Influence of Project Leadership on Success of Public Infrastructural Megaprojects in Kenya

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Abstract
The main objective of this study was to investigate the influence of project leadership on the success of public infrastructural megaprojects in Kenya. The need for this study arose from the thesis that complexity is the main cause of waste and failure that results in infrastructural megaprojects being delivered over budget, behind schedule, with benefit shortfalls, over and over again; and that leadership skill is the most important for successful navigation of this complexity. The study was designed as multiple-method research, based on virtual constructionist ontology recognizing that complexity is the mid-point between order and disorder. A cross-sectional census survey of completed public infrastructural megaprojects was conducted using two interlinked questionnaires. Quantitative data analysis was conducted using both descriptive and inferential statistics, while qualitative data were analyzed using a combination of expert judgment, scenario mapping, retrospective sense-making and critical thinking. Despite the context of these projects being risky, pressured, and fast-changing, the results showed that the typical leadership style exhibited by managers of these projects is goal-oriented. The results of regression analysis showed that success of public infrastructural megaproject was enhanced as the style tended to that of complexity leadership. It was thus concluded that project leadership had a significant influence on the success of public infrastructural megaprojects. Following this conclusion, the study recommends broadening the traditional approach to leadership and decision making in order to form a new perspective based on complexity leadership theory

Key Words: *Complexity leadership, leadership behavior, megaprojects, project success*

1. Introduction

Megaprojects are usually large-scale, complex ventures that cost billions of money, take many years to develop and build, involving multiple public and private stakeholders, are transformational, and impact millions of people (Flyvbjerg, 2014). These projects are generally "greenfield" in nature as they often create new assets and utilize a variety of delivery models depending on their inherent complexity. Megaprojects are often trait-making since they are designed to change the structure of society ambitiously. This is in contrast with smaller and more conventional projects that are trait-taking since they fit into pre-existing structures without modification (Hirschman, l995). Brady and Davies (2014) note that megaprojects are among the most complex category of project, implying that they are also a very different type of project to manage.

The growth in the use of infrastructural megaprojects in Kenya to deliver goods and services has been phenomenal over the past few years, and there appears to be no end in sight for their use. This is despite the fact that megaprojects are always delivered over budget, with schedule delays, with benefit shortfalls, over and over again (Flyvbjerg, 2014). The complexity inherent in the megaproject environment is often cited as the main cause of this poor performance (Cooke-Davies, Crawford & Stephens, 2011). Without a coherent research agenda to understand both its causes and navigation strategies, complexity continues to result in problems, waste and socio-economic failure (Remington & Zolin, 2011).

In the Project Management Institute's research, leadership skill was ranked as the most important for successful navigation of complexity in megaprojects (PMI) 2013. Indeed, **t**hroughout history, the difference between success and failure has been attributed to leadership (Luthans, 2002). Project managers in early documented achievements such as the construction of monuments or biblical narratives had to think and practice their leadership systematically to be successful (Cooke-Davies, 2011). Hayes and Bennett (2011) postulate that in future, managers of complex projects need to be developed and selected based on a range of leadership skills that enables them to operate in uncertain and ambiguous environments. A project manager is not necessarily a leader. Whereas project leaders conquer the context-the volatile, turbulent and ambiguous surroundings that sometimes seem to conspire against us, project managers surrender to the context (Warren, 1989). Leadership style consists of the behavior pattern of a person who attempts to influence others (Northouse

2016). The behavior pattern of leaders is in itself defined by a set of leadership competencies (Dulewicz & Higgs, 2005).

All too often, (project) managers rely on common leadership styles that work well in one set of circumstances but fall short in others (Snowden & Boone, 2007). The reason why these approaches fail even when logic indicates they should prevail is based on a fundamental assumption of organizational theory and practice: that a certain level of predictability and order exists in the world. This assumption, grounded in the Newtonian science that underlies scientific management, encourages simplifications that are useful in ordered circumstances. Circumstances change, however, and as they become more complex, the simplifications can fail. Good leadership is not a one-size-fits-all situation. Snowden and Boone (2007) argue that time has come to broaden the traditional approach to leadership and decision making and form a new perspective based on complexity science. This new perspective gives rise to complexity leadership style, based on complexity leadership theory.

In furtherance of this view, we investigated the influence of project leadership on the success of public infrastructural megaprojects by introducing a new dimension of leader behaviors based on complexity science. The remainder of this paper is organized as follows: section 2 reviews the theoretical and empirical literature relevant to this study and presents the conceptual model. Section 3 describes the methodology that we followed in conducting this study while section 4 presents the findings from the study together with a discussion of those findings. In section 5 we present the conclusions and recommendations.

2. Theoretical and Empirical Literature Review

2.1 Theoretical Literature

This study was operationalized through three key theories namely; theory of the social world of projects (the *Cynefin Framework*), the Complexity Leadership Theory and project success theory. Each of these theories is briefly discussed in the following subsections.

2.1.1 Theory of Social World of Projects

This theory stems from the philosophical positions held about what is a project and project management. According to this theory, the social world of projects can be divided into pre-modern, modern, postmodern and hypermodern/late modern (Gauthier & Ika, 2012). The theory is best described by the *Cynefin Framework* (Snowden & Boone, 2007) which refers to these worlds, respectively as; simple, complicated, complex and chaos. The simple social world philosophizes projects and project management before the onset of modernity. These projects are driven by the need to stimulate the economy and to serve the glory of a god or his representative, or a religion (Kozak-Holland, 2011). The project manager figure is a priest (Gauthier & Ika, 2012). Project management is relatively simple since best practices exist, and there is stability with clear cause-and-effect relationships. In this realm of known knowns, the approach to leadership is to *sense, categorize and respond*. To do this, the leader ensures that proper processes are in place, delegates, use best practices and communicates in clear, direct ways (Snowden & Boone, 2007).

