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GOVERNANCE

MODERATING EFFECT OF GOVERNANCE PRINCIPLE APPLICATION ON THE MEDIATION EFFECT OF TECHNOLOGICAL CAPABILITY

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ABSTRACT

Background of the Study: Sustainability of water service is a key desire for government, non-government and communities at large since a sustained project ensures continuous deliverance of benefits to the target beneficiaries for a long time. Planning for sustainable activities calls for engagements of stakeholders and the target beneficiaries to create a better understanding and pave way for implementation of formulated activities. The presence and functionality of water user committees, training in the Water Service Providers (WSPS) and the level of external support were the institutional factors which impacted on sustainability.

Objective of the Study: The current paper sought to establish the moderating effect of governance principle application on the mediation effect of technological capability on the relationship between management practices and service sustainability of water companies in Kenya.

Theoretical Orientation: This paper was anchored on the Sustainability theory and supported by the theory of constraints, general systems theory and Mc Gregor's Theory X and Y.

Methodology: This paper adopted positivism philosophy. This study employed a cross-sectional survey design. The pilot test was carried out on 8 respondents from the 4 categories of the WSPs. The Quantitative data was analysed using Statistical Package for Social Sciences (SPSS version 22).

Results and Findings: The study revealed that there was a statistically significant moderating effect governance principle application on the mediation effect of technological capability on the relationship between management practices and service sustainability. The joint effect of governance principle application and technological capability was higher and significant compared to the individual effect of individual variables therefore the hypothesis that there is no significant moderating effect of Governance principle application on the mediation effect of technological

capability on the relationship between management practices and service sustainability was rejected and the alternative hypothesis supported. The findings also revealed that when the interaction term was introduced, indicated a significant relationship, thus Governance principle application was found to moderate the relationship between technological capability and service sustainability of water companies in Kenya (moderated mediation).

Conclusion: The study concluded that, the introduction of Governance principle application had a buffering moderating effect on the relationship between technological capability on the relationship between management practices and service sustainability. The study concluded that that there is need for governments and water sector stakeholders to move beyond infrastructure development to ensuring water service providers receive capacity building with a focus on governance, technical capacity and equipping with information. The study also concluded that training community members on financial management is critical to guaranteed transparency and accountability of the revenue and expenses. The adoption of sustainability theory enables project managers and the community to maintain and sustain the project or programme outcomes through utilization of their own resources and assets to enjoy the benefits of a project without compromising enjoyment of such benefits to the future generation.

Recommendations: The study recommends that the management of water services should have an integrated approach that not only addresses physical investments but also improves internal technological skills and provides a governance framework that enhances stakeholder voice. Further, the study recommends that the management of water companies should make informed decisions while planning for their medium- and long-term strategies for water projects that will enable them ensure efficient supply water and sanitation to various regions and hence attain project sustainability. Finally, the study recommends that WSPs should adopt user involvement, executive management support, proper planning and mobilization of resources, realistic expectations, competent staff, clear vision and objectives, availability of resources, competence in technology, managing scope, managing issues that arise from project teams, monitoring and evaluating project progress and risk management.

Keywords: *Management Practices, Governance Principle Application, Technological Capability &Sustainability.*

INTRODUCTION

Sustainability refers to support and maintain a condition so that it continues without interruption, diminution, giving way, fading, or yielding (Conard, 2013). Sustainability also refers to capacity to endure and adapt, prompting the question of what existing conditions need to and should be maintained (Starik & Kanashiro, 2013). Richard (1999) defined sustainability as a continued delivery of a particular service. The author emphasized on the need to involve all stakeholders in consumption and cost recovery strategies to ensure delivery of high quality services and sustainable development projects. Abraham (1998) on the other hand, views service sustainability of water companies in Kenya as a continued flow of water at the same rate and quality, as when the supply system was designed. Kimberly (1998) maintains that sustainability in water projects means, ensuring water supply services and interventions continue to operate satisfactorily and they generate benefits over time as expected. Project sustainability is viewed as the continuous

operation of resources in a way that it ensures the present and future generations continue enjoy their benefits. Sustainability measures the growth, maintenance and/or degradation of resources that affect a community's ability to keep itself (Dungumaro & Madulu 2013).

Studies conducted by Binder (2012) and Nikkhah and Redzuan (2010) have agreed on the definition, pointers and metrics of sustainability as endeavours to satisfy the service expectations and needs of communities in the long-term. Research has shown that projects implementation in sub-Saharan Africa; often demonstrate low levels of sustainability (Gebrehiwot, 2006). The key causes for this include inappropriate policy or legislation; insufficient institutional support; unsustainable financing mechanisms; ineffective management systems; and lack of technical backstopping (Niyi & Felix, 2011). Evaluation studies done by Agevi (2012), Ashley and Barney (2012) widely linked poor management of community projects to the increase in the cycle of poverty and failure of many donor funded projects in developing countries. Low sustainability rates are related to community issues such as limited demand, perceived lack of ownership, limited community education, and limited sustainability of community management structures, such as water use committees (WUCs) (Harvey & Reed, 2008).

Determinants of sustainability of water services have not been researched widely. According to Folifac and Gaskin (2011), provision of potable water supply services involves costs which are incurred at the design, construction and operational stages of any water supply system. However, the magnitude of these costs is utility specific and would depend in part on the type of technology used and management practices. Harvey and Skinner (2002) avers that sustainability of rural water supply facilities is dependent on many factors including policy, legal and institutional framework, social factors such as demand for water, community participation and community organization; economic and financial factors such as ability to meet the cost of maintenance and ability to pay for services; technological factors such as technology choice, availability of spare parts and operation and maintenance and lastly management factors.

Management Practices

The concept of management practices is naturally utilized across types of organizations, institutions, industries and sectors (Bendixsen & De Guchteneire, 2003). The management practices are designed, implemented, and interpreted in accordance organization's management, structure, operations, environment and people (Hall & Jennings, 2008). The adoption of management practices contributes to overall effectiveness of firms thereby improving firm's productivity, customer satisfaction, safety and market share (Valmohammadi & Roshanzamir, 2015). The implementation of a management practice is not a simple process and is influenced by context. Poorly managed projects have a reverse effect on the same success criteria of effective project management, which means time and cost overruns, insufficient quality, loss of reputation and disgruntled stakeholders (Meredith, Mantel Jr, & Shafer, 2017).

