Stakeholder Perspectives on the Use of Satisfaction Metrics in Large Engineering Projects

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Abstract

This paper examines stakeholder perspectives on the use of satisfaction metrics in large engineering projects and asks whether there is a significant difference in the perception of the stakeholders on the use of satisfaction metrics. The rationale for the examination stems from the view by scholars that difficulty experienced by project managers on projects is as a result of the different perception of project performance criteria within the stakeholder group. The study makes use of existing literature in identifying the satisfaction metrics used by stakeholders on construction projects. A mixed method research approach incorporating both objective and subjective paradigms was used in the study to collect empirical data from stakeholders working on four large construction sites being procured by a South African State Owned Company (SOC). The data was collected using a structured questionnaire and focused group interviews. The study established that there are significant differences in the views of participants on important satisfaction metrics. The level of use of this form of success criteria was found to be more important to the client followed by the consultants – engineers and architects, while the project management team perceived it as being of less importance. The paper recommends that clients of large engineering projects should put in place strategies that will bring about explicit communication between the different stakeholders and an avenue for softening the boundary relationships that may exist between them. The research conducted is restricted to one SOC in South Africa and its four sites. Non-disclosure by the SOC of the performance of the projects under construction also brought about difficulties. Therefore, a future research, which would explore the validity of these research findings with another comparable SOC project, is recommended.

Keywords: Large engineering projects, perception, project success and satisfaction.

Introduction

The construction industry is project-based and no two projects are exactly the same. Projects differ in terms of requirements, complexities and are surrounded with uncertainties which make it difficult to manage and satisfy stakeholders (Loosemore, 2006). Projects require planning and efficient management of its stakeholders to be successful, and satisfaction of stakeholders' need is key to achieving desired outcome (Bourne, 2006). Traditionally, projects' success was tied to the three criteria of meeting the cost, schedule and quality of projects. In construction today, successful projects cannot only be viewed from the angle of meeting the three criteria but also in meeting stakeholders' satisfaction.

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Though, stakeholder satisfaction depends on information concerning the three success criteria combined with accuracy and reliability of the data and information (Nguyen et al., 2009).

To meet these requirements, project organisations are becoming more sophisticated and several approaches have been instituted to deliver construction projects on schedule, cost and meet the desired quality. However, in spite of these developments all types of projects still experience high degree of failure which constitutes a dent on the reputations of project stakeholders (Bourne, 2006). It is however not known whether this failure is linked to how a stakeholder views satisfaction on projects which is subjective and their use of objective measures of satisfaction. What makes the concept of project success difficult and complicated in practice is because stakeholders have conflicting interests and goals (Hillman and Klein, 2001), which according to Frödell *et al.* (2008) results in different perceptions of success and in the different ways of measuring success.

This paper thus examines the perception of project stakeholders on the use of satisfaction metrics to measure project success on four large infrastructure projects procured by a State Owned Company (SOC) in South Africa. It also examines whether there are significant differences in their perception of stakeholders' on the performance metrics used. The rationale for this study is hinged on the fact that project success or failure is measured based on how well it meets the expectations of the stakeholder and their perceived value of the project. However, over the decades the construction industry has been singled out to have a poor record of satisfying stakeholders' owing to its fragmented nature (Egan, 1998; Loosemore, 2006). Many of these problems stem from inadequate engagement of stakeholders, lack of clarity on measures of stakeholder management, poor communication among stakeholders and the challenges of identifying "invisible" stakeholder (Yang et al., 2009). This study therefore, argues that identifying common metrics for measuring satisfaction will provide knowledge that would aid the delivery of projects that gratifies all stakeholders and advance the need to soften the boundary relationship that may exist between stakeholders so as to achieve successful delivery of construction projects.

Research Proposition and Objective

The main proposition for this study was that project stakeholders' will have different perception of project satisfaction metrics which can be influenced by identifying and prioritising the metrics. In order to test this proposition, the objective of this paper is to identify major metrics that will consist of both subjective and objective success metrics which can help in drawing more discerning conclusions about a project's success. The study therefore has the potential to offer a means of identifying metrics relevant to success at the beginning of projects so that stakeholders can plan ahead.

