INFLUENCE OF HUMAN BEHAVIOUR ON SUCCESS OF COMPLEX PUBLIC INFRASTRUCTURAL MEGAPROJECTS IN KENYA

Austin Baraza Omonyo[3]

Abstract

The need for this study arose from the thesis that complexity due to human behaviour is the main cause of waste and failure that results in infrastructural megaprojects being delivered over budget, behind schedule, with benefit shortfalls as well as over and over again. The study was designed as multiple-method research utilizing cross-sectional census survey of completed public infrastructural megaprojects. Collected data were analyzed both descriptively and inferentially with results confirming that human behaviour significantly influences on success of public infrastructural megaprojects. Optimism bias was the main human behaviour that led to cost and schedule underperformance but loss aversion was the most occurring cognitive bias. In light of this finding, the study recommends that implementing organizations should adopt structures that allow for continued business justification, focus on products and give project managers sufficient authority over project resources in line with postulations of structural contingency theory.

Keywords: Human behaviour, loss aversion, megaproject, optimism bias.

Introduction

The International Centre for Complex Project Management (ICCPM) describes complex projects as those characterized by uncertainty, ambiguity, with emergent dynamic interfaces, influenced by significant political or external change, are run over a period, which exceeds product life cycles of technologies involved or where significant integration issues exist, they are defined by effect (benefit and value) but not by solution at inception (Hayes and Bennet, 2011). Several studies linking complexity with project success have confirmed that complexity predominantly determines project success (Meyer, 2014; Hargen and Park, 2013; O'Donnell, 2010; Shermon, 2011, Flyvbjerg, Holm and Buhl, 2004; Vanston and Vanston, 2004).

Infrastructural megaprojects are among the most complex category of projects (Brady & Davies, 2014). This inherent complexity in megaprojects is the main source of contextual risk, which is usually referred to as typological risk (Omonyo, 2015). Effectiveness of project control is usually affected by typological risk in such a way that as the magnitude of the risk increases, exercising project control becomes highly difficult. Such difficulty in controlling complexity has been recognized as a major factor in project failure for a number of years (Williams, 1999). This could explain why complex infrastructural megaprojects are usually delivered over budget, behind schedule, with benefit shortfalls, over and over again thereby leading to what Flyvbjerg (2014) characterizes as the "iron law of megaprojects."

According to Kahneman and Tversky (1979) as well as Lovallo and Kahneman (2003), complexity due to human behaviour is the main explanation for "iron law of megaprojects." As

[3] Austine Baraza Omonyo; Centre for Finance and Project Management
Email: baraza@cfpm.co.ke

Remington and Zolin (2011) postulate, without a coherent research agenda to understand both its causes and navigation strategies, complexity (due to human behaviour) continues to result in problems, waste, economic failure and social failure. It is on this thesis that this study was designed in order to investigate the influence of human behaviour on success of complex public infrastructural megaprojects and identify actual behaviours that influence such success.

The main contributions of this research include: confirming that human behaviour has significant negative influence on success of public infrastructural megaprojects; optimism bias remains the main individual behaviour associated with cost overruns and schedule delays; loss aversion is the most occurring cognitive bias among individual systematic biases; and public infrastructural megaprojects in Kenya are delivered within a culture that does not recognize uncertainty, rapid change, emergence, connectedness and dependencies that characterize the context of these projects.

LITERATURE REVIEW AND HYPOTHESIS

Human Behaviour

Human behaviour may be the result of factors such as changing power relationships, political influence and individuals' experiences as well as perspectives (PMI, 2014). These factors may hinder clear identification of project goals and objectives thereby affecting project delivery capability. The PMI Practice Guide for Navigating Complexity identifies four main constructs of human behaviour, namely, individual behaviour; group, organizational and political behaviour; communication and control; and organizational design and development. A broad description of each of these constructs is found in the discipline of organization theory.

Organization theory describes a body of knowledge that brings together several management and organization theories. The main approaches in organization theory stem from works of the main schools of management thought, namely, classical, human relations, systems, contingency, decision and social action (Mullins, 2007). As a body of knowledge, organization theory studies organizational designs and structures, relationships of organizations with their external environment and behaviour of managers together with technocrats within organizations. Besides suggesting ways in which organizations can cope with rapid change, organization theory provides a framework of studying organizations to identify patterns and structures they use to solve problems, maximize efficiency and productivity as well as meet stakeholders' expectations. A related (even though widely held as distinct) body of knowledge relates to organization behaviour. Organization behaviour involves understanding of individual and group behaviour and patterns of structure in order to help improve organizational performance as well as effectiveness (Mullins, 2007). Theories of organization behaviour relate to understanding, prediction and management of human behaviour in organizations (Luthans, 2002).

The study of organization theory can be divided into three levels, namely, micro, meso and macro (Wagner and Hollenbeck, 2010). The first level involves the study of individuals in an organization, the second level involves the study of work groups and the third level involves the study of how organizations behave. Therefore, it can be concluded that organization behaviour is a subset of organization theory and that each of the levels in the study of organization theory represents the main constructs of human behaviour in organizations, namely, the individual, the group and the organization (Mullins, 2007; PMI, 2014). There are several organization theories that explain human behaviour, some of which are described by Miles (2012). However, for the

purposes of this study, three theories were used, namely, agency theory at the micro level, social identity theory at the meso level and structural contingency theory at the macro level.

Agency Theory

Agency theory relates to risk sharing among groups that are in a contractual relationship. With its roots in behavioural economics, agency theory has been applied extensively in organization behaviour (Eisenhardt, 1985, 1988). Agency problem occurs when cooperating parties have different goals and vision of labor (Jensen and Meckling, 1976). As such, this theory is concerned with resolving two problems that can occur in agency relationships.Given operation of the agency problem, organizations are faced with the problem of integrating the individual as well as the organization to enable successful delivery of its initiatives and this requires understanding of both human personality and formal organization. Such integration recognizes that individuals behave differently when acting in their organizational role rather than when acting separately from the organization (Chester, 1938). Thus, agency theory is key in explaining how individual behaviour affects key organizational outcomes.

Many studies have been conducted linking individual behaviours with project success. For instance, in a study to establish the effect of optimism bias on the decision to terminate failing projects, Meyer (2014) showed that in-project optimism bias is a significant contributor to decision-makers' motivation to continue with a failing project. For post-project optimism bias, the study showed that it is prevalent throughout the project and increases as the project approaches the end (*ibid*.). The conclusions of this study are in line with findings of Lovallo and Kahnemann (2003), whose research concluded that optimism and risk aversion were the main biases in forecasting as well as risk taking and that the two undermine executives' decision-making. Mackie and Preston (1998) also found optimism to be among 21 sources of error and bias in appraisal of transport projects. In a study to identify systematic biases in project failures, Shore (2008) conducted research on 8 large projects and wrote case studies on each failure to demonstrate how organizational and project culture could contribute to those biases. Findings from the study confirmed that there are indeed systematic biases and culture in project failure that are worth exploring (*ibid*.). The main premise of the study (*ibid*.) was the fact that systematic biases are common in the human decision-making process and such pattern provides a fundamental reason project failure should not be an unexpected result.

