müller, 2011). However, these additional criteria have scarcely been utilised in evaluating the performance of large construction projects since the focus of both the funding agency and the implementing body is to achieve success on the traditional three dimensions of performance.

KPIs of development projects

The traditional performance evaluation criteria do not effectively capture the social and environmental concerns of the surrounding community and thus cannot ensure the success of development projects in all respects unless the concerns of the community are appropriately incorporated into the performance evaluation framework. According to Mansuri and Rao (2003), Community Based Development (CBD) and its more recent variant, Community Driven Development (CDD), are among the fastest growing mechanisms for channelling

development assistance in developing countries. Thus in order to capture all aspects of performance of development projects, OECD's DAC introduced five pillars of development projects based on *relevance, efficiency, effectiveness, impact*, and *sustainability* (Beck, 2006; Chianca, 2008; Ika et al., 2012). Chianca (2008) reported that these pillars overemphasise the needs of the funding agency rather than those of the targeted communities. Further the pillars, especially relevance, effectiveness and impact are ill defined. According to Ngacho and Das (2014), these pillars do not provide objective and operationalisable measures of performance of development projects on which economic, social and environmental dimensions could be measured.

The additional measures of performance including safety, site disputes and environmental impact suggested by the researchers seem to reflect the social and environmental concerns of the surrounding community. Khwaja (2001) contended that sustainability is one of the KPIs of community based development projects. He did not, however, clearly spell out as to what constitutes sustainability of a development project. Ngacho and Das (2014) observed that although the performance indicators, both traditional and contemporary, suggested by the researchers, widen the scope of performance evaluation of development projects, they are skewed towards either the economic or the social or the environmental dimension. Therefore, they recommended a balanced performance measurement framework of development projects based on six KPIs (*time, cost, quality, safety, site disputes*, and *environmental impact*). Realisation of the above KPIs, however, depends on how project stakeholders could identify the CSFs and accordingly allocate resources on these factors. The CSFs serve as facilitating factors for the success of a project.

Critical success factors (CSFs) of large construction projects

Project management literature is replete with CSFs and innumerable number of success variables which have great potential to affect different dimensions of project performance of large construction projects. Committing resources based on the large number of success variables is neither feasible nor advisable. Thus in order to ensure the success of a large construction project, its CSFs need to be formulated based on specific KPIs and, accordingly, resources need to be committed on those CSFs. The performance of large construction projects is, by and large, evaluated on the traditional three KPIs. These KPIs are, in turn, affected by a number of success variables. *Project time* and *cost performance* are influenced by success variables such as project characteristics, procurement system, project team performance, client characteristics, contractor characteristics, design team characteristics and external conditions (Ahsan & Gunawan, 2010; Kaliba et al., 2009; Koushki, Al-Rashid, & Kartam, 2005). Kaliba et al. (2009) mention that poor site management and supervision lead to both time and cost overrun of a construction project.

As regards the *quality of construction projects*, research findings reveal that success variables such as design changes, lack of quality systems, contractor selection, ineffective use of information technology and inter-organisational interactions significantly influence the quality of construction projects (Alwaer & Clements-Croome, 2010; Love, Edwards, Watson, & Davis, 2010). In addition, inadequate details in drawings and rigidity in project design, lack of technical expertise, and unavailability of right materials or right equipment in the construction site also affects its quality (Kaliba et al., 2009).

Berssaneti and Carvalho (2015) have identified top management support, presence of a dedicated project manager, and project management maturity as CSFs for ensuring success of a project on time, cost and quality. Todorović, Petrović, Mihić, Obradović, and Bushuyev (2015) have suggested a project success analysis framework based on acquisition and transfer of knowledge in project environment. From the manufacturing perspective of achieving a low-carbon economy, Jabbour, Neto, Gobbo, Ribeiro, and Jabbour (2015) formulated a broad range of human critical success factors which are linked to the success of eco-innovation in sustainable supply chain.

CSFs of development projects

All success variables and CSFs of large construction projects are relevant to development projects as well, because these CSFs would ensure success on the three important criteria of project performance. However, development projects also need to identify additional success variables based on the remaining three KPIs namely *safety, site disputes* and *environmental impact*. The success variables influencing safety performance measure are variables such as the number and the rate of fatalities and/or crashes and incidences and emergency response times. According to Tabish and Jha (2011), the variables influencing site disputes performance criterion are thorough understanding and definition of owners, regular monitoring and feedback by top management, adequate communication among all project participants and the affected parties, availability of adequate resources, and timely decisions by top management. The main variables that have been identified as impacting negatively on the environment include excessive use of energy (Saparauskas & Turskis, 2006), emissions into the air, releases to water, incineration and recycling process and inability to use renewable materials in construction (Medineckiene et al., 2010), and poor construction methods (Chen et al., 2010) . Ngacho and Das (2015) have identified six CSFs based on literature review, which, however, have not been empirically tested.

Based on background literature, we have identified several variables of success of development projects along with their impact on specific dimensions of project performance, which are provided in Table 1. The table also reveals specific references relating to each success variable.

Table 1 shows that there are numerous variables present in the project environment which influence different dimensions (KPIs) of project performance. These variables were classified differently by different researchers (Chan & Tam, 2000; Koushki et al., 2005) for the purpose of identifying the CSFs. Research findings indicate that the CSFs have not been identified on the basis of specific KPIs. Previous studies have generally considered CSFs among large construction projects, especially those funded by World Bank. In addition, the studies have mostly sought the perceptions of project supervisors and

Table 1 Project success variables and their impact on KPIs of development projects.