Governance Principle Application

There is a link between the governance principles on a high level and lower levels, and a link between internal processes and its surroundings (Winch, 2001). In other words, project governance defines the space in which day to day project activities occur (Patel, 2007). Three key areas need to be considered. Firstly, to ensure that the appropriate project organization is in place and formally documented to undertake the project (Marnewick & Labuschagne, 2011). Bekker (2015) avers that a governance framework based on the project perspective should provide mechanisms to guide project success versus top leaders micromanaging projects. Joslin and Müller (2016) agreed with Bekker (2015) that an appropriate governance structure should focus on processes, and not on control nor outcomes measures. Joslin and Müller (2016) elaborated by contrasting a control-oriented structure (focused on increasing shareholder wealth) versus a stakeholder-oriented model (focused on prioritizing stakeholder impact).

Joslin and Müller (2016) suggested that a stakeholder-oriented governance model exists to influence behaviors, such as peoples' ability to follow processes, and correlates to project success. Joslin and Müller's (2016) conclusions mirror Bekker's (2015) suggestions about limiting the role of governance to developing overarching strategic mechanisms for project success, and not the control-oriented tactics. All projects should have people identified and held responsible for: governing the project to ensure that managerial and technical oversight is maintained; sponsoring the project in pursuit of stated organizational needs or objectives; and managing the project on a day-to-day basis, ensuring that the deliverables are appropriate to the delivery of the desired outcomes.

Technological Capability

Technology capability refers to the skill needed to acquire, assimilate, use, adapt, change or create technology (Oruwari, Jev, & Owei (2002). Technological capability plays a crucial role in the attainment of firm's efficiency in innovativeness and production process. It is generally associated with the knowledge and skills necessary for a business firm to develop, use, adapt, absorb and transfer technologies (Mori, Batalha, & Alfranca, 2016). Firm's technology can be regarded as part of the extensive body of knowledge, techniques, systems, and tools available for the generation, distribution and the usage of goods and services by the final destination. A firm's technological change can be appreciated as a continuing process to generate and absorb technologies that enable the firm to competitively produce and offer valuable product to the market.

Wang, Lo, Zhang and Xue (2006) opined that the positive impacts of technological capability on firm's performance demonstrated the potential of this capability to stimulate mediating variables such as firm's sustainability. Consequently, technologically oriented firms have the will and ability to acquire important technological knowledge and apply them in the business operation process (Baark, Antonio, Lo & Sharif, 2011). Technological expertise is critical in acquisition and integration of external knowledge, thus detailed technological understanding is required to effectively acquire and exploit new knowledge (Lichtenthaler, 2016). Technological skills are

considered crucial in bringing innovative idea and better product design (Masa'deh, Al-Henzab, Tarhini, & Obeidat, 2018). Therefore, technological capability has been considered to be an essential factor in changing what a firm knows by internalizing new knowledge (Ahmad, Othman & Lazim, 2014; Zawislak, Alves, Tello-Gamarra, Barbieux & Reichert, 2013; Baark et al., 2011; Wang et al., 2006).

Technological factors found to influence sustainability are the choice of the technology of the water supply system, the availability and affordability of spare parts. Inappropriate technologies have been associated with poor levels of maintenance leading to low sustainability of water supply systems (Harvey & Reed 2008; Tadesse 2013). U-Dominic, Ezeabasili and Okoro (2015) concluded that inappropriate engagement of communities in water supply programs resulted in the implementation of inappropriate technologies in Nigeria. This had a negative impact on the maintenance of the water supply systems. Research has shown that technology options which are low-cost, easy to understand and maintain are likely to be more sustainable than those that require specialist skills and equipment (Haysom 2006; Machiwana 2010).

It has also been noted that even with appropriate technologies there should be sustainable spare parts supply for sustainability of water supply systems to be achieved (Oyo 2002; Harvey 2011). Ihuah and Kakula (2014) in their study observed that lack of spare parts had a negative influence on O&M of water supply systems. Spare parts supply chains have been noted to be critical especially in Africa where most hand pumps are imported (Harvey & Reed 2004). Where spare parts would have been availed, Baumann and Danert (2008) noted that the purchase of the spare parts should be made economically feasible and viable.

Service Sustainability of Water Companies in Kenya

Sustainability, as a concept in development projects, is dated to 1980s and defining development and sustainability has been difficult. These includes expanding coverage areas, developing alternative water sources, improving reliability though storage, improving water quality thought treatment facilities and enhanced management using billing systems (IFC, 2011). Access to spare parts is essential for maintenance, but a lack of consistent spare parts supply has left communities with few options when a breakdown occurs (Chowns, 2015). Although studies have identified a community's inability to pay for parts as a barrier to maintenance services, there is also evidence that markets exist for high-quality professional maintenance services, without which communities are left with the task of recognizing and diagnosing hardware problems (Kleemeier & Narkevic, 2010; Klug et al., 2018). Furthermore, while regulatory support is necessary for successful private sector maintenance provision, it need not be a prerequisite for successful pilot endeavors (Kleemeier & Narkevic, 2010).

There is a recognition that focusing solely on reactive repairs and infrastructure expansion is insufficient and unsustainable. This understanding has led to comprehensive maintenance models that build local capacity, foster consistent user payments through quality service, use monitoring to inform proactive maintenance, and reward continual functionality to incentivize maintenance. Though these approaches are still nascent, they have demonstrated the potential to improve the

sustainability of rural water supply; however, their long-term success is dependent on the support of local governing bodies and appropriate policies recognizing the role of maintenance provision in water service sustainability.

LITERATURE REVIEW

Theoretical Review

This paper was anchored on the Sustainability theory and supported by the theory of constraints general systems theory and Mc Gregor's Theory X and Y.

