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TECHNOLOGICAL CAPABILITY AND SUSTAINABILITY OF WATER COMPANIES IN KENYA

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Abstract

The rapid change in technologies, increasing globalization, shifting demographics and greater regulatory oversight are combining to create fundamental shifts in business environment that has led to new opportunities, challenges and risks for the managers. Businesses are in constant lookout for sources of competitive advantage, therefore intangible resources and technological capability are of great strategic potential for the firm. Studies in technological capabilities, although limited, are being carried for both developing and developed countries at national level, and at industry sector or firm level. There is a wide consensus that building technological capability is influenced by both internal and external factors to the firm. Despite the importance of technological capability, there is still a scarcity of research on the integration of technological capability into the performance measurement system in order to quantify the causal impact of technological capability on the business performance. This paper describes the development of an assessment model for assessing the impact of technological capability on the sustainability of the firm. Therefore, effective combination of appropriate operational capabilities enhances the strength of firm's technological capability. The objective of this paper was to establish effect of technological capability on service sustainability of water companies in Kenya. The paper was also guided by positivistic philosophy. This paper employed a cross-sectional design to determine the effect of technological capability on service sustainability. The target population for this study was the 88 Water Service Providers (WSPs) in Kenya. The total respondents from the sample size was 429. Data was collected by use of structured questionnaires. Content analysis and statistics were employed. Quantitative techniques were employed in the data analysis. This paper established that technological capability had a significant influence on service sustainability. The paper recommends that future studies should consider utilizing multiple methodologies to validate and further strengthen the existing research findings.

Keywords: Technological capability, Sustainability, Performance, Water Service Providers, Innovation, Organizational capabilities

INTRODUCTION

Background

Technological capability (TC) is the ability of the company to execute any relevant technical function, including the ability to develop new products, processes, and technological knowledge in order to obtain higher levels of organizational efficiency (Tsai, 2004). Through technological capability, the company can gain a competitive edge within the industry, particularly in a high-tech environment (Duysters & Hagedoorn, 2000; Afuah, 2002; Archibugi & Coco, 2004; Ortega, 2010), such as the chemical, electronic, or pharmaceutical industry (Schoenecker & Swanson, 2002; Tsai, 2004; Wong, 2014). Technological capability has been established in allowing firms to develop and deliver valuable product or services to customers and ensure effective customer relationships which positively enhance performance (Reichert & Zawislak, 2014; Ahmad, Othman & Lazim, 2014; Zawislak, Alves, Tello-Gamarra, Barbieux & Reichert, 2013). Technological capability contributes to the achievement of higher levels of economic performance for firms, since it allows incremental improvements from the use of new technologies (Jonker; Romijn; Szirmai, 2006). Access to a wider range of new technology options (Tatikonda & Stock, 2003) can influence the product cycle time (MontoyaWeiss & Calantone, 1994), speed of firm innovation (Coombs & Bierly III, 2006), launch and time to market of new products (Calantone & Di Benedetto, 2012), product development costs, success in developing new products (Tatikonda & Stock, 2003), and is considered an important component of knowledge and skills for the firm (Tatikonda & Stock, 2003; Renko, Carsrud & Brännback, 2009).

Technological capability is key to gaining competitive advantage (Afuah, 2002; Teece, Pisano & Schuen, 1997; Tsai, 2004), as multinational companies seek to accelerate the transfer from technology units located in developed countries to subsidiaries in developing countries (Chakrabarti & Bhaumik, 2010; Si, Liefner & Wang, 2013), for example: China (Chakrabarti & Bhaumik, 2010), Russia (Väätänen, Podmetina & Pillania, 2009), Mexico, Brazil, and India (Dechezleprêtre, Glachant & Meniere, 2009). However, depending on the diffusion capability of domestic technologies, the country of origin may have a lower rate of technology internationalization, such as in India (Dechezleprêtre, *et al*., 2009). Some reasons that can justify advancing technological capability are: the need for developing and maintaining internal capabilities, changes in technologies underlying the control system, research and development (R&D), closer relations with universities, research institutes, and specialized suppliers (Terawatanavong, Whitwell, Widing, & O'Cass, 2011; Wang & Zhou, 2013), development of new technology components, long-term system integration capabilities and firm internationalization (Kyläheiko, Jantunen, ,Puumalainen, Saarenketo, , & Tuppura, 2011).

