

Complexity and Completion of Projects in the Electric Power Subsector in Kenya

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Abstract

The study sought to find out whether project complexity had significant effect on the execution and completion of strategic projects in the electric power subsector in Kenya. A structured questionnaire was used to collect quantitative data from targeted corporation managers in the electric power subsector. An interview schedule was used to collect qualitative information from donor partners, senior Ministry of Energy officials and project contractor representatives. A multiple regression model was used as a framework for analyzing quantitative data with the help of SPSS Version 26. Qualitative data was analyzed thematically. The study found that complexity was a significant contributing factor to inefficiencies that adversely affected the execution and completion of strategic projects in the electric power subsector in Kenya. Further, the study established that complexity, moderated by organizational culture, adversely affects the execution and completion of projects in the electric power subsector in Kenya. The study recommended that to enhance project completion, inherent inefficiencies brought about by complexity, should be addressed. This would enable financial, human resource and technological resources, which were identified by stepwise regression analysis as having overarching effect on the completion of strategic projects, to be obtained, utilized, projects completed on time and results effectively achieved. Together with potential benefits, the specific approaches for addressing the inefficiencies occasioned by project complexity were recommended.

Key Words: Wicked Problems, Project Inefficiencies, Project Execution, Public Sector Projects

Introduction

For a long time, practitioners recognized that large construction projects are invariably complex (Baccarini, 1996). Project complexity has been cited as a source of inefficiency and poor performance of contractors and other service providers across industries (Cristobal et al., 2018). Attempts at addressing complexity-related performance challenges have been evident (Turner & Baker, 2019). But the study of complexity in the social sciences is recent and nascent (Turner & Baker, 2019). However, complexity theory has had a long history of application in mathematics, medicine, biological and physical sciences, (Dodder & Dare, 2000). At present, the subject is gaining currency across continents and four journals¹ dedicated to addressing complexity issues are periodically published. The social systems theory in sociology has been considered as a precedent, foundation, and an alternative for complexity theory in the social sciences, (Walby, 2007). However, recent studies have challenged social systems theory on account of “its disconnection from research and practice demands” and more specifically from

¹Complexity, J. Wiley and Sons., *Journal of Complexity*, Academic press., *InterJournal*, New England Complex Systems Institute. *Complexity International*, Charles Sturt University

its reductionist framework in understanding performance problems, (Turner and Baker, 2019). Scholars now find complexity theory as providing a more robust approach to solving wicked problems in the social sciences (ibid.). According to Wegener (2005), in both physical and social sciences, the goal of complexity theory is to develop algorithms that provide practical solutions with minimum resources for important problems. The robustness of complexity theory was underscored by Mason & Kirkwood (2019) who asserted that traditional scientific methods can only help in partially understanding projects and their leadership; it is complexity theory which offers a deeper understanding of organizations and how they are led. This finding is exciting because projects are grappling with issues embedded by complexity including emerging phenomena such as technology, globalization, and the myriad of challenges affecting and opportunities available for the project construction industry (Reyes, 2019). In a study, Reyes (2019) concluded that complexity theory underlies responses to critical management problems. Turner & Baker, (2019) recognized complexity theory as a new science for making sense and managing complex systems of today's projects which cannot be observed using traditional "linear methodologies". This study is based on the recognition that projects have difficulty in coping with increasing complexity by the construction industry even in the face of progress in technological innovation (Frenken, 2006). The thesis of this study therefore is that the efficiency in the implementation of strategic projects in large, multimillion-dollar, multi-layered public corporations is through understanding and management of inherent complexity. In the next section, complexity is defined and an exposition of its various dimensions as it relates to projects is made through review of relevant literature.