McGregor's Theory X and Y

McGregor's theory X and Y was founded by Douglas McGregor in 1960. It encapsulated a fundamental distinction between management styles and has formed the basis for much subsequent writing on the subject. McGregor (1960) proposed that leaders guided by Theory Y operated under a set of suppositions which he identified as classical management and he postulated that ordinarily humans prefer to be controlled, shun responsibility and lack ambition. These presuppositions therefore, led managers to oppose to give employees control over their work environment. Theory X managers place priority on the chain of command, they promote motivational methods of punishment or reward and observe close control of employee behaviour. This assumption led McGregor (1960) to conclude that classical management style was retrogressive and hindered achievement of organizations goals.

Based on this inference, Mcgregor (1960) advanced a differing set of managerial presumption referred to as Theory Y leadership style. Theory Y promotes a participative and involvement management style and advocates self-control, self-direction and commitment of employees to organization success. In addition, Theory Y leaders presume that individual are committed to work and that have the capacity to seek for solutions to work related challenges (Hindle, 2003).

Significant application of Theory Y to this research is that it supports employee involvement because managers who practice it tend to involve employees when making decisions, and value not only results but relationships (Sergiovanni, 1975). Thus, for employee involvement to work in organizations, priority has to be given to developing a positive, enabling and conducive work environment for the adaptation of a participatory style of management (Sergiovanni, 1975). In this study, the application of theory X views WSP as an organization composed of different categories of people namely board members, oversight committee members, community members and other stakeholders. All these groups of people need discipline as a means of achieving the desired organizational goals and objectives through setting rules and regulations and once broken to be followed by prescribed punishments. Theory Y on the other hand views WSP as an organization with a project manager being able to apply leadership skills so as to gain willing cooperation from the project employees through the use of rules and regulations set by management. In application of McGregor's theory to this study, the main variables are the management practices and service

sustainability of water companies in Kenya that refers to the effective utilization of time allocated to individual activities in the WSPs. This was the anchor theory since it encompasses the attributes of the management practices that involves maintaining and sustaining the projects within the WSPs. Management practices and service sustainability of water companies in Kenya was supported by this theory.

Sustainability Theory

The Sustainability theory was founded by Barbier in 1987. The concept of sustainability was first employed in relation to natural resources and how they should be used. It is believed that natural resources are finite and cannot support the world's projected population at current levels of resource utilization and growth (Gerald & Cobb, 2010). The scholars argue that resources in our environment are finite (White, 1996). The concept of sustainability is more focused on people being in a position to maintain and sustain the project or programme outcome through utilization of their own resources and assets to enjoy the benefits of a project without compromising enjoyment of such benefits to the future generation (Beata, 2014).

The need for sustainability in projects has become an issue in the current world setting because of the desire to improve the living standards of a given population. Since projects are started for the benefits of the community, it is important that project financiers assess the capacity of the community through involving them in every step of the project so as to make informed judgments on the probability of sustaining such projects once started (Nyaguthii & Oyugi, 2013). The theory argues that one of the key determinants of project sustainability is the community's capacity to manage a project. In cases where the capacity is low, project financiers may consider investing in capacity building to ensure that the community understands the management aspects of the project. This theory holds that project managers need to be ready and willing to manage change process in the community into buying into a given project. This involves attitudinal changes which may bring about resistance. This theory is also relevant in this study because it aimed at evaluating the social, economic and environmental viability of a given project beyond the funding period and the contributions of the community towards the development and implementation process.

Theory of Constraints

The theory of constraints is an overall management philosophy introduced by Goldratt (1990).The fundamental thesis of TOC is that constraints have negative effects on the performance of any firm. The theory of constraints advocates that project managers should focus on effectively managing these constraints. Linhares (2009) argues that most of the constraints faced by firms originate from policies and inadequate physical resources. The theory of constraints emphasizes optimum performance within the existing constraints. It provides a framework of activities that managers should undertake in the course of managing projects.

The theory of constraints can be characterized as a set of concepts, principles and measurements that focus attention on the logistical tools that make project work to flow smoothly (Demming, William &Dettmer, 1997). Noreen, Smith and Mackey (1995) study on the effects of project

management competencies in project performance noted that in order to improve efficiency and effectiveness in the performance of road infrastructure projects, the project manager should work on these constraints. The primary constraints to project management are: cost, time, and scope. The scope constraint refers to what should be done to produce the project's end result. Bigger and complex projects with several tasks to be performed are more challenging compared to smaller projects. Steyn (2001) asserted that theory of constraints can be used together with other management techniques such as Just in Time (JIT) and Total Quality Management (TQM) to provide a comprehensive set of techniques that emphasize continuous improvement in project activities. This enhances timely delivery of project deliverables and creation of value to customers through quality, reduction in project cost and project completion within scheduled time. Mabin and Balderstone (1999) believes that Goldratt's methodology seeks to identify a system's bottlenecks, assess the impact of these bottlenecks and help to suggest efficient solutions to the bottlenecks. This theory supported the relationship between management practices and service sustainability of water companies in Kenya.

General Systems Theory

The general systems theory is attributed to the work of von Bertalanffy (1968), who viewed a system as a set of interrelated and interdependent elements, where each element has an effect on the functioning of the whole. In espousing the theory, von Bertalanffy emphasized that real systems were open to, and interact with, their environments, and that they can acquire qualitatively new properties through emergence, resulting in continual evolution.

The same concepts and principles of organization underlie the different disciplines, providing a basis for their unification. Hartman (2010), cited in Keraro (2014) observed that the general systems theory provides sale aider with a tool for analysing organizational dynamics without providing a specific theory about how an organization should be managed. Smit and Cronje (2002), also cited in Keraro (2014) observed that a system is a collect ion of parts unified to accomplish an overall goal. If one part of the system is removed, the nature of the system is changed as well. Systems theory has a new perspective for managers to interpret patterns and events in the work place. They recognize the various parts of the organization, and, in particular, the interrelations of the parts, for instance, the coordination of central administration with its programs, supervisors and workers, among other variables (Rue & Byars, 2004).

In using the general systems theory approach, the study recognized that there is a strong influence of project sustainability on WSPs in Kenya. Von Bertalanffy saw organizations as a composition of its elements which together make a "whole". The key identifiable organization variables, based on this theory were the people, leadership, structures, processes, human and financial resources, communication systems, position and power. Application of this theory is recognition by management of how the different subsystems work inter-related to enhance organizational performance. Relating the foregoing discussion to the study undertaken, the systems theory thinking will help in visualizing the fact that what may seem as an isolated problem is actually part of an interconnected network of related issues (Keraro, 2014).