Technological capability is a positive predictor of product innovation (Renko, *et al*., 2009); however, high levels of technological capability may prevent the product from generating innovation (Zhou & Wu, 2010). To minimize this impact, investors should look for markets that demonstrate technological expansion potential (the biotech industry, for example) and market innovation (Renko, Carsrud & Brännback, 2009) through firm internationalization (Garcia, Avella & Fernandez, 2012). Intangible resources and technological capability are of great strategic potential for the firm (GarcíaMuiña & Navas-Lopez, 2007). There is a differentiation in relation to competitors, should seek the transfer of knowledge, intangible asset and difficult to spread to be obtained tacitly (Grant, 1996). For this reason, technological knowledge is presented asymmetrically in organizations (Lall, 1992), being directly associated with the absorption capacity of its employees (Zahra & George, 2002; García, Avella & Fernández, 2012; Tzokas, Kim, Akbar & Al-Dajani, 2015) and level of investment in R&D (Coombs & Bierly III, 2006).

Capacity absorption can be considered a facilitator or barrier to obtaining technological capability (Cohen & Levinthal, 1989), because it is directly linked to the speed of innovation of the firm (Lall, 1992). Innovation speed indicates how quickly the company uses new technologies (Coombs & Bierly III, 2006) and is considered crucial to internationalization (formation of strategic alliances, joint ventures, mergers and acquisitions, for example) (Haeussler, Patzelt & Zahra, 2012; García, *et al*., 2012) and launching innovative products (Hsieh, Tsai & Hultink, 2006). Technological capability is influenced by internal factors (planning and control, market orientation, training, investment in R&D, manual labor), external factors (government support, purchasing or licensing technology from other companies, and forming strategic alliances to purchase new technologies), and the mode of technology transfer (Madanmohan, Kumar & Kumar, 2004) must therefore be managed effectively (Tatikonda & Stock, 2003).

Technological Capability

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, Lo, Zhang, & Xue, 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, Alves, Tello-Gamarra, Barbieux, & Reichert, 2012). 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 capability are responsible for significant positive variation in firm's performance (Bergek *et al*., 2008).

Technological capability enables firms 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 a better and efficient way that best satisfies the customer needs, thus enhancing the overall success of firm's new product development and performance (Wang *et al.*, 2006). Technological capability is crucial to firm internationalization, allowing the formation of joint ventures and strategic alliances, mergers and acquisitions (Haeussler *et al*., 2012; García *et al*., 2012), increased productivity (García *et al*., 2012), a level of international competition, entry of foreign investors, increasing exports, launching new products (Hsieh & Tsai, 2007), and profitability. Firm internationalization can be understood as an antecedent variable of technological capability (Tseng & Chen, 2014). A high level of technological capability can prevent product innovation due to the U-shaped (Zhou & Wu, 2010) or bell-shaped relationship (Wu, 2014) that is influenced by the type of innovation (incremental or radical) used by a company (Zhou & Wu, 2010). This curve is nothing more than the trade-off relationship between costs and benefits, which can result in the decreased success of a new product (Homburg & Kuehnl, 2014; Gross, 2014). Thus, a high level of technological capability can inhibit the generation of radical innovation, especially in the short term, as it (Zhou & Wu, 2010) increases globally New Product Development (NPD), costs (Gross, 2014), and increases in investment risk (Duysters, Zhang & Filippov, 2011).

