



The Moderating Effect of Information Systems Capabilities on the Relationship between Information Systems Resources and Performance of Firms in the Telecommunications Industry in Kenya

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Abstract: Kenya's economy is today driven majorly by information-based service businesses where telecommunication industry is playing a critical role. A 2018 report from Communications Authority of Kenya indicates that mobile phone service providers have a combined total of 38 million subscribers with Safaricom Kenya Limited leading in subscription rate, innovative products and services. Extant literature shows that information systems (IS) resources have a direct impact on performance; however the influence of information systems capabilities on the relationship between IS resources and firm performance has not been fully explored. Anchored on resource-based view and contingency theories the study utilized correlational survey design. The population of the study was 408 with a sample of 202 members of staff being drawn through proportionate stratified random sampling method. The findings indicated a positive effect of IS capabilities ($\Delta R^2 = .096, p < 0.05$) on the relationship between IS resources and firm performance signifying that firms in the industry should ensure proper development of innovative IS capabilities since they have significant influence on the relationship between IS resources and firm performance. The findings may be useful to industry players in gaining better understanding on various IS capabilities that they can utilize to improve and sustain their performance besides policy formulation. And by advancing a model that depicts the influence of IS capabilities on the relationship between IS resources and firm performance, this study may make a significant contribution to theory building in the field of information systems.

Key words: *IS Resources, IS Capabilities, Firm Performance*

1. Introduction

The discussion around the contribution of Information Technology (IT) to the attainment of the business goals and objectives has been extensively examined (Rivard, Raymond and Verreault, 2006). IT business value, which results from organisational performance based on substantial investment in IT remains a focus area of management. Finney, Leug and Campbell (2008) offered an argument that places essential competencies as the principal means by which a firm can create and sustain a competitive advantage. In that research, Finney *et al.* (2008) marked core competencies as being made up of combinations of a company's resources and capabilities.

In a global perspective, firms are focusing on becoming more competitive by launching competitive strategies that give them an edge over others, hence the emergence of IS capabilities and core competence as a central concept for competitive strategy. Makadok



(2001) made a distinction between a firm's resources and its capabilities: a resource is an observable but not necessarily tangible asset that can be independently valued and traded, while a capability is unobservable and hence necessarily intangible cannot be independently valued and changes only as part of its entire unit.

Information systems capabilities refer to the ability that an organization assembles, integrates, and deploys its valued IS resources to build unique competencies (Teece *et al.*, 1997). Schreyogg and Kliesch-Eberl (2007) view capabilities as evidence of organisational learning. Bharadwaj (2000) posits that IS capabilities are derived from underlying strengths in IT infrastructure investment, IS human capital and IT-enabled intangibles such as IS partnership quality.

The IT infrastructure offers the platform to launch innovative IT applications faster than the competition; the IS human capital resources enable firms to conceive and implement such applications faster than competition; and a focus on IT-enabled intangibles resources empowers firms to leverage or exploit pre-existing organizational intangibles such as vendor/customer orientation and synergy in the firm via co-presence. Information systems capabilities in this study have been borrowed from Ravichandran and Lertwongsatien (2005) and Ravichandran and Rai (2000) frameworks that identified IS capabilities as IS planning, IS development and IS support maturity. These capabilities can develop at various levels in the organisation such as at the departmental, divisional or organisational level to improve firm performance.

Antonia and Tomas (2008) in their study on the strategic value, resources and capabilities of the Information Systems area and their impact on organizational performance in the hotel sector had two aims; to determine how the strategic value of the IS area affects the organizational performance of three, four and five-star hotels and to check how it influences the resources and capabilities used in the IS area of hotel companies in a determined tourist destination, and their relationship with organizational performance. The study was conducted on a representative sample of hotels in Gran Canaria, Spain.

The results of the study indicated that the more valuable, non-substitutable and inimitable the IS area is, the better the non-financial performance. The results also indicated that the resources and capabilities that most affect hotel performance are the internal and external technical resources and the capabilities of the IS area to influence and strengthen relations with users and with different areas of the hotel. Their work also finds that organizational capabilities have a particular influence on non-financial performance, especially that related to organizational quality.