Overview of Stakeholder Satisfaction

Identifying Stakeholders

In order to satisfy stakeholders, it is essential to identify who the stakeholders are on a project, what are their interests and develop means of meeting their expectations (Nguyen et al., 2009). A stakeholder can be defined as an individual or group of individuals that can heavily influence the success or failure of a project. These categories of people, in turn, have certain expectations from the project, and examining the extent to which these expectations are currently being satisfied in a balanced fashion provides a valuable metric of project success (Curtice, 2006). Different approaches of identifying stakeholders have

been used in literature, for example, French and Granrose (1995) applied *mutuality* approach which is a way of understanding the requirement of each stakeholder on a project plus the importance of the stakeholder to the project. This will assist in establishing the nature of the association between the stakeholders and project and as well guarantee that project managers comprehend the expectation of the categories. According to Pinto (1998) the project stakeholders can be categorised into different types based on various criteria such as those that have direct impact on the project, those indirectly affected and the group with most influence from either category. This study categorises stakeholders into project team, project sponsor/client and consultants. According to Chan and Chan (2004), stakeholders must be satisfied with the overall performance of the project.

Stakeholder Perceived Success Metrics

A metric is any type of measurement used to assess some quantifiable element of project success or performance. The saying that you cannot manage what you cannot measure is a truism in construction project. Absence of satisfaction metrics can make it extremely difficult for project managers to assess the satisfaction of stakeholders. Stakeholders' interests vary as a result of the complex nature of construction projects and it is a common believe that identifying stakeholder interests and expectations is an important task to evaluate stakeholders' satisfaction (Cleland and Ireland, 2007; Freeman et al., 2007).

Previously research has shown the significance of subjective metrics as determinants of construction project success, despite the complexity involved in their measurements (Hughes et al., 2004). For instance, Baker et al. (1974 cited in Hughes et al., 2004: 32) argued that if the project meets the technical expectation specifications and/or mission to be performed, and if there is a high level of satisfaction concerning the project outcome among key stakeholders in the parent organisation, in the client organisation, on the project team, and key end users of the project effort, the project is considered an overall success. They contended further that since stakeholders' perceptions play such a significant role in considering project a success, then it is more appropriate to view it in terms of "perceived success of a project."

Although, success of project has been measured objectively in the past, but objective project metrics cannot offer a comprehensive story concerning project success without an explanation of the context in which the project success attributes were perceived (Hughes et al., 2004). Also, subjective metrics of project success are considered to be only important when viewed from the angle of a specific observer, this is because project success are perceived differently by different project stakeholders and thus, it essential to make clear the point of view at which the subjective success metric is been measured (Hughes et al., 2004). Researchers contend that a wrong conclusion regarding project success could be drawn by project analysts if they only considered the traditional project success metrics (cost, time, quality, and more recently, safety) while disregarding subjective success metrics (Nguyen et al., 2009; Hughes et al., 2004; Abdullah and Ramly, 2006).

Therefore, through an in-depth review of literature, four metrics were identified to measure stakeholders' perceived success on a construction project. This includes meeting requirements, execution efficiency, on-schedule completion of projects and compliance to regulations.

Methods

The focus of this study is on State Owned Company's (SOC) which was established by the government of the Cape in 1928 with the purpose of creating an enabling environment for the development and sustainability of the economy through energy supply. Over the past decades, SOC has undertaken some capital expansion projects through the construction of large new infrastructure so as to meet its objectives in rising to the challenges of the growing South African economy. The authors consider SOC to be a suitable setting for this research for the following reasons: (a) it is engaged in construction projects, which are intended to benefit the public; (b) its performance can be used to benchmark other SOC construction projects; and (c) the construction projects undertaken is unequalled in terms of values for the past five decades in South Africa.

In order to obtain relevant data and better results for the research, this study adopts sequential mixed methods approach, which involves the collection and analysis of qualitative and then quantitative data within one study. According to Tashakkori and Teddlie, (1998) and Creswell (2005), mixed methods research design is a method for collecting, analysing, and "mixing" or integrating both quantitative and qualitative data at some stage of the research process within a single study for the purpose of gaining a better understanding of the research problem. However, in this study mixed methods was used whereby qualitative data were first collected to refine the questionnaire before administering same.

The sample for the focus group interview were drawn from four major construction sites considered in this research using a purposive sampling technique (Noor, 2008) from a population of construction project practitioners (SOC Management, Funding Organization, Project/Contracts Managers, Project Supervisors, Contractor Site Managers, Construction Managers, Project Sponsors and Project Support Managers). The purposive sampling technique was used because knowledge of the project operations was not normally distributed within the target population. These construction project practitioners were perceived by the authors to be able to contribute valuable information to the research. The list of construction project practitioners to be surveyed was obtained from the SOC database, using a random sampling technique. Questionnaires were self-administered to 92 selected construction project practitioners including contractor's on the sites from July 2012 to January 2013 (a six month period). Figure 1 shows the flow of the research framework used in this study.