In a study of causes of cost overruns in 258 transport infrastructure projects across 20 nations, Flyvbjerg, Holm and Buhl (2004) used Regression Analysis. They (*ibid*.) concluded that underestimation cannot be explained by error but it is best explained by strategic misrepresentation, that is, lying, which is a manifestation of agency problem. This is in line with findings from the study by Bruzelius, Flyvbjerg and Rothengatter (2002) who, in a study on improving accountability in megaprojects, argued that differences between forecasts and actual costs could only be explained by the strategic behaviour of project proponents. They (*ibid*.) identified lack of long-term commitment, rent seeking behaviour for special interest groups and tendency to underestimate in tenders to get proposals accepted, as the main strategic behaviours of project proponents that adversely affect project outcomes.

Social Identity Theory

Attributed to Tajfel (1978), this theory explains human behaviour at the meso level. This theory explains behaviour of individuals in groups based on the need to maintain their social identity.

According to this theory, people work to achieve and maintain a positive social identity, which is based on favourable comparisons made among groups to which a person belongs and groups to which a person does not belong and if social identity is unsatisfactory, then people strive to leave their current groups and join more favourable groups or they try to make their current groups highly satisfactory (Tajfel and Turner, 1986).Social identity research findings suggest three important consequences for organizations (Miles, 2012), namely, employees select and perform activities that resonate with their social identities, and they tend to support organizations that support their social identities; and social identification tends to influence important group outcomes, such as cohesion, cooperation, altruism and positive evaluations of the group (Turner, 1982, 1984). In addition, as employees come to increasingly identify with the organization, then values, ideals and practices of that organization can be perceived as more unique, distinctive and positive than other organizations. This theory provides key explanations for group behaviours such as groupthink, group shift, self-organization and tribal mindset. It is at the centre of explaining evolution of team and project culture.

Structural Contingency Theory

This theory explains human behaviour particularly at macro level. It stands on the premise that there is no one best organizational structure rather; the appropriate organizational structure depends on contingencies facing the organization (Burns & Stalker, 1961; Chandler, 1962). The theory posits that organizations will be effective if managers fit characteristics of the organization, such as its structure, with contingencies in their environment (Donaldson, 2001). Such contingencies could include organizational maturity, culture and opacity, among others. One of the most important concepts in the theory is alignment. An organization, whose characteristics align with contingencies in its situation, will perform more effectively than one, whose characteristics do not fit with the contingencies in its situation. According to the theory, there are two main contingencies that need to be considered: organizational size and organizational task (Miles, 2012). This theory is critical in explaining organizational design and development construct.

Several studies have been conducted linking this theory to project outcomes. For instance, in a study involving a critical review of extant literature, Olaniran, *et al* (2015) conclude that complex interactions between project characteristics, people, technology and structure together with culture contribute to occurrence of cost overruns in hydrocarbon megaprojects. In exploring the role of project management maturity (PMM) and organizational culture in perceived performance, Yazici (2009) conducted a survey-based research with 86 project professionals from the manufacturing and service sectors in the United States of America. The study revealed that PMM is significantly related to business performance but not to project performance (*ibid.*). According to the study (*ibid.*), organizational culture change towards sharing, collaboration and empowerment is required in order to deal with (overruns) in project time, cost and expectations.

In a study of cost and time overruns in public sector projects, Morris (1990) identified bureaucratic indecision and lack of coordination between enterprises to be among the main causes of cost and time overruns in large public sector projects. Both factors map onto organizational design and development as an aspect of human behaviour. In a similar study, Kaliba, Muya and Mumba (2008) conducted a study on cost escalation and schedule delays in road construction projects in Zambia and found that administrative structures including inexperienced administrative personnel were among factors that explained cost overruns.

In conclusion, reviewed literature suggests that human behaviour can lead to either positive or negative outcomes, depending on the context. For instance, some positive psychologists postulate that optimism could be a very positive force at the workplace because it could motivate project teams to work harder, have high levels of inspiration and set stretch goals (Luthans, 2002). In the same veil, negative psychologists believe that optimism has a downside effect that could lead to dysfunctional outcomes. With this understanding, this study tested a non-directional research hypothesis that:

H_A1: *Human behaviour has significant influence on success of public infrastructural megaprojects.*

Project Success Theory

Project success theory is generally presented as a body of knowledge bringing together various research contributions to the success school of project management. There have been various attempts over history of project management to define suitable criteria against which to anchor and measure project success (McLeod, Doolin and MacDonell, 2012). The most recognized of these measures is the long established and widely used "iron triangle" of time, cost and quality (Atkinson, 1999; Cooke-Davies, 2002; de Wit, 1988, Ika, 2009; Jugdev, Thomas, and Delisle, 2001). However, the "iron triangle" dimensions are inherently limited in scope (Atkinson, 1999; Ika, 2009; Wateridge, 1998). A project that satisfies these criteria may still be considered a failure and conversely, a project that does not satisfy them may be considered successful (Baccarini, 1999; de Wit, 1988, Ika, 2009). The "iron triangle" only focuses on the project management process and does not incorporate views and objectives of all stakeholders (Atkinson, 1999; Baccarini, 1999; Bannerman, 2008; de Wit, 1988; Jugdev and Muller, 2005; Wateridge, 1998).

In recognition that project success is more than project management success and that it needs to be measured against overall objectives of the project thereby reflecting a distinction between success of a project's process and that of its product (Baccarini, 1999; Markus and Mao, 2004; Wateridge, 1998), researchers have broadened the scope of project success to include three key measures, namely, process success, product success and organizational success (McLeod *et. al*., 2012). Product success involves such criteria as product use, client satisfaction and client benefits. Organizational success criteria incorporate achievement of broader set of organizational objectives involving benefits to the wider stakeholder base (see Shenhar, Dvir, and Levy, 1997; Shenhar, Dvir, Levy and Maltz, 2001; Shenhar and Dvir, 2007; Hoegl and Gemuenden, 2001). This is plausible given that projects are a means of delivering the organization's strategic objectives. Proponents of this school of thought advocate for inclusion of success criteria such as business and strategic benefits.

Research Conceptual Model

Figure 1 illustrates the hypothesized research conceptual model, which is based on PMI (2014) as well as McLeod *et al*. (2012). According to this model, human behaviour as defined by individual behaviour, group behaviour and organizational design as well as development, represent independent variable, while success of infrastructural megaprojects (defined as process, product and organizational success) was identified as the dependent variable.