Success variables	KPIs affected	References
Project location and site conditions	• Time • Cost • Environmental impact • Safety	Frimpong, Oluwoye, and Crawford (2003); Le-Hoai, Lee, and Lee (2008); Long, Ogunlana, Quang, and Lam (2004); Sambasivan and Soon, (2007)
Influence of design complexity	• Cost • Time • Environmental impact • Quality	Alwaer and Clements-Croome (2010); Chan, Ho, and Tam (2001); Jha and Iyer (2006)
Adequacy of project planning, scheduling and control	• Cost • Time • Quality • Site disputes	Long et al. (2004); Sambasivan and Soon, (2007); Yung and Yip (2010)
Project funds secured on time by the client	• Time • Cost • Site disputes	Aksorn and Hadikusumo (2008); Frimpong et al. (2003); Koushki et al. (2005)
Timely approval of design documents by clients	• Time	Sweis, Sweis, Hammad, and Shboul (2008); Syed, Salman, Pragnya, and Dharam (2003); Zhang (2005)
Adequate experience of clients on similar projects	• Cost • Time • Quality	Koushki et al. (2005); Long et al. (2004); Sambasivan and Soon, (2007)
Information sharing and collaboration among project participants	• Cost • Site disputes • Safety • Time	Aksorn and Hadikusumo (2008); Jha and Iyer (2006); Long et al. (2004); Sambasivan and Soon, (2007)
Adherence to the requisite quality standards	• Quality • Safety	Aksorn and Hadikusumo (2008)
Continuous monitoring of actual expenditure	• Cost	Frimpong et al. (2003); Koushki et al. (2005)
Formal dispute resolution mechanism	• Site disputes • Time	Assaf and Al Hejji (2006); Zhang (2005)
Possession of requisite skills by site managers	• Time • Cost • Quality • Site disputes	Ameh, Soyingbe, and Odusami (2010); Frimpong et al. (2003); Long et al. (2004); Sambasivan and Soon, (2007)
Adequate technical skills and experience of contractors	• Cost • Time • Quality	Ameh et al. (2010); Frimpong et al. (2003); Long et al. (2004); Sambasivan and Soon, (2007)
Use of latest construction methods by contractor	• Cost • Site disputes • Safety • Environmental impact	Long et al. (2004); Zhang (2005)
Issues raised by the community against construction of the project	• Time • Site disputes	Ameh et al. (2010); Koushki et al. (2005); Long et al. (2004)
Adverse impact of surrounding weather	• Cost • Time • Quality • Environmental impact	Chan et al. (2001); Jha and Iyer (2006)

(*continued on next page*)

Table 1 (*continued*)

Success variables	KPIs affected	References
Effect of macroeconomic conditions	• Cost • Time • Quality	Ameh et al. (2010); Frimpong et al. (2003); Le-Hoai et al. (2008)
Effect of the governance policy	• Cost • Site disputes • Safety	Syed et al. (2003)
Commitment of consultant to projects according to design specifications	• Quality • Safety • Site disputes	Syed et al. (2003)
Adequacy of design, specifications and documentation for use by contractors	• Quality • Safety • Site disputes	Abudayyeh et al. (2006); Aksorn and Hadikusumo (2008); Zhang (2005)
Client's emphasis on time rather than quality	• Quality • Safety	Frimpong et al. (2003); Syed et al. (2003); Yung and Yip (2010)
Client's tendency to purchase cheap materials	• Quality • Safety • Site disputes • Environmental impact	Frimpong et al. (2003); Jha and Iyer (2006)
Variations in original design of the project during construction phase	• Time • Cost • Site disputes	Koushki et al. (2005); Syed et al. (2003)
Level of technological sophistication	• Quality • Cost • Environmental impact	Alwaer and Clements-Croome (2010); Frimpong et al. (2003); Long et al. (2004); Love et al. (2010)
Incidence of industrial unrest	• Quality • Cost	Frimpong et al. (2003); Long et al. (2004)
Physical and ecological conditions surrounding the project	• Cost • Site disputes • Safety	Chan et al. (2001); Jha and Iyer (2006); Kaliba et al. (2009); Long et al. (2004)
Internal procurement challenges	• Time • Cost	Frimpong et al. (2003); Sambasivan and Soon, (2007)
Client's ability to make timely and objective decisions	• Time • Quality • Site disputes	Frimpong et al. (2003); Long et al. (2004); Syed et al. (2003)
Availability of right equipment in the site	• Cost • Time • Quality • Safety	Aksorn and Hadikusumo (2008); Frimpong et al. (2003); Kaliba et al. (2009); Long et al. (2004); Sambasivan and Soon, (2007)
Stringent insurance and warranty requirements	• Cost • Time • Quality	Zhang (2005)
Adequacy of working capital	• Time • Cost	Le-Hoai et al. (2008); Long et al. (2004); Sambasivan and Soon, (2007)

project managers (Ika et al., 2012). To the best of our knowledge, few studies have identified the CSFs influencing the performance of community driven development projects on the basis of the perceptions of project stakeholders namely clients, consultants and contractors. The present study is an attempt to bridge the gap in that direction.

CDF Projects in Kenya: an overview

Constituency development funds (CDFs) are decentralised funding schemes that disburse funds from the central government directly to electoral constituencies for setting up of local infrastructure projects. National governments in several countries, including India, Pakistan, Bhutan, Jamaica, Papua New Guinea, Uganda, Tanzania and Kenya continue to disburse development expenditure through schemes such as the CDF in order to realise equitable development in all regions. In Kenya, CDF was initiated by the Kenyan government in 2003 to spur development in rural areas so as to ensure equitable development in the country. According to the CDF Act (2003), the Government should allocate at least 2.5% of the ordinary revenue to CDF (Wanjiru, 2008). However, this amount has been increasing consistently and currently stands at around 4% of the revenue. Under the CDF Act (2003) (http://www.cdf.go.ke/images/docs/.....annotatedversion.pdf), funding is usually done for a completely new project or for renovation of an existing facility. Further the project must be development oriented and not recurrent. Broadly CDF projects fall under four different categories, viz. (1) educational facilities (32%), (2) health facilities (26%), (3) water and physical infrastructure including light industries (27%) and (4) agriculture, security, social services and wildlife (15%), (Baskin, 2010). The funds under CDF have been used in improving the condition of schools, healthcare units, agricultural projects like dairy farming and bee keeping, rural electrification, and numerous other programmes.

According to the CDF Act (2003), the stakeholders included in the management of the CDF include the public and community groups, CDF management agencies, existing government institutions, and the Member of Parliament of each constituency. The participation of different stakeholders takes place at different stages starting from project identification to eventual implementation and monitoring (Wanjiru, 2008). In the very first stage, the community, through formal meetings, identifies its developmental needs and the kind of projects it requires. These needs are then forwarded to the Constituency Development Fund Committee (CDFC) which prioritises the projects. The District Projects Committee (DPC) is then called upon to ensure that there is no duplication of projects in the same constituency before transmitting the projects to the CDF National Management Board (NMB). The Board scrutinises and recommends projects for funding. Subsequently the Board allocates funds for various projects and authorises various CDFCs to disburse funds to the approved projects. These projects are implemented by the various Project Management Committees (PMCs) on behalf of the CDFC and for the benefit of the community. Once project construction is complete, they are transferred to the respective line ministries for operationalisation. The monitoring and evaluation of the projects implemented is undertaken by the CDF monitoring Unit, the National Management Board, the District Development Officer (DDO), relevant government line ministries, and other national agencies like the National Taxpayers Association (NTA). Wanjiru (2008) reports that at present, the monitoring systems instituted under the CDF Act (2003) are not thorough enough to ensure proper evaluation of performance of development projects.

Research method

The very first step entailed identification of target projects in the study site and the stakeholders involved in those projects which enabled us to define the target respondents. This was followed by the design of a survey instrument and testing the reliability and validity of the same. Finally, with the help of trained field investigators, the survey instrument was administered to the respondents.

