

# MANAGING END-USERS' SATISFACTION DURING CAPITAL DEVELOPMENTS BY ADOPTING VALUE ENGINEERING AS PROJECT MANAGEMENT TOOL

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The burden of translating the end-users' project briefs into the development of functional support facilities that enhance the performance of the core functions of the organisation require the use of dynamic modern project management methods. In the course of developing capital assets, it is inevitable that original designs are modified, some sections redesigned while some facilities or components are out-rightly removed due to budgetary, time or other constraints. It is imperative, therefore, to incorporate the end-users into the development process, so that managing changes, trade-offs, commissioning and project close-outs will be smooth and enhance the achievement of customers' satisfaction. Customers' satisfaction, in the context of this paper, is viewed in the light of how effective and functional the completed facilities enhance the performance of the core functions of the organisation. The case study method of qualitative research was used in this research. The research data were collected through semi-structured questionnaire complemented with interviews. The thematic method was used to analyse the interview data. The client and end-users provided information on the level of their satisfaction with the performance of the capital development unit as well as identified some areas of concern that require improvement. Recommendations made include the use of Value Engineering as a project management tool; considered suitable for the management of design or scope changes and 'trade-offs', in order to improve on the level of customers' satisfaction.

Keywords: End-users, Managing changes, Trade-offs, Customers' satisfaction, Value Engineering.

## INTRODUCTION

Translating end-users' project briefs into the development of functional support facilities that enhances the performance of the core functions of the organisation requires the dynamic use of modern project management methods as well as applying the hard and soft skills of project management. Critical areas in this exercise include developing functional but flexible execution documents, adopting progressive procurement method, incorporating the end-users into the development process, managing changes, trade-offs, project commissioning and close-outs in order to achieve customers' satisfaction. Customers' satisfaction, in this context, is viewed in the light of how effective and functional the developed facilities enhance the performance of the core functions of the organization. The efforts of the Capital Project Development Unit (CPDU), notwithstanding, will not yield the desired results

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if their output does not serve as a vehicle that will enable the operators of the core functions of the organization to carry out their mandates smoothly in order to achieve the goals of the organisation.

In the course of developing capital assets, it is eminent that the original designs are modified, some sections redesigned while some facilities or components are outrightly removed due to budgetary, time or other constraints. In order to improve on customers' satisfaction, it is important that the customer (end-user) be adequately informed, educated and incorporated into the process of managing the proposed changes. The principle of consensus building embedded in Value Engineering (VE) method (Male *et al.*, 2007) has made the tool most suitable for integrating all stakeholders while resolving problem at any point in the project execution process, so that the end-users can easily accept and use the completed facility (Pemsel *et al.*, 2010).

This paper is part of a wider case study on the Facilities Management (FM) operation in a higher educational institution in Sub-Sahara Africa and advocates the adoption of the principles of Value Engineering (VE) as a project management tool for managing changes during project execution that will facilitate improved customers' satisfaction. Due to ethical considerations, generic names will be used to describe the institution, operational units and officials involved in this research.

## **THEORETICAL BACKGROUND**

The literature reviewed in this section centred on end-users' involvements, performance assessment and value engineering in relation to end-users' satisfaction with the completed physical asset developed for the performance of the core function of the organization.