Figure 1 …

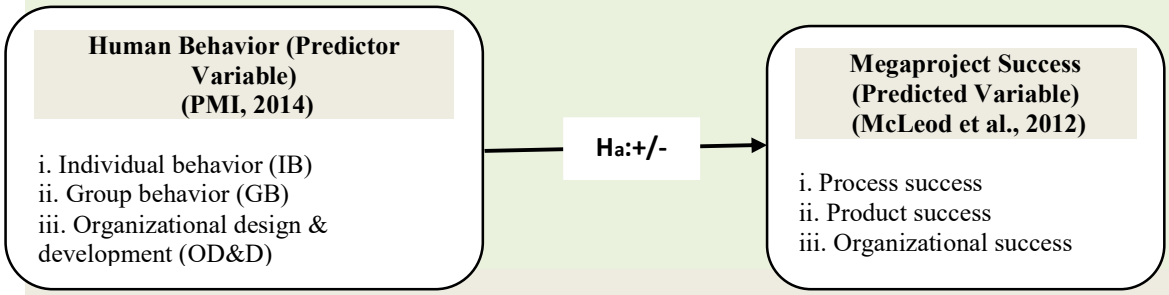

Figure 1: Proposed Research Model

METHODOLOGY

Context and Design

This study was operationalized through exploratory, descriptive and explanatory research goals based on Neuman's (2003) classification of research goals. To achieve these goals, a post-positivist paradigm emphasizing on virtual constructionist ontology (Gauthier and Ika, 2012) was assumed. This paradigm utilizes both interpretivist (Bryman and Bell, 2007) and pragmatist (Goldkuhl, 2012) epistemologies to generate knowledge based on a combination of deductive and inductive approaches. The choice of this philosophical perspective was guided by the social world of complex megaprojects. This study was designed to be mixed-method research combining both quantitative and qualitative strategies (Burch and Carolyn, 2016). To generate data for this study, a cross-sectional census survey design was used.

Population and Sample

This study had as its primary population public sector infrastructural megaprojects implemented by the government of Kenya since 2005. Following Flyvbjerg (2014), the minimum budget for megaprojects included in this study was approximately Kenyan shillings (Ksh.) 1 billion. Managers, team members, sponsors and key stakeholders of the projects constituted the population of respondents from whom data were collected. A total of 31 projects were included in this study. For each project, four respondents comprising the project manager, project sponsor and two project team members were surveyed. In total, 108 respondents participated in this study. A total of 27 completed infrastructural megaprojects, representing a response rate of 87.1 percent, were surveyed as part of this research. Out of the projects, 2 were from Kenya Ports Authority, 2 were from Kenya Pipeline Company, 6 were from Kenya Airports Authority, 3 were from Kenya Power and Lighting Company, 1 was from Kenya Electricity Generating Company, 5 were from Kenya Urban Roads Authority, 1 was from Kenya Civil Aviation Authority, 1 was from Geothermal Development Company with the remaining 6 from Kenya National Highways Authority.

Instruments and Data Collection

Fieldwork for this study utilized two interlinked questionnaires, namely, the human behaviour assessment questionnaire and the project success questionnaire. The human behaviour questionnaire was constructed based on the Practice Guide for Navigating Complexity (PMI, 2014), while project success questionnaire was developed based on works of Shenhar and Dvir (2001) as well as McLeod et al. (2012). The human behaviour scale comprised a 22-item Likert-type scale with responses on each item being rated on a 5-point mutually exclusive scale where a

rating of 1 denoted "strongly agree" response, 2 denoted "agree" response, 3 denoted "somewhat agree" response, 4 denoted "disagree" response, while 5 denoted "strongly disagree" response. A choice of either 1 (strongly agree) or 2 (agree) implied low complexity, while a choice of either 4 (disagree) or 5 (strongly disagree) implied high complexity due to human behaviour. A choice of 3 (somewhat disagree) implied a neutral and borderline response, which did not communicate much on complexity of projects studied and therefore, it was dropped from further analysis. Success scale comprised 18 items blending open-ended and close-ended questions on one part and Likert-type questions on the other part. The first part involving close-ended and open-ended questions was meant to assess process success, while the Likert-type questions assessed product and organizational success on a scale of 1 (strongly agree) to 5 (strongly disagree).

The first phase of data collection involved a pilot study on four projects to test reliability and validity of the instruments. The results from the pilot study showed that both instruments were reliable with the human behaviour scale recording internal reliability of 0.879. The overall internal reliability of the success scale was 0.889 and thus, both values are greater than the cut-off Cronbach's alpha of 0.7 (Nunnally, 1978). The pilot study results also demonstrated high concept, construct and external reliability in the study instruments. The second phase involved using revised study instruments to collect primary data from the remaining 24 projects.

DATA ANALYSIS AND RESULTS

Collected data were processed and analyzed using Microsoft Access 2010, IBM's SPSS version 20 and Microsoft Excel 2010. Quantitative data analysis was conducted using both descriptive and inferential statistics. Qualitative data analysis was done through expert judgment, scenario mapping and critical thinking. The results are presented in the next sub-sections.

Infrastructural Megaproject Success

Process success incorporates traditional measures of efficiency (delivery within budget and time schedule) and quality. Efficiency was measured using cost and schedule performance indices with the weighted average of indices calculated to denote overall efficiency index for the project. The CPI results showed that 14 (52%) projects were delivered over budget, 9 (33%) projects were delivered on budget with the remaining 4 (15%) delivered under budget. SPI results showed that of the surveyed 27 megaprojects, 22 (81%) were delivered behind schedule, 3 (11%) were delivered on schedule, while 2 (7%) were delivered ahead of schedule. Simple weighted averages of the CPI and SPI values were calculated to give the Weighted Project Efficiency (WPE) values for each project. Using these values, a total of 4 (15%) megaprojects had efficiency levels greater or equal to 1 (100%). The rest (85%) of the megaprojects were delivered at efficiency levels lower than 100 percent. As shown in Table 6, the energy sector projects had the lowest relative cost performance (CV=0.42) but had the highest schedule (CV=0.19) and overall efficiency (CV=0.14) performances. The roads sector scored the highest on cost performance (CV=0.16), while ports (air and sea) projects scored the lowest in both schedule performance (CV=0.47) and overall efficiency (CV=0.31).

Table 1: Project Efficiency by Sector

SECTOR	DESCRIPTIVE STATISTICS FOR EFFICIENCY MEASURES								
	CPI			*SPI*			*WPE*		
	MEAN	STDEV	CV	MEAN	STDEV	CV	MEAN	STDEV	CV
Ports $n = 9$	0.85	0.17	0.20	0.79	0.37	0.47	0.80	0.25	0.31
Energy $n = 7$	0.97	0.41	0.42	0.78	0.15	0.19	0.88	0.12	0.14
Roads $n = 11$	0.91	0.15	0.16	0.66	0.19	0.28	0.79	0.12	0.15

The process success score was determined by adding a score for project quality to the score for project efficiency. The quality score was based on effect of changes (if any) to the scope baseline and was based on a scale of 1 (no or low impact) to 3 (high impact). The results showed that 6 (22%) megaprojects underwent more than three scope changes, 13 (48%) megaprojects underwent up to 3 scope changes, while 8 (30%) megaprojects (30%) did not undergo any scope change. Product and organizational success were measured using a 9-item questionnaire of Likert-type scale with participants asked to respond to each item based on a 5-point scale (1=strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = agree, 5 = strongly agree). A score of 1 indicated low success score and 5 indicated high success score. Product success measures effectiveness of the project in delivering a product that meets customer requirements improves customer performance and satisfies customer needs.