Study site, target projects and target respondents

The present study was carried out in 24 constituencies located in the Western Province of Kenya. Different types of CDF projects are undertaken in these constituencies. Inspection of the list of projects in each constituency revealed that there were over 4000 projects undertaken between 2003 and 2011. This period was considered for the study because prior to 2003, construction projects were undertaken separately by line ministries and thus it was very difficult to access data during that time. With the creation of CDF in 2003, information regarding all construction projects became readily available. Out of 4000 projects undertaken between 2003 and 2011, those projects were considered as target projects which were involved in the construction of educational facilities, health facilities, light industries and agricultural markets. It was found that only 586 projects were involved in the construction of the above facilities and thus they qualified as target projects in the present study. These 586 projects allowed us to define the target respondents of the current study. We identified three categories of target respondents, namely clients, consultants and contractors. There were 586 clients for 586 projects. In addition, there were 124 consultants and 212 contractors registered by the Architectural Association of Kenya (AAK) and Kenya contractors' associations (KCA) county offices respectively in the Western Province. Therefore, the size of the population became 922. We considered the entire population of 922 as the target respondents and accordingly collected data from all three strata of respondents.

Design of survey instrument

The design of the survey instrument in the present study involves, first of all, identification and extraction of relevant items of project success from the existing literature. The sources from which the items have been derived are cited in Table 1. With the help of these items, suitable questions were framed based on the research objectives of the present study, which finally gave rise to a structured questionnaire. (This is attached in Appendix A.) However, before the exercise of questionnaire design was undertaken, the list of the items constituting project success derived from the extant litera-

ture was shown to five experts with a view to securing their viewpoints regarding the suitability of the items in capturing various dimensions of success of development projects in Kenya. The five experts comprised two professors in the area of project planning, two practitioners and one consultant. Both the professors possessed more than 10 years of teaching and consulting experience for many government projects. The two practitioners were chairmen of Kenya association of contractors, Busia and Kakamega counties, Western Kenya, who had rich experience with construction projects in their respective regions. The fifth expert, a regional public works officer in charge of the Busia county since 2003, was responsible for all CDF projects funded by the Government in Busia county. The experts confirmed that the success items identified were relevant to CDF construction projects in Kenya.

Once the items of project success were endorsed by the experts, a preliminary questionnaire was designed which was divided into two sections. The first section of the questionnaire contains questions relating to the background information of the respondents, the type of CDF construction projects they are currently involved in, the procurement approach followed in the current project and their experience associated with construction projects in general and CDF construction projects in particular. The second section contains questions pertaining to the perception of the respondents on their level of agreement on various statements relating to project success. A total of 30 project success variables were identified. A five-point Likert scale was used as a response format for different variables with the assigned values ranging from 1 = *strongly disagree* to 5 = *strongly agree*. 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 success of development projects and also the user-friendliness and overall workability of the questionnaire. They stated that some of the questions needed to be rephrased for ease of understanding, given the varying levels of education of the prospective respondents. Accordingly the relevant questions were rephrased. The entire exercise ultimately helped us in achieving the content validity of the questionnaire. With the help of language experts, the questionnaire was also translated into local (Swahili) language for those respondents who could not understand the English language. To ensure that the meaning of the questionnaire was not lost while translating the same into Swahili, both English and Swahili versions of the questionnaire were administered to five project managers, who were fully conversant with both the languages. They were requested to provide answers in both the versions. The responses provided by all five managers were an exact match in both the versions. This mitigated the concern of meaning of the questionnaire getting lost during translation.

Reliability of the survey instrument

To evaluate the reliability of the survey instrument, a pilot survey was carried out through personal interviews with five contractors, four consultants and 21 clients, who were working on ongoing construction projects. These respondents were found to have over seven years of experience in the construction industry and had been involved in the construction of CDF projects for at least three years. Further, they handled over four CDF projects per year in various constituencies. This bears testimony to the fact that these respondents were quite experienced in providing relevant information requested in the questionnaire. Scale reliability was checked using Cronbach's coefficient alpha (Cronbach, 1951). In this study, the Cronbach's coefficient alpha for the entire scale consisting of 30 measurement variables was 0.881 with relatively high corrected item-to-total correlations indicating the presence of high internal consistency in the measurement scale.

Data collection

Twenty four field investigators were selected, one each for each of the 24 constituencies that constitute the Western Province. They were trained on the contents of the survey instrument and the data collection exercise in general, and asked to ensure that they carried a copy of the questionnaire in both versions, English and Swahili, while visiting a particular constituency for fieldwork. Simultaneously, all three categories of respondents including clients, consultants and contractors were identified. The contact number, e-mail address, and postal address of all 922 respondents comprising clients, consultants and contractors spread over 24 constituencies were collected from the database maintained by CDF regional office, Western Kenya, and the respondents were then contacted through telephone calls and e-mails seeking an appointment along with the date, time and venue. Based on the appointment, the field investigators visited the designated place in person with a view to eliciting responses from them through a face-to-face interview. A total of 196 completed questionnaires were received, out of which 21 were found either incomplete or improperly filled. Thus the total number of effective responses came to be 175. These 175 responses came from 175 different projects provided by clients, consultants or contractors. The scores on negatively framed questions were suitably reversed. We could not specifically carry out non-response bias test due to the limited time devoted towards collection of data which did not allow us to make a distinction between early and late respondents. However, the test for common method bias was carried out as the final analysis of the study is based on the responses provided by single respondents from each individual project. Harman's one-factor test using CFA was applied to 30 items of CSFs. The model fit statistics indicate that a single factor does not represent the data well. Test indices of 30 items of CSFs considered under one-factor model are: $\chi^2 = 3897.975$, degrees of freedom (df) $= 405$, $P = 0.00$, $\chi^2/df = 9.625$, GFI = 0.391, AGFI = 0.301, NFI = 0.331, TLI = 0.305, CFI = 0.353, RMSEA = 0.223. Common method bias was further tested by examining the percentage of variance accounted for by a single factor in the unrotated factor solution, which reveals that the maximum proportion of variance explained by a single factor was 30.18%, much below the upper limit (50%) of the total variance. The results thus indicate that the common method bias is not a major concern in this study.

Data analysis and interpretation of results

The scores provided by the respondents were fed into SPSS software (version 20). We present an overview of the

demographic profile of the projects and respondents and the related descriptive statistics. Finally the results of EFA carried out through SPSS and CFA carried out through AMOS (version 20) are presented.

Description of CDF construction projects and their procurement approaches

Table 2 presents relevant data pertaining to the type of the projects surveyed and their procurement approaches.

The projects surveyed in this study consist of 65 educational projects (37.1%), 44 health facilities (25.1%), 33 industrial estates (18.9%) and 33 agricultural markets (18.9%). The dominance of educational and health projects among CDF construction projects can be attributed to the fact that the majority of the people residing in rural areas in Kenya are mainly women and children as men usually migrate to urban areas in search of employment. Owing to this, the projects that focus on children and women, namely educational and health projects, have a multiplier effect on the quality of life in rural areas.