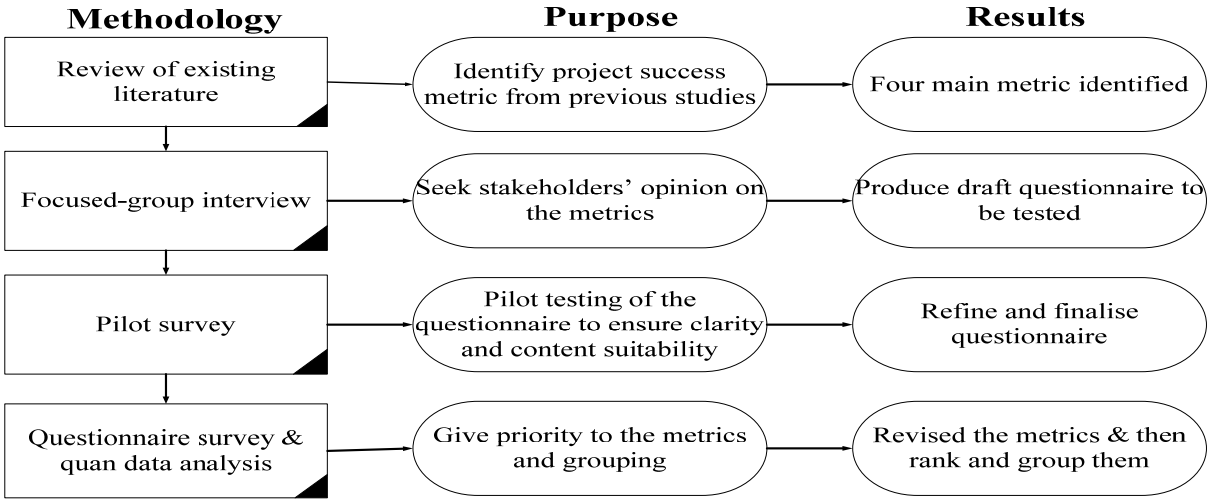

Figure 1. Research framework (adapted from Yang et al., 2009)

Data Analysis

In order to elicit relevant information on the perception of the stakeholders on project satisfaction metrics, the respondents were requested to rank the metrics on a five-point Likert scale, where 1 = strongly disagree and 5 = strongly agree. Mean statistics were used in analysing and rating the data obtained from the questionnaires so as to establish common trends and differences amongst the respondents on each project success metric.

$$MIS = \frac{5M_5 + 4M_4 + 3M_3 + 2M_2 + 1M_1}{5 \times (M_5 + M_4 + M_3 + M_2 + M_1)}$$

(Where: M_1 = strongly disagree; M_2 = disagree; M_3 = somehow agree; M_4 = agree; and M_5 = strongly agree)

To examine whether there is significant difference in the perception of stakeholders on the metrics of project success, non-parametric statistical technique was employed. This is because parametric assumptions requiring data to be normally distributed and homogenous in terms of variance are not fulfilled (Pallant, 2011), and since these assumptions were not fulfilled by survey data, the non-parametric methods was used.The research used Pearson Chi square statistics (Using R software) in examining whether there are significant differences in the perception of the project stakeholders regarding success metrics. The results of this test were interpreted in terms of goodness-of-fit test. The probability associated with the chi square statistic indicates whether or not there is a significant difference in the perception of the stakeholders on the metrics of project success. If the probability is significant at 5% level, this means there is significant differences in their perceptions. The research findings may be constrained by the fact that the available archival documents for the projects were not sufficiently explicit and comprehensive in providing details of the existing project success metric.

Results and Discussion

Profiles of Respondents

Table 1 shows the profile of the respondents in this research.

Table 1. Distribution of Respondents by Project and Group

Stakeholder Group	Engineering Project Sites				Tota l	Percentage (%)
	1	2	3	4		
Project Supervisors	10	9	10	10	39	42.4
Project Managers	4	4	4	4	16	17.4
Contractor representatives	2	3	2	3	10	10.9
Client (SOC)	2	2	3	3	10	10.9
Consultants	2	2	3	2	9	9.8
Project Sponsor/Financier	1	2	2	3	8	8.7
Total	21	22	24	25	92	100

The highest number of respondents by group is the project supervision team, which comprises of engineers and project managers who oversee the construction of the large

engineering projects on behalf of the client. Designated project managers who are in charge of the individual project sites and who are employees of the SOC constitute the second highest respondents in the study. Table 1 also indicates that the highest numbers of respondents were from Site 4 followed by Sites 3, 2 and 1 respectively.

Rating of Project Satisfaction Metrics

The analysis of the questionnaire survey response was used to generate the means for the 4 main project satisfaction metrics identified in literature. The ranking and the mean values for the success metrics are shown in Table 2.