The modern project management is closely linked to the scientific management approach (Joffre, Auregan, Chedotel & Tellier, 2006). These projects have a core belief in progress, through knowledge and reason, thus challenging religion, myth, and tradition (Habermas, 1997). In this world, a project is a temporary endeavor undertaken to create a unique product, service or result, and project management is the application of skills, knowledge, tools, and techniques to project activities to produce results (PMI, 2013c). The approach to leadership in this context is to *sense, analyze and respond*. The leader does this by using co-located and expert teams and by listening to conflicting advice (Snowden and Boone, 2007).

The postmodern and the hypermodern social worlds have evolved with the development of socio-technical objects such as the internet (Giddens, 1990), megaprojects, giga-projects or even terra-projects. This world emphasizes constant redefinition as a means of avoiding the pitfalls experienced by modernity (Dery, 2009). In this world, reflexivity and rhetoric thrive over reason and the project is either a network of actors

embedded in a social context and in constant transformation, or, a discourse of legitimation and an arena of social and power plays serving the interests of powerful stakeholders (George & Thomas, 2010; Hodgson & Cicmil, 2006). Depending on whether the postmodern world is predominantly characterized by rapid change or by emergence, the approach to leadership is either to *act or probe* before *sensing and responding* (Snowden & Boone, 2007). The leader does this by either; looking for what works instead of searching for right answers, taking immediate action to reestablish order and providing clear direct communication; or, by creating environments and experiments that allow patterns to emerge, increasing levels of interaction and communication, using methods that can help generate ideas, encouraging dissent and diversity and managing starting conditions and monitoring them for emergency.

2.1.2 Complexity Leadership Theory

This theory represents a growing concern that traditional models of leadership are insufficient for understanding the dynamic, distributed, and contextual nature of leadership in (megaproject) organizations (McKelvey, 2008; Johannessen & Stacey, 2005; Stacey, 2003a; Marion & Uhl-Bien, 2001; Rost, 1991). This approach to leadership is consistent with the central assertion of the meso argument that leadership is multi-level, processual, contextual, and interactive (Uhl-Bien & Marion, 2009). Unlike other models of leadership such as Transformational Leadership Theory (TLT), CLT does not view change as only, or even primarily, top-down; it does not see change as being "led" in the traditional sense of the word. Rather, a core premise of CLT is that change is emergent, unpredictable, and essentially uncontrollable (Marion & Uhl-Bien, 2007).The main outcomes of Complexity Leadership Theory are innovation, learning, adaptability and new organizational forms. CLT combines three styles of leadership namely, adaptive, generative and administrative. The purpose of adaptive leadership is to identify adaptive challenges, regulate distress, maintaining disciplined attention, give the work back to the people and protect leadership voices from below (Heifetz, 1994). The purpose of generative leadership is to embrace an informal leadership that fuels entrepreneurial system within the organization (Surie & Hazy, 2006). The purpose of administrative leadership is to loosen administrative systems in order to create an enabling environment for complexity leadership to thrive (Katz, 1955; Mumford, Zaccaro, Harding, Jacobs, and Fleishman, 2000).

2.1.3 Project Success Theory

There have been various attempts over the history of project management to define suitable criteria against which to anchor and measure project success (McLeod, Doolin & 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, & 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; 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 the views and objectives of all stakeholders (Atkinson, 1999; Baccarini, 1999; Bannerman, 2008; de Wit, 1988; Jugdev & Muller, 2005; Wateridge, 1998).

Researchers have progressively widened the scope and constituency of what is meant by project success, recognizing that project success is more than project management success and that it needs to be measured against overall objectives of the project thus reflecting a distinction between the success of a project's process and that of its product (Baccarini, 1999; Markus & Mao, 2004; Wateridge, 1998). Product success involves such criteria as product use, client satisfaction and client benefits (McLeod et al., 2012). Researchers are also increasingly advocating for project success criteria that incorporate achievement of a broader set of organizational objectives involving benefits to the wider stakeholder base (see Shenhar, Dvir, & Levy, 1997; Shenhar, Dvir, Levy & Maltz, 2001; Shenhar & Dvir, 2007; Hoegl & 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.

2.2 Empirical Literature

Several types of research have been conducted linking leadership with organizational outcomes. For instance, a research study by Cambridge University's School of Business and Economics concluded that 80% of projects

failed because of poor leadership (Zhang & Faerman, 2007). The findings further suggested that poor leadership skills reflected limited or no teamwork, inadequate communication, and an inability to resolve conflicts as well as other human-related inefficiencies. As Hauschildt, Gesche, and Medcof (2000) report, the success of a project depended more on human factors, such as project leadership. They also found that the human factors increased in importance as projects increased in complexity, risk, and innovation. Further, they found that the critical role of the project manager's leadership ability had a direct correlation to project outcomes.