### **End-users' involvement**

The development of infrastructure for teaching and research requires long term planning. The resulting edifice should be robust, solid and yet flexible so that they can be adaptable for future changes; this infrastructure should be able to serve many generations of end-users. It is important therefore, to involve the current end-users in all stages of the development (for new, rehabilitation or modification projects). Pemsel *et al.* (2010) observes that end-users' satisfaction is the product of the outcome of the project and the way the result is achieved. Thus the, active not passive, involvement of the end-users is the ideal, otherwise the end-users can become hostage, where their opinions do not really matter (Mumford and Sackman, 1975). Two broad areas of concern in infrastructure development that can affect customer satisfaction are management of design or scope changes and orientation or induction of the end-users into the developed edifice (Yeo, 2008). The problems arising from design or scope change, modification of specification and decision on appropriate trade-offs can be managed through the effective and contextual use of the principle of Value Engineering (VE). Through the process of consensus building, the most functional and cost effective alternatives are agreed upon and executed; thus allowing all stakeholders to move progressively from existing situation to the "negotiated representation of the desired situation" (Thiry, 2001, p. 75). Other salient approaches include conducting study tours and workshops, where end-users are exposed to different scenarios of good and not so good projects that are similar to their context (Pemsel *et al.*, 2009). Though, project commissioning and close-outs are scheduled into capital development, when the project is running behind schedule, these laudable

stages are either omitted or hurriedly executed. Nevertheless, the most effective way of enabling the end-users to settle into the new edifice comfortably is to progressively induct or orient them into the fixtures, features and facilities in the new edifice in specific or general orientation exercise (Dvir, 2005; Lowry, 2002). Primarily, the specific orientation or capacity building exercise can be achieved by incorporating the end-users into the installation, testing and commissioning stages; beside familiarising the end-users with the features, they are equally being empowered to operate and manage the features and only resort to the experts in case of major repairs (Berg, 1993; Tay and Ooi, 2001; Lowry, 2002; Potter and Brough, 2004; Lai, 2010). The general orientation should be conducted when the project is complete with all the fittings, fixtures and features in place. This exercise is aimed at educating the end-users on how to use the facilities to execute the core functions of the organisation as well as know what to do during emergency period (Wong and Fong, 2005). This concluding phase, like the 'icing on cake', encapsulates how well the project briefing has been translated into the developed edifice for the performance of the core functions that will facilitate the achievement of the set goals of the institution. Effective end-users' involvement during project execution enables them to 'own' the project and be proud of the resulting edifice including the imperfections (Pemsel *et al*, 2010).

### **Assessment of performance**

The term, 'Performance measurement', conveys different meanings to different people, agency or units of the same organization. Several management tools have been developed to measure the contribution of the organ providing the support facilities to the effective performance of the core function of the organization and the improvements in the level of customers' satisfaction (Amaratunga and Baldry, 2002; Amaratunga and Baldry, 2003; Pitt and Tucker, 2008).

A common performance measurement tool known as 'balance scorecard', has been described as "the dials in an airplane cockpit: it gives managers complex information at a glance" (Kaplan and Norton 1992, p. 71). It can be used to measure the performance of an organization or unit from four interrelated perspectives by addressing four relevant questions. Adapting the balance scorecard concept of Kaplan and Norton (1992), the four perspectives and related questions can be rearranged as follows:

Financial Perspective: How do we look to shareholders?

Customer Perspective: How do customers see us?

Internal Business Perspective: What must we excel at?

Innovation and Learning Perspective: Can we continue to improve and create value?

The first two perspectives of the balance scorecard could serve as 'balance sheet' for the operators responsible for the development of capital assets to measure the level of satisfaction of their client and end-users, while the last two perspectives and associated questions should serve as 'internal audit' check to know where and how to improve. Furthermore, the Financial Perspective can measure the client's satisfaction on the quality of asset developed weighed against the money invested. On the other hand, the "Customer Perspective" and its accompanying question: "How do customer see us?" can be used to measure the end-users' satisfaction on how functional the facilities, fixture and fittings in the new asset are facilitating their ability to perform the core functions of the organization; especially in terms of "time, quality,

performance, service, and cost” (Kaplan and Norton, 1992, p.73). These contribute to creating value and satisfaction for the end-users.

The operational concerns of the end-user in the completed capital asset include the functional flow of the workplace interface (Carder, 1995, 1997), the quality of the fittings and fixtures and the ease of operation as well as functional escape routes in case of emergencies (Wong and Fong, 2005). The end-users’ satisfaction can be measured through realistic evaluation of the quality, functionality and how the completed asset enhances the ability of the end-users in the performance of the core functions of the organization.