Table 2. Descriptive statistics

Metric	Mean	Rank
Execution Efficiency	4.60	1
Meeting Requirement	4.55	2
Compliance to Regulations	4.55	2
On-schedule completion	4.50	4

It was found out that the means of the metrics ranged from 4.50 to 4.60, which shows that all respondents consider these 4 attributes relevant in satisfying stakeholder expectations and meeting their requirements in construction projects. The highest ranking by all respondents was "execution efficiency" (mean = 4.60), which therefore was considered as an extremely significant metric in measuring the success of projects and satisfaction of stakeholder. "Meeting clients'/project sponsor's requirements/needs and compliance to regulations" (mean = 4.55) were both ranked as the second most important metrics. The 4th ranked metric was "on-schedule completion of project" (mean = 4.50).

Perceptions of stakeholders on project success metrics

In order to examine whether there were significant differences in the perception of stakeholders on the metrics used in measuring project satisfaction, the Chi square statistics was used. Table 3 shows the Chi square statistics of the four metrics used in the study

Table 3. Pearson's Chi-Square results of stakeholders' perception

	Test Statistics		
Metric	X^2	*df*	*P-Value*
Meeting Requirement	4.8913	10	0.8983
Execution Efficiency	31.4403	20	0.0496
On-schedule completion	2.6748	10	0.9881
Compliance to Regulations	3.2516	5	0.6613

The chi-square goodness-of-fit test presented in Table 3 indicates that there was significant difference in the perception of stakeholders on execution efficiency as measures of project satisfaction when compared with the other metrics $\chi 2$ (1, n = 92) = 31. 4403, $p < .05$. These statistical results indicate a general consensus on the perception of the different stakeholders' on the use of "meeting client's requirement, on-schedule completion of projects and compliance with regulations as project satisfaction metrics.

Discussion of Findings

Findings from the survey data through ranking suggest that execution efficiency and effectiveness (i.e. meeting specification requirement, quality and health and safety) is the

most influential metrics of project success and stakeholder satisfaction. The result also reveals that meeting client's requirement and compliance to regulation are essential in measuring project satisfaction. These findings are consistent with Torbica and Stroh (2001), assertion that meeting client's need is one the frequently success criteria used in measuring satisfaction on construction projects, and is supported by Prabhakar (2008) who argues that these metrics have an impact on stakeholder's satisfaction, such as meeting the project specifications and quality standards. This accounts for the reason Chan et al. (2001) pointed out that these subjective metrics of project satisfaction form the basis for meeting the stakeholder's expectations. This position was re-affirmed by the conclusion of Takim and Adnan (2008) that asserted that quality and meeting client's need are the most significant measures of project success.

The results of the non-parametric analysis indicated that there is no significant difference in the perception of stakeholders on project satisfaction metric except on execution efficiency. Therefore, it can be said that the finding do not lend credence to the proposition that that there will be significant differences in the perception of stakeholders on the measure of project satisfaction metrics. This implies that data collected in this study does not support the view that there may be significant differences in perceptions within the stakeholders groups working on the four SOC projects studied on measures and use of project satisfaction metrics. The findings do not also resonate the view of previous researchers who found significant differences in the opinion of stakeholders on project success criteria (e.g. Hillman and Klein 2001; Wang and Huang, 2006; Toor and Ogunlana, 2010). This results may be due to the fact that the SOC is experienced in implementing large construction projects and it has in place documented procedures, standards and processes which it uses on its projects and hands these out to its employees and service providers to use as reference in project implementation.

Conclusions and Recommendations

This paper examines stakeholder perspectives on the use of satisfaction metrics in large engineering projects and whether there are significant differences in their perceptions on the use of satisfaction metrics. The study found that the stakeholders rated the identified satisfaction metrics very high, and meeting project requirements was rated the highest. The study also established that there was a significant difference in the perception of stakeholders on the use of meeting project requirements as a project satisfaction metrics while there perceptions did not differ on the use of the other identified satisfaction metrics. Based on these findings, the study concludes that the difficulty experienced on projects especially large engineering projects and the high degree of failure may be traced to the differing views of stakeholders on the use of meeting project requirements as a project satisfaction metric. Evidence from literature indicates that it is essential that stakeholders at the commencement of the project ensure they have a common insight into how project success will be determined and that stakeholders must be satisfied with the overall project performance. However, the research is limited in scope to one SOC in South Africa and its four project sites and this affects the generalizability of the results even though it provides significant results. Non-disclosure by the SOC of the performance of the projects under construction also brought about limitations. The study could not compare the subjective data obtained to the objective data gathered by the SOC. Therefore further research which would explore the validity of these findings with another comparable SOC project is recommended.

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