Literature Review

Theoretical Literature Review: Complexity Theory

This study was anchored on complexity theory which has been developing over the last six decades in the field of organization and management. The theory has benefitted from contributions of Simon (1962) who focused on the architecture of complexity, pointing out hierarchy and near-decomposability as key characteristic of complex project systems. Simon sought to present a structural design that would guide project managers and leaders in designing organizational systems that efficiently deliver performance results. Organizational structure and hierarchies were considered by Simon (1962) as sources of complexity and also change, because they get modified or adapted in a dynamic fashion as the environment changes. Complexity is one of the challenges that Simon (1962) sought to address, and to establish an optimal design for organizations. Other contributions towards developing complexity theory include Cyert and March (1963) who focused on behavioral aspects of an organization; Hannah and Freeman (1984) who studied adaptation, selection, and inertia through population ecology, among others.

While Simon (1962) foresaw the difficulty in getting optimal project organizational designs because of the multiple dimensions of large projects in a dynamic environment, some theorists have argued that the relationship between project organizational structure and performance is incomplete (Davis et al., 2009). Other theorists proposed complementary designs including change in project organizational processes (Stacey, 1995); co-evolution or changing as the environment changes (Lewin & Volberda, 1999); self-organization (Levi, 1994) and complex adaptive systems. These proposals imply dynamic change as a result of learning, project organizational initiatives, or changes in the environment (Brown & Eisenhardt, 1997).

Whereas project organizational structure is considered one source of complexity and inefficiencies, Rittel and Webber (1973) sought to provide an understanding of complicated as opposed to complex problems. They demonstrated that complexity exacerbates wicked problems. Such problems are characterized by participation of many stakeholders with conflicting priorities, are complicated and not easy to understand, and change with every attempt to address them. In addition, they have few, if any, precedents, and there is no way of evaluating whether a solution will work, (ibid). The large size and multi-dimensionality of project organizational structures, functions, processes, people as well as interaction with external environment tend to create wicked problems in project execution in the manner anticipated by Rittel and Webber (1973). Mason and Kirkwood (2019) add another dimension; that complexity comprises independent actors who can unintentionally demonstrate patterned behavior and properties that while present in the overall system, are not present in any one component of that system (p. ii). Patterned behavior is reminiscent of Chaos Theory² which Waldrop (1992) argued consists of non-linear systems of social complexity; explaining that it is not about disorder but about very complicated systems of disorder which does not fall completely out of control but “can be spontaneous, adaptive, and alive” (p.6). Complexity, however, displays a characteristic of coherence of self-organizing system, which resides at the edge of chaos, meaning that the actor or components in the system are not locked in a particular position but rarely fall out of control, (Waldrop, 1992). No wonder large projects still manage to get some things done despite evident inefficiencies brought about by complexity of the systems. Thus complexity, though it has patterned behavior, is characterized by chaos that has a self-organizing, adaptive system that does not get out of control, (Waldrop, 1992). It is in its chaotic, adaptive, self-organizing system that delays required actions, and therein lies the source of project organizational inefficiencies. The self-organizing, adaptive systems seem to imply organizational dexterity which Hodge et al., (2003) defined as the ability to take actions that overcome difficulties or that adapt a project to fit into environmental changes that threaten their performance. This view is contradicted by complexity and related wicked problems which make it difficult to identify both the problem and the solution to facilitate adaptation.

The various dimensions of complexity would be helpful in understanding its nature, and give an indication about how to address inherent inefficiencies associated with it. First, project complexity arises from existence of multiple and varied internal and external stakeholders with competing interests (Mason & Kirkwood, 2019). These interests are expressed in politics, in conflicts relating to and jostling for leadership, authority and power over project resources (Armstrong & Taylor, 2021). Second, in situations where there are many overlapping stakeholders with different perspectives, they enhance structural and cultural complexity, and further exacerbate wicked problems which by nature are unstructured, cross-cutting and relentless; meaning that they become more difficult to find their causes and effects or to get consensus on identifying problems and solutions (Weber & Khademian, 2008). Third, large projects with many employees and other stakeholders with diverse interests, and the structural multiplicity of decision-making layers, coupled with poor role clarity and reporting relationships, in an environment where functions, systems and subsystems are mutually dependent and interdependent, increase the chances of multiple wicked problems that take the project towards inertia (Jones, 2013). Fourth, from a social systems theory perspective, a project has socio-cultural networks comprising interconnected employees interacting through collaborative, dynamic ties such as shared goals, values, perspectives and needs (Baltacı &