Table 2 shows that three procurement approaches are used in securing construction of CDF projects in Western Province, Kenya. These are (i) design/build, (ii) competitive bid and (iii) negotiated general contract. Majority of these projects were procured through negotiated general contracts (55.4%), followed by competitive bidding (40%) and design/build (4.6%). These procurement approaches differ from each other in terms of allocation of responsibilities, sequencing of activities and organisational approach in project delivery. The results indicate that the negotiated general contract is the most popular procurement method used among CDF construction projects in Kenya. Under this approach, a single prime contractor is entrusted with the responsibility of undertaking the entire work. This approach creates common project goals and objectives and acts as a single point of responsibility that enhances project communication.

Respondents' profile

Table 3 attempts to capture the respondents' profile in terms of their position on the project, their experience in the construction industry and how long they have been involved in CDF construction projects.

The respondents comprised 92 clients (52.6%), 29 consultants (16.6%) and 54 contractors (30.8%). Almost half of the respondents (49.7%) have been in the project construction industry for 3–6 years followed by those with over six years' experience (32.0%) and only 32 respondents (18.3%) had experience of less than three years. Further, most of the respondents (70.3%) have specifically been involved in the construction of CDF projects for a period exceeding three years. This adds credence to the study in the sense that the views expressed by the respondents are based on their actual

Table 2 Types of CDF projects and their procurement approaches.

	Total	Project classification			
		Educational	Health care	Industrial estate	Agricultural market
Procurement approach used					
Design/Build	**8 (4.6%)**	2 (25.0%)	4 (50.0%)	1 (12.5%)	1 (12.5%)
Competitive bid	**70 (40.0%)**	32 (45.7%)	5 (7.1%)	17 (24.3%)	16 (22.9%)
Negotiated general contract	**97 (55.4%)**	31 (31.9%)	35 (36.1%)	15 (15.5%)	16 (16.5%)
TOTAL	**175 (100%)**	**65 (37.1%)**	**44 (25.1%)**	**33 (18.9%)**	**33 (18.9%)**

Table 3 Respondents' profile.

	Total	Respondent's position on the construction project		
		Client	Consultant	Contractor
Experience in construction of projects				
<3 Years	32 (18.3%)	14 (43.8%)	11 (34.4%)	7 (21.9%)
3–6 Years	87 (49.7%)	60 (69.0%)	4 (4.6%)	23 (26.4%)
>6 Years	56 (32.0%)	18 (32.1%)	14 (25.0%)	24 (42.9%)
Respondent involvement in CDF projects				
<3 Years	52 (29.7%)	14 (26.9%)	11 (21.2%)	27 (51.9%)
3–6 Years	97 (55.4%)	70 (72.2%)	13 (13.4%)	14 (14.4%)
>6 Years	26 (14.9%)	8 (30.8%)	5 (19.2%)	13 (50.0%)
Value of CDF projects worked on in the last 3 years				
Over Kenyan Shilling (Ksh.) 15,000,000	35 (20.0%)	15 (42.9%)	7 (20.0%)	13 (37.1%)
Ksh. 10,000,000–15,000,000	56 (32.0%)	32 (57.1%)	2 (3.6%)	22 (39.3%)
Up to Ksh. 10,000,000	84 (48.0%)	45 (53.6%)	20 (23.8%)	19 (22.6%)
Total	**175 (100%)**	**92 (52.6%)**	**29 (16.6%)**	**54 (30.0%)**

experience associated with the construction industry in general and CDF construction projects in particular. Jin, Doloi, and Gao (2007) reported a similar comparative analysis of respondents among the stakeholders working on building projects in China.

An analysis of the average value of projects the respondents had handled in the past revealed that the majority had handled relatively small projects. Of the projects surveyed, 84 projects (48.0%) had a value of less than Kenyan Shilling (Ksh.) 10,000,000, 56 projects (32.0%) had a value of Ksh. 10,000,000 to Ksh. 15,000,000 whereas 35 projects (20.0%) were large with values above Ksh. 15,000,000 (1 USD = Ksh.85). This information indicates that apart from having adequate experience in terms of number of years the respondents have been involved in construction projects, they had also handled projects of different sizes.

Descriptive statistics of success variables

The responses on all 30 variables relating to CSFs provided by the respondents were observed. The minimum and maximum scores were 1 and 5 respectively in 29 out of 30 variables. These scores indicate that the respondents used the entire 5 point survey scale implying adequate variation in the responses. The mean score ranged between 2.27 *(adequate experience on similar projects)* and 4.10 *(working capital was adequate)*. Standard deviations were found to be above 1 except in three variables; *"few internal procurement challenges" (0.985)*, *"right equipment were available" (0.921)* and *"working capital was adequate" (0.736)*. These variables were initially subjected to EFA, which resulted in an instrument consisting of six factors and 26 items. This is discussed in the following section. Subsequently CFA was carried out on this reduced set of items, which gave rise to a parsimonious scale consisting of six factors and 18 items. This is explained in the sub section titled "Confirmatory factor analysis". Descriptive statistics pertaining to the mean and standard deviation of 18 items loading on six factors are provided in a table (Table 6) presented later.

Factor analysis following varimax rotation

Before carrying out factor analysis, factorability of 30 variables was assessed by finding out the correlation of each pair of 30 variables with the help of a correlation matrix provided in SPSS output. A large number of significant correlations were found amongst different pairs of variables in this matrix. The overall significance of the correlation matrix and its factorability were tested with the help of Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, respectively. Bartlett's test statistics were found significant at 0.000 levels, which indicate the presence of non-zero correlations in the correlation matrix. Further KMO measure of the sampling adequacy was 0.771. Although both tests met the minimum criteria for carrying out factor analysis in the dataset, observation of the correlations along the diagonal of the anti-image correlation matrix (as revealed in SPSS output) showed that three variables had KMO values of less than 0.5, which indicated that the dataset was still not suitable for factor analysis. These variables were iteratively removed one after another starting with the one whose correlation along the diagonal of the anti-image matrix was the lowest (Hair, Black, Babin, Anderson, & Tatham, 2006). This resulted in the improvement of overall KMO measure of sampling adequacy to 0.802. Further Bartlett's test statistics was found significant at 0.000 levels. These measures indicate that the reduced set of variables is appropriate for factor analysis.

Principal axis factoring (PAF) was used with varimax rotation given that the primary purpose was to identify the underlying factors. Initially all 27 variables were allowed to load freely on various factors so long as they had eigenvalue greater than one. Using the scree plot generated, we were able to establish the appropriate number of factors to be extracted as six. Therefore, while identifying the final factors underlying the CSFs, the process was subjected to four conditions: (i) the number of factors fixed at six, (ii) deletion of items with loadings of less than 0.5 or cross loadings of greater than 0.5, (iii) communalities of variables be at least 0.5, and (iv) the number of factors extracted should together account for at least 60% of the variance (Hair et al., 2006).