Technological capability is a knowledge-based comprehensive set of organizational capabilities that enables a firm to search, recognize, organize, apply and commercialize innovative products and services (Chang *et al*., 2012).Through technological capabilities, firms are able to successfully adopt technology that enables them to implement new production techniques and in turn solve problems arising from the use of outdated production systems (Chen, Tang, Jin, Xie, & Li, 2014; Shin, Taylor & Seo, 2012). Technological capability often leverages external resources, thereby reducing the risk inherent in breakthrough innovations (Chen *et al*., 2014; Teece, 2007). As part of the organizational capabilities of a firm (Barney, 2001), technological capability also enables a firm to use resources to generate competitive advantage. Technological capabilities are considered a dynamic capability held by a firm to better adapt to technological opportunities (Teece, 2007) and hence are positively linked to organizational effectiveness.

Technological capability works as a set of functional abilities that reflects an organization's performance through various technological activities and whose ultimate purpose is firm-level value management by developing inimitable organizational abilities (Voudouris, Lioukas, Iatrelli, & Caloghirou, 2012). Equally important, Wang, Lo, Zhang and Xue (2006) suggested that TC aids to escalate a firm's capacity to recognize and apply new exterior knowledge to continue the competence enlargement, which may result in superior performance. Technological capability reduces the inherent risk associated with breakthrough innovations (Teece, 2007) and facilitates the introduction of new or improved products and services to the market (Chang, Chang, Chi, Chen, & Deng, 2012). Technological capability exists within the context of additional organizational capabilities which help organizations and the individuals within them, to respond better when faced with challenges.

Sustainability

Sustainability is a multidimensional phenomenon (Albertini, 2013). It is often merged with environmental performance and economic performance. It is often described as a measure of a firm's capability to accomplish its mission and serve its stockholders over a longer period and to have an acknowledged and quantifiable influence. Sustainability, when successfully achieved, can lead to more extensive sources of funding and configure a firm capacity to provide value in the long run (Carsrud & Brännback, 2010). In short, a firm that relies on sustainability leads to a greater emphasis on long-term survival. Firms with successfully achieved sustainability can achieve their long-term goal (Gundry, Kickul, Iakovleva, & Carsrud, 2014) and can better perform in a resource-constrained environment (Carsrud & Brännback, 2010). Sustainability is also a state in which an organization or a society exhibits a relation to economic, environmental and social aspects (Munck, Bansi, Dias & Cella-de-Oliveira, 2013). Therefore, usually when

it is said that an organization or a society is sustainable, it is meant that it holds a certain state of sustainability. As such, sustainable is what can be maintained, in other words, nothing is stagnant, that is why sustainability must be viewed in levels (Van Marrewijk & Werre, 2003). This way, the correct would be to say that a given organization or society holds a certain level of sustainability, rather than what is and is no longer sustainable.

Sustainability is about expanding the financial bottom line into a triple bottom line, which includes environmental and social aspects of corporate performance (Albertini, 2013). Sustainability should not be restricted to only practices to gain environmental objectives, but it can also facilitate other advantages (e.g., gaining long-term survival and profitability) in a turbulent market when successfully achieved (Grewatsch, & Kleindienst, 2017). In this study, sustainability is considered an essential practice of a firm that provides environmental, social and economic benefits to configure the firms' sustainable competitive position. For instance, Nidumolu, Prahalad and Rangaswami (2009) described sustainable development as the only way available for enterprises' growth, decreasing production costs and generating additional revenues from novel offerings or business expansion.