²Chaos theory is an interdisciplinary theory that states that, within the apparent randomness of chaotic complex systems, there are underlying patterns, interconnectedness, constant feedback loops, repetition, self-similarity, fractals, and self-organization (Encyclopedia Britannica)

Balcı, 2017). These networks can be positively harnessed to promote project performance (Thomson, et al, 2018). Alternatively; employees can utilize such networks to stifle the efficient operations of a project in their quest to improve their terms of service. This implies that complexity contributes to ineffective and inefficient utilization of human resources (Mullins, 2020), and by extension, other resources as defined under the resource-based view (Barney & Hesterley, 2019). Thus, complexity is a source of project inefficiencies, conflicts, delayed decision making, and inflexibility to adapt (dexterity) and change quickly (agility), and can significantly contribute to the delays in completing strategic projects in the electric power projects in Kenya.

Empirical Literature Review

Cristobal et al. (2018) postulate that complexity is the sum of the different functions of a large project that make up systems and sub-systems which interact, are interrelated and interdependent. It can be explained by multiplicity of operations, structures, and the variety of specializations), newness and sophistication of technology in use; interdependence and interrelatedness of structures and processes; and management practices including ethics. All these functions and operations are part of, and are embedded by dominant culture of project participants (Schein & Schein, 2016). Project culture and complexity influence the intention, attitude and behavior control of stakeholders to perform according to the standards or norms established by the project (Djajadikertac et al., 2015).

Complexity is brought about by multiplicity of structures through which proposals and approvals pass before final decisions are made. In the public sector structures proposals are made from one level, checked by the next, reviewed by a higher level and sometimes returned to the lower level with comments. That level may then call for a committee meeting; where the proposals are then approved with amendments, after which they are cleared and passed onto the next higher level. That level may consult and then pass their recommendations to various management levels for approvals before they reach the highest level relevant for that particular kind of decision for authorization (Olivier, 2015). Olivier further found that complexity is exacerbated when roles, responsibilities and reporting relationships of the various actors in the structure are unclear. In addition, complexity is enhanced when there is dependence and interdependence of multiple functions, systems and subsystems (Cristobal et al., 2018). The adaptation and self-organization inherent in complex organizations is a slow process which delays decision making, and by extension project completion and response to changes in the environment (Cristobal et al., 2018). Further, the technical complexity of projects in terms of size measured by components, systems, subsystems, that depend and interdepend on one and each other exacerbate complexity (ibid.). Other features of project complexity include inadequate managerial, technical and operational capacity; technological changes; dynamic operating environment that impacts on the strategy and operations of a project; and other dynamics in the operating environment, (Turner & Baker, 2019).

More closely, because decisions have to pass through multiple stages of project decision-making levels before they are finally made, and because there are many stakeholders with competing interests in the process, decisions have to be negotiated at the various levels with many parties with diverse interests; delays become inevitable, (Mason & Kirkwood, 2017). As a result, projects are not completed on time. Further, complexity stifles project ability to adapt (Alzoubi, 2020). The inability to change or adapt quickly or on a timely basis means that an project loses agility which is a basis for sustained competitiveness (Aginha et al., 2015).

Study Objective and Hypothesis

This study sought to determine the effects of project complexity on the execution and successful completion of projects in the electric power sub-sector in Kenya. The null hypothesis that was tested and rejected was that project complexity has no effect on the execution and completion of strategic project in the electric power subsector in Kenya.

