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Effect of Business Intelligence Infrastructure Capabilities on Performance of Commercial Banks in Kenya

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Abstract:

Besides promoting economic progress and national development, performance of commercial banks is vital in order to reward shareholders for their investment. The Kenyan banking sector has continuously invested in business intelligence capability with most banks' management justifying the investment to achieve the expected growth and improved efficiency in operations from use of data. This study focused on investigating business intelligence infrastructure capabilities on performance of commercial banks in Kenya. The study was anchored on Resource-Based View Theory. An explanatory non-experimental design was employed to conduct a census involving the 43 commercial banks in Kenya. The heads of IT, Operations Managers and Credit Managers of the commercial banks were the respondents. Both primary and secondary data were applied. A semi-structured questionnaire was used to gather primary data whereas secondary data was gathered from banks audited financial statements using data collection sheet. Descriptive and inferential statistics were applied for analysis. Means, standard deviation and frequencies were used. Ordinary least squares model was also used in analysis. The study results were relayed in charts, graphs and tables. The study concludes that business intelligence infrastructure capabilities have a positive effect on bank performance. It was recommended that the leadership of commercial banks should embrace business intelligence infrastructure capabilities to augment performance.

Keywords: Infrastructure capability, return on assets, commercial banks in Kenya

1. Introduction

Commercial banks are essential agents of financial intermediation that supports economic growth (Ongore, 2013). They facilitate reallocation of excess funds from deficit to surplus units of economy for economic growth (Ojo, 2010; Eken, Selimler, Kale & Ulusoy, 2012). They contribute to the economic growth as they facilitate financial inclusion by availing funds to the investors to borrow (Otuori, 2013). They further support mobilization and efficient allocation of national resources through intermediation, and hence increases investment quantum and thereby increase in national output (Adebayo & Olalekan, 2012).

As banks engage in competition and meet customer needs, the sector has emerged among the topmost adopters of technology. BI and analytic systems constitute major information system (IS) innovations capabilities adopted by commercial banks for improved performance (Côte-Real, Ruivo & Oliveira, 2014). On the other hand, BI capability relies on technological infrastructure for reliable prediction of outcomes. Having realized the importance of millions of data they generate every day, (Chandani, Mehta, Neeraja & Prakash, 2015), banks have begun to exploit it through business intelligence to understand customers' behaviour and expenditure patterns.

According to Marjamäki (2017), banking is among the top major industries noted to be influencing business intelligence development and research. In 2017, global Business Intelligence (BI) and analytics revenue prediction was \$18.3 billion, a 7.3% increase from 2016. Total Software compounded annual Growth rate (CAGR) 2014-2019 estimation is at 6.4 percent with applications and infrastructure at 7.6 and 5.4 percent respectively. Most of the spending would be in business intelligence and analytics as predicted by Gartner. At the same time, the business intelligence market would grow to \$22.8 billion (Gartner, 2017). Kappelman, McLean, Luftman, and Johnson (2013) assert that in America, business intelligence has always been on top three IT investments and that it is always ranking high on CIO's technology list.

Business intelligence infrastructure is the base for implementation of the related techniques and tools that are required for business improvement (Oliveira, McCormack & Trkman, 2012; Kauffman, Srivastava & Vayghan, 2012). It is the organization ability in terms of physical information technology hardware and software components of business

intelligence systems. Kiron, Prentice, and Ferguson (2014) also identified IT platforms as part of core dimensions of business intelligence and analytics capabilities.

1.1. Statement of the Problem

The Kenyan banking sector has continuously invested in business intelligence infrastructure to drive growth and improved efficiency in operations from use of data. Banks are increasingly leveraging on this technology to enhance their performance through user experience and the customers have recognized improvement on services (KBA, 2019).

Despite the increase in investment in business intelligence infrastructure capability, the Kenyan commercial banks average performance has been declining with respect to the investment (CBK, 2019). The poor performance resulted to implementation of some control measure by the regulator. Some of the banks have resorted to mergers while a few, such as Imperial Bank, Chase bank and Dubai bank have been placed under receivership by the regulator. The profitability of the Kenyan commercial banks has been on downward trend since 2013 as indicated by the decline of ROA (CBK, 2019). The banking sector profitability decreased by 9.6% between 2016 and 2017. According to IMF, in the banking sector, return on assets has been on decline for a period of six years, dropping from 4.89 in 2013 to 3.18 in 2018 (IMF, 2018).

Given the declining performance on investment returns, the fundamental question is what value and benefits are achieved by commercial banks through investment in innovation through business intelligence infrastructure capabilities. The heavy investment in business intelligence infrastructure and the declining performance of commercial banks point to inconsistencies worth investigating. This research, therefore, pursued the exploration of the influence of BI infrastructure capability on performance of commercial banks in Kenya.