In a comparative study of two megaprojects, Brady and Davies (2014) demonstrated how complexity leadership was applied by the British Airports Authority and the Olympic Delivery Authority to manage both structural and dynamic complexity. The two projects are the over US$ 7 billion Terminal 5 project and the over US$ 13 billion London 2012 Olympic Park, respectively. Both these projects were a system of systems (array projects) with very high levels of complexity. In both projects, there was deliberate effort to create a collaborative culture, and integrated teams were used to come up with innovative solutions to emergent problems. In the case of the London Olympics project, the overall leadership approach was tight-loose. Loosening behaviors (exploration) involve enabling conditions for interaction, search, experimentation and information flow whereas tightening behaviors (exploitation) involves reducing variance through choice, execution, standardization, and restricting information flows (Uhl-Bien, 2012).

In order to identify a leadership style which can maximize the potential for project managers to achieve project success, Blaskovics (2014) used a mixture of library search (archiving) and field research to prove that project managers use a special combination of leadership style based on emotional intelligence and leadership style based on behavior. The study showed that the more democratic elements of communication, empowerment or creating an atmosphere which supports generating innovative ideas contribute to project success to a greater extent. The results of the study showed that classic elements are very important to achieve project success and cannot be neglected, but it should be enhanced by a more democratic leadership style.

In a study to examine leadership and adaptability in the healthcare industry using a complexity lens, Uhl-Bien (2012) conducted a qualitative investigation in 6 hospitals to examine leadership processes in the context of a strategic initiative. In this research, each hospital was visited twice-first with the executive team to identify the strategic initiative and second to snowball the sample. A total of 195 interviews were conducted between April 2008-July 2009. Despite the importance of "complex" responses, the study found that only 2 of the 6 hospitals engaged in leadership styles appropriate to a complex response. The other 4 hospitals responded using traditional leadership approaches.

In exploring the question as to whether successful leaders of large-scale complex projects have an internal process leading to a display of administrative, adaptive, and enabling behaviors that foster adaptive processes, Pisarski, Chang, Ashkanasy, Zolin, Mazur, Jordan and Hatcher (2011) developed a model in which they proposed interactions of key attributes, namely cognitive flexibility, affect, and emotional intelligence. The result of these cognitive-affective attribute interactions is leadership leading to the enhanced likelihood of complex project success. According to this model, a project leader's cognitive flexibility; affect, and emotional intelligence determine a project leader's adaptive and maladaptive behaviors that, in turn, create adaptive or maladaptive structures and processes at the project level. Ultimately, it is these structures and processes that determine project outputs, outcomes, and impact (Pisarski et al., 2011). The qualities that enhance adaptive leadership, especially in large-scale complex projects, can save billions of dollars of taxpayers' money, potentially create better quality leaders.

In a study designed to determine to what extent servant leadership can contribute to project success, Thompson (2010) used a quantitative descriptive research approach involving an online electronic survey of 308 members of the Project Management Institute (PMI). The study used Chi-square tests to determine the relationship between the dependent variable, successful project outcomes and the independent variable, servant leadership. The results of the tests led to the rejection of all ten null hypotheses, indicating a relationship between successful project outcomes and servant leadership.

Using a non-experimental, quantitative approach, O'Donnell (2010) conducted a study with the objective of providing insight into the relationships among project management leadership practices, project

complexity, and measurements of project success within a variety of projects across six different organizations. The primary population for the study comprised 105 project managers and approximately 300 project stakeholders (management, team members, sponsors, customers) within the United USA. The study found positive and medium to strong correlations between leadership and external and internal project success.

In a study to determine whether a project manager's leadership competencies contribute to project success, Geoghegan and Dulewicz (2008) utilized the Leadership Dimensions Questionnaire (LDQ) (Dulewicz & Higgs, 2005) and the Project Success Questionnaire (PSQ) (Pinto & Slevin, 1986, 1988a, 1988b) to prove that there is a statistically significant relationship between a project manager's leadership competencies and project success. Based on the survey results of 52 project managers and 52 sponsors working within the same company, the study correlated the scores from the LDQ survey with those of the PSQ survey and found a statistically significant relationship between leadership and project success at both 99 percent and 95 percent confidence levels.In meta-study of project management leadership research, Turner and Muller (2005) summarized the literature observing that project manager competence is related to success, different project leadership styles are appropriate at each stage of the project life-cycle, multi-cultural projects require specific leadership styles, project managers have an important role in creating an effective work environment for team members, project managers prefer task-oriented behavior to people-oriented, and leadership style influences perceptions of success.

In a study of over seventy change stories from ten organizations, Higgs and Rowland (2003) examined for effectiveness in a broad range of change contexts. They found that as the complexity of the context increased, a more facilitative style of leadership became necessary for success. A leader-centric or directive style was found to be inappropriate and ineffective in such context. However, such a style was found to be more common (and indeed dominant) in relatively simple and straightforward contexts (Dulewicz & Higgs, 2005).

In a landmark study to assess leadership styles and organizational context, Dulewicz and Higgs (2003) conducted a review of the literature covering different leader behaviors in differing contexts of change and identified three distinct leadership styles namely, engaging leadership (focused on producing radical change with high levels of engagement and commitment), involving leadership (based on a transitional organization which faces significant, but not necessarily radical changes in its business model) and goal-oriented leadership (a Leader-led style aligned to a stable organization delivering clearly understood results). They also developed the Leadership Dimensions Questionnaire (LDQ) containing 15 dimensions made up of 3 Intellectual Dimensions (IQ), 5 Managerial Dimensions (MQ) and 7 Emotional and Social Dimensions (EQ) using a combination of content and item analysis.