Methodology

Taking a positivist philosophical standpoint, the study adopted a mixed method design, collecting both quantitative and qualitative data using a survey questionnaire and an interview guide respectively. The study targeted the managers of five corporations in the electric power subsector that implement strategic power projects. The respondents also included senior managers of the Ministry of Energy, project financiers (donor partners), and contractors. A census of 223 managers in the corporations was invited to participate but 166 were available and responded to the questionnaire while senior Ministry of Energy officials, donors and contractors were purposively selected and engaged in in-depth qualitative interviews until saturation using an interview guide. The data collection instruments were piloted prior to engaging the respondents and amended as appropriate following the feedback obtained. A multiple regression model was used as a framework for analyzing data. The data was processed using Statistical Package for Social Sciences (SPSS) application.

Findings

Descriptive Statistics

The profiles of the respondent managers of the corporations comprised 81% males and 19% females with all of them having a first degree and 74% had a post graduate degree. Over 96% of the managers had stayed in the corporations for over 6 years. Thus, the target managers included both male and female members, were highly educated and experienced. A set of descriptive statistics from analysis of responses to an 8-item questionnaire on a Likert scale of 1 to 5, with the latter being the highest and the former being the lowest score, was obtained. Considering the means and standard deviations of the items assessed, complexity was indicated, *prima facie*, arising mostly from a large number of employees performing specialized functions; multiple structural layers operated by different specialized people; and the large size of projects, considering their value (over \$100 Million). It was also clear that though the organizations have managers with high educational qualifications, the implementing agencies have to outsource provision of certain services due to their technical complexity. This enabled the agencies to access new and appropriate technologies as well as capacity to handle highly technical and complex projects, and for this purpose had to outsource comparatively cheaply to external parties. From these analyses, other notable but less significant causes of complexity relate to long operations processes, overlapping roles and unclear reporting relationships. The effect of this complexity was project implementation delays, which in turn increased costs.

Considering all the six determinants which made up the independent variables in the study, namely, complexity, human resource, financial resource, project structure and technology innovation strategy, project complexity appeared to be the highest rated variable with an overall mean of 4.01, followed by others like financial resource capacity at 3.69. Technology innovation strategy was rated last with a mean of 3.16. Others had scores between 3.69 and 3.16.

Exploratory Factor Analysis

The conclusions from descriptive statistics were subject to exploratory factor analysis which sought to determine the reliability of constructs of the variables; and confirmatory factor analysis which confirmed validity of constructs and extracted the constructs that explained the factors more closely.

On reliability, a construct which fell between a coefficient of 0.7 and 0.9 of Cronbach's Alpha index was considered reliable, while those outside the threshold were revised or discarded, (Institute for Digital Research and Education, 2016). After processing through this criterion, three construct items of the complexity variable were dropped and five items with overall reliable Cronbach's alpha index of 0.736 were retained for further analysis as shown in Table 1.

Table 1: Construct Items Retained

• Project has many employees performing different specialized functions
• Budget exceeds \$100 Million
• Project structure has multiple layers operated by different specialized people
• The project has long processes that slow operations
• The complexity of the project delays and increase costs over budget

To validate the constructs of the variables under consideration, and specifically to establish the constructs that closely explain project complexity, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was used. This statistic, which indicates the proportion of variance in variables that might be caused by underlying factors, reported a value of 0.675 (Table 2) which was close to 1.0, and greater than 0.6, hence indicate sufficient items for each factor. Bartlett's Test of Sphericity reported a value of 0.000, (Table 2), which is less than 0.05, indicating that the construct items were ideal for factor analysis. The statistic tests the hypothesis that correlation matrix is an identity matrix, which would indicate that variables are unrelated and therefore unsuitable for structure detection (Brown, 2015).