2. Literature Review

2.1. Theoretical Review

This study was founded on Resource-Based View Theory. This is a view mainly referred to as RBV whose primary proponent is Penrose (1959). It postulates that if a company or business controls its resources, then it can achieve superior performance. It was later advanced to fit the growing usage (Wernerfelt, 1984; Rumelt, 1984 & Barney, 1986). This view is intra-organizational focused with performance resulting from unique capability of the firm. It explains sustainability and performance of a firm by focusing on the characteristics of the resources applied (Mahoney & Pandian, 1992). Conner (1991) states that the capability of the primary resource determines the ability of a firm to remain profitable in the marketplace.

Resource-based view perspective emphasizes that exclusive capabilities and resource of a firm is the basic source of competitive advantage and higher performance (Barney & Hesterly, 2010). Every firm owns numerous intangible and tangible resources (Barney, Wright & Ketchen, 2001). According to Barney (1991) there would be no difference in firms' profitability if all firms were equally endowed since any firm in the industry could implement the same strategy. However, when a firm develops unique, distinct and implicit capability, it will be successful in future competitiveness (Rumelt, Schendel & Teece, 1991). These distinct capabilities should further define the organization strategy (Rumelt, 1984).

Resources that accord a firm superior performance enabled through competitive advantage must be non-substitutable, imperfectly imitable, valuable and very rare to provide sustainable competitive advantage that yields better or higher performance (Barney & Hesterly, 2010; Bradley, Wiklund & Shepherd, 2011). Constructs of resources in general are advanced as competencies, capabilities and resources. Competencies and skills allow firms to respond to customer needs with differentiated services and products by innovating technological systems. This enables firms to out-compete other firms (Arend & Levesque, 2010, & Anderson, 2011).

In this study, RBV theory played a crucial role of assessment of the infrastructure capabilities of commercial banks that accord them sustain competitive advantage. Consequently, this leads to improved financial performance. The theory enables managers to identify the drivers of higher performance of the firm (Locket, Thompson & Morgenstern, 2009). RBV emphasizes that to attain competitive advantage, firms should deploy both intangible and tangible assets in form of physical assets (Lonial & Carter, 2015). Business intelligence infrastructure is a technological intangible resource. Nevo and Wade (2010) and Cosic, Shanks and Maynard (2012) recommend that VRIN resources should be derived through synergy between technological innovations and other organization resources.

2.2. Empirical Review

Ibrahim, Saifullahi and Muhammad (2013), investigated how ICT influences commercial banks performance in Nigeria. They used business intelligence as a proxy of ICT while return on equity and profit were the measures of performance. The study considered five-year panel data which was analysed using Fully Modified ordinary squares (FMOLS). The results indicated that ICT has influences commercial banks performance positively. The overall conclusion was that business intelligence influences performance of commercial banks positively. They recommended implementation of ICT to enhance performance. The investigation was based on ICT as a direct predictor of banks performance. This study conceptualizes ICT as an aspect of BI infrastructure capability in line with observation that ICT innovation alone cannot provide improved performance.

Gonzales, Wareham and Serida (2015), conducted a research in Peru to evaluate how data centre and business intelligence affects performance of enterprises. The study used 23 interviews for exploratory model and examined 110 survey responses for quantitative model. This research used user impact which was represented as net benefit to mediate the influence of data quality on organization performance. The research found data warehouse and business intelligence

positively impacts performance of the firm. The study conceptualized data warehouse as only aspect of BI while current study focuses on ICT and CRM as aspects of BI infrastructure.

Bezovski and Hussain (2016), carried out a study on the advantages derived from customer relationship management systems by banks. The study aimed at investigating whether use of CRM has any benefits to customers as well as to banks. The study findings indicate that customer relationship management systems positively impact banks performance by increasing revenue, cross-selling and decreasing administrative costs. They further assert that through availing of customers past transactions, CRMs enable proper analysis of customers' behaviour which can be used for target marketing. This increases revenue and profit per customer hence overall organization performance. This study was specific on electronic customer relationship management systems while the current study focuses on business intelligent infrastructure capabilities and performance.

Kebede and Tegegne (2018) studied the effects of CRM on selected commercial banks' performance in Amhara region, Ethiopia. The cross-sectional survey used convenience sampling technique to select respondent customers of commercial banks. Using logistic regression for analysis, the study concluded that CRM has a significant effect on performance of commercial banks. The Study used convenience sampling method and focused on selected banks in a region of Ethiopia. The convenience sampling method may result to inability to generalize due to under or overrepresentation of the population. This study was a census which covered whole of Kenya to overcome any sampling related errors.