The empirical literature reviewed thus far indicates that project leadership could impact outcomes and depend on the context, a leadership style may enhance or impede successful delivery of a project. It is also clear that effective project leadership depends on the context. Thus, this study sought to answer two questions:

Are the project leadership behaviors of managers of public infrastructural megaprojects in Kenya consistent with their context?

Does project leadership significantly influence the success of public infrastructural megaprojects?

2.2 Conceptual Framework

Based on both the theoretical and empirical literature reviewed, the following conceptual model was developed to guide the study:

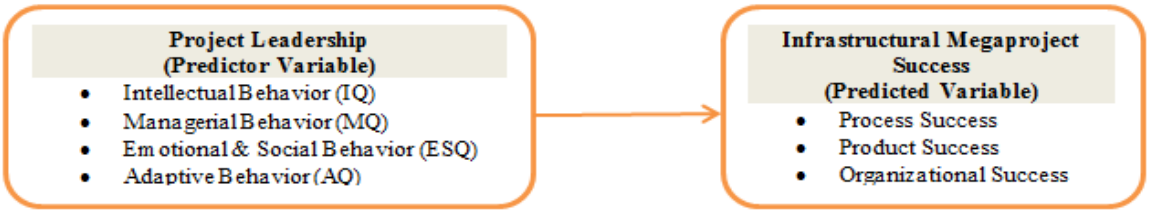

Figure 1: Study Conceptual Model

3. Methodology

3.1 Research Design

This study was operationalized through exploratory, descriptive and explanatory research goals based on Neuman (2003) classification of research goals. To achieve these goals, a post-positivist philosophy emphasizing virtual constructionist ontology (Gauthier & Ika, 2012) was assumed. The choice of this philosophical perspective was guided by the social world of complex megaprojects. In this social world, mega project management is neither practice nor a tool (as is the case with projects implemented in the modern social world) but rallying rhetoric in a context of the power play, domination, and control (Gauthier & Ika, 2012).

This study was designed to be mixed-method research combining both quantitative and qualitative strategies (Burch & Carolyn, 2016). The mixed-method research provides an epistemological paradigm that occupies the conceptual space between positivism and interpretivism (Tashakkori & Creswell, 2007), the main epistemologies on which the virtual constructionist ontology thrives. To generate data for this study, a cross-sectional survey design was used. This design entails the collection of data (predominantly by questionnaire or structured interview) on usually quite a lot more than one case and at a single point in time in order to collect a body of quantitative or quantifiable data in connection with two or more variables, which are then examined to detect patterns of association (Bryman & Bell, 2007).

3.2 Target Population

This study had as its primary population public sector infrastructural megaprojects implemented by the government of Kenya since 2005. Given the continual reorganizations within government and the several projects implemented by the government, it was unlikely that project records and managers for earlier projects could be traced with ease. Following Flyvbjerg (2014), the minimum budget for megaprojects included in this study was approximately Ksh. 1 billion. Managers, team members, sponsors and key stakeholders of these projects constituted the population of respondents from whom data was collected.

The rationale for selecting infrastructure among other foundations of national transformation was based on its huge actual and projected expenditure in comparison to other sectors. Specifically, in the Government of Kenya (2013) Second Medium Term Plan, infrastructure was allocated over Ksh. 7.5 trillion with the second highest allocation of Ksh. 2.5 trillion going to the Information, Communication and Technology sector.

3.3 Sampling Frame and Sample

The sampling frame of this study comprised a listing of completed public sector infrastructural megaprojects implemented in Kenya since 2005 with a minimum budget of approximately Ksh. 1 billion. The list of these projects was obtained from the Vision 2030 Secretariat and counterchecked with key informants from government parastatals. A total of 31 such projects was identified. Given the number of completed infrastructural megaprojects for the period under study as described by the sample frame, a census survey was found to be appropriate. Generally, when a sample frame is known, it can also be construed to mean that the population is known. In this case, collecting data on each member of the population becomes possible.

3.4 Instruments

Fieldwork for this study utilized two interlinked questionnaires namely; the Leadership Behavior Questionnaire (LBQ) and Project Success Questionnaire (PSQ). The questionnaire survey is hailed to be an efficient data collection mechanism when the researcher knows exactly what is required and how to measure the variables of interest (Neuman, 2003). The Leadership Behavior Questionnaire (LBQ) was constructed based on the Leadership Dimensions Questionnaire (Dulewicz & Higgs, 2003). The LBQ utilized a 53-item Likert-type scale in which the respondents were required to indicate on a scale of 1-5 (1=never, 2=rarely, 3=at times, 4=often, 5=always) the extent to which the project manager engaged in the behaviors described in the questionnaire and provide a brief comment (where applicable) to explain their response. Of these items in the scale, 6 assessed Intellectual Behavior (IQ), 18 assessed Managerial Behavior (MQ), 13 assessed Emotional and Social Behavior (ESQ) while 16 assessed Adaptive Behavior (AQ). For each item on the scale, a score of 1 or 2 mapped onto goal-oriented leadership behavior while a score of above 4 mapped onto complexity leadership behavior. An intermediate score of between 2 and 4 mapped onto involving leadership behavior.

The PSQ was developed based on Shenhar and Dvir (2004) and McLeod et al. (2012). The PSQ used in this study incorporates broader project success measures beyond the traditional critical dimensions of the “iron

triangle." The scale measured success along three constructs namely; process, product, and organizational success. The success scale comprised 18 items blending open and closed-ended questions on one part and Likert-type questions on the other part. The first part involving closed and open-ended questions were meant to assess process success while the Likert type questions assessed product and organizational success on a scale of 1 (strongly agree), 2 (agree), 3 (Neither agree nor disagree), 4 (disagree) and 5 (strongly disagree).