Sustainability scholars have utilized different theoretical frameworks such as institutional theory, among others, to understand why and how sustainability initiatives emerge (Delmas, 2002; Hoffman, 2001) and how such efforts lead to different environmental, financial and market performance outcomes at the organizational level (Bansal, 2005; Bansal & Roth, 2000; Chatterji & Toffel, 2010; Flammer, 2013; Klassen & McLaughlin, 1996; Russo & Harrison, 2005). Despite the evolution of the sustainability construct, the essence of the idea remained the same; it was still an issue of needs weighed against limitations. Continuing to emerge from the spaceship earth idea and others like sustainable society (Santos & Filho, 2005), the authors pointed out the consensus of these ideas with respect to society and the need for it to be in balance with its surroundings. Further, sustainability was referred to as a fundamental and complex construct that mandates the balance of several factors for the planet to continually exist (Aras & Crowther, 2009). Yet, in its simplest form, sustainability refers to a value and a belief of the enhancement and preservation of the natural environment (Shrivastava, 1995). Originated decades ago, and through the significant momentum gained with the Brundtland Report (1987), the construct continued to gain attention becoming one of the most leading issues facing the world due to continuous pressure from the society and the stakeholders (Stefan & Paul, 2008; Epstein, 2008; Lippman, 2010). Several definitions of sustainability were found in the literature; although they differed slightly based on the source, the core (with respect to the society and the environment) remained the same.

LITERATURE REVIEW

Technological Capability and Sustainability

Oruwari, Jev, and Owei (2002) define technological capability as the capability needed to acquire, assimilate, use, adapt, change or create technology. Such capability enables a firm to assimilate, use, adapt, and change existing technologies. It also enables a firm to create new technologies and to develop new products and processes in response to the changing economic environment. Of all the factors contributing to achieving better competitive position, technological developments play the most prominent role (Khalaji, 2014). Academic research on technological capability of a firm has led to a better understanding of the technical change process. To continue operating in a chosen environment, the firm must produce some different solution, which is recognized as such by the consumer. Technological learning is increasingly based on a combination of internal and external learning: internal learning comes about by the internal development of new products and through internal Research and Development (R&D) processes, external learning thrives on technology acquired through technology alliances. According to Kotha and Swamidass (1998) investments are made each year in advanced manufacturing technology because practitioners perceive several benefits attributed directly to their use namely reduced cycle-time, market share growth, progress towards zero defects, return on investment and focused production.

Firms invest heavily in the building of technological capability that offers the skills and abilities to deploy and utilize various resources and know-how. According to Afuah (2002) and Zhou and Wu (2010) when a firm builds its technological capability, it invests substantial resources in research and development, which involves the discovery of new products, the accumulation of knowledge stores, and the training of technical personnel. A firm's technological capability is developed over time and accumulated through its past experience. It is widely recognized in the theoretical literature that firms are required to use both internal and external sources of innovation in order to achieve competitive advantage. Cabral (2010) suggests that the sustainability of competitive advantage will depend on the extent to which the firm is able to develop capabilities for innovation. Sustainability of innovations reflects not only the economic aspect, but also the social and environmental concerns embedded on innovation, whilst innovation capability indicates the sources of knowledge to achieve that sustainability.

Alizadeh (2012) puts that technological capability is implied in four categories; hardware and facilities, codified knowledge and information, human tacit knowledge and skills, and organization culture, routine and processes. TC is accumulated and embodied in skills, knowledge, experience and organizational systems (Cortes de Castro & Figuereido, 2005; Dutrénit, 2004; Figueiredo, 2002, 2008; Jonker, Romijn & Szirmai, 2006; Kumar, Kumar & de Grosbois, 2008; Romijn & Albaradejo, 2002). The accumulation of TC is described by Dutrénit (2004) as the learning processes involved in the gradual building up of a minimum base of technological knowledge to be able to carry out innovative activities. The nature of the technology strategy, the processes of knowledge management inside firms and the characteristics of the national innovation systems determine the level of TC development in the firm (Kim, 1997; Lall, 2000; Lall & Pietrobelli, 2002).

In a much broader sense, TC development can be conceptualized in different levels for instance at the acquisitive, operative, adaptive, innovative, supportive and marketing level (Lall, 1992; Bell & Pavitt, 1995; Panda & Ramanathan, 1996; Guifu & Hongjia, 2009). From the perspective of these authors, TC can be interpreted as basic or acquisition level when for instance, a firm has the ability to acquire equipment, blueprints and technical knowledge, intermediate or operative level and when the firm has the ability to operate and to manage these elements. The advanced level is achieved when the firm has the ability to improve the possessed technology, and to be able to develop new products or processes. Technological capability has been described as the totality of organization's abilities directed at obtaining technical knowledge to enhance business performance (Yahya Al-Ansari, Altalib & Sardoh, 2013). The significance of technological capability in influencing the success of business firm in rapidly changing business environment has been extensively recognized practically and in academic literatures (Zahra, 1996), hence businesses firms use technologies to improve a perpetual competitive position by introducing new products or exploiting new processes (Utterback, 1994). Consequently, the intense effects of technology on firms' activities has universally manifested in almost all area of economic activities (Zahra, 1996).