Factor analysis was iteratively repeated resulting in a final instrument of 26 items. The 26- item 6-factor instrument accounted for 74.376% of the variance in the dataset. In this study, factors were named as *project related*, *client related*, *external environment related*, *supply chain related*, *consultant related* and *contractor related factor* based on the content of the items loading significantly on each individual factor. Table 4 summarises the factor loadings for the 26-item instrument.

The factor analysis results shown in Table 4 reveal that *project related factor* is the most important construct of project success having the highest eigenvalue of 5.344 and accounting for 20.554% of the variance in the data set. This is followed by *client related factor* with an eigenvalue of 4.270, which explains 16.422% of the total variance. The third most important CSF is found to be *external environment related factor* with an eigenvalue of 3.174 and explaining 12.209% of the variance, while the fourth most important factor turns out to be *supply chain related factor* with an eigenvalue of 2.441 and contributing to 9.387% of the total variance. The last two critical success factors in order of importance are *consultant related factor* and *contractor related factor* with an eigenvalue 2.066 and 2.043 respectively and the variance explained of 7.945% and 7.859% respectively. The six factors extracted indicate different dimensions of success among CDF construction projects. The significant loadings of all the items on a single factor indicate unidimensionality while the absence of cross loading of items supports discriminant validity of the instrument.

Validation of CSFs

The measurement properties of six CSFs of development projects were evaluated by assessing the key components of construct validity and reliability. The following properties are considered important for assessing the CSFs: (1) content validity, (2) reliability, (3) convergent validity and (4) discriminant validity.

Table 4 Results of exploratory factor analysis.

	Component					
	1	2	3	4	5	6
Cronbach's alpha (α)	0.945	0.931	0.873	0.869	0.826	0.780
Influence of design complexity	.909					
Adherence to the requisite quality standards	.906					
Continuous monitoring of actual expenditure	.832					
Formal dispute resolution mechanism	.836					
Effect of location and site conditions	.777					
Adequacy of information sharing and collaboration	.743					
Adequacy of project planning and scheduling	.685					
Level of experience on similar kind of projects		.936				
Usage of cheap materials		.919				
Timely availability of project funds		.865				
Client's emphasis on time rather than quality		.838				
Approval of design documents on time		.702				
Issues raised by the community against the project			.876			
Impact of the surrounding weather			.820			
Effect of the governance policy			.769			
Physical and ecological conditions			.691			
Effect of macroeconomic conditions			.669			
Internal procurement challenges				.968		
Availability of right equipment				.783		
Effect of stringent insurance/warranty rules				.735		
Variations in original design of the project					.873	
Adequacy of designs/specifications and documentation					.744	
Level of commitment of consultant to the project					.610	
Possession of requisite skills by site managers						.973
Possession of technical skills by contractors						.736
Use of latest construction methods by contractors						.567
Eigenvalue	5.344	4.270	3.174	2.441	2.066	2.043
Percentage of variance explained	20.554	16.422	12.209	9.387	7.945	7.859
Cumulative percentage	20.554	36.976	49.184	58.572	66.517	74.376

Extraction method: Principal axis factoring.
Rotation method: Varimax with Kaiser normalisation.
Rotation converged in 6 iterations.
Kaiser-Meyer-Olkin measure of sampling adequacy = 0.812.
Bartlett's test of sphericity = 4989.157.
Significance = 0.000.

Content validity

Content validity indicates whether the instrument contains measurement items that cover all important aspects of a research question (Nunnally, 1978). Its evaluation is primarily a rational judgement process and does not involve application of statistical tools to establish its validity. In the current study, the content validity of the instrument measuring CSFs was achieved while designing the same. This was carried out through extensive literature review followed by securing opinions from experts comprising academics and practitioners through in-depth interviews. This has already been discussed in detail in an earlier section.

Confirmatory factor analysis (CFA)

For evaluating reliability, convergent validity and discriminant validity, CFA was performed on all 26 items identified at EFA stage in order to determine how well these items represent the constructs. Confirmatory factor analysis was carried out with the help of AMOS (version 20). The initial measurement model indicated poor fit to almost all the goodness of fit (GOF) indices. This necessitated item purification through CFA, thereby eliminating items based on theoretical reasons and empirical examination. To ensure that the data consistently conform to theory, items were deleted one at a time. The deletion of the items is based on their theoretical importance and practical significance, standardised regression weight, standardised residual covariance, and finally modification indices (Hair et al., 2006). At the end of item purification, eight items were removed from the construct, thereby leaving a total of 18 items for CSFs of development projects. The re-specified model fits better than the initial one which is demonstrated through the recommended fit indices. The GOF measures of the final measurement model are as follows: $\chi^2 = 237.169$, degrees of freedom (df) = 120, $p = 0.00$, $\chi^2/df = 1.976$, GFI = 0.868, AGFI = 0.812, NFI = 0.928, TLI = 0.952, CFI = 0.963, RMSEA = 0.075. As is evident from the

GOF measures, the measurement model fits reasonably well to the data on almost all major indices. The final measurement model is shown in Fig. 1. The model visually shows the loading (standardised regression weight) of each individual item on its respective construct. In addition, it also shows the correlation of each pair of constructs.

All six success factors with their respective items loaded under each factor are shown in Table 5. The table indicates standardised regression weight of the items and their respective squared correlation (R^2) values. All variables retained in the table are important given that the standardised regression weight exceeds the threshold value of 0.7 and R^2 value exceeds the threshold value of 0.5. R^2 values of the items have been shown in the second column of Table 5 while the standardised regression weights of the same loaded under each factor are mentioned below each factor provided in column 1 through 6. In addition, the right side of the diagonal of Table 5 includes the inter-factor correlation of all six constructs and their respective p-values.