Table 2: KMO and Bartlett's Test for Complexity Construct

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.675
	Approx. Chi-Square	169.368
Bartlett's Test of Sphericity	df	3
	Sig.	.000

Extraction communalities, which are estimates of the variance in each variable accounted for by the factors in the factor solution, reported values greater than 0.5, (Table 3), implying that that all the three items fit well with the factor solution and were retained for analysis (Bosten et al. 2017).

Table 3: Communalities

	Initial Extraction	
• Budget exceeds \$100 Million	1.000	.722
• The project has long processes that slow operations	1.000	.635
• The complexity of the project delays and increase costs over budget	1.000	.802
Extraction Method: Principal Component Analysis.		

Using principal **component analysis**, Eigenvalues (characteristic roots) were extracted to show the variance explained by a specific factor out of the total variance. The rule is that factors with Eigenvalues greater than one (1) should be considered, (Orcan, 2018). The three items extracted seem to measure one underlying factor, of which 71.99% of the variance is accounted for by the first factor. This is because only the first component has an Eigenvalue of at least one (1) as shown in Table 4.

Table 4: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.160	71.991	71.991	2.160	71.991	71.991
2	.537	17.888	89.879			
3	.304	10.121	100.000			

Extraction Method: Principal Component Analysis.

The component matrix in Table 5 shows the Pearson correlation between the construct items and the component (called factor loading). The component, project complexity, had a correlation of 0.85 with the first item, 0.797 with the second and 0.896 with the third items respectively, showing that they are closer to 1. According to Lind et al. (2021), the nearer the correlation to 1, the stronger the relationship. Thus, the correlation between each of the three items with the component extracted and listed in Table 5 are closely related to, and from principal component analysis, account for the variance of the project complexity.

The emerging subthemes confirmed by Pearson correlation analysis, indicate that complexity, in the main, is explained by three constructs: first, the sheer size of the projects as measured by their budgets; second, long bureaucratic processes and, third, the technical complexity of the projects themselves.

Table 5: Component Matrix

Item	Component 1
• Budget exceeds \$100 Million	.850
• The project has long processes that slow operations	.797
• The complexity of the project delays and increase costs over budget	.896

These findings are consistent with the qualitative views expressed by respondents in in-depth personal Interviews who said that complexity arose out of the sheer size of the projects, and their long processes, all of which cause delays and increase costs. Cristobal et al. (2018) confirm the three identified explanatory factors including structure, diverse stakeholders and many employees.

Regression Analysis Results

To test the null hypothesis that complexity has no effect on strategic project completion in the electric power subsector in Kenya, project complexity was regressed against project execution and completion and the results were as presented in Table 6.

Table 6: Results of Regression of Complexity on Project Completion

	Coefficient	t-statistic	P-value	R ²	Adjusted R ²	F-ratio
Project execution and completion						
Constant	1.665	7.560	0.000	0.187	0.182	36.537
Project complexity	0.353	6.045	0.000			

The results were found to be significant ($F= 36.537$, $p< 0.05$). Likewise, the Adjusted R² (=18.7%) indicated that 18.7% of the variation in project execution and completion can be explained by project complexity. The coefficient of 0.353 of project complexity means that a change in one unit of project complexity is associated with a positive change of 0.353 units in the outcome of project completion. Given that the p-value (=0.000) is significantly less than 0.05, the hypothesis that project complexity has no effect on project execution and completion is rejected and the alternative that there is a relationship between project complexity and project execution and completion is not rejected.