Organizational success measures the interaction of process and product success to meet organizational objectives, maximize stakeholder value and enhance organizational innovation capacity to deliver future projects. The results indicated that the projects had a mean product success score of 4.09 with a standard deviation of 0.94 and a mean organizational score of 4.39 with a standard deviation of 0.82. The overall success scores were obtained by taking the simple weighted average of the mean success scores for process, product and organizational dimensions. With the highest score assigned to process, product and organizational dimensions being 8, 5, and 5, respectively, the highest possible mean composite success score was therefore 6.

Human Behaviour

Based on responses, items on the individual behaviour scale were mapped onto common cognitive biases that have been linked to project failures by past researches and in extant literature. The first item on the scale mapped onto “framing effect” bias, the second item mapped onto “anchoring” bias, the third and the fourth items mapped onto “optimism bias,” the fifth item mapped onto “misrepresentation/noble lying,” the sixth item mapped onto “resistance to change” bias, while the seventh item mapped onto “loss aversion/sunk cost effect” bias. Using responses for those who either disagreed or strongly disagreed, results showed that loss aversion (sunk cost effect) was the most cited individual behaviour exhibited by the projects (48.1%) followed by optimism bias (25.9%), misrepresentation (14.8%), anchoring bias (7.4%) and resistance to change (3.7%). Table 2 summarizes cost and schedule performance for projects exhibiting the identified cognitive biases with the general result that projects that exhibited optimism bias had most of them delivered with budget overrun and schedule delay.

Table 2: Individual Behaviours and Performance

Individual Behaviour	% of Projects Exhibiting Behaviour	% Delivered Within Budget	% Delivered Within Schedule	% Delivered With Budget Overrun and Schedule Delay
Anchoring bias	7.4	50	0	50
Optimism bias	25.9	42.9	0	57.1
Misrepresentation	14.8	25	25	50
Resistance to change	3.7	100	0	0
Loss aversion	48.1	46.2	15.4	46.2

Since individual behaviour can collectively define the culture of an organization, identified individual behaviour systematic biases identified were mapped onto four dimensions of organizational culture using the Competing Values Model (Livari and Huisman, 2007) in order to determine the culture of each project. The dimensions are internal focus, external focus, stability and change. Results showed that all projects exhibiting the identified biases mapped onto a project culture that can be characterized as having a preference for an internal focus and stability. Such biases were associated with escalation in cost and schedule overrun. Table 3 shows mapping of individual behaviours on the competitive values model.

Table 3: Cognitive Biases Mapped onto Competing Values Model

Cognitive Bias	% of Projects Exhibiting Bias	Dimensions of Competing Values Model Implied			
		Internal Focus	External Focus	Stability	Change
Anchoring Bias	7.4	✓		✓	
Optimism Bias	25.9	✓		✓	
Misrepresentation	14.8	✓		✓	
Resistance to Change	3.7	✓		✓	
Loss Aversion (Sunk Cost Effect)	48.1	✓		✓	

Analysis of project delivery was conducted based on responses in the group behaviour scale and summarized as in Table 4. Overall, results showed that low complexity (strongly agree/disagree responses) was associated with somewhat better project delivery than instances of high complexity (disagree/strongly disagree response).

Table 4: Cost and Schedule Performance Based on Group Behaviour Responses

Item in the Scale	Responses			
	Strongly Agree/Agree		Strongly Disagree/Disagree	
	% of Projects Delivering Within		% of Projects Delivering Within	
	Budget	Schedule	Budget	Schedule
Senior management team and other key stakeholders were fully committed to the project	48.2	18.5	-	-
The project had the support, commitment and priority from the organization and functional groups	52.0	20.0	-	-

The project team was cohesive and always worked towards common goals and objectives	54.2	20.8	-	-
Contractual terms were well understood by all parties involved	55	25	0	0
The project team members were co-located, co-incentivized and co-responsible for the outputs of their projects	38.9	16.7	33.3	0
The project team members primarily worked face to face (rather than virtually) throughout the life of the project	47.4	10.5	0	0
Team members or stakeholders were able to accept the project information that may have been contrary to their beliefs, assumptions or perspectives	50.0	16.7	25.0	0

Responses to the first set of items measuring organizational design and development were analyzed as well as linked to cost and schedule performance as shown in Table 5. Whereas the distinction in cost performance based on complexity levels is not apparent, results indicated that projects that had low complexity recorded relatively better schedule performance than those with high complexity.

Table 5: Delivery Based on Alignment, Opacity and process Maturity

Item in the Scale	Responses			
	Strongly Agree/Agree		Strongly Disagree/Disagree	
	% of Projects Delivering Within		% of Projects Delivering Within	
	Budget	Schedule	Budget	Schedule
Alignment:				
The project had clearly defined boundaries with other projects and initiatives that were running in parallel	47.8	21.7	100	0
The organization had the right people with the necessary skills and competences as well as the tools, techniques or resources to support the project	54.5	22.7	0	0
There was an effective portfolio management process within the organization to facilitate strategic alignment and enable successful delivery of projects	41.2	17.6	50	0
Opacity:				
The sponsor or project organization made decisions, determined strategies, and set priorities in a manner that promotes transparency and trust	50.0	20.8	0	0
There was open communication,	47.8	13	0	0

collaboration and trust among the stakeholders and project team				
Process Maturity:				
It was feasible to obtain accurate status reporting throughout the life of the project	52.2	21.7	100	0
The client created and ensured the use of common processes across all projects	47.4	21.1	66.7	0
The project manager had the authority to apply internal or external resources to project activities	45.5	18.2	40	10

Data on organization structure showed that the studied megaprojects fall into two main categories following the classification by Shenhar and Dvir (2007). Most of the projects were system projects, which produced a single outcome such as the KCAA Headquarters building, comprising a collection of assemblies, components and subsystems. Yet, others, such as Mombasa Port Modernization Project, were array projects (system of systems) that integrated a collection of systems functioning together to achieve a common goal. The results showed that the number of layers in the governance structure of the projects was related to their cost and schedule performance in such a way that structures with less than 10 layers had better cost and schedule performance than those with more layers.

All studied 27 megaprojects were organized in a "one-size-fits-all" approach with 9 (33.3%) of the megaprojects delivered through a pure functional structure, 5 (18.5%) megaprojects through a weak matrix structure, another 18.5 percent delivered through a strong matrix structure and the remaining 8 (29.6%) megaprojects delivered through a projectized structure. Projects that were organized through a weak matrix structure had the highest relative variability in their mean success (CV=0.29) followed by those organized through a pure functional structure (CV=0.18). Projects organized through a strong matrix structure recorded the lowest relative variability in mean success (CV=0.13) followed by those utilizing a projectized structure (CV=0.16). On stakeholder management, the main forms of engagement were through site meetings and progress reports with some projects involving stakeholders only in preparatory stages. Stakeholder engagement was a formal role in only 4 (14.8%) projects with 6 (22.2%) projects having a clearly documented stakeholder engagement plan that was used to manage stakeholders.