3.5 Pilot Test and Reliability

The pilot test involved validating the instruments and testing the feasibility of the data collection schedule. Through this study, the reliability and dimensionality of the measurement scales were tested to ensure that the items actually and reliably measured the intended variables. A total of four megaprojects and 16 respondents were surveyed as part of the pilot study. This was well above the "10% of the sample projected for the larger parent study" rule (Connelly, 2008). The results of the pilot study showed that both the LBQ and PSQ were reliable with a Cronbach's alpha of 0.980 and 0.889 respectively.

Reliability is concerned with the question of whether the results of a study are repeatable. It is concerned with whether or not the measures that are devised for concepts are consistent (Bryman & Bell, 2007). Cronbach's (1951) coefficient alpha (α) is commonly used to measure the reliability of the scales for Likert-scaled sub-items (Spector, 1992). This is because the underlying assumption of the Likert scale is that it represents an underlying continuous latent scale, although the observations are ordinal (Likert, 1931), and a high score of Cronbach's coefficient alpha means high reliability, stability, and accuracy (Papadopoulos, Ojiako, Chipulu & Lee, 2012). If the sub-items have a high agreement and are highly correlated, then α will be close to 1. Hair, Babin, Money, and Samouel (2003) asserted that an alpha coefficient between 0.8 and 0.9 shows the very good strength of association. When α is ≥ 0.7, the scale is generally reliable (Nunnally, 1978). All items in the LBQ and PSQ satisfied this criterion.

3.6 Data Analysis

Collected data were analyzed descriptively using measures of central tendency and dispersion. Given that Standard Ten scores (STens) are generally used in the analysis of personality-type questionnaires, the raw leader behavior scores were converted to STens, and their standard deviations were determined. By definition, STens have a mean of 5.5 and standard deviation of 2.0 (Geoghegan & Dulewicz, 2008). All items satisfying this condition were considered for further analysis while those that did not satisfy this condition were dropped. The leader behavior STens were assessed further based on a descriptive 3-point scale of "High" (STens of 8 and above), "Medium" (STens above 6.5 but less than 8), and "Low" (STens between 5 and 6.5 inclusive). These results were mapped onto 3 key leadership styles namely; Complexity Leadership (CL), Involving Leadership (IL) and Goal-Oriented Leadership (GL) to understand whether infrastructural megaproject managers have a typical leadership style.

To check whether the leadership behavior mean STens were consistent with those of the norm group, a one-sample *t*-test was conducted at the 95% confidence level. The calculated *t*-statistics were then compared with the critical value of *t* obtained from the Student's *t* distribution table. The null hypothesis used was that there is no significant difference between the leadership behavior dimensional scores and those of the norm group. Megaproject success was analyzed using the Cost Performance Index (CPI), Schedule Performance Index (SPI) and the Weighted Composite Index.

4. Findings and Discussion

4.1 Findings

A total of 27 completed infrastructural megaprojects were studied as part of this research. This represented a return and response rate of 87.1%. Of these projects, 2 (7.4%) were from Kenya Ports Authority, 2 (7.4%) were from Kenya Pipeline Company, 6 (22.2%) were from Kenya Airports Authority, 3 (11.1%) were from Kenya Power and Lighting Company, 1 (3.7%) was from Kenya Electricity Generating Company, 5 (18.5%) were from Kenya Urban Roads Authority, 1 (3.7%) was from Kenya Civil Aviation Authority, 1 (3.7%) was from

Geothermal Development Company, with the remaining 6 (22.2%) coming from Kenya National Highways Authority.

4.1.1 Leadership Behavior

When the raw scores were converted to STens, the results indicated that all items measuring intellectual behavior satisfied the STens condition and were included in further analysis. These items measured critical analysis and judgment, vision and imagination, and strategic perspective. The 18 items on managerial behavior scale measured managing resources, engaging communication, empowering, developing and achieving. Of these items, 7 did not satisfy the STens condition and were dropped from further analysis.

On emotional and social behavior, 6 of the 13 items on the scale did not satisfy the STens condition and were left out of the further analysis. The items on this scale measured key leadership behaviors of self-awareness, emotional resilience, intuitiveness, interpersonal sensitivity, influence, motivation, and conscientiousness. Of the items measuring adaptive behavior, 13 did not meet the STens condition for further analysis. Items on this scale assessed key adaptive leadership behaviors of ambiguity acceptance, ambidexterity, generative and loosening leadership behaviors. The mean STens were calculated as the simple average of the STens for the items for each construct in every dimension of leader behavior. Table 4.1 summarizes these mean STens. Based on the mean STens, each of the leader behavior dimensions was assessed on a descriptive 3-point scale of "High" (STens of 8 and above), "Medium" (STens above 6.5 but less than 8), and "Low" (STens between 5 and 6.5 inclusive). Based on IQ dimension, the results indicated a leadership style characterized by medium score on critical analysis and judgment, vision and imagination, and strategic perspective.

