



# **ANALYSIS OF BUSINESS INTELLIGENCE CAPABILITY AND PERFORMANCE: EMPIRICAL EVIDENCE FROM COMMERCIAL BANKS IN KENYA**

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## **Abstract**

*The banking sector in Kenya has continuously invested in business intelligence capability for growth, efficiency and financial performance. During the period 2013 to 2020, returns on assets of commercial banks diminished despite the adoption of business intelligence capability. Following that fact, this study intended to evaluate the effect of business intelligence capability on the performance of commercial banks in Kenya. It focused on investigating how infrastructure, data integration and organisational capabilities influence the performance of commercial. Resource based view theory, DeLone and McLean's model and dynamic capability theory anchored the study. An explanatory non-experimental design was employed to conduct a census of commercial banks in Kenya. The respondents comprised the heads of IT, Operations Managers and Credit Managers drawn from these commercial banks. The study applied both primary and secondary data. Semi-structured questionnaire was used to collect primary data whereas data collection sheet was used to gather secondary data from banks audited financial statements. Descriptive and inferential statistics were applied for analysis. Ordinary least squares model was also used in analysis. The main beneficiaries of the study are commercial*



*banks management, academia and policy makers. The results revealed that business intelligence infrastructure, data integration and organization capabilities positively and significantly affect performance of commercial banks in Kenya. The study concluded that business intelligence capability has an effect on bank performance. It was recommended that the leadership of commercial banks and other stakeholders should embrace business intelligence capability as it is an effective performance enhancement strategy.*

*Keywords: Business intelligence, infrastructure, data integration, organizational capability, commercial banks*

## INTRODUCTION

Commercial banks form a crucial section of economy as major players in financial intermediation (Ongore, 2013; Otuori, 2013). As their primary function, they reallocate excess funds between deficit and surplus units of economy to boost economic growth (Ojo, 2010; Eken, Selimler, Kale & Ulusoy, 2012). Through intermediation, commercial banks further mobilize and facilitate efficient allocation of national resources hence increases investment quantum and thereby increase in national output (Adebayo & Olalekan, 2012). As agents, commercial banks collect cheques and income (dividends, pension, rent, interest among others) and paying expenses (bills, salaries, interest among others) on behalf of other businesses. This makes them a key determinant of growth of economic sector of any nation. As such, it is paramount that they perform efficiently. Any instability in commercial banks sector could lead to systemic collapse of a national economy. According to Sharma and Mani (2012) poor performance of commercial banks raises fears among planners and policy designers as this can potentially precipitate collapse of the economy.

Banking sector expectations are highly dynamic and volatile. According to Ubiparipović and Đurković (2011) banking environment faces the risk of high dynamic market, fierce competition, dynamic customer demands and necessity of strict controls. Other primary problems facing commercial banks include product management, loss prevention, customer management, fraud discovery and prevention as identified by Curko, Bach and Radonic (2007). These challenges and uncertainties have compelled commercial banks to implement business intelligence systems to meet strategy and improve on performance (Fedouaki & Alami, 2013).

The sector is among the highest adopters of technology as banks strive to remain competitive. Business intelligence and analytics systems constitute major information system (IS) innovations capabilities adopted by commercial banks for performance (Côte-Real, Ruivo & Oliveira, 2014). BI capability relies on data patterns for reliable prediction. On the other hand,

commercial banks generate millions of transactional data everyday through multiple channels (Chandani, Mehta, Neeraja & Prakash, 2015; Mutuku, Muathe & James, 2019). Having realized the importance and potential of the data as an asset, banks have begun to exploit it through business intelligence to understand customers' behaviour and expenditure patterns. Business intelligence (BI) systems support achievements of business objectives and improve decision making which has made it very popular with scholars and industry practitioners (Olszak & Ziamba, 2012; Moro, Cortez & Rita, 2015). With this data capability, banks can easily understand customers behaviour through transactions pattern, do segmentation and offer differentiated-targeted marketing for improved performance and build a loyal customer base (Bagchi, 2014).

According to Marjamäki (2017), banking is among the top major industries noted to be influencing BI 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 BI and analytics as predicted by Gartner. At the same time, the BI market would grow to \$22.8 billion (Gartner, 2017). Kappelman, McLean, Luftman, and Johnson (2013) assert that in America, business intelligent has always been on top three IT investments and that it is always ranking high on CIO's technology priority list.