Hypothesis Testing

The human behaviour complexity score for each project was determined based on scores of individual constructs. The scores were based on mean response scores for each item in the questionnaire. The results showed that individual behaviour returned a mean complexity score of 2.21 with a standard deviation of 0.62, while group behaviour had a mean complexity score of 3.29 with a standard deviation of 1.02. Organizational design and development recorded a mean complexity score of 1.97 with 0.60 standard deviation, while the overall weighted complexity score had a mean of 1.87 with a standard deviation of 0.50. To enable use of these scores in parametric tests (such as correlation and regression analysis), their coefficients of skewness and kurtosis were determined to ensure that the data meet the normality assumption of parametric tests. The results showed coefficients of skewness, which are within the -1 to +1 range and coefficients of kurtosis, which are also within the recommended range of -2.2 to +2.2 (Sposito, Hand, and Skarpness, 1983).

To test the hypothesis that human behaviour has a significant influence on success of public infrastructural projects, the mean scores of human behaviour constructs were first correlated with those of project success constructs to determine if they have any association. The results showed that at 99 percent confidence level, there was a strong significant positive correlation between product success and organizational success ($r = 0.709$). At 99 percent confidence level, the results showed that there is significant moderate positive correlation between individual and group behaviour (r=0.674); the correlation between individual behaviour and organizational design and development is moderately positive and significant (r=0.539); there is a significant strong positive correlation between group behaviour and organizational design and development (r=0.783); and group behaviour has the strongest significant positive correlation with the weighted human behaviour complexity (r=0.995) followed by organizational design and development (r=0.0.866) and individual behaviour (r=0.816).

On the relationship between human behaviour and project success, results indicated that at 99 percent confidence level, group behaviour and overall human behaviour have significant but negative correlation with process success (r=-.639, and r=-.575, respectively). At 95 percent confidence level, results indicated that individual behaviour and organizational design and development have significant but negative correlation with process success (r=-.387, and r=-.430, respectively) and that organizational design and development have a significant negative correlation with product success (r=-.415). It is indicated that at the 99 percent confidence level, all three constructs of human behaviour have significant, though negative correlation with the overall project success. Furthermore, results showed that human behaviour has a significant negative correlation with overall project success.

Causal relationship between human behaviour (HB) and megaproject success (PS) was tested using OLS linear regression at 95 percent confidence level using a two-tailed test. Results indicated that the overall model had a 46.3 percent predictive power (R^2=0.463). ANOVA results showed that the overall model was significant with $F_{(1,25)}$ = 21.530 and P<0.025. The results indicated that there was no serial correlation in data used to conduct regression analysis given a Durbin-Watson statistic less than 2. Data were also checked for collinearity using Tolerance and VIF statistics. Results indicated a VIF value much lower than 4, which is used as the threshold to indicate multicollinearity [(particularly in small samples) O'Brien, 2007]. The problem of heteroscedasticity was checked using residual statistics in a scatter plot. Results indicated that almost all residuals had a mean of 0.000 and were approximately equally spread, implying that data were homoscedastic and therefore, they were good for OLS regression analysis.

The regression equation is presented below:

$$\bar{PS}_i = 6.421 - 0.681 HB_i$$

$$s(\hat{b}_i) = (0.377) \quad (0.147)$$

$$t = \ (17.05) \quad (-4.64) \qquad R^2 = 0.463$$

At 95 percent confidence level with a two-tailed test, if the $s(\hat{b}_i) < \left(\frac{\hat{b}_i}{2}\right)$, the null hypothesis that $b_0 = b_1 = 0$ is rejected and conclusion is made that betas are significant (Koutsoyiannis, 1992). In this study, results showed that the slope of human behaviour is significant; implying that a one unit increase in the complexity score for human behaviour reduces project success score by 0.681. Thus, the research hypothesis that human behaviour has a significant influence on success of public infrastructural megaprojects is accepted.

DISCUSSION

This study used developments in project success theory to identify broader measures of project success. Results agree, in part, with the trending view that megaprojects are always delivered over budget, behind schedule, with benefit shortfalls, over and over again (Flyvbjerg, 2014). With 52 percent of the projects delivered over budget and 82 percent delivered behind schedule, and thus, the "iron law of megaprojects" is partly confirmed. Whereas existing positive literature indicates that one out of ten infrastructural megaprojects is delivered on budget and one out of ten megaprojects is delivered on schedule (Flyvbjerg, 2014), this study only confirms this to the extent that 11 percent of the projects were delivered on schedule. The short run results for project benefits, however, seem to disagree with the view that megaprojects are delivered with benefit shortfalls.

Results show that more of the variability in overall project efficiency is attributed to schedule performance rather than to cost performance and most projects that were delivered on or under budget experienced schedule delay. This is a key finding that may be pointing to the fact that most emphasis in megaproject management is directed on the cost element rather than to an integrated trade-off among cost, time and quality. It has been shown in previous studies that project duration is positively associated with size of cost overrun (Flyvbjerg *et. al*., 2004). Findings from this study also add to the growing view that operational excellence or process success does not necessarily imply project success (Baccarini, 1999; de Wit, 1988; Ika, 2009). For instance, when sectoral comparison was done, the ports sector had the lowest relative variability in process success (CV=0.29) but the highest relative variability in product (CV=0.20), organizational (CV=0.13) and composite (CV=0.12) success. The finding that a project that has high product success is also likely to have high organizational success supports the generally accepted project management principle of "focusing on products**"** as opposed to focusing on the activity (Axelos, 2017). The correlation results also showed that there is no significant correlation between process success and product or organizational success. This supports the argument by Baccarini (1999), de Wit (1988) and Ika (2009) who contend that the project that satisfies process criteria may still be considered a failure and the project that does not satisfy them may be considered successful.

Results from this study agree with postulation of both positive and normative literature that optimism bias and the other biases in individual behaviour have negative implications throughout the life cycle of programs and projects (PMI, 2014; Shore, 2008). With results showing that projects exhibiting optimism bias had more incidences of delivery over budget and behind schedule compared to those exhibiting misrepresentation and loss aversion, this study is in consonance with findings of Lovallo and Kahnemann (2003), Flyvbjerg et al. (2003),

Kahnemann and Lovallo (1993), Wachs (1989:1986) as well as Meyer (2014) who posit that optimism bias is the main cause of delivery over budget and behind schedule.

The results also point to the fact that identified individual behaviours have more adverse effect on schedule performance than cost performance. Indeed, the mean cost performance for the entire sample was higher and more stable than the mean schedule performance. This finding may be pointing to the fact that public infrastructural megaproject sponsors feel more pressure from the public when projects are delivered over budget than when they are delivered behind schedule and so they prioritize cost performance over schedule performance. This may be counterproductive since previous studies have shown that implementation sluggishness has a significant relationship with cost escalation in infrastructure projects (Flyvbjerg, Holm, & Buhl, 2004).