Technological capability has been considered as a critical element that improve firm's performance (Zhou, Yim & Tse, 2005) therefore, most successful business firms around the globe depends on their technological capability to effectively execute their routine business processes and activities (Ajonbadi, 2015). Generally, businesses engage in developing technological capability to improve product, enhance production, reduce production cost, improve turnover and profit as well as international competitiveness (Adelowo, Ilori, Siyanbola & Oluwale, 2015). Therefore, the position of firm's competitive advantage is determined by its boldness toward technological activities (Hitt & Hoskisson, 1990). Hence, most innovative firms are faithful to investment in research and development and are also proactively aggressive to obtain new and discover new technologies in the course of developing new products that better meets the customer expectations than competitors (Zhou et al., 2005, Hitt, Hoskisson, & Ireland, 1990). Technological capability enables firms create differentiation in responding to changing marketing environment through efficient innovation process (Lestari, Thoyib, Zain & Santoso, 2013).

Moderating Effect of Technological Capability on Sustainability

Several academic papers investigated the moderating effect of technological capability (Ortega, 2010; García *et al*., 2012; Haeussler *et al.*, 2012; Renko, *et al*., 2009; Wu, 2014; Hsu, Tsai, Hsieh, & Wang, 2014). Some studies show the technological capability variable with moderating effects (Jabar, Soosay & Santa, 2011), direct effects (Hsieh & Tsai, 2007; Tzokas *et al*., 2015), or both (Renko, *et al*., 2009). García *et al*. (2012) examined the moderating effect of companies with technological capability on the relationship between exporters and productivity. The research results infer that exporters have a greater propensity to learn than firms holding less technological capability. Ortega (2010) examined the variable 'technological capability', in relation to the formation of competitive strategies and firm performance. The study found that technological capability improves the relationship between quality, cost orientation, and performance. Haeussler *et al*. (2012) studied the role of strategic alliances in generating partnerships of higher value. The research results indicate that companies with high technological capability made strategic alliances in order to gain knowledge and resources. However, companies with low international experience and limited resources are more vulnerable to opportunistic behavior of their partners.

Hsu *et al*. (2014) investigated the moderating effect of technological capability in relation to the performance of new products and strategic direction. The study results suggest that technological capability strengthens the guidance relationship of the performance of the market, besides affecting financial performance of the company. Wu (2014) examined the relationship between cooperation with competitors and product innovation with the moderating role of technological capability and strategic alliance with universities and research institutes. The study results show that cooperation with competitors has an inverted U-shaped relationship with innovation of successful products. Strong technological capability and collaboration with universities and research institutes has a moderate, negative

relationship with the innovation of successful products. Excess cooperation with competitors negatively affects product innovation performance as a result of opportunistic behavior of competitors (Wu, 2014).

TC is recognized to have a direct effect on the new product development (NPD) and overall business performance (Wang, Lo, Zhang, & Xue, 2006). Both performances are also indirectly affected when the customer value participates as mediator. Customer value on its own has an important impact on NPD performance and overall business performance. As such, it mediates the impact on TC. Nonetheless, the finding on the impact of TC on learning orientation and environmental turbulence is provisional, while the market turbulence has a negative moderating in the correlation between customer value and TC as well as the correlation between new product development performance and TC. There is another research that examined TC and its correlation with operational performance in manufacturing cost and quality of final product. The results indicated that TC, considered as technology absorption capability, was found not directly correlated to the performances (Khan & Haleem, 2008). Guifu and Hongjia (2009) established three TC levels; technological shifting capability, technological acquiring capability, and technological operating capability on the impact on innovation performance. The findings revealed that technological shifting capability is significantly positively associated with product upgrading.