Business intelligence capability has been conceptualized based on its definition and purpose (Zhu & Kraemer, 2005; Zhu, 2004, Mithas, Ramasubbu, & Sambamurthy, 2011). In their study on achievements of business intelligence capability, Shanks and Bekmamedova (2012) assert that business intelligence capabilities include processes, routines and skills that effectively apply in business intelligence. These include data quality administration, data warehousing, application of reports and OLAP apparatuses and analytic software applications that support decision making. According to Olszak (2014) business intelligence capabilities include people, culture, process and Technology dimensions.

Xu and Jongwoo (2014) conceptualized BI capability using technical and organizational dimensions and argued that performance is through enablement of dynamic capability. Parks and Thambusamy (2017) identified organization, culture, data management and processes as dimensions of business intelligence capability. Ali, Shahadat and Miah (2017) pointed out organization capability as a dimension and aspect of BI capability. From the various definitions, business intelligence capability leverages on the business intelligence systems, ICT infrastructure, data and other organization resources. This study also leveraged on ICT business intelligence infrastructure, data integration and organization capabilities to define

business intelligence capability. BI capability was therefore defined as BI infrastructure, data integration processes and organization capabilities that are used by commercial banks to gather, store, manage, analyse and present the data from within and outside organization for decision making. It was operationalized as business intelligence infrastructure, data integration and organization capabilities.

### **Statement of the problem**

Performance of commercial banks is very important since beyond promoting economic progress and national development, there has to be a good reward shareholders for their investment (Kenya & Gitonga, 2016). The Kenyan banking sector has continuously invested in business intelligence capability with most managers justifying it as a means to investment of the expected growth and improved efficiency in operations by 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 capability, the Kenyan commercial banks return on assets has been declining with respect to the investment (CBK, 2018; KFSR, 2018). The poor performance had resulted to some banks mergers while a few, such as Imperial Bank, Chase bank and Dubai bank had been placed under receivership by the regulator. The profitability of the Kenyan commercial banks had been on downward trend since 2013 as indicated by the decline of ROA (CBK, 2018). 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 seven years, dropping from 2.35 in 2013 to 0.77 in 2019.

As a result of the declining performance, it is critical to assess the benefits accruing to commercial banks through investment in business intelligence innovation. Scholars and researchers have posited that investment in business intelligence leads to improved firm performance (Chen et al., 2012). At the same time, it has been a challenge to quantify and measure business intelligence innovation contribution to an organization (Holsapple, Lee-Post & Pakath, 2014; Owusu, 2017). This research, therefore, undertook to explore the influence of BI capability on performance of commercial banks in Kenya.

## **LITERATURE REVIEW**

### **Theoretical Review**

The study was anchored on resource-based view theory (RBV), DeLone and McLean's IS Success Model and the dynamic capability theory. RBV theory, an intra-organizational focused with performance resulting from unique capability of the firm, was championed by

Penrose (1959). It postulates that if a company or business controls its resources, then it can achieve superior performance. RBV emphasizes that exclusive capabilities and resource of a firm is the basic source of competitive advantage and higher performance (Barney & Hesterly, 2010). 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).

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). The theory, in this study informed the assessment of the capabilities of commercial banks that support attainment and sustainability of competitive advantage. It emphasizes deployment of tangible and intangible assets such as organizational capability, human and physical assets for competitive advantage (Lonial & Carter, 2015). Business intelligence 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. DeLone and McLean's IS Success Model was proposed by William and McLean (1992). Six dimensions of assessing information systems success are identified. These are net system benefits, information quality, intention of use, quality of system, its quality of service and user satisfaction. According to the model, system and information qualities influences satisfaction of user as well as use of an information system. The use and user satisfaction in turn influences each other while both influence individual impact. Individual impact in turn influences organizational impact.