The results from this study put misrepresentation in the second place among individual biases associated with cost overrun and schedule delay. Misrepresentation, which is sometimes referred to as "noble lying" has its support in Hirschman's theory and a postulation that if people knew in advance real challenges and costs involved in delivering megaprojects, they would probably never have touched them and nothing would get built (Flyvbjerg, 2014). In terms of occurrence on projects, this study finds that loss aversion has almost twice the frequency of optimism bias and thrice the frequency of misrepresentation. These results corroborate with those of Shore (2008) who found twice as many incidences of sunk cost effect (loss aversion) in comparison with overconfidence (optimism). Continued exhibition of loss aversion bias on projects does not support the generally accepted project management principle of "continued business justification" (Axelos, 2017). According to this principle, a project can be canceled any time during its life cycle whenever it is found that its business case is not viable, desirable or achievable.

Top management support and support from other key stakeholders have long been recognized in extant literature as key factors that contribute to project success (PMI, 2014; Hauschildt, Gesche, and Medcof, 2000). This is even highly important for infrastructural megaprojects, which are transformational in nature, whose budget may be more than the entire implementing organization's asset base in real terms. In some cases, the project may be the only activity the organization is involved in for over several years. For the most part, senior management confuse this support for micromanagement and may get involved in the day-to-day management of the project denying the project manager and the team flexibility they require to manage the project as per the project charter. This micromanagement comes with a lot of interests, including issues of servitude (as identified in this study), which could lead to poor project delivery capability. Therefore, it is not surprising that despite centrality of top management support in delivering successful projects, this study found that less than 50 percent of projects where senior management teams were fully committed to their course were delivered within budget and a dismal (18.5%) were delivered within schedule.

Normative literature recognizes that team working can improve efficiency (Green, 1997) but team work does not guarantee in itself good results (Belbin, 1993). Rather, what is important is how individuals within the group work cohesively together (Mullins, 2005). Various behaviours of the team members must mesh together in order to achieve objectives (Crainer, 1998). Results from this study confirmed that projects in which respondents strongly agreed that the project

team was cohesive and always worked towards common goals and objectives, recorded better cost and schedule performance with over 54 percent of those projects delivered within budget. Again, compared with results from the study by Flyvbjerg (2014), this is plausible. Results from this study do not provide clear support for benefits of co-locating, co-incentivizing and making teams co-responsible for project outputs. Normative literature postulates that co-location is a factor in ensuring rapid and faster communication when managing projects in dynamic environments (Collyer, 2016) and it enhances the ability of team members to perform as a team (PMI, 2013). Besides co-location, co-incentivizing and making project teams co-responsible for project outputs is one way of dealing with the agency problem that manifests itself in infrastructural megaprojects. When teams are co-located, co-incentivized and co-responsible, innovation in handling emerging problems is usually enhanced and the teams are motivated to go out of their way in identifying early warning signs. It is expected that such teams are highly agile and ambidextrous in resolving emerging issues and dealing with ambiguity and system dynamics. Thus, working face-to-face on projects increases chances for better performance. As a result, this study showed that projects in which team members worked primarily face-to-face had better cost and schedule delivery than those did not.

In strategic and organizational project management, projects are generally taken as "tactics" of delivering strategic and organizational objectives. In that environment, the business case of the project is usually derived from that of the portfolio, programme or vision to which the project is directly traceable. In all cases, it is important that there exist an effective portfolio management process within the organization that facilitates strategic alignment to ensure that the right projects are implemented with the right resources within clearly defined boundaries and interfaces. Misalignment may result in conflicting priorities and direction for the program or project team (PMI, 2014). Findings from this study agree with this postulation and establish that project misalignment adversely affects schedule delivery and to a considerable extent, budget delivery.

Organization design and development improve the organization's visioning, empowerment, learning and problem-solving processes (Mullins, 2005), which are critical aspects of adaptive behaviour that project managers require to successfully deliver complex megaprojects. However, this is only possible in an environment that promotes open communication and where project decisions, priorities and strategies are made transparently. Project complexity may increase where the organization conducts business in an opaque manner, leading to mistrust, which may affect its outcomes. The findings from this study agree with this postulation to the extent that none of the projects in which decisions, strategies and priorities were made in a transparent manner was delivered within budget or schedule. The results agree with the postulation in extant literature that effective communication has an impact on project execution and/or outcome (PMI, 2013; Olaniran, Love, Edwards, Olatunji and Matthews, 2015).

It is also widely recognized in literature that trust within the project team and among team members has a positive effect on knowledge transfer (Holste and Fields, 20101; Maurer, 2010), which is critical for the team to explore and exploit decision choices in complex megaprojects. This study noted that in projects where there was no open communication, collaboration and trust among stakeholders and project team, the probability of delivery within cost and schedule dropped from 47.8 percent and 13 percent, respectively, to 0 percent. Perhaps this finding provides the first level reply to Olaniran et al. (2015) who postulated that there is need for further empirical research to examine how communication influences megaproject performance. There

is evidence that project management maturity (PMM) is significantly related to business performance but not to project performance (Yazici, 2009). A critical aspect of PMM is process maturity, which involves ensuring that common processes are followed across all projects - of course with a considerable amount of tailoring. On whether or not PMM has a relationship with project performance, this study posts mixed findings - on one hand, it is concluded that lack of process maturity has negative relationship with schedule delivery while the results are mixed on the relationship between lack of process maturity and cost performance. Thus, results from this study partly disagree with findings from the study by Yazici (2009).

Project organization provides the basic framework within which decisions are made and projects governed. Project governance enables organizations to consistently manage projects and maximize the value of project outcomes (PMI, 2013). It is argued that a project organization structure cannot be bad but can be inappropriate given the complexity of the project and the overall level of organizational maturity. This argument is supported by existing empirical literature, which shows that project organization based on a "one-size-fits-all" approach can deliver successful projects just as a "tight-loose" system of systems approach (Brady and Davis, 2014). Results from this study also support this view given that all studied projects were organized in a "one-size-fits-all" approach with 48.2 percent of the projects meeting their budget objective and 18.5 percent meeting the schedule objective. Strong matrix and projectized organization structures usually give the project manager full authority to make project decisions, within constraints of the project charter. Project management success draws positive synergies from the authority of the project manager over project resources and it is highly likely that projects in which the project manager has near total authority over resources have more stable outcomes than those in which the project manager has weaker authority. Results from this study support this thesis by showing highly stable mean success results for projects utilizing strong matrix and projectized structures.

It is generally agreed that stakeholders can impact on project outcomes and stakeholder satisfaction such that they should be managed as a key project objective (PMI,2013) just like time, cost, quality, risk, scope and benefits (Axelos, 2017). Both ISO 21500:2012 and the PMBOK®*Guide* place stakeholder management at the centre of project management theory. However, this study finds that there is an identifiable gap between the prescriptions of theory and actual practice. Indeed, results show a practice that is long on management for stakeholders and short on management of stakeholders. This is despite the fact that communication and stakeholder management are critical success factors for projects in complex contexts.