Table 4.1: Mean STens for Leadership Dimensions

Leader Behavior	STens
Intellectual Behavior (IQ)	
Critical Analysis & Judgment	7.16
Vision & Imagination	6.77
Strategic Perspective	6.77
Managerial Behavior (MQ)	
Managing Resources	7.25
Engaging Communication	5.61
Empowering	Dropped
Developing	5.74
Achieving	7.55
Emotional & Social Behavior (ESQ)	
Self-awareness	5.23
Emotional Resilience	5.23
Intuitiveness	5.61
Interpersonal Sensitivity	Dropped
Influence	Dropped
Motivation	6.97
Conscientiousness	6.19
Adaptive Behavior (AQ)	
Ambiguity Acceptance	Dropped
Ambidexterity	5.23
Generative	Dropped
Loosening	6.97

On MQ, the results indicated a leadership style characterized by medium score on managing resources, low score on both engaging communication and developing and medium score on achieving. On ESQ, the results

indicated a leadership style characterized by low Self-awareness, emotional resilience, intuitiveness and conscientiousness; and medium score on motivation. On AQ, the results indicated a leadership style characterized by a low score on ambidexterity and medium score on loosening behavior.

These results were mapped onto 3 key leadership styles namely; Complexity Leadership (CL), Involving Leadership (IL) and Goal-Oriented Leadership (GL) to determine whether infrastructural megaproject managers have a typical leadership style. The results showed that out of the 14 leadership dimensions that met the STens threshold (mean=5.5 and standard deviation=2.0), 9 dimensions mapped onto Goal Leadership, 5 dimensions mapped onto Involving Leadership while 4 dimensions mapped onto Complexity leadership. Thus, the results portrayed a leadership style that is long on goal-leadership but short on both involving and complexity leadership. Table 4.2 summarizes the identified leadership styles.

Table 4.2: Mapping of Leadership Styles

Leader Behavior	Item in the Scale	STen Score		
		Low	Medium	High
Intellectual Dimension (IQ)				
Critical analysis and judgment	A1		CL, IL	
Vision and imagination	A2, A3, A4		CL	
Strategic perspective	A5, A6		CL, IL	
Managerial Dimension (MQ)				
Managing resources	B1,B2,B3,B4		IL	
Engaging communication	B5, B6, B7	GL		
Empowering	B8,B9			
Developing	B10,B11,B12,B13,B14	GL		
Achieving	B15,B16,B17,B18		CL, IL	
Emotional and Social Dimension (ESQ)				
Self-awareness	C1,C2	GL		
Emotional resilience	C3,C4	GL		
Intuitiveness	C5	GL		
Interpersonal sensitivity	C6,C7,C8			
Influence	C9			
Motivation	C10,C11		GL	
Conscientiousness	C12,C13	GL		
Adaptive Dimension (AQ)				
Ambiguity acceptance	D1,D2,D3			
Ambidextrous	D4	GL		
Generative	D5,D6,D7,D8,D9,D10,D11			
Loosening	D12,D13,D14,D15,D16		GL, IL	

To check whether the leadership behavior mean STens were consistent with those of the norm group, a one-sample *t*-test was conducted at the 95% confidence level. The calculated *t*-statistics were then compared with the critical value of *t* obtained from the Student's *t* distribution table. Using a two-tailed test and given 26 degrees of freedom, the critical value of *t* was obtained as 2.056. The results showed that all the IQ dimensions had significantly higher STen mean scores when compared to the standardization sample. For the MQ dimensions, managing resources, empowering and achieving had statistically significant STen mean scores. For ESQ dimensions, interpersonal sensitivity, influence, motivation, and conscientiousness had statistically significant STen mean scores when compared to the standardization sample. Except for the ambidexterity dimension, all AQ dimensions had statistically significant STen mean scores. Empowering, Interpersonal sensitivity, influence, ambiguity acceptance, and generative dimension, all had lower STen mean scores but were statistically significant.

Table 4.3 summarizes the significance of the leadership dimensions.

Table 4.3: Significance of Leadership Dimensions

Leader Behavior	Mean STens	STDEV	Test Value=5.5 t-statistic	*df*	Significance
IQ Dimensions					
Critical Analysis & Judgment	7.16	1.02	8.47	26	Significant
Vision & Imagination	6.77	1.52	4.35	26	Significant
Strategic Perspective	6.77	1.18	5.61	26	Significant
MQ Dimensions					
Managing Resources	7.25	1.84	4.95	26	Significant
Engaging Communication	5.61	1.85	0.31	26	Not Significant
Empowering	2.33	1.50	-11.00	26	Significant
Developing	5.74	2.23	0.56	26	Not Significant
Achieving	7.55	2.08	5.13	26	Significant
ESQ Dimensions					
Self-awareness	5.23	1.29	-1.09	26	Not Significant
Emotional Resilience	5.23	1.80	-0.78	26	Not Significant
Intuitiveness	5.61	0.89	0.64	26	Not Significant
Interpersonal Sensitivity	3.68	1.93	-4.89	26	Significant
Influence	0.98	1.19	-19.78	26	Significant
Motivation	6.97	1.34	5.69	26	Significant
Conscientiousness	6.19	1.40	2.57	26	Significant
AQ Dimensions					
Ambiguity Acceptance	3.30	1.72	-6.64	26	Significant
Ambidexterity	5.23	0.82	-1.71	26	Not Significant
Generative	2.86	2.44	-5.63	26	Significant
Loosening	6.97	2.13	3.59	26	Significant