A basic assumption of a system is that the whole is more than the sum of its parts, that a system cannot exist in isolation or on its own therefore its interaction with the environment cannot be ignored. According to Friedman and Allen (2014), each system is a unique entity of wholeness that is distinguishable from other systems by a clearly defined boundary. In this regard, von Bertalanffy's systems theory differentiates between open and closed systems; open systems being those that exchange matter with their environments unlike closed systems, which are isolated from their environments. From this perspective, a closed system has a few variables while an open system typically deals with a more complex set of interrelationships (Chikere & Nwoka, 2015). Openness is a critical quality for system functioning that enables it to obtain inputs from its environment, process them in the system to generate outputs that are transmitted back to the environment, to effect outcomes (Friedman & Allen, 2014). In this context therefore, the systems theory is relevant to the study because the project output is intended to positively affect the environment, and positive impact can only be felt if a project's output is sustainable. This theory explained the relationship between technological capability and service sustainability of water companies in Kenya.

Moderating Effect of Governance Principle Application on The Mediation Effect of Technological Capability on The Relationship Between Management Practices and Sustainability

A moderated mediation model determines whether a mediation model, or part of the mediation model, is contingent upon a moderator variable. A moderated mediation model attempts to better explain the paths of a mediation analysis by explaining how the paths of a mediation model may differ for certain individuals (Hayes, 2013). Hypothetically moderator(s) could affect the relationship between X (management practices) and M (governance principle application) and Y (service sustainability of water companies in Kenya), or both X (management practices) and M (governance principle application) and M (governance principle application) and Y (service sustainability of water companies in Kenya), (Hayes, 2013). In fact, some researchers argue that although they are not always measured, almost every relationship between two variables has a moderator (MacCallum, 2003; Hayes, 2013). Although conditional process analysis is a relatively new term, introduced into the literature in 2013 (Hayes & Preacher, 2013; Hayes, 2018a), the idea of analytically combining moderation and mediation is not new. The strength of the association between service sustainability of water companies in Kenya and technological capability can be moderated with the help of governance principle application.

Similarly, the utilization of governance principle application drives the projects towards utilizing and sustaining the available resources. A moderated mediation model (Preacher, Rucker, & Hayes, 2007) was used in this study to further analyze the moderation effect of governance principle application on the mediating effect of technological capability on the relationship between management practices and service sustainability of water companies in Kenya. Hayes (2015) recommended the use of an index of moderated mediation to test the significance of the effect. The index of moderated mediation is found by multiplying the regression coefficients (Hayes, 2018a).

If a moderating variable (governance principle application) changes the value of the product of Path A and B, then it is a significant moderator of the mediating relation. Hayes (2018b) recommends the use of bootstrap confidence intervals to measure the significance of the index.

Technological capability has been described as the firm's ability to design and develop new process, product and upgrade knowledge and skills about the physical environment in unique way, and transforming the knowledge into instructions and designs for efficient creation of desired performance (Wang et al., 2006). Technological capability entails not only technical mastery capability, but also the capacity to expand and deploy the firm's core capabilities, and effectively combine the different streams of technologies and mobilize technological resources throughout the firms (Zawislak et al., 2013). Furthermore, technological capability comprises the body of practical and theoretical knowledge, procedures, experience, methods and physical equipment and devices (Ahmad et al., 2014). Technological capability represents a firm's superior and heterogeneous technical resources which meticulously related to the design technologies, product technologies, information and process technologies, sourcing and integration of external knowledge (Bergek, Tell, Berggren, & Watson, 2008). These components of technological capabilities are responsible for significant positive variation in firm's performance (Bergek et al., 2008).

Technological capability enables firm to identify, acquire and apply new external knowledge to develop operational competencies, which leads to the attainment of superior performance. Through effective technological capability, a firm creates and delivers new products and services in better and efficient way that best satisfies the customer needs, thus enhances the overall success of firm's new product development and performance (Wang et al., 2006). Technological capability enables firms to endure the effects of dynamically changing business environment throughout the life of business, right from the startup to the age of corporate social responsibility. Effective development of technological capability in firms entails becoming open-minded to the development in technological environment, perpetual accumulation of valuable knowledge and deployment of the current technologies effectively (Ahmad et al., 2014; Bergek et al., 2008; Wang et al., 2006). Therefore, effective combination of appropriate operational capabilities enhances the strength of firm's technological capability. Technological capability has been established in allowing firms to develop and deliver valuable product or services to customers and ensure effective customer relationship which positively enhance performance (Reichert & Zawislak, 2014; Ahmad et al., 2014; Zawislak et al., 2013; Wang et al., 2006).

A standard community project follows these steps in a sequence: Project identification, design, implementation and finally evaluation (Chandra, 2010). Sustainability should be incorporated at each of these stages, failure to which the eventual success of the project will be placed on a balance (Junbeum, Allenby & Ming, 2007). Each stage is faced by different unique issues that a project manager must be aware of (Junbeum, et al. 2007). Of all the stages of the project cycle, it is during project conceptualization and identification that basic project outline is set meaning substantial impact on sustainability can be made in this stage (Junbeum, et al. 2007). At this stage of

conception, the project manager and his support team need to be fully aware of the factors that promote sustainability if they are to make good judgment from the onset.

Conceptual Framework for the Study

This paper investigated the moderating effect of governance principle application on the mediation effect of technological capability on the relationship between management practices and service sustainability as presented in a diagrammatical form in Figure 1.