In line with Shore (2008) who found that failed projects map onto a culture that can be characterized as having preference for internal focus and stability, based on the individual behaviours and biases that were identified, this study affirmed that all projects exhibiting those biases operated in a culture characterized with internal focus and stability. This type of culture is generally suitable for organizations that operate in highly deterministic environments characterized with greatly stable outcomes. Public infrastructural megaprojects are implemented in complex environments in which hindsight does not affect foresight and emergence is order of the day. Such projects require a highly adaptive culture capable of assimilating emergence of external stimuli and inherent change.

CONCLUSION AND RECOMMENDATION

This study set out to investigate influence of human behaviour on success of complex infrastructural megaprojects in Kenya. The constructs of human behaviour were defined based on organization theory, while the constructs of megaproject success were defined based on the project success theory. With the finding that human behaviour has a significant influence on success of public infrastructural megaprojects, this study contributes to developments in the behaviour school of thought in project management research (Turner *et. al*., 2010). The study established that individual behaviour, group behaviour as well as organizational design and development, all have a significant but negative correlation with process success. Only organizational design and development have a significant correlation with product success. Optimism bias remains the main individual behaviour that leads to cost and schedule underperformance in infrastructural megaprojects but loss aversion is the most occurring cognitive bias. Despite rapid change, uncertainty, dependency and emergence that characterize public infrastructural megaprojects, implementation of these projects still assumes culture characterized by stability and internal focus. Thus, there is need for a shift in delivery culture to reflect the complexity in these projects. This underscores application of the structural contingency theory in delivery of these projects.

Thus, it is recommended that implementing organizations should adopt and utilize project structures that allow project managers sufficient authority over project resources; allow for stakeholder satisfaction to be managed as a key project objective; allow for transparency in the manner in which organizations make project decisions; ensure right people with necessary skills and competences as well as tools, techniques or resources support the project; encourage innovation, creativity, learning and attainment of process maturity; and ensure continued business case justification.

REFERENCES

Atkinson, R. (1999). Project management: Cost, time and quality, two best guesses and a phenomenon, it is time to accept other success criteria. International Journal of Project Management, 17(6), 337-342.

Axelos Limited. (2017). Managing Successful Projects with PRINCE2® (6th ed.). United Kingdom: TSO, ISBN: 9780113315338.

Baccarini, D. (1999). The logical framework method of defining project success. Project Management Journal, 30(4), 25-32.

Bannermann, P.L. (2008). Defining project success: A multilevel framework. In Proceedings of the PMI Research Conference (pp. 1-14). Newton Square, PA: Project Management Institute.

Belbin, R.M. (1993). Team Roles at Work. Butterworth, Heinemann.

Blaskovics, B. (2014, November). Impact of leadership styles on project success–The case of a multinational company. Dynamic Relationships Management Journal, 3 (2), 21-36.

Brady, T., & Davies, A. (2014). Managing Structural and Dynamic Complexity: A Tale of Two Projects. Project Management Journal, 45(4), 21-38.

Bryman, A., & Bell, E. (2007). Business Research Methods (2nded.). New York, United States: Oxford University Press Inc., p. 55.

Burch, P., & Carolyn, H. J. (2016). Mixed Methods for Policy Research and Program Evaluation. Thousand Oaks, CA: Sage.

Chester, B.I. (1938). The Functions of the Executive. Cambridge, M.A: Harvard University Press.

Clegg, S.R. (1990). Modern organizations: Organization Studies in the Postmodern World. Sage.

Collyer, S. (2016). Culture, Communication, and Leadership for Projects in Dynamic Environments. Project Management Journal, 47(6), 111–125.

Cooke-Davies, T. (2002). The real success factors on projects. International Journal of Project Management, 20(3), 185-190.

Crainer, S. (1998). Key Management Ideas: Thinkers That Changed the Management World (3rd ed.). Financial Times, Prentice Hall.

de Wit, A. (1988). Measurement of Project success. Project Management Journal, 6(3), 164-170.

Eisenhardt, K. (1985). Control: Organizational and economic approaches. Management Science, 31, 134- 149.

Eisenhardt, K. (1988). Agency and institutional explanations of compensation in retail sales. Academy of Management Journal, 31, 488-511.

Eisenhardt, K.M. (1989). Agency theory: An assessment and review. Academy of Management Review, 14(1), 57-74.

Flyvbjerg, B. (2014). What You Should Know About Mega Projects and Why: An Overview. Project Management Journal, 45(2), 6-17.

Flyvbjerg, B., Holm, M.K.S., & Buhl, S.L. (2004). What causes cost overrun in transport infrastructure projects? Transport Reviews, 24 (1), 3-18.

Gauthier, J-B., & Ika, L.A. (2012). Foundations of Project Management Research: An Explicit and Six-facet Ontological Framework. Project Management Journal, 43(5), 5-23.

Geraldi, J., Maylor, H., & Williams, T. (2011). Now, let's make it really complex (complicated): A systematic review of the complexities of projects. International Journal of Operations & Production Management, 31(9), 966 – 990.

Goldkuhl, G. (2012). Pragmatism vs interpretivism in qualitative information systems research. European Journal of Information Systems, 21(2), 135-146.

Government of Kenya. (2013). Second Medium Term Plan, 2013-2013. Kenya Vision 2030: Author.

Green, J.R. (November, 1997). Team Building in Practice. Chartered Secretary, 34-5.

Hagen, M., & Park, S. (2013). Ambiguity Acceptance as a Function of Project Management: A new Critical Success Factor. Project Management Journal, 44(2), 52-66.

Hair, J.F., Babin, B., Money, A., & Samouel, P. (2003). The essentials of business research methods. London: Wiley.

Hauschildt, J., Gesche, K., & Medcof, J. (2000). Realistic criteria for project managers. Selection and Development, 31(3), 23-32.

Hayes, S., & Bennet, D. (2011). Managing projects with high complexity. In T. Cooke-Davies, L. Crawford, & C. Stevens, (Eds.), Aspects of Complexity: Managing Projects in a Complex World (pp. 17-25). Pennsylvania, USA: Project Management Institute.

Hirschman, A.O. (1995). Development projects observed (2nd ed.). Washington, D.C: Brookings Institution.

Hoegl, M., & Gemuenden, H.G. (2001). Team work quality and the success of innovative projects: A theoretical concept and empirical evidence. Organization Science, 12(4), 435-449.

Hofstede, G., Hofstede, J.G., & Minkov, M. (2010). Cultures and Organizations: Software of the Mind (3rd ed.). New York: McGraw Hill.

Hollander, E. (1958). Conformity, status and idiosyncrasy credit. Psychological Review, 65(2), 117-127.

Holste, J.S., & Fields, D. (2010). Trust and Tacit Knowledge Sharing and Use. Journal of Knowledge Management, 14(1), 128-140.

Ika, L.A. (2009). Project success as a topic in project management journals. Project Management Journal, 40(4), 6-19.