4.1.2 Project Leadership and Success

To enable the use of raw project leadership and success scores in parametric tests (in this case, correlation and regression analysis), coefficients of skewness and kurtosis were determined to ensure that the data met the normality assumption of parametric tests. Skewness involves the symmetry of the distribution of the variable about its mean, whereas kurtosis involves the peakedness of probability distribution of a variable (Hassan, Bashir, & Abbas, 2017). The results showed coefficients of skewness which are within the -1 to +1 range and coefficients of kurtosis which is also within the recommended range of -2.2 to +2.2 (Sposito, Hand, & Skarpness, 1983). In order to test the hypothesis that there is a significant relationship between leadership and success of public infrastructural megaprojects, the bivariate correlation was first performed between the scores of the constructs of project success and the leadership dimensions. The bivariate correlation results showed that at the 99% confidence level, intellectual and managerial leadership dimensions were significantly positively correlated with process success. At the 95% confidence level, both emotional and social dimension and adaptive dimension had a significant and positive correlation with process success. Within the intellectual leadership dimension, the results showed that vision and imagination were positively correlated with process success and this correlation was significant at the 95% confidence level. The strategic perspective aspect of intellectual leadership dimension had a strong and significant positive correlation with product success at the 99% confidence level. The results also showed moderately positive and significant correlation between strategic perspective and organizational success, at the 99% confidence level. Overall, the results showed that project leadership had a positive and medium correlation with the product and organizational success and had a near strong positive correlation with overall project success. Table 4.4 presents these correlation coefficients.

Table 4.4: Correlations between Leadership and Success

Leadership Dimensions	Project Success Dimensions			
	Process Success	Product Success	Organizational Success	Composite Success
Intellectual Dimension	**.765****	**-0.22**	**-0.28**	**0.31**
Critical Analysis & Judgment	0.27	-0.05	-0.02	0.16
Vision & Imagination	.413*	-0.11	0.03	0.25
Strategic Perspective	0.07	.801**	.553**	.653**
Managerial Dimension	**.584****	**-0.25**	**-0.12**	**0.23**
Managing Resources	.809**	-0.10	-0.21	.428*
Engaging Communication	.503**	-0.28	-0.11	0.17
Empowering	0.03	-0.18	-0.03	-0.07
Developing	.579**	-0.23	-0.22	0.20
Achieving	.739**	-0.05	-0.06	.461*
Emotional & Social Dimension	**.451***	**-0.14**	**-0.02**	**0.24**
Self-awareness	0.13	0.23	0.33	0.33
Emotional Resilience	.487*	0.00	0.13	.388*
Intuitiveness	0.16	-0.02	0.07	0.13
Interpersonal Sensitivity	.576**	-0.06	-0.08	0.34
Influence	0.11	-0.04	-0.06	0.03
Motivation	.737**	-0.37	-0.34	0.20
Conscientiousness	.772**	-0.27	-0.18	0.33
Adaptive Dimension	**.395***	**-0.28**	**-0.11**	**0.10**
Ambiguity Acceptance	0.24	0.13	0.14	0.29
Ambidexterity	0.07	0.29	0.33	0.32
Generative	0.17	0.16	0.03	0.21
Loosening	0.04	.736**	.576**	.610**
Leadership Score	**.195**	**.650****	**.617****	**.693****

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

When the standard error of beta is less than half of the beta coefficient, and the test is 2-tailed at the 95% confidence level, the beta coefficient is deemed to be significant (Koutsoyiannis, 1992). When the success and leadership scores data were subjected to OLS regression, the results showed that at 95% confidence level, the $s(\hat{b}_i) < \left(\frac{\hat{b}_i}{2}\right)$ for both the intercept and the leadership. Thus, both the intercept and the slope were significant. Accordingly, a one unit increase in leadership (L_i) score increased project success (PS_i) by 0.79. In other words, as leadership style moved from pure goal-oriented to complexity leadership, the project success rate was enhanced. The regression equation assumed the form:

$$\bar{PS}_i = 1.68 + 0.79L_i$$

Standard error of beta, $s(\hat{b}_i)$ =(0.64) (0.16)

t= (2.62) (4.81) Coefficient of Determination, $R^2 = 0.48$

This results showed that leadership behavior explained 48% of the variation in infrastructural megaproject success.

4.2 Discussion

This study tailored the framework in Dulewicz and Higgs (2005) to analyze leadership style. This framework used three dimensions with 15 measures to map leadership styles. In the current study, an additional dimension

with 4 measures was introduced to capture the essence of leadership in a complexity context (Snowden & Boone, 2007; Heifetz, 1994; Uhl-Bien, Marion, & McKelvey, 2007; Surie & Hazy, 2006). When the raw leadership scores were transformed into Standard Tens (STens), a total of 5 measures were dropped leaving 14 measures which were used in further analysis. An important parallel between the findings of this study and those of Geoghegan and Dulewicz (2008) relates to the items that were dropped from the scale following transformation of raw scores to STens. Geoghegan and Dulewicz found that vision and imagination had STens lower than the norm group and was thus dropped from the scale. The findings of the current study did not agree with this. Indeed, envisioning is a critical determinant of the application of a tight-loose administrative leadership style in a complex project environment.