It is found in Table 5 that some pairs of inter-factor correlation do not show any statistical significance. While investigating the possible reason behind this phenomenon, we found that the responses in the present study were provided by only one respondent, i.e. client, contractor or consultant for each individual project. The perception of these three types of respondents is likely to differ towards success variables, given the varying level of motivation of these stakeholders in the project environment. This might be the possible reason behind non-occurrence of any particular pattern of relationship amongst different factors, which may also be considered as one of the limitations of the present study. However, this does not render the study findings frivolous. Given the scenario of very few studies of this type undertaken in an African nation such as Kenya, the present study would certainly act as a trigger for researchers to carry out further research in this domain. The above limitation could be overcome by creating a mechanism through which the client, consultant and the contractor associated with a par-

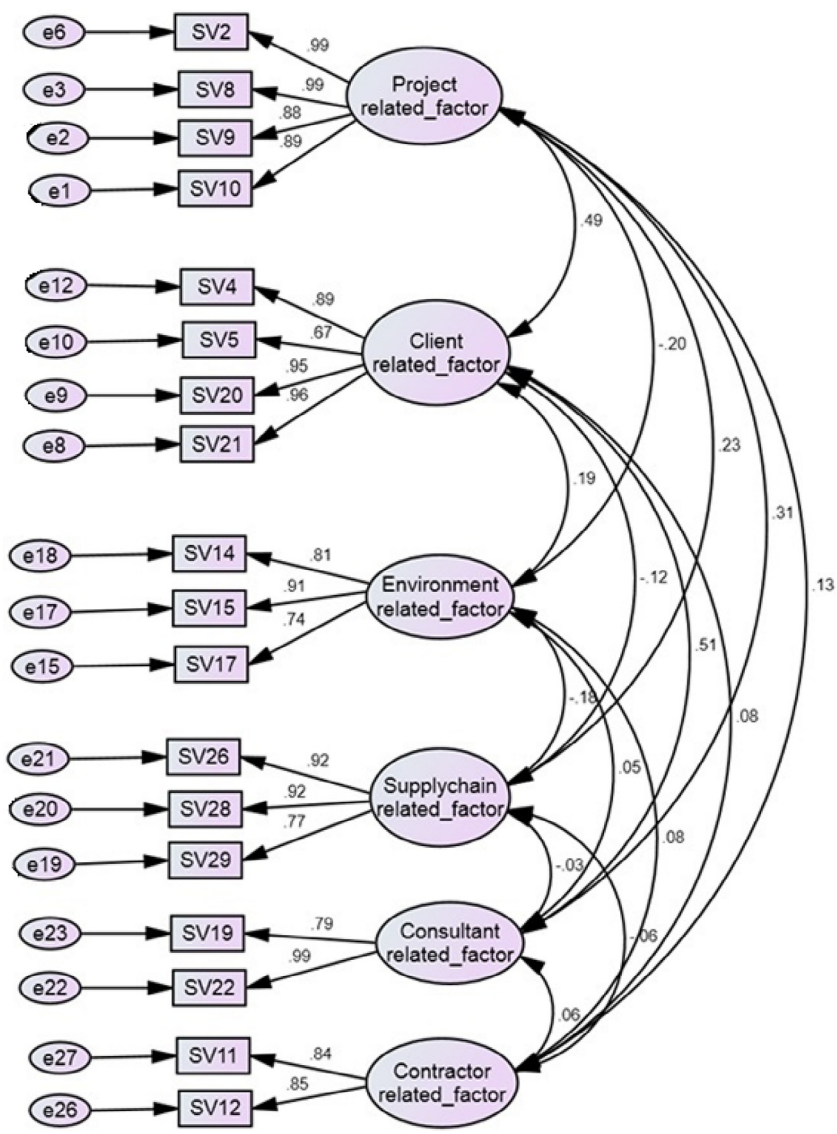

Figure 1 Final measurement model of the factors influencing the success of development projects.

Table 5 Loadings of success variables on success factors (Results of CFA).

Success factor	R2	(1)	(2)	(3)	(4)	(5)	(6)
Project related factor (1)		-	0.489[a] (***)	–0.202[a] (0.015)	0.232[a] (0.004)	0.307[a] (***)	0.132[a] (0.114)
SV2	0.987	0.99					
SV8	0.987	0.99					
SV9	0.775	0.88					
SV10	0.795	0.89					
Client related factor (2)			-	0.188[a] (0.025)	–0.120[a] (0.128)	0.512[a] (***)	0.076[a] (0.367)
SV4	0.795		0.892				
SV20	0.899		0.948				
SV21	0.923		0.961				
Environment related factor (3)				-	–0.182[a] (0.031)	0.051[a] (0.531)	0.075[a] (0.396)
SV14	0.661			0.813			
SV15	0.827			0.910			
SV17	0.553			0.744			
Supply chain related factor (4)					-	–0.028[a] (0.723)	–0.055[a] (0.517)
SV26	0.844				0.919		
SV28	0.855				0.925		
Consultant related factor (5)						-	0.057[a] (0.494)
SV19	0.619					0.787	
SV22	0.986					0.848	
Contractor related factor (6)							-
SV11	0.707						0.841
SV12	0.719						0.848

[a]Inter-factor correlation; ***$p < 0.001$.
SV2, SV4.....SV28 etc. indicate individual items (success variables) of project success. The corresponding statement of each item against the notation used in the above table is provided in Appendix A.

Table 6 Summary of reliability and convergent validity tests.

Construct	Number of items	Mean	Standard deviation	Cronbach's α coefficient	Construct reliability coefficient	Normed fit index (NFI)	Non-normed fit index (NNFI)
Project related factor	4	2.955	1.268	0.970	0.969	0.993	0.991
Client related factor	4	2.502	1.408	0.931	0.928	0.898	0.901
Environment related factor	3	3.173	1.206	0.861	0.864	0.986	0.992
Supply chain related factor	3	3.39	1.040	0.869	0.907	0.978	0.982
Consultant related factor	2	2.595	1.325	0.877	0.889	0.982	0.983
Contractor related factor	2	3.255	1.223	0.832	0.832	0.976	0.974

ticular project would be brought together by the interviewer for the purpose of eliciting their perception with regard to the success variables. The purpose is to motivate these three respondents to discuss among themselves the status of success variables influencing the performance of the said project and finally allow them to reach consensus on each success variable. This exercise would be repeated for all other projects as well. This would ensure balanced participation of the direct stakeholders and likely to result in improved pattern of responses.

Reliability

Once the measurement model is finalised, we include mean value of the items loaded under each factor and their corresponding estimate of standard deviation, which is reported in Table 6. As regards reliability, two estimates of reliability, Cronbach's alpha coefficient (Cronbach, 1951) and construct reliability coefficient (Hair et al., 2006) were computed. A scale is considered reliable if Cronbach's α coefficient is 0.7 or higher. Similarly if the value of construct reliability coefficient turns out to be 0.7 or higher, the scale is considered reliable. The estimate of construct reliability is considered a composite measure of reliability. The calculated values of the composite measure of reliability are very close to the values of Cronbach's α as reported in Table 6. It is observed that all coefficients are more than the threshold value 0.7 thereby indicating sound construct reliability of all constructs.

Convergent validity

Convergent validity requires that the indicator variables of a given construct share a high proportion of variance in

Table 7 Results of convergent and discriminant validity.