## **Value Engineering (VE)**

Some practical description and application of VE include but is not limited to the following:

VE is an innovative thinking methodology that enables creative decision making through *good group* interaction skills (Thiry, 2001; Abidin and Pasquire, 2007). The process enables the group to systematically define common objectives, functionally prioritise what needs to be done, then creatively identify how best to achieve the desired result (McGeorge and Palmer, 2005; Male *et al*, 2007).

The principle can be used to resolve problems in any aspect of the built environment industry, manufacturing, health, hospitality and other engineering sectors. It can be used in the construction method, process, product, service system, human resources and management style, (Cheah and Ting, 2005, Bowen *et al*, 2011; Male *et al*, 2007). The result exceeds the benefits of the ‘iron triangle’ of cost, time and quality to include, effective teamwork and improved communication among stakeholders (Fong, 1998; Atkinson, 1999; Cheah and Ting, 2005; Toor and Ogulana, 2010).

The practice of VE in the construction industry is well established in the United State of America, UK and VE application was introduced into Japan, Italy, Australia and Canada in the 1970s (Cheah and Ting, 2005). It is “not widely understood and practiced by engineers in the SA (South African) construction industry” (Bowen *et al*, 2010, p. 293) and in the Engineering and Built Environment industry in many other African countries (Bowen *et al*, 2009). A VE session may take the form of ‘seminar or workshop that should embrace critical stakeholders of the whole project or those directly connected with the section, equipment, component, fittings, fixture or feature to be reviewed. As a rule, it is recommended that someone not connected or knowledgeable in the profession should be included as participant in the workshop because, the contribution of such neutral person has added value in reshaping the thinking of other participants. Typical VE seminar or workshops follow a ‘five-step’ principle with each step building on the information and conclusions reached in the previous step. The steps include:

*Information phase:* This is concerned with the identification and collection of relevant information about the project or problem to be solved;

*Functional phase:* Through functional analysis of the information, set in order of priority, the cause and effect relationship is determined that enables the project team members to know where to concentrate energy and project resources to meet the customers’ requirements or address the problem that was the subject of the seminar or workshop;

*Creative phase:* This allows participants the opportunity to 'think outside the box' for alternative solutions to the current problem by building on the achievements of the previous step;

*Evaluation phase:* This requires systematic synthesis of each alternative weighed against the overall (cost, functionality, maintainability, flexibility and other factors) benefit throughout the life-cycle of the project;

*Presentation phase:* Here the chosen alternative or alternatives that most appropriately addresses the problem is or are developed as a proposal with responsibility matrix and time frame. The presentation should include audit time line to evaluate the success or failure of the proposal (Zhang *et al*, 2008; Formentini and Romano, 2011).

When the information gathered in the 'information phase' are adequately processed through the instruments of functional analysis, creative thinking and evaluation, the decisions presented in the proposal phase will not be seen as 'imposed' but as having been achieved through collective decision (Cheah and Ting, 2005; Male *et al*, 2007; Pemsel *et al*, 2010).

The majority of the literature reviewed has described VE; the procedure, its use in managing the construction project as well as a demonstration of its limited use in the built environment industry in different parts of the world. However, there is yet no evidence of the use of VE in managing design or scope changes or project trade-offs with the active participation of the end-users. This paper, therefore, seek to advocate the use of VE to manage end-users participation in critical decision making during construction processes.

## **RESEARCH METHODOLOGY**

The case study method of qualitative research was chosen as the most appropriate methodology suitable for addressing the research questions and achieves the research objectives. The case study method allows the sourcing of in-depth and accurate information (Lateef, *et al*, 2010) about a particular situation or phenomenon within its context (Green and Thorogood, 2009); this method allows the researcher to relate with the operatives directly involved in the subject matter being investigated. The research data were obtained through the administration of 'semi-structured' questionnaire complemented with interviews. The participants were drawn from the university administration (client), academics (end-users) and the management staff of the Capital Projects Development Unit (CPD), known as the 'operators'. The information obtained from the operators was corroborated with responses obtained from the client and end-users in order to clarify issues and validate the information obtained.