The findings of this study revealed that managers of public infrastructural megaprojects exhibited a leadership style that was short on adaptive behavior indicating reduced ability to navigate through inherent complexity. This finding is consistent with that in Uhl-Bien (2012) where a majority of organizations operating in a complex environment were found to be responding to complexity using traditional approaches to leadership. However, this finding runs counter to that by Baskovics (2014) and Pisarski et al. (2011), who both argue that classical leadership style needs to be enhanced in order to achieve project success in complex contexts. Further, this finding is also not supported by extant literature which posits that complexity leadership style becomes increasingly applicable as project contexts metamorphose from complicated to complex and to chaos. The project environment of these contexts is risky, pressured, and fast-changing and calls for seemingly contradictory leadership capabilities-absolute clarity about the mission at a high level, extraordinary adaptability on the ground, and a knack for managing complex, technically precise systems (Weiss, Donigian & Hughes, 2010).Of the four measures of adaptive behavior, ambiguity acceptance and generative behavior were dropped from the scale leaving ambidexterity and loosening. This study takes the view that both ambiguity acceptance and generative behavior are subsets of ambidexterity and loosening. Based on STens, the top ranking leadership behaviors commonly exhibited by project managers were: achieving, managing resources, critical analysis and judgment, loosening and motivation, respectively. This order does not seem to support the leadership decision-making framework developed by Snowden and Boone (2007). This framework shows that complex or chaotic contexts require a leader who can act or probe first before sensing and responding.

The findings of this study portrayed a style that is long on goal-leadership but short on both involving and complexity leadership. This practice is not supported by the postulations of both positive and normative leadership literature which recognize that in order to respond positively to complexity in megaprojects, there is need for transformational and appropriate leadership (Cooke-Davies, 2011; Hayes & Bennett, 2011; PMI, 2013a; Snowden & Boone, 2007; Uhl-Bien & Marion, 2009; Gauthier & Ika, 2012; Chen, Donahue & Klimoski, 2004; Packendorff, 1995; Weiss, Donigian & Hughes, 2010). Generally, high complexity contexts require a more facilitative style of leadership (Higgs & Rowland, 2003) because leader-centric or directive style of leadership works best in relatively simple and straightforward contexts (Dulewicz & Higgs, 2005).

This study confirmed the findings by Dulewicz and Higgs (2005) and Geoghegan and Dulewicz (2008) who showed that leadership competencies affect project success and organizational outcomes. Based on their correlation strengths, the study identified managing resources, conscientiousness, achieving, motivation and developing, in that order, as the most important leader behaviors that affect process success. However, what was surprising is the insignificance of critical analysis and judgment which are key in judging various scenarios to enable tight-loose decisions.

As expounded in both positive and normative project success literature, factors that lead to process success may not necessarily lead to product and organizational success. The results of this study resonate with this view given that the leadership behaviors that significantly correlated with process success are distinct from those that correlated significantly with the product and organizational success. This study puts forth the thesis that leadership which is characterized by high strategic perspective and loosening is most likely to achieve both product and organizational success. Further, the findings of this study agree in part with the findings of

O'Donnell (2010) that project leadership has positive and medium to strong correlation with project success.

Earlier studies have shown that there is a significant positive relationship between ambiguity acceptance and customer and organizational outcomes for team members (Hagen & Park, 2013). On the contrary, this study did not find any significant relationship between these variables. However, it is noted that loosening behavior heavily draws from a leader's ability to recognize that a complex project context can present ambiguous situations which require being either explored or exploited. It can, therefore, be said that ambiguity necessitates loosening behavior and its acceptance facilitates decision making.

Whereas the individual behaviors within the adaptive leadership dimension did not portray a significant relationship with process success, they did have when combined. And with the loosening behavior has had a significant positive relationship with the product and organizational success, adaptive leadership was the only leadership dimension that had a significant relationship with all the dimensions of project success. The regression results showed that project success was an increasing function of leadership score in such a way that as project leadership score increased (thus tending to complexity leadership), infrastructural megaproject success was enhanced. Therefore, in line with the recommendation of Snowden and Boone (2007), there is need to broaden the traditional approach to leadership and decision making and form a new perspective based on complexity science. Such an approach to leadership is consistent with the central assertion of the meso argument that leadership is multi-level, processual, contextual, and interactive (Uhl-Bien & Marion, 2009).

5. Conclusion and Recommendation

This study identified goal-oriented leadership to be the typical style exhibited by managers of infrastructural megaprojects in Kenya. This is despite the context of these projects being risky, pressured, and fast-changing. Given that these contexts require leadership style characterized by extraordinary adaptability, the current style of leadership was found to be inappropriate. Indeed, the results of regression analysis showed that success of public infrastructural megaproject was enhanced as the style tended to complexity leadership. It was thus concluded that project leadership had a significant influence on the success of public infrastructural megaprojects. All the four leadership behavior dimensions namely; intellectual, managerial, emotional and social, and adaptive, were significant in attaining project management success (herein referred to as process success). Managing resources, conscientiousness, achieving, motivation, developing, interpersonal sensitivity, engaging communication, emotional resilience, and vision and imagination, were the most significant leader behaviors supporting process success. Only two leader behavior dimensions were shown to be significantly correlated with product success. These were intellectual (strategic perspective behavior) and adaptive (loosening behavior) dimensions. These were also the very behaviors that had a significant correlation with organizational success. The leader behaviors that had a significant correlation with the overall project success were; strategic perspective, loosening, achieving, managing resources and emotional resilience.

These conclusions put complexity leadership theory at the heart of resolving the "iron law" of megaprojects-delivery over budget, behind schedule, with benefit shortfalls, over and over again! As such, the classical leader behavior dimensions need to be enriched with the adaptive dimension to manage contexts as they "become." It is recommended that future public infrastructural megaproject managers be selected not just on their ability to exhibit strategic perspective, achieve results, manage resources, and demonstrate emotional resilience, but also on their ability to loosen administrative systems, protect leadership voices from below, and embrace informal leadership, so as to foster innovation, learning, adaptability and new organizational forms.

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