Discussion

Developing and improving TC in an organization is a long-term commitment. The importance of technology strategy assessment itself had motivated scholars and practitioners to research and assess the theoretical and practicality of TC. The studies and assessment of TC have contributed to some extent valuable intangible resources to any organization. Nevertheless, it must take the effort and commitment of every individual involved in the organization to realize the success. TC plays a very significant role that helps an organization to endure the dynamically changing market turbulence for a long period, from the beginning of new ventures until to the stage of firms with corporate social responsibility. For that reason, organizations ought to start evaluating their level of TC. For companies that have not yet been implementing any, they must consider having one now before any unwanted winding-up happens, while, companies, which are already implementing some TCs, must upgrade the current TC to a higher level for them to improve the companies' performance and satisfy customer needs. Extant studies on TC reflected the well-known operational performance non-financially; cost, quality, delivery, flexibility, and innovation are still scarce. Future research on TC which thoroughly focuses on sustainability measures are worthwhile since it will exclusively verify the operational part of firm performance. The basic understanding of TC and its impact on performance, organizations may develop suitable strategies to escalate the performance and, hopefully, improve competitiveness as well. Their commitment on TC will determine a long-term victory for the company.

Previous studies indicate theoretical evidence for the moderating effect of technological capacity, as argued by Ortega (2010), García, *et al*. (2012), Haeussler *et al*. (2012), Renko *et al*. (2009), Wu (2014), and Hsu *et al.* (2014). The studies show technological capability as a moderating variable (Ortega, 2010 ; García *et al*., 2012 ; Haeussler *et al*. 2012 ; Gross, 2014 ; Renko *et al*., 2009 ; Wu, 2014 ; Hsu *et al*., 2014). However, despite the growing literature on sustainability, very few studies have reviewed the technological capability-sustainability link, making this paper relevant to academia. This limited existing work primarily focuses on assessing the relationship between the technological capability and sustainability practices in organizations. Furthermore, the focus of this paper is on incorporating insights from technological capability to understand the drivers and determinants that may have an impact on the levels of sustainability initiatives undertaken by organizations.

Hypothesis

The following research hypothesis was developed in order to accomplish the aims of the study:
H0$_1$: There is no significant effect of technological capability on service sustainability of water companies in Kenya

Conceptual Framework for the Study

Most studies in TCs literatures have shown a momentous role played by TC on various organization performances, especially in financial terms ; accounting and market-based measures. As a result, TC is being labeled as a crucial determinant that promotes competitive advantage through firm performance growth. However, the literature reviewed reveals gaps in the findings and the inferences of past studies. There have been mixed findings as some of the previous studies hold that there is a direct technological capability-sustainability link, while others argue that this relationship is not conclusive and is subject to other factors. This paper investigated the effect of technological capability on sustainability as presented in a diagrammatical form in Figure 1.

Figure1: Conceptual Framework

RESEARCH METHODOLOGY

Research Design

This paper was guided by positivistic philosophy. The paper employed a cross-sectional design to determine the effect of technological capability on service sustainability of water companies in Kenya. This paper involved collection of data from a sufficiently large numbers of participants in order to test hypotheses, draw conclusions and considering research issues using a quantitative research approach.

Population

This study targeted the Water Service Providers in Kenya registered by the Water Services Regulatory Board as at June 2017. There are 88 Water Service Providers. These are the units of analysis for this study. 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.

Sampling Design

This paper employed Mugenda and Mugenda (2003) formula for obtaining the desired sample size. From the population, the number of respondents to be sampled was calculated. The total respondents from the sample size was 429. Using proportionate sampling, the researcher established the number of board members and top managers to be interviewed in each water company.