2.3. Conceptualization and Measurement of Variables

Performance of commercial banks formed the dependent variable for the study. Its indicator was return on assets (ROA). The independent variable was business intelligence infrastructure capability with three indicators: ICT infrastructure, data warehouse and customer relationship management system.

ICT Infrastructure acts as an enabler that gives organizations ability for proper use of information for business improvement to boost business performance and enhance sales and marketing. The data warehouse serves as the central repository of all data sources. It is the portion that supports data collection and storage in the business intelligence implementation. CRM applications supports in managing and displaying the data acting as a user interface. From these characteristics and the reviewed study, it was hypothesized that investment in BI infrastructure capability would yield better return on assets.

2.3.1. Hypothesis

From reviewed literature and conceptualization of variables, H_{01} hypothesis was derived.

- H_{01} : BI infrastructure capabilities have no significant influence on performance of commercial banks in Kenya.

3. Methodology

The study was based on positivism paradigm (Remenyi, Williams, Money & Swartz, 2005). An explanatory non-experimental design of research was considered in execution of the study. It involved collection of qualitative and quantitative data on variables to ascertain relationship (Gay & Airasian, 2000). It attempted to provide answers to 'why' and 'how' questions of a phenomenon under study (Grey, 2014). This design was useful in explaining the relationship between variables and their characteristics using data on quantitative variables (Gay & Airasian, 2000).

A census study covering all commercial banks in Kenya was conducted. The approach was adopted since commercial banks are relatively few and their published information is readily available. Saunders et al (2009) asserts that census enhances validity of the collected data as it includes more cases which provide extra information. The target population for this study therefore constituted the 40 commercial banks which were under normal operations and whose data was readily available.

Both primary and secondary data were collected. A questionnaire was used to collect primary data on the independent variable, BI Infrastructure capabilities. The respondents were the management cadre comprising the heads of IT, Operations and Credit. Secondary data on the dependent variable, performance, measured using return on assets (ROA), was collected for the 40 commercial banks. The data was compiled from disclosures on financial statements for the period 2013-2019 using data collection sheet.

To analyze the data, descriptive and regression methods were used. Equation 1 was used. Data analysis utilized both descriptive and inferential statistics. The following empirical model used:

$$ROA_i = \beta_0 + \beta_1 BIC_i + e \dots\dots\dots 1$$

Where:

β_0 = Intercept Constant

DIC = BI infrastructure Capability of bank i

$\beta_i, \beta_0, \beta_1$ = Regression coefficients of Bank i

i = Bank1, 2, 3... 40

e = the error term.

ROA = Return on Asset

4. Research Findings and Discussions

4.1. Descriptive Statistics

The study focused on determining the effect of business intelligence infrastructure capabilities on performance of commercial banks. The BI infrastructure capability of the commercial banks was measured using three indicators of ICT infrastructure, enterprise data warehouse and customer relationship management system (CRM) which were measured by different sub-constructs. Consequently, the responding managers were enquired to show their level of agreement on whether ICT infrastructure influenced performance of commercial banks or otherwise. The outcome was as displayed in table 1.

	Frequency	Percent
Yes	60	73.2
No	22	26.8
Total	82	100

Table 1: ICT Infrastructure and Bank Performance
Source: Survey Data (2021)

As per the results, the larger portion, denoted by 73.2 percent, agreed that ICT infrastructure influences performance of commercial banks in Kenya. Further, the managers were required to rate business intelligence infrastructure capability indicators on a Likert scale of 1 to 5. A rating of 1 denoted strong disagreement while a scale of 5 represented a strong agreement. Table 2 shows the means and standard deviations which were consequently calculated.

Statement	N	Mean	Std. Dev
ICT Infrastructure supports business intelligence adoption	82	3.83	1.20
ICT infrastructure enhances use of BI for efficiency	82	4.13	1.04
Robust ICT complements business intelligence use	82	4.28	0.73
In our bank customer relationship management system supports interaction with customers during our daily operations.	82	4.32	0.66
Customer relationship management system enables customer segmentation for targeted product offering	82	4.18	0.74
We use Customer relationship management systems for operational reports and dashboards.	82	3.88	0.67
Customer relationship management is a complements business intelligence service.	82	4.26	0.58
The bank has invested in enterprise data warehouse to support business intelligence activities	82	4.32	0.59
The data warehouse contributes to firm performance through storage of key customer data and information.	82	4.43	0.52
Data warehouse is necessary for bank performance growth.	82	4.44	0.61
Data warehouse is a key supports activity off business intelligence technology for competitive advantage.	82	4.23	0.65
Average		4.21	0.73

Table 2: Business Intelligence Infrastructure Capability
Source: Survey Data (2021)