In a study by Ismail *et al.* (2012) on the relationship between organizational resources, capabilities, systems and competitive advantage, the researchers posits that organisational capabilities are a vital cog in the relationships among organisational resources and competitive advantage because organisational capabilities enhance the resource elements towards attaining competitive advantage. The research was conducted among manufacturers listed in the 2008 federation of Malaysian manufacturers' directory where a cross-sectional study using a structured questionnaire was used to obtain responses from the manufacturers.

Finally, Yashil (2009) in his study on the effect of information systems resources and capabilities on company performance in the South African financial service industry documented evidence that information technology indeed support firm performance. He



further documented a positive relationships between IS capabilities and IT support for core competencies which translate into enhanced company performance. A quantitative methodology was employed, using a five-point Likert scale survey, which was emailed to senior managers within the financial services sector of South Africa. The empirical results were then analysed to develop the implications for South African business managers.

Based on the citations made it is clear that limited research has been carried out to establish the moderating effect of IS capabilities in the relationship between IS resources and firm performance. It was also noted that the studies reviewed only examined the direct relationship between resources, capabilities and firm performance. The present study however sought to extend that line of thought by examining the moderating effect of IS capabilities on the relationship between firm's IS resources and performance in Kenya's telecommunications industry. By focusing on IS capabilities as a moderating variable, the study addressed one of the limitations of earlier researches and provided empirical evidence thereby contributing further to theory development.

2. Problem statement

The challenge facing most firms today is the ability to identify the set of innovative IS capabilities that can blend well with their IS resources as the ground to establishing sustainable competitive advantage. It is when these resources and capabilities are ingeniously managed, through a mixture of skills and knowledge that a firm can gain. In Kenya, firms in the telecommunications industry have portrayed mixed performance results with only Safaricom Kenya Limited sustaining its' performance over the years. According to Communications Authority of Kenya second quarter sector statistics report for the financial year 2017/2018; the company announced its' service revenue of 85.5%; while Airtel Kenya Limited announced its service revenue of 14.43% with Telkom Kenya and Equitel returning a 0.01% and 0.06% respectively. With the belief that the performance of any company in any industry is directly influenced by how they employ their IS resources to come up with ingenious IS capabilities, this study sought to establish the moderating effect of IS capabilities on the relationship between IS resources and firm performance in the industry, because of the worrying revenue figures of the other struggling players.

3. Theories and Literature

Resource-Based Theory

The focus of the Resource Based Theory (RBT) is on attributes of resources and capabilities gained from them to clarify a firm's heterogeneity, performance and sustainability. Resources are substances of approach in that, gaining supremacy in a belligerent marketplace is reliant on on firm ability to recognize, build up, position and safeguard meticulously resources that distinguish it from its rivals.

The central premise of this research stream is that mutual coherence between IS priorities, initiatives and firm strategies is necessary to efficiently prioritize IT activities and channel IS resources toward areas of core strategic importance to the firm. Empirical studies have confirmed that firms with a higher IS orientation are more likely to utilize IT for strategic purposes (Sabherwal and King, 1992) assemble IT resources and capabilities to support



market positions (Henderson, and Venkatraman, 1993) and focus IT energies on areas most critical to the firm to maintain and improve performance (Das, Zahra and Warkentin, 1991).

Contingency Theory

Contingency theory on the other hand is an approach to the study of organizational behaviour in which justifications are given as to how dependent factors such as technology, culture and the external environment influence the design and function of organizations. The assumption is that organizational effectiveness is dependent on a fit or match between the type of technology, environmental volatility, the size of the organization, the features of the organizational structure and its information systems (Islam and Hu, 2012). The concept of fit in this study has broad utility to how telecommunications industry players in Kenya combine their IS resources and capabilities from various business units to drive their goals while firm performance is a function of match, congruence, intersection or union of the two factors of IS resources and capabilities.

Information Systems Resources

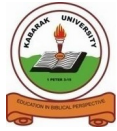
Information Systems (IS) resources are defined as the set of tangible and intangible factors that are directly or indirectly related to the IT area and have sufficient potential to achieve competitive advantage and help organizations perform better than its rivals (Grant, 1991; Amit and Shoemaker, 1993).

In employing this definition, this study considered the aspects specified by Bharadwaj (2000), who distinguished between IS resources, human resources linked to IS management, management capabilities and other organizational or business capabilities that may be complementary to IS resources. With this consideration in place the researcher adapted their classifications to profile the sector under study by considering IS human capital, IT investment (IT infrastructure sophistication) and IS partnership quality as IS resources.