Data Collection

Data was collected by use of structured questionnaires. The study used purely primary data sources. The questionnaire was distributed by the researcher through drop and pick method to the selected respondents. The researcher administered the questionnaires both in person and through the help of field assistants by visiting the respondents. This increased the response rate.

Data Analysis

Content analysis and statistics were employed. The qualitative data from the open-ended questions were analysed using thematic content analysis and presented in narrative form. The data analysis was done using quantitative techniques. The study conducted correlation analysis to measure the relationship between technological capability and service sustainability constructs. This paper employed both descriptive and inferential statistics.

RESULTS AND FINDINGS

Response Rate

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%. 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 4.1 gives results for the response rate.

Table 4.1: Response Rate

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

Reliability

Reliability of the questionnaire was tested using Cronbach Alpha. The research instrument was reliable as the alpha for the variables was above 0.7. Table 4.2 shows the reliability results.

Table 4.2: Reliability

Variable		α=Alpha	No of Items	Decision
Technological capability	.893	.885	11	Reliable
Service Sustainability			22	Reliable

Descriptive Statistics

Technological Capability

The study sought to establish the influence of technological capability on service sustainability. The grand mean of statements depicting technological capability was 4.19, standard deviation of 0.755 and coefficient of variation of 18% a high mean indicating that Water companies are highly dependent on technology for their operations, therefore the development of technological capabilities is critical to ensure service sustainability. Table 4.3 gives the results of the findings.

Table 4.3: Technological Capability Factors

Technological Capability Factors	N	Mean	Std. Deviation	Coefficient of Variation (%)
Type of technology				
The WSP has access to the best technology for service provision	348	4.24	0.747	18
Procurement of standardized technology in construction of new water facility is in place	348	4.34	0.865	20
The water project use cost effective technologies	348	4.30	0.750	17
Customer record management, billing and communication operations are computerized	348	4.44	0.648	15
The WSP uses a computerized accounting system	346	4.38	0.789	18
The water equipment are properly installed for easy maintenance	348	4.37	0.750	17
Advice about technical architecture is available for the project.	347	4.28	0.705	16
There is sufficient technical expertise to manage the project.	347	4.38	0.693	16
Overall Mean				
Cost of technology				
There are clear and achievable estimates in the project schedule and budget.	348	4.28	0.612	14
Use of standardized procedures for repairs and maintenance of the water supply facility is in place	348	4.32	0.625	14
There is availability of the best technological equipment	348	4.19	0.681	16
The procured equipment's spare parts are available at an affordable price	348	4.24	0.751	18
WSP can afford to regularly hire key specialists and experts for particular aspects of the installed technologies	348	4.12	0.817	20
Overall Mean	**348**	**4.23**	**0.697**	**17**
Operation & maintenance				

Technological Capability Factors	N	Mean	Std. Deviation	Coefficient of Variation (%)
WSP staff have the necessary knowledge and skills for successful operation of water facilities	348	4.32	0.647	15
There are sufficient spare parts readily available in the market	348	4.26	0.834	20
WSP can afford the cost of spare parts	348	4.13	0.893	22
Cost of inputs such treatment chemicals can be met from revenues	347	4.37	0.746	17
The cost of energy (power, fuels and lubricants) is manageable	348	4.20	0.959	23
Overall Mean	**348**	**4.26**	**0.816**	**19**
Grand Mean	**348**	**4.19**	**0.755**	**18**

Service Sustainability

From the results in table 4.4, the grand mean of service sustainability attributes was 4.30, standard deviation of 0.740 and coefficient of variation of 17% a high mean implying that there was ease accessibility of the community members to clean water and hence improved their well-being (quality of life). This could also point to more coverage areas, developed alternative water sources, improved reliability though storage, improved water quality thought treatment facilities and enhanced management using billing systems. The findings indicated that WSP had sufficient resources to cater for their expenses which included paying out salaries, carrying out major repairs on times and ensuring that the water facilities operated in good conditions. It is therefore evident that it is critical for finance functions to improve long-term capital planning through best practice financial governance that will support the development of financially sustainable utilities. Table 4.4 gives the results of the findings.