In 2003, Delone and McLean reacting to the model critiques, combined individual and organization impacts into benefits. Information and system qualities have been found to be drivers of information systems use leading to individual satisfaction and hence firm performance (Iivari, 2005; Petter & McLean, 2009). Popovic, Coelho and Jaklic (2012) applied the model to study the success of BI capabilities. Business intelligence is an information system innovation by commercial banks. This theory guided the study in identification of specific dimension of "net benefit", in form of return on asset for commercial banks.

The dynamic capability by Teece, Pisano and Shuen (1997) describes the vibrant capacity of a company. It defines firms' ability to sense an opportunity, seize, implement and reconfigure and to readjust the existing resources (Danneels, 2002 & Teece, 2007). Drnevich and Kriauciunas (2010) suggest that dynamic capabilities positively influence creation of new

organizational products, suppliers and processes which contribute positively and indirectly to organization performance. Dynamic capabilities also represent competency of an organization to endure fluctuating environment by building enhancement of internal resources (Cosic, Shanks & Maynard, 2012).

Sensing element of dynamic capability theory includes technological capacity assessment and modern technology assessment (Ashraf, Jahanyar & Maghsud, 2013). Chae and Olson (2013) leveraging dynamic capability, described business intelligence capability as information technology supported by robust tool for decision making. Olszak, (2014) also draws from dynamic capability and operationalizes BI capability using Technology, culture, people (analytical, leadership and organizational skills) and processes. In this study, the theory was relevant in assessing the commercial banks capabilities that integrate with business intelligence technology for competitive advantage for performance improvement.

### **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 influences commercial banks performance positively. They recommended implementation of IT to enhance performance. The investigation was based on ICT as a direct predictor of banks performance. This conceptualized business intelligence as ICT only. In line with observation that IT innovation alone cannot provide improved performance current study introduced organization and data capability as aspects of BI capability.

Gonzales, Wareham and Serida (2015) conducted a research in Peru to evaluate how data centre and business intelligence affects performance of firms. The study used twenty-three interviews for exploratory model and examined 110 survey responses for quantitative model. This research used user impact which that 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 business intelligence capabilities using information and its qualities and omitted the technical components. This study conceptualized BI using infrastructure, data and organization aspects.

Kamara (2014) used Equity Bank (Kenya) as a case study relating to the benefits accrued from business intelligence systems. The respondents of this descriptive study were five hundred senior staff of the bank. The study findings indicated that business intelligence systems provides strategic value that improves performance through innovative services, products and

enhanced decision making. The study recommended executive and management support to ensure business intelligence value attained. The study, however, focused on one commercial bank and hence it would not be rational for results generalization. In the current study, a census study was carried out.

Bezovski and Hussain (2016) conducted 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 indicated that CRM 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 is useful for target marketing. This increases revenue and profit per customer hence overall firm performance. This study was specific on electronic customer relationship management systems while the current study focused on business intelligence capabilities and performance. The contextual differences between this study and current study makes it hard for generalization of the findings.

A study conducted by Lautenbach, Johnston and Adeniran-Ogundipe (2017) investigated factors that influence implementation and use of business intelligence and analytics in South African organizations. The study findings revealed that data-grounded decision making that promotes analytics and BI use improves on firm performance. Their focus was on business intelligence and analytics use whereas the current study focus was on business intelligence capabilities and performance which made the two studies completely different.

Ali, Miah and Khan (2018) studied the gains of business intelligence utilization by small businesses. The study was a review of seventy-five articles on relationship between the agility of an organization and business intelligence. The business intelligence variables in the study were personnel, organizational and technological capabilities. The study found that business intelligence is recognized as an enabler of achievement of organizational agility by small businesses. The study used literature review methodology while the current study conducted an empirical review to assess how business intelligence capability affect performance. The difference in the methodology used would most likely impact on the findings and conclusions so derived.

Barua, Mani and Mukherjee (2012) studied the influence of data quality on performance of firms in Dublin. The sample considered consisted 150 firms selected across all major industries. Financial performance was operationalized into ROI, ROA, and ROE while data quality, usability, analytics, intelligence and accessibility were the attributes of data integration capability. Data mining proxied as data management tool for finding useful information on

customers through predictive and prescriptive techniques. Using the data mining capability of predictive, data predictability and intelligence, they concluded that quality data leads to increased financial performance. This study scope was too broad since it covered all major industries hence the findings are not specific for commercial banks. This research considered only commercial banks to enable detailed and more specific analysis and conclusion.