Bharadwaj (2000) maintained that firms with strong human resources in their IS areas are able to integrate those resources with the processes of business planning, developing applications at an effective cost, efficiently supporting the business's needs for information, and anticipating future needs earlier than the competition. IT technical and managerial skills are developed over time with the accumulation of experience and are characterized by being tacit, dependent on interpersonal relations and requiring sufficient time to develop and tend to be highly localized in specific organizations.

Many expenditure trends between the year 2011 and 2013 indicated on average, that IT Investments have been the fastest growing investment category, accounting for approximately 5% of increasingly squeezed organisational budgets (Li, Huang, Luftman and Sha, 2010; Luftman *et al.*, 2013). Yet many organisations' ability to commendably evaluate IS Investment impact on the recognition of business benefits, and ultimately organisational performance continues to be mired in controversy (Bush, Lederer, Li, Palmisano and Rao, 2009; Ward and Daniel, 2012).

On IS partnership, Rockart and Short (1989) argued that the ability of the IS unit to deliver its services is dependent on an effective partnership between IS units and line managers. IS units and line managers must develop an appreciation and understanding of each other's environment which has been found necessary for IS to deliver value to the firm. Ravichandran and Rai (2000) posits that, in addition to internal partnerships, the relationship



an IS entity has with vendors and service providers can be an important determinant of its functional capabilities.

Information Systems Capabilities

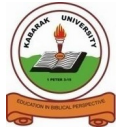
According to Laudon and Laudon (2012) IS capabilities are the routines within the IS department that enable it to deliver IT services to the organization. The primary reason for this lies in the understanding that IS capabilities are one of the major sources of competitive advantage and they are developed as a result of or in the context of organisational resource allocations. These capabilities when used for production and operations can improve performance of companies that must plan, monitor, and control inventories, facilities, and the flow of products and services. Other scholars have defined IS capabilities as an organisation's capacity to deploy resources in combinations that make appropriate business sense and provide the desired company results (Jarvenpaa and Leidner, 1998). Schreyogg and Kliesch-Eberl (2007) stipulated that capabilities can be developed at various levels in the company such as at the departmental, divisional or organisational level.

IS planning is an important process that enables organizations to identify business priorities and ensure that IS goals and initiatives are aligned with business priorities. It is likely that with sophisticated IS planning, a greater convergence between IS and business managers on IT priorities can be realised (Boynton, Zmud, and Jacobs, 1994). Such convergence allows the synergistic integration of IT and business knowledge Boynton, *et al.* (1994), which in turn improves the identification and development of strategic IT applications. In addition to making choices about targeting IT resources, firms have to successfully develop and implement technology solutions and ensure their effective utilization in order to improve their core competencies. Ability to develop high-quality applications in a timely and cost-effective manner is a critical capability that is likely to affect technology deployment in organisations (Rockart and Hoffman, 1992).

A mature IS support process in addition can ensure that systems are effectively utilized by end users. Since firms cannot reap benefits from IT unless it is effectively used, IS support maturity could determine how successful a firm is in using IT initiatives to improve its core competencies. For many organizations, continuity of business operations is dependent on efficient and reliable IS operations. With the increased penetration of IT into business operations, system failures can lead to significant business disruptions and losses. This study borrowed from the three definitions above to study how telecommunication industry players in Kenya utilizes their IS resources in developing IS capabilities (IS Planning, development and support) and hence enrich their service provision.

Firm Performance

Firm performance refers to organizational effectiveness in terms of its financial and operational performance (Langdon and Gosain, 2007). Ahmed and Khababa (1999) in their assessment of bank performance in Saudi Arabia employed accounting ratios as measures of firm performance these ratios include return on equity, return on assets and percentage change in earnings per share. Their justification was reinforced by Sinkey (1992) who postulates that from an accounting point of view, return on asset is a comprehensive measure of overall performance. Akintoye (2004) also acknowledged the accounting ratios that can be used as indicators for firm performance as net profit margin, return on capital and return on assets.