Moderating Variable

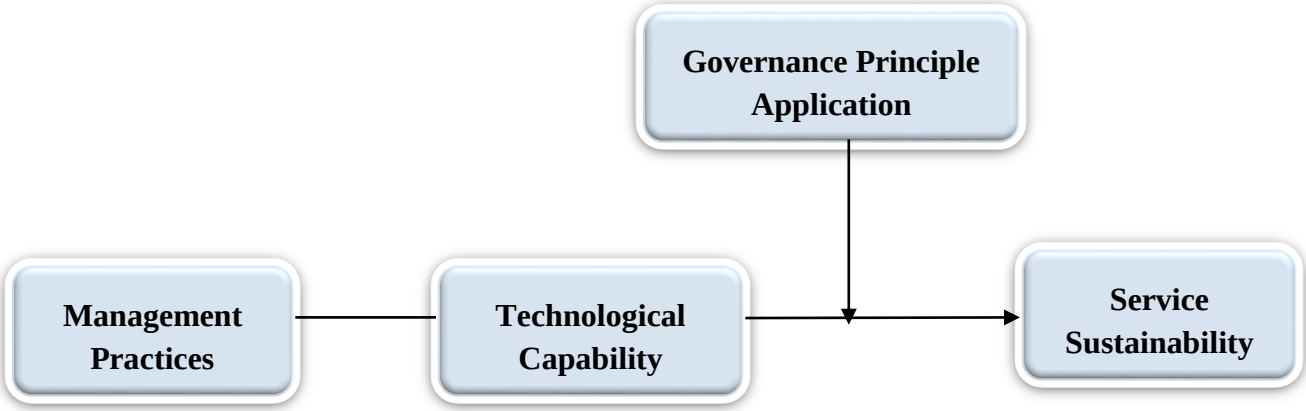

Figure 1: Conceptual Framework

Hypotheses of the Study

This paper was guided by the following hypothesis

$H0_1$: There is no significant moderating effect of governance principle application on the mediation effect of technological capability on the relationship between management practices and service sustainability of water companies in Kenya.

METHODOLOGY

Research Philosophy

The study adopted a positivist paradigm which involves a statistical analysis approach. This paper adopted positivism view with the aim of assessing the moderating effect of governance principle application on the mediation effect of technological capability on the relationship between management practices and service sustainability of water companies in Kenya.

Research Design

This study employed a cross-sectional survey design. The adopted design enabled collection of data across different facilities and testing their relationships. The cross-sectional study was concerned with finding out what, when and how much of the phenomena under study (Cooper & Schindler, 2014).

Population of the Study

The study population consisted of 80 Water Service Providers in Kenya registered by the Water Services Regulatory Board as at June 2017. The water companies are in four categories, classified by WASREB based on the total number of registered consumer connections for both water and sewer, namely Very Large, Large, Medium and Small as summarised in Table 1. The target population for the study comprised of the 80 WSPs in order to maintain population validity. This is because while the study population is small, there may be substantial variability in the characteristics of the WSPs in terms of technologies deployed for service provision, governance setup, and management approaches within the strata. The WSPs are also widely spread geographically across the entire country.

Table 1: Distribution of Study Population

Category	WSPs
Very Large (≥35,000 connections)	9
Large (10,000-34,999 connections)	32
Medium (5,000-9,999 connections)	14
Small (<5,000 connections)	25
Total	**80**

Data Analysis

The study used primary data. Primary data was obtained from the selected respondents using questionnaires. Quantitative data was analysed using Statistical Package for Social Sciences (SPSS version 22). The study employed linear regression analysis to determine the relationships that exist between the dependent, the moderating and the intervening variables. A multiple linear regression model was used to determine moderating effect of governance principle application on the mediation effect of technological capability on the relationship between management practices and service sustainability of water companies in Kenya. To determine moderating effect of Governance Principle Application on the intervening effect of Technological Capability, Hayes and Rockwood (2020) model for moderated mediation was adopted. Pearson correlation analysis was also done to measure the strength and direction of the relationship between the dependent, the moderating and the intervening variables.

FINDINGS AND DISCUSSIONS

Response Rate

The water companies that were surveyed were in four categories, classified by WASREB based on the total number of registered consumer connections for both water and sewer, namely very large, large, medium and small. The WSPs were widely spread geographically across the entire country. The target population for the study comprised all the 80 WSPs in order to maintain population validity however the study managed to collect information from 74 WSPs giving a response rate of 92.05%.

Further, the questionnaires were self-administered to the board members and top managers in water companies who are considered to have the information relating to how management practices affected service sustainability of water companies in Kenya by the registered water companies in Kenya. The researcher distributed 429 questionnaires, out of which 348 responded positively by filling and returning the questionnaires. This represented an overall positive response rate of 81.12%. The remaining 18.88% were unresponsive even after several follow-ups and reminders. Table 2 and 3 give results for the response rate.

Table 2: Response Rate of Study Population

Category	Population of Water Companies	Response of water companies	Percentage
Very Large (≥35,000 connections)	11	8	72.73%
Large (10,000-34,999 connections)	34	29	85.29%
Medium (5,000-9,999 connections)	16	13	81.25%
Small (<5,000 connections)	27	24	88.89%
Total	**80**	**74**	**92.05%**

Table 3: Response Rate

Category	Questionnaires distributed	Questionnaires filled and returned	Percentage %
Respondents	429	348	81.12%

This study's response rate was considered very good for survey research as recommended by Creswell and Creswell (2017) who proposes a score of 70-85% as good response rate, whereas Yin (2014) suggest a 50% response rate is adequate, 60% good and above 70% very good. Such a high response rate for this study can be attributed to the use of introductory letters from the

University explaining the purpose and nature of the study, as well as the use of trained research assistants who were equipped with skills on how to build rapport with respondents.

Inferential Statistics

Moderating Effect of Governance Principle Application on The Mediation Effect of Technological Capability on The Relationship Between Management Practices and Service sustainability of water companies in Kenya

To test this relationship, the following hypothesis was tested; Hypothesis $H0_1$: There is no significant moderating effect of governance principle application on the mediation effect of technological capability on the relationship between management practices and Service sustainability of water companies in Kenya. The hypothesis was tested through Stepwise regression analysis using two steps. The first step involved testing the influence of technological capability and Governance principle application on service sustainability of water companies in Kenya by the registered water companies in Kenya. The second step involved introduction of the interaction term through stepwise regression analysis. Regression results for the influence of Governance principle application on the relationship between technological capability and service sustainability of water companies in Kenya are contained in Table 4.