Further, the study found that with the moderating effect of culture, F-Ratio increased from 23.63 to 24.567; and the Adjusted R² increased from 0.220 to 0.308; respectively indicating; first, an improved accuracy of the results; and second, that project complexity accounts for about 30.8% of the variation in project completion and execution as indicated in Table 7. Further, the analysis of project complexity turned out a p-value of 0.001 (i.e. $p< 0.05$) indicating that the results are significant. On this basis, the null hypothesis that dominant culture has no moderating effect on the relationship between project complexity and successful completion of projects in the electric power subsector in Kenya is rejected; and the alternative hypothesis that culture has a moderating effect on the relationship between project complexity and successful execution and completion of projects in the electric power subsector in Kenya is not rejected. Therefore, project culture works as a moderating variable for project complexity in influencing project execution and completion in the electric power subsector in Kenya. That the moderating effect of culture enhances the explanatory value of complexity from 18.7% to 30.8% in explaining the variation in project execution and completion may be interpreted to mean that a less than expected performance culture exacerbates the inherent inefficiencies of project complexity

Table 7: Regression Analysis Results of Culture, Complexity and Project Completion

Project execution and completion	Coefficient	t-statistic	P-value	R ²	Adjusted R ²	F-ratio	Recommendation
Model without moderation effect							
Constant	3.408	5.468	0.001	0.229	0.220	23.63	significant
Project complexity	0.196	2.518	0.013				
Project culture	-0.323	-2.971	0.003				
With Moderation effect							
Constant	4.038	6.698	0.000	0.321	0.308	24.567	significant
Project complexity	0.200	2.740	0.007				
Project culture	-0.461	-4.319	0.000				
Interaction	0.223	4.538	0.000				

These results explain the inherent inefficiencies in the in the electric power subsector in public sector which stifles their ability to efficiently implement and complete projects. This is consistent with the empirical finding that complexity affects project agility and ambidexterity

(Gillespie, 2017). The implication of this finding is that as a precursor to implementation of strategic projects, organizations need to address project complexity, which is within their control, and move towards improved agility and ambidexterity (Reyes-Ortiz, 2019). Thus, there was evidence that project complexity, moderated by dominant culture, adversely affects the execution and completion of projects in the electric power subsector in Kenya.

Discussion

Whereas stepwise regression analysis identified financial, human and technological resources as overarching determinants of project execution and completion in the electric power subsector in Kenya, regression analysis to test relevant hypothesis confirmed that project complexity, within its cultural context, explained a significant 30.8% of the variation in project execution and completion. Further, descriptive statistics rated it as a top factor affecting the execution and completion of strategic projects in the electric power subsector in Kenya. But project complexity has been established as a source of inefficiency –delays and cost overruns at best- in the execution and completion of projects (Gillespie, 2017). It is these inefficiencies that increase risks of loss of financial support, with some donor partners withdrawing support as a result of delays as in the case of Laikipia wind power plant where donors withdrew because of delays and the project was abandoned, (Africa Energy Portal, 2020). When that happens, the existence of highly skilled and experienced human resources will lack the resources that would enable them to progress the project, (Barney & Hesterly, 2019). Similarly, technological resources would not be utilized (ibid). Thus, addressing the underlying complexity in project management facilitates the use of available financial, human and technological resources. It is on this basis that this article recommends that project complexity needs to be addressed as a precedent or prior to implementation of strategic projects. This way, holding other factors constant, the project avoids related inefficiencies (Aginha et al., 2015) and reap the benefits of the resultant timely decision making (Cristobel et al., 2018), as well as provide an environment where human resources can be motivated, (Mullins, 2020); financial resources can be attracted and utilized, (Barney & Hesterly, 2019) and operations can be carried out efficiently and projects completed on a timely basis (Mason & Kirkwood, 2019).

Further, the high rating of complexity in descriptive and regression analysis statistics represents the perceptions of the respondents, the managers, and therefore implies their likelihood to accept proposals to initiate change of some of the causes of project complexity and to allocate adequate resources for that purpose, amidst competing priorities, (Palmer et al., 2009). Secondly, given the managers' perceptions and likelihood of acceptance to address complexity, and given that its sub-variables such as multiple levels of decision making, long processes and unclear reporting lines as well as poor accountabilities, among others, are within their control and influence, the feasibility of successfully addressing complexity increases, with the result that challenges of efficiently executing and completing strategic projects can be realized, (Heywood et al., 2010).