Barney (2011) asserts that a firm’s performance supremacy is not from one source of resources but from a bundle of resources which are both tangible and intangible. He argued that in most cases tangible resources do not translate to sustainable competitive advantage and hence eliminate above normal profitability of a firm. On the other hand technology as an intangible resource is able to produce higher performance as they are valuable, rare, inimitable and non-substitutable (Gamero *et al.*, 2011; Costa, Cool and Dierick, 2013).

Based on the arguments presented on firm performance measures this study treated firm performance as a multidimensional construct consisting of three dimensions: financial performance, operational performance, and market based performance (market share). Financial performance refers to the variation between revenue and cost, higher revenue is an indication that a firm is performing financially.

On the other hand operational performance refers to an organisational focus towards the efficiency in handling various business processes; improved control over its resources, enhanced co-ordination within organisations, and also the ability to foresee the future and prepare for changes while market share represents the percentage of an industry or market's total sales that is earned by a particular company over a specified time period.

In the present competitive environment, IS has been an integral element of business strategy. Though firm performance can be attributed to IS resources and IS capabilities, it can also be argued that as a moderator, IS capabilities can enhance IS resources contribution towards better firm performance. This claim is backed by Teece *et al.* (1997) acknowledgment that resources are the basic units of analysis, while a capability is the capacity for resources to perform a task or activity together.

Theoretical Framework

The study model figure 1.1 was guided by empirical analyses from previous models such as those of Ravichandran and Lertwongsatein (2005), Yashil (2009) and Mitra and Chaya (1996) that have attempted to integrate empirical research findings on the relationship between IS resources, IS capabilities and firm performance as cited in the literature.

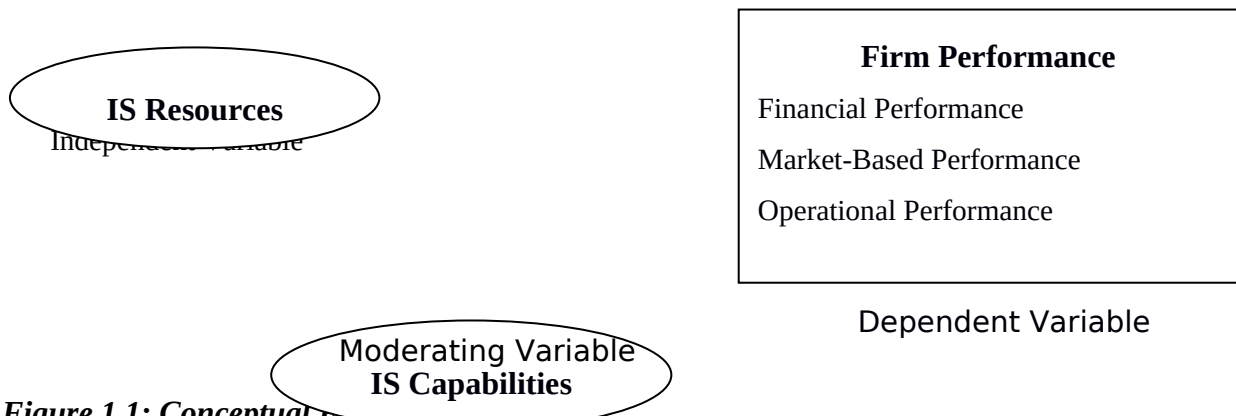
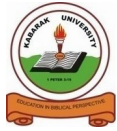


Figure 1.1: Conceptual Framework
Source: Adapted and modified from (Yashil, 2009; Ravichandara and Lertwongsatien, 2005 and Mitra and Chaya, 1996).



4. Methodology

Telecommunications industry is very information intensive, and innovative uses of IT can be vital to the success or failure of its players. The impact of IS capabilities on the relationship between IS resources and firm performance can vary across industries and countries. The research scope focused mainly on firms operating in Kenya's telecommunications industry between 2018 and 2019.

This study employed both correlational and survey study research designs. Creswell (2012) defines correlation design as a statistical test to determine the tendency or pattern for two (or more) variables or two sets of data to vary consistently. In correlational research designs, researchers use the correlation statistical test to describe and measure the degree of association (or relationship) between two or more variables or sets of scores. This type of design was deemed useful in this study because apart from just describing, survey can also be used to explain and explore the existing status of two or more variables at a given point in time (Mugenda and Mugenda, 2003).