Though there are no strict rules in literature specifying the sample size in a qualitative research, other than the sample must be truly representative (Green and Thorogood, 2009). However, by including experts in the research area can reduce the number of participants needed in a study (Jette, *et al*, 2003). The majority of the academics representatives were from the Faculty of Engineering and Built Environment; "This ensures ...optimal quality data and minimum dross" (Morse, *et al*, 2002, p. 18). The principles of member check (Amaratunga *et al*, 2002), where research information and analysis are recycled back to key informants for confirmation of reported speech and thick description which involves detailed description of the context in which the enquiry took place (Gilchrist, 1992) were applied, to guarantee the validity and reliability of the research information. Further, information from different sources

were compared and sieved to harness the most useful information that answered the research questions and objectives.

## **THE CASE STUDY, FINDINGS AND RESULTS**

The Capital Project Development Unit (CPD), of the university under reference, is charged with the responsibilities of translating project briefs of the respective end-users into fully developed asset suitable for the execution of the core functions of teaching and research. The unit is managed by two full-time professional staff, while others are engaged on project basis. According to a senior officer of the institution, the unit (CPD) adopts the principle of “Top-down middle-up” while considering projects to be executed within each faculty or unit; this system allows for contribution from staff members at the middle level of leadership in the university.

The Director of CPD disclosed, during the interview, that there are two levels of communication structure for consideration and execution of capital projects. They are, the ‘University Planning and Development Committee’ (UPDC) and the ‘Technical Execution Team’ (TET). The CPD motivates all capital development proposals to the UPDC for detailed consideration. Projects that meet the requirements are given temporary approval and the funding prospectus forwarded to the university’s advancement unit for fund raising. According to the Director, “when the fund is secured substantially and the university is willing to write off the shortfall”, UPDC communicates approval to the requesting faculty or unit through CPD. Relevant consultants are commissioned to produce the detailed design and contract documents.

The ‘Technical Execution Team’ (TET) is made up of CPD, project manager, consultants, contractor, the client, end-users and other project personnel as the occasion demands. An interesting feature at this level is that the number of representatives from the immediate beneficiaries (end-users) of the project is increased to allow for more objective contribution and familiarization with the project. To underscore the importance of the active participation of the end-users, according to the Director, “the client and end-users attends the site meetings, visits the project site and makes objective contributions through the TET”. The Dean and one of the Head of Schools occupying the new faculty building confirmed that they usually attend the periodic site meetings. However, they noted that when dealing with design changes, they are not adequately consulted or educated; thus some of the changes undermine the effective performance of their core functions.

### **Project closeout**

In an effort aimed at developing better relationships with the end-users, helping them to settle into their property with relative ease and facilitating its operation and maintenance, the Director opined that strong emphasis is being laid on proper project closeout sessions. He said “at the end of each project, a complete set of the ‘As-Built Documents’ (ABD) is handed over to the representatives of the end-users and the maintenance unit respectively”. To buttress the importance on producing authentic ABD, the Director emphasised that a clause in the letter engaging all consultants read thus: “The final 10% (ten percent) of the full fee payable will only become processed for payment on submission of a project completion report and “as built” drawings, acceptable to University authorized representative”. (Ogbeifun, 2011, p. 85). These documents are produced in both hard and electronic copies.

However, some of the end-users of the new faculty building complained that the close-out or commissioning processes need improvements. Some of their complaints include the fact that:

“...they have difficulties relating with some of the features in the drawings and what they are meant to serve; thus hindering the effective performance of their core functions of teaching and research. The Heating, Ventilation and Air-conditioning (HVAC) system in some of the lecture halls are not functioning, within a short period after handing over the project to the faculty. The maintenance unit and the nominated contractors have had difficulties resolving the problem and the capital development unit is yet to find suitable solution.”