Table 4: Moderated Mediation of Governance Principle Application on Technological Capability

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.646[b]	.417	.413	.30516	.076	45.108	1	345	.000
2	.677[c]	.459	.454	.29440	.042	26.699	1	344	.000

a. Predictors: (Constant), Technological Capability, Governance Principles
b. Predictors: (Constant), Technological Capability, Governance Principles, TC_GP

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.952	2	11.476	123.234	.000c
	Residual	32.128	345	.093		
	Total	55.080	347			
2	Regression	25.266	3	8.422	97.175	.000d
	Residual	29.814	344	.087		
	Total	55.080	347			

a. Dependent Variable: Service Sustainability
b. Predictors: (Constant), Technological Capability, Governance Principles
c. Predictors: (Constant), Technological Capability, Governance Principles, TC_GP

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance
1	(Constant)	.937	.216		4.335	.000	.512	1.362	
	Technological Capability	.500	.058	.415	8.631	.000	.386	.614	.730
	Governance Principles	.315	.047	.323	6.716	.000	.223	.408	.730
2	(Constant)	1.557	.241		6.471	.000	1.084	2.030	
	Technological Capability	.429	.058	.356	7.439	.000	.315	.542	.687
	Governance Principles	.244	.047	.250	5.138	.000	.150	.337	.667
	TC_GP	-.331	.064	-.236	-5.167	.000	-.457	-.205	.756

Table 4 shows that model 1 is significant (p-value < 0.05, R^2 = .417 implying that technological principle and Governance principle application jointly explain 41.7% of variation in service sustainability of water companies in Kenya. Further, upon introduction of the interaction term, coefficient of determination (R^2) changed from .417 in model 1 to .459 in model 2 therefore giving a variation change of .042 which is significant at 95% confidence level (p=0.000<0.05). Further the change in p-value in model 2 is 0.00 which is also significant (p-value<0.05) implying that governance principle significantly moderates the relationship between technological capability and service sustainability of water companies in Kenya. The results further depict that F-value for both models were high and significant (F=123.234 for model 1; F=97.175 for model 2) implying that the overall models for direct and moderating relationships are significant and have explanatory value in explaining service sustainability of water companies in Kenya. The results further show that technological capability (β = .500, t = 8.631, p-value = .000<.05) and Governance principle (β = .315, t = 6.716, p-value = .000<.05) individually are significant in explaining service sustainability of water companies in Kenya in model 1. For model 2 when interaction term is introduced it is also significant (β = -.331, t= -5.167, p-value .000<0.05). Therefore, it was concluded that, the introduction of Governance principle application had a buffering moderating effect on the relationship between technological capability and service sustainability of water companies in Kenya. Based on the results of the test, the hypothesis that there is no significant moderating effect of Governance principle application on the mediation effect of technological capability on the relationship between management practices and service sustainability of water

companies in Kenya was rejected and the alternative hypothesis supported. This means that there exists a moderation on the mediation effect.

This was guided by the following model; $S= \alpha+ \beta_1 TC+ \beta_2 GP+\beta_3 TC*GP + \varepsilon$

Where: S is Service sustainability of water companies in Kenya

TC is Technological Capability

GP is Governance principle application (Moderating variable)

TC*GP is Technological Capability and Governance principle application (interaction)

ε= Error term

β = the beta coefficients of independent variables after the regression analysis results, the model became

S = 1.557 + .429TC + .244GP - .331TC*GP

CONCLUSIONS

The findings in the study indicated that on service sustainability of water companies in Kenya, WSP had adequate and properly managed systems to assure standards are consistently met, had adequate infrastructure, proper monitoring and effective planning and management of water quality and that drinking-water provided by the WSP meets health-based standards established by law. Additionally, the WSP had a plan of action for handling emergency situations relating to breaches in water quality, had established systems and mechanisms for assuring the microbial safety of drinking-water supplies as well as system of independent surveillance and quality control to monitor water quality.

On moderating effect of Governance principle application on the mediation effect of technological capability on the relationship between management practices and service sustainability of water companies in Kenya, the study established a statistically significant moderated mediation effect between Governance principle application and sustainability of water services. In general, Governance principle application collectively influences service sustainability of water companies in Kenya. Governance mechanisms serve as determining forces of performance whereby water companies with good Governance principle application are able to entice and attract capital providers, since many water services involve large capital investments, hence it may seem critical that good Governance principle application would attract financing for projects in the water sector aimed at improving service sustainability. The study findings realized that it has become a challenge financing rural water supply projects since these projects cannot recover costs, capital maintenance, cost of operations and maintenance yet they collect revenues from the sale of water. Hence all these factors jointly have a great effect on sustainability of water services by the registered water companies in Kenya.

The study concluded that there is need for governments and water sector stakeholders to move beyond infrastructure development to ensuring water service providers receive capacity building with a focus on governance, technical capacity and equipping with information. The increasing rate of water project failure especially in the rural areas should be addressed in order to achieve reliable supply of safe and clean water to the rural populations. The stakeholders of the WSPs should make sure that both technical aspects and regular follow-ups, capacity buildings to the community and water user association members become a sustainable process for the attainment of water project sustainability. The study also concluded that training community members on financial management is critical to guaranteed transparency and accountability of the revenue and expenses. Additionally, ensuring sustainable access to clean water depends on ensuring continued functionality of the infrastructure.

The adoption of sustainability theory enables project managers and the community to maintain and sustain the project or programme outcomes through utilization of their own resources and assets to enjoy the benefits of a project without compromising enjoyment of such benefits to the future generation. The study recommends that the management of water projects should have an integrated approach that not only addresses physical investments but also improves internal technological skills and provides a governance framework that enhances stakeholder voice. Further, the study recommends that the management of water companies should make informed decisions while planning for their medium- and long-term strategies for water projects that will enable them ensure efficient supply water and sanitation to various regions and hence attain project sustainability. Finally, the study recommends that WSPs should adopt user involvement, executive management support, proper planning and mobilization of resources, realistic expectations, competent staff, clear vision and objectives, availability of resources, competence in technology, managing scope, managing issues that arise from project teams, monitoring and evaluating project progress and risk management.

REFERENCES

Abrams, L. J. (1998). Understanding sustainability of local water services. In *25th WEDC Conference. Addis Ababa, Ethiopia. Retrieved April* (Vol. 12, p. 2001).