The researcher used survey design to obtain data from strategic, management and operational level managers of Safaricom, Airtel, Telkom and Equitel companies to help in describing, explaining and exploring the relationship between their information systems capabilities and performance. The population of interest comprised all the 408 executive, management, and operational level managers of the four telecommunications industry players in Kenya namely; Safaricom, Airtel, Telkom and Equitel from both business and IT departments.

Proportionate stratified sampling technique was employed to determine the sub-samples per company where a sample of 202 was drawn. Simple random Sampling was then applied to select the respondents from each stratum. Primary data on IS resources, capabilities and firm performance was obtained using a structured five-point Likert scale questionnaire. Secondary data on measurement of IS resources, capabilities and performance of the firms in the telecommunications industry in Kenya was obtained from literature published as peer reviewed work by researchers, books, periodicals and other related publications.

Reliability of the research instrument was tested against Cronbach's alpha coefficient where an overall reliability score of 0.814 was achieved while validity was gauged using panel of experts, ensuring that the indicators of each variable were within the same construct and operationalizing the instrument as per the variables. Multivariate regression analysis was used to determine the moderating effect of IS capabilities on the relationship between IS resources and performance.

5. Results and Discussion

Information systems capabilities was taken as a moderating variable in the study to address one of the limitations of earlier researches and provides empirical evidence of the presence or absence of a moderating effect in the relationship between IS resources and firm performance thereby contributing further to theory development by providing validation or abrogation of the researcher's claim.

Thus, before introducing IS capabilities as a moderator into the regression model, the effect of IS resources on the firm performance was first established to be significant.



Hypothesis stated,

Ho: Information systems capabilities do not have a moderating effect on the relationship between information systems resources and performance of firms in the telecommunications industry in Kenya.

To test hypothesis Ho, linear regression model was conducted. The model was run as;

$$Y = \beta_0 + \beta_{i1}W_i + \beta_{i2}Z_i + \beta_i W_i Z_i + \epsilon_i$$

Where:

Y is firm Performance

β_0 is constant term

β_1 and β_2 are the beta coefficient values for IS resources and IS capabilities

W_i is IS resources

Z_i is IS capabilities

$W_i Z_i$ is the Interaction between IS Resources and IS capabilities

ϵ_i is the error term assumed to be normally distributed with a mean of zero and constant variance

Table 1: Model Summary for Regression Analysis of the Moderating Variable

Item	Step 1	Step 2	Change after Moderation
R	0.372	0.484	0.112
R²	0.138	0.234	0.096
F-Value	32.070	20.203	-11.867
β Constant	11.011	16.637	5.626
β IS Resources	0.404	-0.490	-0.894
β IS Capabilities	-	0.304	0.304
Interaction ($W_i Z_i$)	-	1.028	1.028

Decision Criterion for Moderation

Model 1	Model 2	Test	Conclusion
$\beta_1 = .404$ ($p = .000$) Significant at $p < 0.05$	-	Necessary condition exist	There is overall significant relationship to moderate
$\beta_1 = .404$ ($p = .000$)	$\beta_{IS\ Capabilities} = .304$ ($p = .000$)	$\beta_{IS\ Resources} - \beta_{IS\ Capabilities} = .404 - .304 = .100$	There is presence of partial moderation
		VIF- 2.145	Within the accepted range
		Durbin-Watson -1.4398	Within the accepted range

Source: Research Data, (2019)

Table 1 presents the regression analysis of information systems capabilities as the moderating variable between information systems resources and firm performance. The value for Durbin-Watson (D=1.498) was established to be within the recommended range of 1-3 indicating that



there was no autocorrelation detected. Variable inflation factor (VIF = 2.145) also fell between 1 and 10 indicating the absence of multicollinearity on the predictor variables.

The findings in step 1 indicated that the regression had a coefficient of 0.372 which shows a moderate significant and positive correlation between the dependent and independent variables. Further, the coefficient of determination R squared of 0.138 indicates that only 13.8 % of the variation in firm performance was explained by the change in IS resources, leaving 86.2% unaccounted for.

Step 2 shows that regression had a coefficient of 0.484 indicating a fairly strong positive and significant correlation between the dependent and independent variables. Accordingly, the coefficient of determination R squared of 0.234 shows that only 23.4% of the variation in firm performance is explained by the change in IS capabilities and IS resources, leaving 76.6% unexplained.