The results revealed that the managers concurred that ICT infrastructure supports BI adoption by an average of 3.83 standard deviation of 1.2, ICT infrastructure enhances use of BI for efficiency by mean = 4.13 and standard deviation of 1.04 statement on robust ICT complements business intelligence had a mean response of 4.28 and a deviation of 0.73. Similarly, a mean of 4.32 and a standard deviation of 0.66 was registered in response to the statement that customer relationship management system supports interaction with customers during daily operations, customer relationship management system enables customer segmentation for targeted product offering had an average response rate of 4.18 with standard deviation value 0.74 while an average response of 3.88 and a standard deviation of 0.67 was observed on statement that customer relationship management system is used for operational reports and dashboards.

With regard to the statement that customer relationship management complements business intelligence service, a mean response of 4.26 and standard deviation of 0.58 was obtained, the claim that the bank has invested in enterprise data warehouse to support business intelligence activities an average response rate of 4.32 and standard deviation of 0.59 while claim that data warehouse contributes to firm performance through storage of key customer data had a mean response rate of 4.43 and standard deviation of 0.52.

Lastly, results shows a mean response of 4.44 in supporting that data warehouse is necessary for bank performance and growth with an average response rate being 4.23 with a standard deviation of 0.65 asserting that data warehouse is a key support activity of business intelligence technology for competitive advantage. Using a five-point Likert scale, the overall mean response and standard deviation were 4.21 and 0.73 respectively. This indicated a very clear concurrence that stated actions of infrastructure capability supports business intelligence which enhances performance of commercial

banks. Some of the business intelligence infrastructure capabilities adopted to improve performance include ICT infrastructure, customer relationship management system and enterprise data warehouse to support BI adoption.

The findings in this section support the arguments by Ibrahim, Saifullahi and Muhammad (2013) that ICT influences commercial banks performance positively. Gonzales, Wareham and Serida (2015) also established that data warehouse and business intelligence influences performance of the firm while Bezovski et al (2016) found that customer relationship management systems influence banks performance by increasing revenue, cross-selling and decreasing administrative costs. They further assert that through availing of customers history of transactions records, CRMs enable proper analysis of customers' behaviour which can be used for target marketing.

4.2. Hypothesis Testing

To establish the effects of business intelligence infrastructure capabilities on performance of commercial banks in Kenya the null hypothesis (H01) was tested. The results are shown in table 3

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-7.651	1.003		-7.631	0.000
	Infrastructure capability	0.664	0.254	0.253	2.616	0.011
a. Dependent Variable: (ROA) Performance						

Table 3: Regression Coefficients

Source: Research Data (2021)

Regression results in Table 3 exhibit a regression coefficient of business intelligence infrastructure capabilities as 0.664 with a p-value of 0.011. From the results, p-value of $0.011 < 0.05$ and therefore the null hypothesis is rejected. This implies that business intelligence infrastructure capabilities have positive and significant influence on performance of commercial banks in Kenya. A positive coefficient implies that an increase in business intelligence infrastructure capabilities results to a significant improvement in bank performance. These results are coherent with the observations and conclusion of Bezovski et al., (2016) that infrastructure capabilities such as ICT positively and significantly impact banks performance by increasing revenue, cross-selling and decreasing administrative costs.

According to Gonzales et al., (2015) data warehouse and business intelligence through customer relationship management positively impacts performance of the firm. Similarly, Oliveira, McCormack and Trkman (2012) argued that business intelligence infrastructure is the base for implementation of the related techniques and tools that are required for improved firm performance. Through adequate IT platforms, Kiron et al, (2014) argued that as they are part of core dimensions of business intelligence, they improve the performance of an organization. Conversely, the results in this section fail to support empirical results by Yu (2010) regarding the association between infrastructure capability where they used firm-level performance (ROA) and concluded that infrastructure capability does not enhance firm performance of banks.

5. Summary and Conclusions

The main purpose and concern of an enterprise is the performance in form of returns to the shareholders investment. Performance of commercial banks performance is paramount considering their necessity to the economy. In this study, the researcher examined how business intelligence infrastructure capabilities affects the performance of commercial banks in Kenya. Following the findings, the conclusions were that business intelligence infrastructure capability is statistically and significantly influential to the performance of commercial banks in Kenya.

5.1. Recommendations of the Study

The results of the study confirm that business intelligence infrastructure capability has positive impact on commercial banks performance. The study therefore recommends that business intelligence infrastructure capability which positively influences commercial banks performance, should be prioritized as a major contributor of performance: Consequently, banks leadership teams must support in investment and adoption of business intelligence infrastructure capabilities in form of ICT infrastructure, data warehouse and CRM systems for better performance.

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