Jensen, M., & Meckling, W. (1976). Theory of the firm: Managerial behaviour, agency costs, and ownership structure. Journal of Financial Economics, 3, 305-360.

Jugdev, K., & Muller, R. (2005). A retrospective look at our evolving understanding of project success. Project Management Journal, 36(4), 19-31.

Jugdev, K., Thomas, J., & Delisle, C.L. (2001). Rethinking Project Management: Old truths and new insights. Project Management Journal, 7(1), 36-43.

Kahneman, D., & Tversky, A. (1979). Intuitive prediction: biases and corrective procedures. In

Kothari, R.C. (2006). Research Methodology: Methods & Techniques (Revised 2nd ed.). New Delhi, India: New Page.

Koutsoyiannis, A. (1992). Theory of Econometrics (2nd ed.). Hong Kong: Macmillan Education.

Livari, J., & Huisman, M. (2007). The Relationship Between Organizational Culture and the Deployment of Systems Development Methodologies. MIS Quarterly, 31(1), 35-58.

Lovallo, D., & Kahneman, D. (2003). Delusions of success, how optimism undermines executives' decisions.Harvard Business Review, 81 (7), 57–63.

Luthans, F. (2002). Organizational Behaviour (9th ed.). New Delhi, India: McGraw-Hill.

Maurer, I. (2010). How to Build Trust in Inter-organizational Projects: The Impact of Project Staffing and Project Rewards on the Formation of Trust, Knowledge Acquisition and Product Innovation. International Journal of Project Management, 28(7), 629-637.

Maylor, H., Vidgen, R., & Carver, S. (2008). Managerial Complexity in Project based Operations: A grounded model and its implications for practice. Project Management Journal, 39(1), 15-26.

McLeod, L., Doolin, B., & MacDonell, G. S. (2012). A Perspective-Based Understanding of Project Success. Project Management Journal, 43(5), 68-86.

Meir, S.R. (2008). Best project management and systems engineering practices in pre-acquisition practices in the federal intelligence and defense agencies. Project Management Journal, 39(1), 59-71.

Meyer, W. G. (2014). The Effect of Optimism Bias on the Decision to Terminate Failing Projects. Project Management Journal, 45(4), 7-20.

Miles, A.J. (2012). Management and organization Theory. USA, San Francisco: Jossey Bass.

Mullins, J.L. (2007). Management and Organization Behaviour (8th ed.). England: Prentice Hall.

Nassiuma, D.K. (2000). Survey Sampling: Theory and Methods. Nairobi: UoN Press.

Neuman, W.L. (2003). Social research methods: Qualitative and quantitative approaches, (5th ed.). Upper Saddle River, NJ: Pearson Education.

Nunnally, J.C. (1978). Psychometric Theory (2nded.) New York, NY: McGraw-Hill.

O'Brien, R.M. (2007). A Caution Regarding Rules of Thumb for Variance Inflation Factors. Quality and Quantity, 41(5), 673-690.

O'Donnell, J.G. (2010). A study of the relationships among project managers' leadership practices, project complexity, and project success. East Eisenhower Parkway, USA: UMI Dissertation Publishing.

Olaniran, O.J., Love, P.E.D., Edwards, D., Olatunji, O.A., & Mathews, J. (2015). Cost Overruns in Hydrocarbon Megaprojects: A Critical Review and Implications for Research. Project Management Journal, 46(6), 126-138.

Omonyo, B.A. (2015). Lectures in Project Monitoring and Evaluation for Professional Practitioners. Deutschland, Germany: LAP Lambert Academic Publishing. ISBN: 978-3-659-62815-3.

Project Management Institute. (2013). A Guide to the Project Management Body of Knowledge (5th ed.). Pennsylvania, USA: Author.

Project Management Institute. (2014). Navigating Complexity: A Practice Guide. Pennsylvania, USA: Author.

Remington, K., & Zolin, R. (2011). Controlling Chaos? The Value of the Challenges of applying complexity theory to project management. In T. Cooke-Davies, L. Crawford, & C. Stevens, (Eds.), Aspects of Complexity: Managing Projects in a Complex World, (pp. 115-128). Pennsylvania, USA: Project Management Institute.

S. Makridakis, & S. C. Wheelwright (Eds.), Studies in the Management Sciences: Forecasting, 12. North-Holland, Amsterdam, pp.313–27.

Sargut, G., & McGrath, R.G. (2011). Learning to live with complexity: How to make sense of the unpredictable and the undefinable in today's hyperconnected business world. Harvard Business Review, 89(9), 68-75.

Shenhar, A. J., & Dvir, D. (2007a). Reinventing project management: the diamond approach to successful growth and innovation. Boston, MA: Harvard Business School Press.

Shenhar, A.J., & Dvir, D. (2007b). Project management research-The challenge and opportunity. Project Management Journal, 38(2), 93-99.

Shenhar, A.J., Dvir, D., Levy, O., & Maltz, A.C. (2001). Project success: A multidimensional strategic concept. Long Range Planning, 34(6), 699-725.

Shermon, D. (2011). The Impact of Complexity on Project Cost and Schedule Estimates. In T. Cooke-Davies, L. Crawford, & C. Stevens, (Eds.), Aspects of complexity: Managing projects in a complex world, (pp. 57-72). Newton Square: Project Management Institute.

Shore, B. (2008). Systematic Biases and Culture in Project Failure. Project Management Journal, 39(4), 5-13.

Snowden, D. J., & Boone, M. E. (2007). A Leader's Framework for Decision Making. Harvard Business Review, 85(11), 68-76.

Spector, P. (1992). Summated rating scale construction. Thousand Oaks, CA: SAGE.

Sposito, V., Hand, M., & Skarpness, B. (1983). On the Efficiency of Using the Sample Kurtosis in Selecting Optimal Ipestimators. Communications in Statistics, Simulation and Computation, 12(3), 265-272.

Turner, J.R., Huemann, M., Anbari, F.T., & Bredillet, C.N. (2010). Perspectives on Projects. London, U.K.

Urban Resources, 4(1), pp 23-30

Vanston, J.H., &.Vanston, L. K. (2004). Testing the Tea Leaves: Evaluating the Validity of Forecasts. Research-Technology Management, 47(5), 33-39.

Wachs, M. (1986). Technique vs. advocacy in forecasting: A study of rail rapid transit.

Wachs, M. (1989). When Planners Lie with Numbers. Journal of the American Planning Association, 55(4), 476-479.

Wagner, J.A., & Hollenbeck, J.R. (2010). Organizational Behaviour: Securing Competitive Advantage. New York: Routledge.

Wateridge, J. (1998). How can IS/IT projects be measured for success? International Journal of Project Management, 16(1), 59-63.

Weihrich, H., & Koontz, H. (2001). Management: A Global Perspective (10th ed.). New Delhi: Tata McGraw- Hill

Williams, T.M. (1999). The need for new paradigms of complex projects. International Journal of Project Management, 17(5), 269-273.

Yazici, H.J. (2009). The Role of PMM and Organizational Culture in Perceived Performance. Project Management Journal, 40(3), 14-33.