Chegini, Taleghani and Gerdvisheh (2013) in their research confirmed a positive association of firm performance and data quality. They concluded that data quality improves movement of information and hence firm performance. Another study by Chae *et. al.* (2014) examined the influence of data on firms in the manufacturing sector. The survey analysed sample of 533 firms collected from Global Manufacturing Research Group. The study concluded that quality and accuracy of data positively impacts firm performance through proper planning. Operational performance may not be a clear indicator of firm performance as the main purpose of business is return on the invested assets which also indicate the profitability. Therefore, the study findings are limiting as it is not quantifiable. This study quantified the performance and operationalized it in terms of return on Assets.

In a different study, business intelligence and data warehouse impacted positively to firm performance (Gonzales *et. al.*, 2015). This research used user impact which was proxied as net benefit to mediate the influence of data quality on organization performance. The research found that data quality positively impacts performance of the firm.

A study conducted to evaluate whether Big data analytics has any impact on firms' performance (Wamba, Gunasekaran, Akter, Ren, Dubey & Childe, 2017). Data was collected through online survey by 297 respondents. These were experts in areas of business, big data analytics, IT management and business analysis. The study findings concluded that integration of data analytics in the firm's decision making significantly influences performance. The level of adoption of business intelligence capability in China and Kenya is different. China has advanced in technology and business intelligence capability usage is high, hence study findings from China cannot be extrapolated to firms operating in Kenya market.

Another study conducted by Kasemsap (2018) concluded that use of business intelligence and multiple use of data mining maximizes opportunities, minimizes risk and supports business growth. The study revealed that business intelligence and knowledge management maximizes business opportunities for organizations through integration of relevant information. This leads to improved firm performance. The study conceptualized business intelligence as knowledge and data mining omitting the technical component of business intelligence. The current study brought in business intelligence capability with Technology and organizational aspects of BI.



Cherian and Farouq (2013) undertook a study to find out how leadership style affects the main commercial banks' performance in Abu Dhabi and Dubai. Judgemental sampling technique was used in the research. A sample of eighteen commercial banks was used as the source of secondary data. They determined that performance of commercial banks operating in United Arab Emirates is positively associated with the leadership style. The judgemental sampling approach used could be biased and therefore not suitable for generalization of research findings. This study considered a census method to ensure representation of the entire population.

In the study of Chegini et al. (2013), employee Skills, continuous improvement policy, IT investment, IT infrastructure and organization learning were used as the variables of interest. The study concluded that organization skills impacts firm performance positively and significantly. The same study asserted that both employees' capability and skills influence firm performance significantly.

An empirical study by Hou (2016) investigated how business intelligence impacts performance of Taiwanese firms. A sample of 139 was drawn from semiconductor sector firms. The descriptive study used balanced scorecard dimensions as variables and subjected them to firms' performance. The study established BI to be indirectly and positively associated with financial performance. They also asserted that organization performance is positively and significantly affected by internal processes through business intelligence usage. The authors operationalized business intelligence usage as a single component. This study used business intelligence construct that encompassed Infrastructure capability, organization capability and the data integration capability which was not the focus of Hou's study.

Owusu (2017) also investigated the effect of business intelligence on firm's performance in Ghana's banking industry. The descriptive study analysed data collected from a sample of 130 bank executives. Contrary to most of the studies on BI and organization performance, the findings of this study showed that business intelligence systems do not impact financial performance. In the same study, internal processes did not exhibit significant influence on performance, but culture and learning did. The author in this study did not focus on various capabilities of BI and only considered usage of the same. This study put in consideration, the components that define business intelligence in order to cover this gap.

A study conducted by Zhou, Zhou, Feng and Jiang (2019) focused on dynamic capabilities and organizational performance in China. A sample of 204 firms provided the data. Partial least squares structural equation supported data analysis. Overall results disclosed a substantial positive influence on performance by the firm of dynamic capabilities. This focused on dynamic capabilities which are broad in scope, but the current study emphasized on

organisational capabilities, integrated with infrastructure and data to form BI capabilities. Further, the maturity of business intelligence capabilities in China may differ with Kenya which makes current study different.