Further, the Dean observed that, though volumes of drawings are delivered at the handing over stage, they have difficulties relating some of the drawings with the relevant sections of the project. These observations are reflected in the assessment of the performance of CPD by the academics connected with the capital project in this research.

### Assessment of performance

The performance of CPD was measured in a 5 point linker scale; where 1= not satisfied and 5= very satisfied. The client and the end-users expressed their levels of satisfaction and this was compared with the self-assessment of CPD. Each respondent provided additional explanations to substantiate their assessments, where necessary. Table 4.1 shows the composition of the respondent, while Table 4.2 show the average score in the assessments for CPD and Fig. 4.1 shows the graphical representation of the assessment.

Table 4.1 Respondents to the Question on Performance Assessment.

Class	Sample size	No of response	Percentage %
CPD	1	1	100
Administration	1	1	100
End-users (academics)	8	7	87.5

(Source: Ogbeifun, 2011)

Table 4.2 Average Score of the Assessment of the Performance of CPD

Respondent	KPI	Level of consultation	Quality of internal management & reporting	Quality of project delivery	Delivering project within budget	Delivering project on time
CPD	-	2	2	3	3.5	3
Admin.	-	4	4.5	4	4	4
End-users	-	2.13	1.75	2.38	4.5	2

(Source: Ogbeifun, 2011)

The administration and the academics expressed their satisfaction with the performance of CPD in terms of delivering projects within cost limits and they rated the performance of the unit higher than CPD rated its own performance. The administration, on the one hand, was quite satisfied with the performance of CPD and rated them high in every item. However, the academics (end-users), on the other hand, expressed reservations on the level of consultation with clients during the period of

project execution, especially as this affects the management of changes and trade-offs. Other areas where the division needs improvements include: quality of internal project management and reporting; quality of project delivery; and delivering projects within time schedule. The Director of CPD accepted these observations “as fair representation” of their performance in the present circumstances (Ogbeifun, 2011). Noting that each capital development project is dynamic, the lessons learnt in one project form a vital component in the learning curve that will assist in improving performance in the execution of subsequent projects.

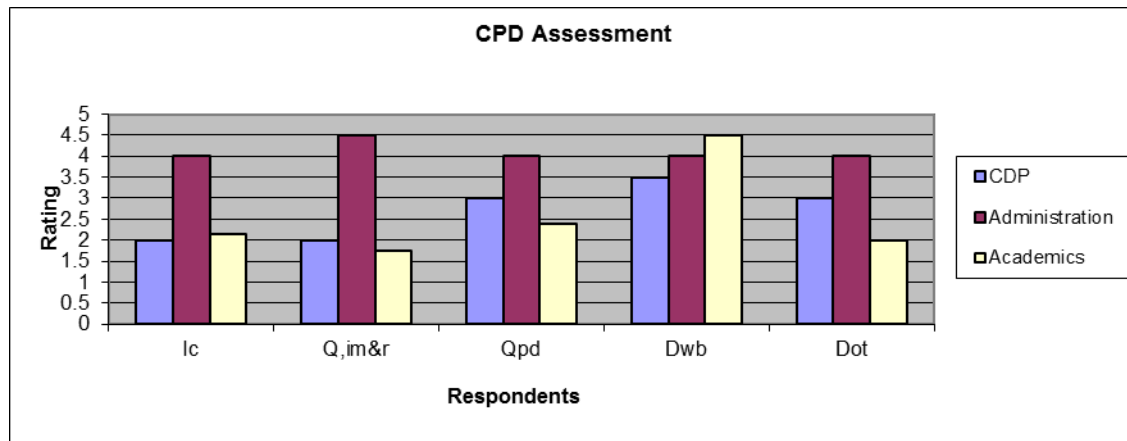


Fig. 4.1 Graphical Representation of Assessment of the Performance of CPD

(Source, Ogbeifun, 2011)