Agevi, T. (2011) Conceptual Frame Work on Self- Reliance in Community Development in Nigeria. *International Social Work,* 25(13):13-22.

Ahmad, N., Othman, S. N., & Lazim, H. M. (2014). A review of technological capability and performance relationship in manufacturing companies. In *2014 International Symposium on Technology Management and Emerging Technologies* (pp. 193-198). IEEE.

Allen, K., & Friedman, D. (2014). Systems Theory. *Description of Systems Theory*. 10. 13140/2.1.1132.9281

Baark, E., Antonio, K. W., Lo, W., & Sharif, N. (2011). Innovation sources, capabilities and competitiveness: Evidence from Hong Kong firms. In *Paper presented at the DIME Final Conference* (Vol. 6, p. 8).

Barbier, E. B. (1987). The concept of sustainable economic development. *Environmental conservation*, *14*(2), 101-110.

Baumann, E., & Danert, K. (2008). Operation and maintenance of rural water supplies in Malawi: study findings. *SKAT–Zurich, Switzerland: Swiss Resource Centre and Consultancies for Development*. Study Findings, Skat, St Gallen, Switzerland.

Baumann, E., & Danert, K. (2008). Operation and maintenance of rural water supplies in Malawi: study findings. *SKAT–Zurich, Switzerland: Swiss Resource Centre and Consultancies for Development*.

Beata, J; Hans P. K; Anandasivakumar. E. & Grazyna,P. S. (2014). *Key competences of public sector project managers*. 27th IPMA World Congress.

Bekker, M. C. (2015). Project Governance–the definition and leadership dilemma. *Procedia-Social and Behavioral Sciences*, *194*, 33-43.

Bendixsen, S., & De Guchteneire, P. (2003). Best practices in immigration services planning. *Journal of Policy Analysis and Management*, *22*(4), 677-682.

Bergek, A., Tell, F., Berggren, C., & Watson, J. (2008). Technological capabilities and late shakeouts: Industrial dynamics in the advanced gas turbine industry, 1987-2002. *Industrial and Corporate Change*, 17(2), 335-392.

Binder, D. (2008). Sustainability of water service delivery in rural environment: Past approaches and the way forward. *Emerging Markets Group, Ltd*.

Chandra, P. (2010). *Project Planning, Analysis, Selection, Financing, Implementation and Review*, Seventh Edition. New Delhi: Tata McGraw-Hill Education, Private Ltd.

Chikere, C, C., & Nwoka, J. (2015). The Systems Theory of Management in Modern Day Organizations - A Study of Aldgate Congress Resort Limited Port Harcourt. *International Journal of Scientific and Research Publications*, *5*(9)

Conard, B. R. (2013). Some challenges to sustainability. *Sustainability*, *5*(8), 3368-3381.

Cooper, D. R., & Schindler, P. S. (2014). *Business research methods* (12th Edn.). New York, NY: McGraw-Hill/Irwin

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Demming W., William H. & Dettmer, R. (1997), *Goldratt's Theory of Constraints*; A systematic Approach to Continuous Improvement, Milwaukee, ASQ Quality.

Dungumaro, E. W., & Madulu, N. F. (2003). Public participation in integrated water resources management: the case of Tanzania. *Physics and Chemistry of the Earth, Parts A/B/C*, *28*(20-27), 1009-1014.

Folifac, F., & Gaskin, S. (2011). Understanding potable water supply costs, pricing, tariffs and cost recovery in low income and developing countries: a comprehensive synthesis. *Journal of Ecology and the Natural Environment*, *3*(13), 400-409.

Gebrehiwot, M. (2006). An assessment of challenges of sustainable rural water supply: The case of Ofla Woreda in Tigray Region. *Addis Ababa, Ethiopia*.

Gerald, F. D., & Cobb, J. A. (2010). Resource dependence theory: past and future. *Research in the Sociology of Organizations*. 28, 21-42

Goldratt, E. M. (1990). *Theory of constraints*. Croton-on-Hudson: North River.

Hall, J. L., & Jennings Jr, E. T. (2008). Taking chances: Evaluating risk as a guide to better use of best practices. *Public Administration Review*, *68*(4), 695-708.

Hamilton, A. (2004). *Handbook of project management procedures*. Thomas Telford.

Harvey, P. (2011). *Sustainable Supply Chains for Rural Water Services: Linking local procurement of handpumps and spare parts supply* (No. 2011-1, p. 1). Field note.

Harvey, P., & Reed, B. (2004). *Rural water supply in Africa: Building blocks for handpump sustainability*. WEDC, Loughborough University.

Harvey, P.A. & Skinner, B., H. (2002). *Sustainable Hand Pump Projects in Africa: A Report on Fieldwork in Zambia April 18- May 2002,* Leicestershire, WEDC.

Harvey, P.A., & R.A. Reed (2008). Community-Managed Water Supplies in Africa: Sustainable or Dispensable?' *Community Development Journal*, *42*(3), 365.

Hayes, A. F. (2013). Introduction to mediation, moderation, and conditional process analysis. New York, NY: Guilford Press

Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate behavioral research*, *50*(1), 1-22.

Hayes, A. F. (2018a). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). New York, NY: Guilford Press.

Hayes, A. F. (2018b). Partial, conditional, and moderated moderated mediation: Quantification, inference, and interpretation. *Communication Monographs*, *85*, 4-40.

Hayes, A. F., & Preacher, K. J. (2013). Conditional process modeling: Using structural equation modeling to examine contingent causal processes. In G. R. Hancock & R. O. Mueller

(Eds.), *Structural equation modeling: A second course* (2nd ed., pp. 219–266). Greenwich, CT: Information Age.

Hayes, A. F., & Rockwood, N. J. (2020). Conditional process analysis: Concepts, computation, and advances in the modeling of the contingencies of mechanisms. *American Behavioral Scientist*, *64*(1), 19-54.

Haysom, A. (2006). *A study of the factors affecting sustainability of rural water supplies in Tanzania* (Doctoral dissertation, Cranfield University at Silsoe).