Construct	(1)	(2)	(3)	(4)	(5)	(6)
Project related factor (1)	0.942					
Client related factor (2)	0.489	0.875				
Environment related factor (3)	−0.202	0.188	0.824			
Supply chain related factor (4)	0.232	−0.120	−0.182	0.875		
Consultant related factor (5)	0.307	0.512	0.051	−0.028	0.895	
Contractor related factor (6)	0.132	0.076	0.075	−0.055	0.057	0.844
Average variance extracted	**0.888**	**0.766**	**0.68**	**0.766**	**0.802**	**.713**

The shaded (diagonal) elements are the square root of average variance extracted (AVE) and the off-diagonal elements represent correlations between constructs.

common. It has been evaluated by following three different approaches. The first method involves inspection of estimated factor loadings of items on constructs in the final CFA model (Anderson & Gerbing, 1988; Singh, Power, & Chuong, 2011). It is found that the standardised loading of all items is greater than 0.5 and statistically significant ($p < 0.001$). The values range from 0.669 to 0.99, which, in other words, indicates that a very high proportion of variance is captured by each individual item.

The second method involves assessment of convergent validity of each individual construct with the help of two GOF indices: normed fit index (NFI) and non-normed fit index (NNFI) (Ahire, Golhar, & Waller, 1996). These fit indices indicate the proportion of improvement of the overall fit of the specified measurement model relative to a null model. The above fit indices were obtained by testing each construct as a one-factor congeneric model (Joreskog, 1971). If a construct contained less than four items, model fit statistics could not be obtained. In this case, a two-factor model is developed and tested by adding the items of another construct. The items of another construct are added only to provide a common basis for comparison and to keep the items in sufficient number so that model fit statistics could be obtained. Similar kind of approach has been used by Li, Rao, Raghu-Nathan, and Raghu-Nathan (2005) to find out the convergent validity of a construct consisting of less than four items. For example, to find out the convergent validity of the construct namely environment related factor, its items and the items of project related factor were added into AMOS and a two-factor unconstrained model was developed after allowing these two constructs to co-vary between each other. The model was run in AMOS which gave rise to the fit statistics as shown in Table 6. In a similar fashion, the convergent validity of the remaining constructs with less than four items have individually been determined by adding the items of one construct with the items of project related factor construct. Table 6 shows that NFI range from 0.898 to 0.993 and NNFI from 0.901 to 0.992. These results of these values suggest strong convergent validity of each construct.

Finally convergent validity of six constructs was also assessed with the help of average variance extracted (AVE). The AVE indicates the average variance that a construct is able to extract from each measurement item that loads on it. In other words, this indicates the explanatory power of the constructs. The six constructs have AVE ranging from 0.68 to 0.888. This demonstrates that the variables of all six constructs share a high proportion of variance among them. An AVE of 0.5 or more of a construct indicates satisfactory level of convergent validity (Hair et al., 2006). All constructs have more than the threshold level of AVE, thus indicating very strong convergent validity. The last row of Table 7 below shows the values of AVE of each construct.

Discriminant validity

Discriminant validity was also assessed by following three different approaches. The first method involves investigation of correlation between each pair of constructs in the revised CFA model. It is found that the correlations are weak to moderate as shown in Table 7. If the correlations between constructs are well below 0.9, then there is very little possibility that a group of items loading significantly on one construct would also load on another construct (Kline, 2005). This suggests that the items are unidimensional.

The second method entails examining chi-square differences between all pairs of constructs. The two constructs would be considered distinct if the null hypothesis is rejected which states that the two constructs together form a single construct. A pair-wise comparison of constructs was carried out by comparing the model with correlation constrained to one with an unconstrained model. A difference between chi-square values (d.f. = 1) of the two models that is significant at $p < 0.05$ level indicates support for discriminant validity (Anderson & Gerbing, 1988; Joreskog, 1971; Singh et al., 2011). Table 8 reports the results of 15 pair-wise tests of discriminant validity for the constructs of CSFs of development projects. Table 8 reveals that except in two pairs, i.e. (1) project related factor and client related factor and (2) client related factor and consultant related factor, chi-square differences in all remaining 13 pairs of the constructs show significant differences. This indicates that most of the constructs are distinct and possess discriminant validity.

The third and final method involves comparison of AVE of each construct with the shared variance of each pair of constructs. The comparison is made with the square root of AVE of each construct with the correlation of each pair of constructs. This is shown in Table 7 above. The diagonal values indicate square root of AVE while the off-diagonal values indicate correlation of each pair of constructs. If the square root of AVE of each construct is more than the correlation of each pair of constructs, then this implies that these constructs account for a greater proportion of variance of the

Table 8 Assessment of discriminant validity.

Construct	1	2	3	4	5	6
Project related factor (1)	-					
Client related factor (2)	0.422 (p = 0.516)	-				
Environment related factor (3)	80.496 (p < .001)	26.477 (p < .001)	-			
Supply chain related factor (4)	30.832 (p < .001)	61.552 (p < .001)	30.501 (p < .001)	-		
Consultant related factor (5)	13.503 (p < .001)	0.622 (p = 0.430)	53.657 (p < .001)	55.184 (p < .001)	-	
Contractor related factor (6)	29.148 (p < .001)	30.026 (p < .001)	49.0 (p < .001)	73.99 (p < .001)	36.849 (p < .001)	-

items that are assigned to them (Fornell & Larcker, 1981). The table reveals that all the values are more than the correlation of each pair of constructs which indicates strong discriminant validity. If a comparison is made between Table 7 and Table 8 in respect of correlation of each pair of constructs and chi-square differences of each pair of constructs, it is found that the two pairs (client related factor and consultant related factor, project related factor and client related factor) which have high values of correlation (0.512 and 0.489), have very low and insignificant chi-square differences. However, since the correlation of both pairs of constructs is much less than 0.9, it can be safely inferred that the items loading significantly on one construct are not loading on another one. Thus we can reasonably conclude that all the constructs possess discriminant validity.

Discussion and theoretical implications

The CSFs determined through EFA of success variables of development projects and subsequently validated through CFA enabled us to develop and validate a measurement scale for evaluating success of development projects. The study demonstrates that the success factors of a development project can be described in terms of *project related factor, client related factor, external environment related factor*, *supply chain related factor*, *consultant related factor* and *contractor related factor* and the corresponding variables of project success. This may be considered as the major contribution of the present work. The naming of the factors is based on individual items loading significantly on a single factor without any cross-loading on another factor. In addition, the content of each individual item loading on a particular factor was carefully looked into before deciding on the naming of all six factors.