Similarly, Dev, Gill and Singh (2019) undertook a survey on how the organizational capability impacts the manufacturing industries in India. Research data was gathered across forty-one respondents of medium and small-scale manufacturers in Punjab. The findings concluded that organization capabilities positively and significantly influence firm performance. This study only focused on organisational capability which is not necessarily BI capability. The conceptual focus of the two studies is completely different. Similarly, level of adoption of business intelligence capability maturity in India and Kenya is at various levels hence study findings from India cannot be extrapolated to firms operating in Kenya Market.

### **Conceptualization and measurement of Variables**

Business intelligence capability has been conceptualized based on its definition and purpose (Zhu & Kraemer, 2005; Zhu, 2004, Mithas, Ramasubbu, & Sambamurthy, 2011; Bekmamedova, 2012; Olszak, 2014; Xu and Jongwoo; Shahadat & Miah, 2017). The dependent variable was commercial banks performance, indicated by return on asset (ROA). The independent variable was business intelligence capability. It had been operationalized into infrastructure, data integration and organization capabilities.

### **Hypothesis**

From these characteristics and the reviewed study, it was hypothesized that if commercial banks invested in BI capability, they would yield a better return on assets. Hypothesis H1, H2 and H3 were therefore derived.

H01: Business intelligence Infrastructure capability has no significant effect on performance of commercial banks in Kenya.

H02: Business Intelligence data Integration capability has no significant influence on performance of commercial banks in Kenya.

H03: Business intelligence Organization capability has no significant influence on performance of commercial banks in Kenya.

### **METHODOLOGY**

A positive paradigm was adopted for the study with the aim of uncovering the truth about what things focus on and how they are (Bell and Bryman, 2003; Remenyi, Williams, Money & Swartz, 2005). Explanatory non-experimental research design research was applied. An

explanatory study is used to describe and account for descriptive information. It attempts to provide answers to ‘why’ and ‘how’ questions of a phenomenon under study (Grey, 2009). The study is nonexperimental research which involved collection of data on quantitative variables to determine their relationship (Gay & Airasian, 2000). Faraway (2002), Field (2009) and Hayashi (2000) recommends use of multiple linear regressions in case the number of independent variables is greater than one. Performance of commercial banks, the dependent variable, is continuous and multiple regression was also relevant.

Model 1 was used to examine the effect of BI infrastructure, data integration and organization capabilities on the dependent variable, return on asset.

$$ROA_i = \beta_0 + \beta_1 BI_i + \beta_2 BID_i + \beta_3 BIO_i + e \dots\dots\dots \text{model 1}$$

A census study covering all commercial banks in Kenya was conducted. Saunders et. al. (2009) asserts that census enhances validity of the collected data as it includes more cases which provides extra information. The data comprised primary and secondary (Kothari, 2004). The study used a questionnaire to collect primary data on the independent variable (Mugenda & Mugenda, 2003; Kothari, 2004). Cooper and Schildler (2014) assert that secondary data is past information obtained by the researcher from articles, or report books. The secondary data comprised the commercial banks return on assets (ROA) for forty commercial banks that were in normal operations during the study period. The data was gathered from disclosures on financial status and statement for the period 2013-2019, which is the period in which return on assets was on a decline trend (Cooper & Schildler, 2014). A data collection template was used.

**FINDINGS AND DISCUSSIONS**

**Descriptive Results**

The first objective was to determine the effect of BI infrastructure capability on performance of commercial banks. It was measured using IT 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.

Table 1: ICT Infrastructure effect on Bank Performance

	Frequency	Percent
Yes	60	73.2
No	22	26.8
<b>Total</b>	<b>82</b>	<b>100</b>

As per the results, the larger portion (73.2%) agreed that ICT infrastructure impacts on performance of commercial banks. Further, the managers were required to rate business intelligence infrastructure capability indicators on the 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.

Table 2: Business Intelligence Infrastructure Capability

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
<b>Average</b>		<b>4.21</b>	<b>0.73</b>

The overall mean response and standard deviation were 4.21 and 0.73 respectively. This indicated agreement that infrastructure capability supports business intelligence which enhances performance. 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 positively impacts performance of the firm while Bezovski *et. al.* (2016) found that CRM systems positively impact 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.