IFC, (2011). *The Market for Small-Scale Piped Water Systems in Kenya*. Sanitation and Safe Water for All Program, Nairobi: International Finance Corporation, a member of the World Bank Group

Joslin, R., & Müller, R. (2016). The relationship between project governance and project success. *International journal of project management*, *34*(4), 613-626.

Junbeum, K., Allenby, B., & Ming, X. (2007). Sustainability Network Theory and Industrial Systems. AnnnArbor: University of Michigan. *Center for Sustainable Engineering*. pp.3–15.

Keraro, V. N. (2014). Role of Governance in the Strategic management of Counties in Kenya. *Unpublished PhD Thesis, Juja: Jomo Kenyatta University of Agriculture and Technology*.

Kimberley, C. (1998). Guidance Manual on Water Supply and Sanitation Programs. *WEDC, London, UK*.

Kleemeier, E. L. (2010). Private Operators and Rural Water Supplies. *A Desk review of Experience Water Papers: The World Bank*.

Klug, T., Cronk, R., Shields, K. F., & Bartram, J. (2018). A categorization of water system breakdowns: Evidence from Liberia, Nigeria, Tanzania, and Uganda. *Science of the Total Environment*, *619*, 1126-1132.

Lichtenthaler, U. (2016). Determinants of absorptive capacity: The value of technology and market orientation for external knowledge acquisition. *Journal of Business & Industrial Marketing*, *31*(5), 600–610.

Linhares, A. (2009). Theory of constraints and the combinatorial complexity of the product-mix decision. *International Journal of Production Economics*, *121*(1), 121-129.

Mabin, V. J., & Balderstone, S. J. (1999). *The world of the theory of constraints: a review of the international literature*. CRC Press.

Machiwana, V. R. (2010). The Impact of Rural Water Supply and Sanitation Programs in Chivi District, Zimbabwe. *Harare: University of Zimbabwe*.

Marnewick, C., & Labuschagne, L. (2011). An investigation into the governance of information technology projects in South Africa. *International Journal of Project Management*, *29*(6), 661-670.

Masa'deh, R., Al-Henzab, J., Tarhini, A., & Obeidat, B. Y. (2018). The associations among market orientation, technology orientation, entrepreneurial orientation and organizational performance. *Benchmarking: An International Journal*, *25*(8), 3117–3142.

Meredith, J. R., Mantel Jr, S. J., & Shafer, S. M. (2017). *Project management: a managerial approach*. John Wiley & Sons.

Nikkhah, H. A., & Redzuan, M. R. B. (2010). The role of NGOs in promoting empowerment for sustainable community development. *Journal of Human Ecology*, *30*(2), 85-92.

Niyi, G. & Felix, O. (2011). Assessment of Rural Water Supply Management in Selected Rural Areas of Oyo State, Nigeria. *ATPS Working Paper*, Series No. 49.

Noreen, E., Smith, D., & Mackey, J. T. (1995). *Theory of constraints and its implications for management accounting: A report on the actual implementation of the theory of constraints*. North River Press, Incorporated.

Nyaguthii, E., & Oyugi, L. A. (2013). Influence of community participation on successful implementation of constituency development fund projects in Kenya: case study of Mwea Constituency. *International journal of Education and Research*, *1*(8), 1-16.

Oruwari, Y., Jev, M., & Owei, O. (2002). *Acquisition of technological capability in Africa: A case study of indigenous building materials firms in Nigeria.* ATPS Working Paper Series No. 33.

O'Sullivan, R. G. (2004). *Practicing evaluation: A collaborative approach*. Sage.

Oyo, A. (2002). Creating successful private sector supply chains: a resource guide for rural water supply and sanitation practitioners. *World Bank Report,* Washington DC, pp.1–32.

Patel, D. (2007). Why executives should care about project governance; What your peers are doing about it. *PM World Today*, *9*(4), 165-187.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate behavioral research*, *42*(1), 185-227.

Reichert, F. M., & Zawislak, P. A. (2014). Technological capability and firm performance. *Journal of technology management & innovation*, *9*(4), 20-35.

Richard, C. (1999). Impact and Sustainability of Water Supply and Sanitation Program in Developing Countries. *Journal of the chartered institution of water and environment management*, *13*, 292-296.

Rue, W.L., & Byars, L.L. (2004). *Management Skills and Application.* Richard: Irwin Inc.

Starik, M., & Kanashiro, P. (2013). Toward a theory of sustainability management: Uncovering and integrating the nearly obvious. *Organization & Environment*, *26*(1), 7-30.

Steyn, H. (2002). Project management applications of the theory of constraints beyond critical chain scheduling. *International Journal of Project Management*, *20*(1), 75-80.

Tadesse, A., (2013). Rural Water Supply Management and Sustainability: The Case of Adama Area, Ethiopia. *Journal of Water Resource and Protection*, 5(February), pp.208–221.

U-Dominic, C.M., Ezeabasili, A.C.C. & Okoro, B.U., (2015). Community-government partnership and sustainability of rural water programmes in Anambra state, Nigeria. *Journal of Environment and Earth Science*, 4(13), pp.1–13.

Valmohammadi, C., & Roshanzamir, S. (2015). The guidelines of improvement: relations among organizational culture, TQM and performance. *International Journal of Production Economics,164*, 167-178.

Von Bertalanffy, L. (1968). General system theory—a critical review. *Modern Systems Research for the Behavioral Scientist. Chicago: Aldine*, 11-30.

Wang, Y., Lo, H. -P., Zhang, Q., & Xue, Y. (2006). How technological capability influences business performance: An integrated framework based on the contingency approach. *Journal of Technology Management in China, 1(1), 27–52.*

White, L. (1996). The historical roots of our ecological crisis. Routledge, New York-USA.

Winch, G. M. (2001). Governing the project process: a conceptual framework. *Construction Management and Economics*, *19*(8), 799-808.

Yin, R. K. (2014). *Case study research: Design and methods (applied social research methods)*. Thousand Oaks, CA: Sage publications.

Zawislak, P. A., Alves, A. C., Tello-Gamarra, J., Barbieux, D., & Reichert, F. M. (2013). Influences of the internal capabilities of firms on their innovation performance: a case study investigation in Brazil. *International Journal of Management*, *30*(1), 329.