Table 4.4: Service Sustainability

Service Sustainability of Water Projects	N	Mean	Std. Deviation	Coefficient of Variation (%)
Service Coverage				
The WSP provides continuous flow of water on regular basis	348	4.29	0.712	17
The WSP can assure non-discriminatory physical access to a water outlet in urban areas with a 30-minute cycle and in rural within a distance of 2 km	348	4.34	0.724	17
The tariff charged is affordable (i.e is not more than 5% of household income as maximum)	348	4.34	0.720	17
Customers have a right to have complaints resolved (with access to standardised complaint mechanism)	348	4.49	0.624	14
Overall Mean	**348**	**4.37**	**0.695**	**16**
Service Reliability				
The WSP has the room to meet emerging water demand	348	4.23	0.71	17
The WSP connections has been increasing		4.45	0.626	14
The Community participate in water resource protection				
The WSP can assure minimum service of at least12 hours	348	4.21	0.839	20
The community plays a critical role in ensuring water is used efficiently (water quantity)	348	4.15	0.752	18
Overall Mean	**348**	**4.26**	**0.723**	**17**

Table 4.4: Service Sustainability *(cont...)*

Service Sustainability of Water Projects	N	Mean	Std. Deviation	Coefficient of Variation (%)
Project implementation considers environmental impacts of investments and includes mitigating mechanisms	348	4.39	0.615	14
Project implementation considers social impacts of investments and includes mitigating mechanisms	348	4.28	0.67	16
Project implementation considers technological impacts of investments and includes mitigating mechanisms	348	4.32	0.704	16
Overall Mean	**348**	**4.33**	**0.663**	**15**
Service Quality				
Drinking-water provided by the WSP meets health-based standards established by law	348	4.46	0.554	12
The WSP has systems and mechanisms for assuring the microbial safety of drinking-water supplies	348	4.41	0.631	14
The WSP has adequate and properly managed systems to assure standards are consistently met	348	4.49	0.668	15
The WSP has adequate infrastructure, proper monitoring and effective planning and management of water quality	348	4.40	0.703	16
The WSP has system of independent surveillance and quality control to monitor water quality	348	4.40	0.691	16
The WSP has a plan of action for handling emergency situations relating to breaches in water quality	348	4.42	0.705	16
Overall Mean	**348**	**4.43**	**0.659**	**15**

Inferential Statistics

Inferential analysis was conducted to generate correlation results, model of fitness, and analysis of the variance and regression coefficients. The study first determined the relationships among the study variables. The association between the independent variable and service sustainability of WSPs were determined through correlation coefficient determination. The relevant results are presented in Table 4.5.

Table 4.5: Correlation of Study Variables

		Technological Capability	Service Sustainability
	Sig. (2-tailed)	.000	.000
	N	348	348
Technological Capability	Pearson Correlation	1	.583**
	Sig. (2-tailed)		
	N	348	.000
Service Sustainability	Pearson Correlation	.583**	348
	Sig. (2-tailed)	.000	1
	N	348	348

The correlation results between technological capability and service sustainability (r =.583 and P<0.05), showed a high correlation value above 0.5 indicating that technological capability is positively correlated to sustainability and p-value of below 0.5 indicates that the relationship is statistically significant.

CONCLUSION

This paper established that technological capability had a significant influence on service sustainability. The findings noted that even with appropriate technologies, supply of spare parts, their quality, access to adequately trained mechanics, financing of repair costs and decision-making around this are also critical for sustainability of water supply systems to be achieved. Additionally, adequate funding of the water sector, proper management of water supplies are technological capability factors were found to greatly influence sustainability of the WSP.

RECOMMENDATIONS

The paper concluded by providing recommendations and suggestions for future study. The paper recommends future studies should consider introducing other study variables in assessing the relationship between technological capability and sustainability. This paper also recommends that future studies should consider utilizing multiple methodologies to validate and further strengthen the existing research findings.

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