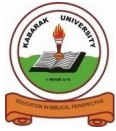
The R squared value for the two models 1 and 2 were .138 and .234 respectively. The change in R squared between the two models was .096. The F change in model 1 was $F(-11.862) = 32.070$, $P < 0.05$, suggesting that the model relationship was significant. In the same model, IS resources individually explained 13.8% of the variation in firm performance.

The change in R squared suggests that IS capabilities explained additional 9.6% of the variation in firm performance in model 2 indicating that the explanatory power increased due to moderation and therefore the null hypothesis that IS capabilities do not have a moderating effect on the relationship between IS resources and firm performance in the telecommunications industry in Kenya was rejected. This implies that whenever firms invested in information systems capabilities there was a significant improvement in the relationship between information systems resources and firm performance. However, the beta coefficients for IS resources in model 1 is .404 which changes to -.490 in model 2, thereby suggesting that the influence of IS resources on firm performance decreased by 0.894 units with the introduction of IS capabilities.

The beta coefficient for IS capabilities in model 2 was significant at 0.304 and $p < 0.05$ which means that IS capabilities significantly affected the relationship between IS resources and firm performance. The beta coefficients for the interaction term was 1.028 and was significant at $p < 0.05$, indicating that IS capabilities moderate the relationship between IS resources and firm performance.

Further investigation revealed that the total effect and the direct effect $\beta_1 - \beta_2$ (.404 - .304 = .100) confirmed at 95% confidence level were significant indicating a partial moderation of IS capabilities on the relationship between IS resources and firm performance. Therefore, this study concludes that IS capabilities significantly moderates the relationship between IS resources and firm performance in Kenya's telecommunications industry.

The findings are not similar to those of Antonia and Tomas (2008) who in their study on the strategic value, resources and capabilities of the Information Systems area and their impact on organizational performance in the hotel sector did not look at IS capabilities as a moderator and established that the more valuable, non-substitutable and inimitable the IS area is, the better the non-financial performance.



Similarly, a study by Ismail *et al.* (2012) on the relationship between organizational resources, capabilities, systems and competitive advantage that posits that organisational capabilities are a vital cog in the relationships among organisational resources and competitive advantage did not find support from the findings since the study looked at organizational capabilities and competitive advantage while the present study considered IS capabilities as a moderating variable between IS resources and firm performance in the telecommunications industry in Kenya.

Lastly, Yashil (2009) in his study on the effect of information systems resources and capabilities on company performance in the South African financial service industry documented a positive relationships between IS capabilities and IT support for core competencies which translate into enhanced company performance, the present study however did not find support from Yashil's study since IS capabilities was not considered as a moderator.

6. Conclusions

The findings demonstrated that IS capabilities have a moderating effect on the relationship between IS resources and firm performance. Therefore any firm must ensure that the capabilities of information systems are carefully identified and developed to ensure that better performance is achieved.

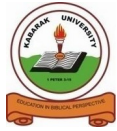
7. Limitations of the study

This research achieved its aim of providing a general view on the influence of IS capabilities on the relationship between IS resources and firm performance in Kenya's telecommunications industry. However some limitations were encountered; the study restricted itself to interviewing management of the four companies under study who were well conversant with most of the study concepts; the study was also limited by lack of locally based studies in the topical area and hence may have led to inadequacy of the relevant empirical literature to regulate it.

Lastly, a longitudinal work to investigate the relationship of the three variables of IS capabilities and performance will provide more robust results than those of the snapshot research in the present study. However, the application of multiple research methods helped to avoid the potential biases in the research process. The limitations noted here do not however weaken the validity of the research undertaken and its findings.

8. Suggestions for further research

This study makes the following suggestions for future research: With respect to the methodology, a future longitudinal research based on specific case studies in the telecommunications industry could be undertaken. There should also be an analysis of other factors not captured in this study related to information systems resources, capabilities and their relationship with firm performance. Lastly, another line of research could centre on the analysis of factors determining success in the identification and development of IS capabilities using this study's proposed model as the framework. However, it would be useful



to include new factors related to IS resources and capabilities in future scales in order to analyse the extent to which the variance in performance can be explained by those new factors.

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