## DISCUSSION

Though CPD may have suitable project execution structure and adopts dynamic modern project procurement instruments, they have limited number of (two) full-time professional project personnel. Further, the objective of integrating the end-users in the project development processes is to ensure that the developed infrastructure is suitable for the performance of the core functions that will facilitate the achievement of the goals of the university. The performance assessment results identified the key areas that demonstrate how the CDP’s efforts are yet to effectively satisfy the end-users. The active involvement of stakeholders in capital developments follows best practice, where “line function” departments work closely with project personnel from the earliest part of the project to completion phases (Heywood and Smith, 2006). Representatives of the stakeholders that participated at the planning stage should translate into the execution governance for effective implementation (Pemsel *et al*, 2010).The Dean and some of the Head of School of the faculty building actively participated through the construction processes.

The implications of executing project within budget and the project is also associated with negative observations (table 4.2) suggests that some basic project management systems (such as managing change, trade-offs) were not properly followed (Anbari, 2003). In this regard, adapting the VE method, project managers and the relevant stakeholders resort to roundtable talks to agree on essential ‘trade-offs’ that will not compromise the strategic importance of the project (Cheah and Ting, 2005; Thiry,



2001; Pemsel *et al*, 2010). Through the process of consensus building, the most suitable alternatives are mutually agreed on (Thiry, 2001; Male *et al*, 2007). The low assessment rates of the performance of CPD evidently show the dissatisfaction of the end-users irrespective of the fact that the unit may be working with modern project procurement instrument that is designed to improve on end-users satisfaction.

## **CONCLUSIONS**

Though CPD has made appreciable progress in translating project briefs into the development of functional capital asset, especially integrating the end-users in all the stages, nevertheless, the end-users' assessment of their level of satisfaction of the completed asset is below average (less than 3) (Thiry, 2001; Pemsel *et al*, 2009). These may be precipitated by the lean full time professional project personnel while others are engaged on project basis; this creates discontinuity in the transfer of knowledge between capital projects. The management of multiple capital projects simultaneously can overstretch the capabilities of two full-time professional staff. Though the end-users have been incorporated into the project development processes, their complaints and assessment of the performance of CDP shows that the end-users have been hostages, where their opinions do not really matter (Mumford and Sackman, 1975). The positive effects of the active involvement of end-users include their ability to 'own' the project and identify with the resulting edifice including the imperfections (Pemsel *et al*, 2010). Here, the CDP requires the mastery in the use of hard and soft project management skills in order to avoid the negative comments of the end-users as shown in the project close-out section and assessment of performance.

Since it is not feasible to develop the physical asset that was envisioned during the project briefing without changes, it is important that CDP should effectively manage the change processes in order to improve on end-users' satisfaction. As shown in this research, the major areas of dissatisfaction to the end-user had to do with effective communication, management of change and transferring the final project to the end-users. The inherent problems in these processes can be managed through the effective and contextual use of the principle of VE (Cheah and Ting, 2005; McGeorge and Palmer, 2005; Formentini and Romano, 2011). Through the process, dynamic consensus is built to resolve emerging problems before they escalate, thus the most functional and cost effective alternatives are agreed upon and executed; allowing all stakeholders to move progressively from existing situation to the "negotiated representation of the desired situation" (Thiry, 2001, p. 75). Thereafter, the level of disaffections associated with completed projects will be reduced.

## **FURTHER RESEARCH**

In order to improve on the level of consultation and communication with end-users during project execution, as well as improve on the quality of project management and reporting that will facilitate the delivery of project on schedule, the researchers posit that further research be conducted to determine: **The effects of 'lean' in-house (full-time) professional staff on the quality of capital project delivery and the level of satisfaction of the end-users.** This is to test if increase in the quantity of in-house professional staff will have positive impact on the quality of project delivery.

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