Project related factor captures the unique characteristic features of a project in terms of its nature, complexity, size, necessity of planning, scheduling, and control, which are not covered by other factors. These characteristic features collectively determine the construction process and eventually determine the performance of a project. Client related factor represents the client's level of experience in handling similar kind of projects, ability to get the design documents approved on time, ability to arrange funds, emphasis on time, quality of materials, processes and so on. External environment is considered to be the combination of ecological, political, economic, socio-cultural and technological (EPEST) environment in which a project is executed (Litsikakis, 2009). Accordingly external environment related factor accounts for these relevant elements. Supply chain related factor tries to capture the availability of project resources including man, machine and materials in the right time and right place to ensure success of a project. Consultant related factor covers the availability of drawings, design specifications, documentations for use by contractors, and extent of variation in original design of the project. Finally contractor related factor captures the experience and skill requirements of contractors and site managers who would be able to undertake construction work in accordance with the prescribed technical and managerial specifications. Thus the above six factors covering the entire gamut of activities of a development project constitute the backbone of its success.

Project planners have to grapple with numerous variables of project success to adhere to the performance benchmark of development projects in respect of time, cost, quality, safety, site disputes and environmental impact. The findings of the present study have enabled numerous variables of project success to be grouped under six broad factors. These success factors are considered as enablers or facilitators or HOWs of project success. These HOWs, also referred to as the backbone of project success, finally enable a development project to realise its performance objectives in terms of *time, cost, quality, safety, site disputes and environmental impact*. These six dimensions of performance measures could be considered as the WHATs of development projects. The objectives on these WHATs of development projects could only be achieved, when the HOWs, i.e. the success factors developed in the present study are suitably addressed. This may be considered as the theoretical underpinning of the present work.

Conclusion and managerial implications

To sum up, the present work has carried out the study in two phases. The first phase involves identification of six CSFs of

a development project with the help of EFA, while the second phase involves validation of those CSFs identified in the first phase through application of relevant statistical tests. Out of the six CSFs, *client related, consultant related* and *contractor related factors* are stakeholder based whereas project related factor is based on the characteristic features of a project. *Supply chain related factor* is based on sourcing and delivery of construction resources and *external environment related factor* addresses all environmental issues that affect project success.

The development and validation of the above scale would enable practitioners to get an idea about the success factors of a development project. The managers can directly utilise the scale in evaluating the ground realities of the enabling factors of a development project. Based on the status of a development project on its different success factors, project managers can make an optimal and judicious allocation of resources to those factors which would eventually lead to satisfactory performance of the project. The scale would enable the managers to identify diverse goals and motivation of direct stakeholders including clients, consultants, and contractors associated with the project and also the indirect stakeholders encompassing the surrounding community and the local government. Accordingly, the managers would be able to make a holistic decision pertaining to the success of a project which would result in reconciling the somewhat conflicting interests of different stakeholders. The scale would also allow the managers to address the unique requirements of a specific project, i.e. educational, healthcare, industrial estate and agricultural market project, undertaken in a particular geographical region depending on the status of development of that region and the varied needs of different stakeholders associated with that project.

The study is not without limitations. Given that the data for the development of the measurement instrument was gathered in one province in Kenya, there is an important need to undertake cross-cultural validation of the instrument using data gathered from other provinces of Kenya and other developing countries as well in order to enhance the generalisation of items. Further the influence of CSFs on KPIs of development projects has not been empirically investigated in the present study. These could be taken up as future areas of research.

Appendix A

Questionnaire

Section A: Project and respondent information

1. Contract at: .....Constituency.....
2. Type of project: (1) Educational (2) Health (3) Industrial estate (4) Agricultural market
3. Your position on the project: (1) Client (2) Consultant (3) Contractor
4. Please indicate how long you have been associated with construction projects?
   (1) Below 3 years (2) 3 – 6 years (3) Over 6 years
5. Please indicate how long you have been involved in the construction of CDF projects?
   (1) Below 3 years (2) 3 – 6 years (3) Over 6 years
6. Please indicate the overall value of CDF construction projects that you have worked on in the last 3 years?
   (1) Over Ksh. 15 Millions (£175,000) (2) Ksh. 10 Million to Ksh.15 Millions (£115,000-£175,000) (3) Up to Ksh. 10 Million s (£115,000)
7. Please indicate the procurement approach employed for this project.
   (1) Design/Bid/Build (2) Design/Build (3) Competitive bid (4) Negotiated general contract (5) Build–Own–Operate–Transfer (6) Turnkey contract.

Section B

Factors influencing the success of CDF construction projects

The success of CDF construction projects depends on several variables of project success. These variables include different aspects covering uniqueness of a project, external environment surrounding the project, stakeholders related variables etc. Based on your association with the current project, you are kindly requested to indicate your level of agreement on the following statements in a 5-point Likert scale as explained below.

(1) Strongly disagree (2) Disagree (3) Indifferent (4) Agree (5) Strongly Agree

Success Variables	1	2	3	4	5
#SV1: The location and site conditions did not affect the construction of this project					
SV2: Design complexity of this project (type, size, nature and number of floors) has influenced the project cost and time					
#SV3: Project planning, Scheduling and control were adequately done on this project					
SV4: The client secured necessary funds for this project and hence there were no delays in material acquisition and payments to contractor					
SV5: The client got the design documents approved on time for this project.					
#SV6: The client had adequate experience on similar kind of projects					
#SV7: Information sharing and collaboration among project participants were adequate in the current project					
SV8: The construction work adhered to the requisite quality standards in the current project					
SV9: Continuous monitoring of actual expenditure and time and their comparison with the budget and schedule was done regularly on this project					
SV10: There was a formal organisation structure for dispute resolution within the project organisation					
SV11: Site managers possessed requisite skills necessary for the kind of projects executed					
SV12: The contractor had adequate technical skills and experience on similar type of projects					
#SV13: The contractor used latest construction methods in the current project					
SV14: The community did not raise any social, political or cultural issues against construction of the current project					
SV15: The project execution was adversely affected by the surrounding weather and climatic conditions					
#SV16: Macroeconomic conditions (such as interest rates, inflation) did not significantly affect the execution of this project					
SV17: The current project was affected by the governance policy of the relevant government agencies which has affected its success					
#SV18: The consultant was highly committed to ensuring construction work according to design specifications in this project					
SV19: There were adequate drawings, design specifications and documentation made available by consultant for end use of contractors					
SV20: The client emphasised on completing the current project very fast without any reference to quality in this project					
SV21: The client tended to purchase construction materials at cheaper rate which led to the dilution of other project objectives					
SV22: No variations in original design took place in the current project during construction phase					
*SV23: The level of technological sophistication considered in the current project was satisfactory					
*SV24: There was no incidence of disagreement resulting from industrial relations prevailing at the time of project implementation					
#SV25: The physical and ecological conditions surrounding the current project were favourable to project execution					
SV26: There were very few internal procurement challenges in the current project					
*SV27: The client's decisions were timely and objective in this project					
SV28: Right equipment was available in the construction site of this project					
SV29: The current project faced stringent insurance and warranty contractual requirements					
*SV30: Working capital was adequate in this project					

*These items were dropped after exploratory factor analysis.
#These items were dropped after confirmatory factor analysis.

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