Electric power project funding is mainly sourced from donor partners as loans or grants, and form a very large part (sometimes up to 90 percent) of the total project funds. Such funds would not be easily available for organizational restructuring but rather for specific project activities to be completed within specified time. Hence financial resource capacity is not entirely within the control or influence of top and senior management teams. Addressing complexity is therefore harvesting "low hanging fruits" where results are within management control, and action could be taken as and when management decides, and results used to mitigate the challenges and risks posed by complexity. It is different from addressing human resource

motivation which may comprise increasing compensation packages, training or other career development issues which do not always translate into staff retention. Addressing complexity will benefit all strategic projects. At the end, putting money, competent human or technology resources in projects with inbuilt inefficiency occasioned by complexity results in suboptimal performance (Barney & Hesterly, 2019)

Whereas Cristobal et al. (2018) suggested that complexity can be managed by integration, coordination and control; and whereas Reyes-Ortiz (2019) proposed that organizations can remove some of the elements of complexity by simplifying the business model, Heywood et al. (2010) suggest that complexity that makes it difficult to get things done and create little value, should be eliminated. They suggested that addressing complexity should start with what managers and employees experience as a problem in the project and identifying and addressing what amounts to root causes. Further, they suggested that managers need ambidextrous capabilities to be able to perceive and manage complexity. This can be achieved through targeted training. Alternatively, they suggested hiring managers with ambidextrous capabilities. Managers should look for ways to improve the situation including collaboration across projects, identifying and implementing opportunities beyond role definition.

Empirical studies seem to converge on a number of things that can be done to mitigate the adverse effects of project complexity including; first, simplifying and layering reporting structure; second, building roles and responsibilities up from the projects and limiting headquarters to the minimum necessary to run the business; third, streamlining decision making supporting systems and tools, to ensure that the enterprise has the right tools to support an agile way of working; fourth, enabling the design and evolution of architecture based on requirements; fifth, automating, testing and integration processes to enable fast and continuous delivery; sixth, obtaining appropriate infrastructure and operations to support rapid changes; seventh, training managers to provide vision, inspire, model, and coach employees; eighth, challenge existing culture and mindsets and create opportunities for employees to form networks and collaborate, communicate and work as cross functional teams (Aginha et al., 2015; Quy, 2018; Cristobal et al. 2018; Reyes-Ortiz, 2019; Brosseau et al., 2019; Adams, et al., 2020; Alzoubi, 2020).

Olivier (2015) argued that attempts at alleviating complexity in the public sector projects will be subject to employee resistance to any change which brings about ambiguity, uncertainty, complex rules and unclear accountabilities. This position was confirmed by qualitative interviews which cited difficulties in navigating government and corporate bureaucracy in decision making and getting project activities moving seamlessly. Study respondents indicated that managers need skills to manage stakeholder relations to be able to mobilize them to work together to get projects implemented more efficiently than they would otherwise be. The ability of managers to perceive and address challenges of complexity needs to be developed.

Conclusions

The foregoing findings and discussions have established that complexity, especially within a less performing culture, is a significant factor that contributes to inefficiencies that adversely affects the execution and completion of strategic projects in the electric power subsector in Kenya. To enhance project completion, it is necessary to address inherent inefficiencies brought about by complexity so that financial, human resource and technological resources may be easily obtained, utilized; projects completed on time and results effectively achieved.

The delays and cost overruns that come with complexity-related inefficiencies are thus avoided. Addressing complexity may involve reorganization or restructuring which may face resistance of employees. However, the managers' perception of complexity as a challenge impacting on project completion may be a starting point to cultivate acceptance of proposed changes for addressing it. Other approaches to addressing complexity have been identified in this article. The proposed solutions need to be implemented precedent to resource mobilization and implementation of strategic projects to get maximum benefits of project efficiency in decision making, human resource motivation and improved project outcomes.

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