### Business Intelligence Data Integration Capability

The next goal pursued evaluation of the effects of BI data integration capability on performance of commercial banks. Applying a five-point Likert scale, the level of agreement of respondents on different statements with respect to data integration capability and performance of commercial banks was sought. This variable was measured through three indicators namely data analytics, data management and data quality. The results were as displayed in Table 3.

Table 3: Business Intelligence Data Integration Capability

Statement	N	Mean	Std. Dev
Data analytics has supported segmentation of our customers for targeted engagement	82	4.09	.79
With analytics, we are able to customize products for our customers	82	4.26	.72
Using analytics, we can predict customer spending behaviour for cross selling	82	4.50	.53
Our data governance measure ensures good data is clean for better decision making	82	3.94	.73
We use data analytics to derive the real identity of our customers to ensure data security reducing loss due to fraud.	82	4.01	.79
With proper data security, customer data is safe which reduces loss of income due to data loss.	82	4.29	.73
Data is classified to ensure proper use of data for benefit of the bank.	82	3.89	.90
We ensure company data is cleansed for proper decision making	82	4.38	.54
High quality data supports informed decision making.	82	4.51	.53
<b>Average</b>		<b>4.21</b>	<b>.69</b>

Table 3 illustrates that BI data integration capability exhibited an overall average score of 4.21 while the standard deviation was 0.69. This implies that majority of the managers agreed that data integration capability enhances performance of commercial banks. The findings in this section conform with results of Barua et.al. (2012) who asserted that quality data leads to increased financial performance. Chegini *et al.*, (2013) also confirmed a positive association of firm performance and data quality with the latter improving movement of information and hence improved firm performance. On their part, Chae *et al.*, (2014) found that quality and accuracy of data positively impacts firm performance through proper planning.

## Business Intelligence Organizational Capability

We sought to ascertain the effects of business intelligence organizational capability on performance of commercial banks as the third objective. The business intelligence organizational capability of the commercial banks was measured using three indicators which are internal processes, employee analytical skills and leadership skills. Means and standard deviations supported in analysing the responses. Table 4 presents the results.

Table 4: Business Intelligence Organizational Capability

Statements	N	Mean	Std. Dev
Our internal processes are aligned with BI strategy and this improves on our profitability	82	4.39	.49
Our business processes for business intelligence support in increasing service revenue	82	4.22	.69
Our data-based decision-making processes enable quick turnaround for customers hence increased revenue.	82	4.01	.69
Analytics skills of our staff are key driver of performance improvement.	82	4.38	.64
Analytic skills enable targeted marketing therefore improves on profitability per customer.	82	4.41	.59
We leverage on analytic skills to realize spending pattern for cross selling which raises our revenue per customer.	82	4.15	.67
The bank leadership motivates use of business intelligence for performance improvement.	82	4.11	.79
The top management supports and use business intelligence for performance improvement.	82	4.21	.70
Bank leadership take full responsibility of business intelligence which in turn ensures better decision making which improves on bank revenues.	82	4.13	.72
The top leadership is in support and always funds of BI related activities to improve bank performance.	82	4.43	.59
<b>Average</b>		<b>4.24</b>	<b>.66</b>

The output shows that BI organisational capability had a combined mean score of 4.24 and a standard deviation 0.66. This indicates an overwhelming agreement that business intelligence organisational capability contribute in augmenting performance of commercial banks. The outcomes in this segment support the conclusions of Cherian and Farouq (2013) that performance of commercial banks is positively associated with the leadership style and dynamic capabilities. They argued that sales are driven by internal processes and process

innovation capabilities. Further, they assert that leadership skills and process capabilities lead to better financial performance.

### Hypotheses Testing

The predictor variables were regressed on performance which was proxied by return on assets (ROA). Multiple linear regression was used. The results are illustrated according to the three research hypotheses. The equation represented by model 1 was used to test the first three hypotheses. The model summary is given in Table 5.

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.729	0.531	0.513	2.486958

a Predictors: (Constant), Organizational Capability, Infrastructure capability, Data integration capability

The coefficient of determination,  $R^2$  was 0.531 while the corresponding adjusted R-squared was 0.513. This implied that the various indicators of BI capability jointly accounted for 51.3% of the changes in performance of commercial banks. Table 6 displays the model summary.

Table 6: ANOVA Table

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	545.671	3	181.89	29.408	.000
	Residual	482.427	78	6.185		
	Total	1028.098	81			

a Dependent Variable: Performance

b Predictors: (Constant), Organizational Capability, Infrastructure capability, Data integration capability

The results indicates a P-value of 0.000, which is less than 0.05 and F statistic of 29.48 as illustrated in Table 6. This is a confirmation of statistical fitness of the model linking business intelligence capability and performance of commercial banks. The model fitness results revealed that the investigated business intelligence capability, made up of infrastructure, data integration and organizational capabilities significantly predict performance of commercial banks in Kenya. The resultant coefficients are shown in Table 7.

Table 7: Regression Coefficients

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
	Data integration capability	0.643	0.297	0.235	2.163	0.034
	Organizational Capability	1.258	0.309	0.39	4.069	0.000

a Dependent Variable: (ROA) Performance

On application of the coefficients to model 1, the output is:

$$\text{Performance} = -7.651 + 0.644\text{BII} + 0.643\text{BID} + 1.258\text{BIO}$$

The model coefficients in Table 7 were further used in testing the hypotheses of the study and results are covered per hypothesis as followed:

***H<sub>01</sub>: Business intelligence Infrastructure capability has no significant effect on performance of commercial banks in Kenya***

Results in Table 7 exhibit a regression coefficient of BI infrastructure capability as 0.66 with a p-value of 0.011. The null hypothesis is therefore rejected implying that BI infrastructure capability have positive and significant influence on performance of commercial banks in Kenya. 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, through adequate IT platforms, Kiron et al., (2014) argued that as core dimensions of business intelligence, improve the performance of an organization.

***H<sub>02</sub>: Business Intelligence data Integration capability has no significant effect on performance of commercial banks in Kenya***

According to the obtained results, BI data integration capability has a coefficient of 0.643 and a p-value of 0.034. Given p-value of 0.034 < 0.05, the study rejected the null hypothesis. The implication is that BI data integration capability has a significant and positive effect on performance of commercial banks in Kenya. This finding is supported by Wamba, Gunasekaran, Akter, Dubey and Childe (2016) whose study on improving performance of a firm using big data analytics found that encompassing management, technology, control, planning, investment,



talent capability, connectivity, compatibility, modularity, coordination and technology management, data analytics possesses positive impacts on organisational performance.

***H<sub>03</sub>: Business intelligence Organization capability has no significant effect on performance of commercial banks in Kenya***

The results showed that the regression coefficient of business intelligence organization capability was 1.258 having an associated p-value of 0.000. The p-value  $0.000 < 0.05$  and therefore the null hypothesis was rejected. This indicates that business intelligence organization capability has positive and significant influence on performance of commercial banks in Kenya. This implies that an increase in business intelligence organization capability has a significant improvement in bank performance.

The results agree with the empirical findings of Cherian *et al.*, (2013) who found that performance of commercial banks is positively associated with organization leadership style and capabilities.

The coefficients of the model depicted in Table 7 indicate that all three BI capabilities significantly affect performance of commercial banks in Kenya. This is an indication that a rise in any of business intelligence capabilities significantly improves performance of the commercial banks.

## **CONCLUSIONS AND RECOMMENDATIONS**

All investments have financial performance as the key concern. Performance of commercial banks performance is of great concern given the role they play in the economy. In this study, the researcher examined how BI affects the performance of commercial banks in Kenya. From the findings, the following conclusion were made. Each of the components of BI consisting infrastructure capability, data integration capability and organization capability, statistically and significantly influence the performance of commercial banks in Kenya. The study further concluded that overall BI capability influences performance of commercial banks positively.

The results of study confirmed that BI influences performance. From the conclusion, managerial recommendations were made: Commercial banks managers should prioritize the deployment and adoption of BI infrastructure and data integration capabilities as they are significant drivers of performance. Further, the management should invest in organization capabilities in order to augment performance. Finally, the commercial banks should work with other regulators and the government to lobby for implementation of policies that create conducive environment for business intelligence technology to thrive.

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