

Big Data Relative Advantage and Performance of Commercial Banks in Kenya

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Abstract: The banking industry is fast moving away from the traditional manual methods to sophisticated digital methods of doing business that is leading to production of large quantities of customer data. Despite the migration to digital era, commercial banks are still struggling to remain afloat with some of them having been placed under receivership due to deteriorating performance. This study sought to determine the effect of big data relative advantage on performance of commercial banks in Kenya. The study used an explanatory research approach. The target group consisted of all 39 commercial banks that were registered as of December 31, 2020. Descriptive statistics were used to explain the nature of the study variables. Through the use of inferential statistics linear regression research, the relationship between the study variables was determined. The results showed that big data relative advantage had a positive and significant effect on bank performance. This study encourages commercial banks to evaluate the big data technology they have in place to ensure it gives them a relative advantage to improve their efficiency and overall performance. As a result, it's important to make sure that big data technology results in quicker and more accurate decision-making. Utilizing big data capabilities is also necessary to prevent moral hazards and adverse selection, to facilitate work by utilizing the information acquired through big data, and to archive crucial data for future decision-making.

Keywords: Big Data Relative Advantage, Performance, Commercial Banks.

1. INTRODUCTION

Commercial banks serve as major financial middlemen in the banking industry, facilitating the transfer of money (Li, Madura & Richie, 2013). Following the global financial crisis, United States banks grew their market share while their European counterparts shrank (Goodhart & Schoenmaker, 2016). Technology is gradually gaining traction in Ghanaian banks, resulting in a more comfortable way of serving customers and, increased earnings and competition (Jushua, 2015). According to Kamau and Were (2013), the Kenyan banking system has undergone a significant transition as a result of technological innovation.

The best reward for shareholder investment, according to Gitonga (2016), is financial performance. There has also been a recommendation that the best measure of impact of Information system capability (E-commerce) on Performance is financial terms (Guerreiro, 2015). Return on Asset (ROA) is strong and good financial measure of commercial bank's financial performance. ROA has been widely accepted as good indicator of firm's financial health. It adjusts to firm size and shows management's effectiveness in generating revenue with institutional resources; therefore, it is a good measure of profitability (Germann, Lilien & Rangaswamy, 2013).

One of the contemporary technologies that businesses are using to improve their performance and competitive advantage in the market is big data technology. Legal and regulation framework, Organisation Culture, Predictive modelling, big data analytics have an effect to the performance of an organization (Che, Safran & Peng, 2013). Data processing and management is a framework used for parallel processing of ever-growing amounts of data. Data analysis provides visualization and predictive analysis (DTB, 2014). Rodgers (2003) proposes five qualities of an innovation that can influence whether an idea is adopted.

1.1 Problem Statement

The contribution of monetary sector to Kenya's GDP had dropped from 9.2 percent in 2013 to about 7.4 percent in 2018 (CBK, 2018). This therefore implies that the country is not on course to achieve financial goals as envisioned in the vision 2030. Furthermore, the profitability of commercial banks as measured using ROA has been on the decline. In 2016, ROA of commercial banks was 3.99 percent, this was followed by constant decline in the subsequent financial years; where ROA was 3.6 percent in 2017, 3.5 percent in 20218, 3.3 percent in 2019 and 2.07 percent in 2020 (CBK, 2020). The figures above show that commercial bank performance in Kenya is a severe problem.

Big data aids in giving all companies a competitive edge, particularly corporate organizations looking to grow their market share and enhance their performance (Matthias et al., 2017). Many modern firms gather data at the most precise level imaginable, creating enormous, dynamic data libraries. The performance of organizations within the corporate sphere, which serves as the basis for the research, is greatly impacted by the huge amounts of data that must be analyzed in order to develop plans that will guide enterprises going forward.

Wamba (2016) analysed the effect of big data analytics capability on Performance. However, the study focused on different measures of big data capabilities to those in the current study. This difference in variables operationalization implies that the two studies had different area of focus. Raguseo and Vitari (2018) investigated the relationship between spending on big data analytics and business outcome. Despite this, the study has a contextual flaw because it was conducted in a developed country rather than Kenya, which is an underdeveloped country. Mehandjiev (2019) investigated the impact of big data analytics capabilities on business performance. However, the study relied on meta-analysis of existing literature hence the findings confirmed the subjective thinking and bias of previous studies. Based on the forementioned deficiencies, this study sought to determine the effect of big data relative advantage on performance of commercial banks in Kenya.

1.2 Research Hypothesis

H₀₁: Big data relative advantage has no substantial effect on performance of commercial banks in Kenya.

2. LITERATURE REVIEW

Yadegaridehkordi et al. (2020) investigated how big data affects hotel industry performance. Information from senior managers and/or SME hotel owners in Malaysia was gathered using an online survey. Structural equation modeling was used as a technique. According to the research, relative advantage, managerial support, IT skill, and external pressure are the factors that have the biggest impacts on a company's performance. The results of the survey can assist lawmakers, businesses, and governments in making educated judgments about big data use. However, the study was conducted in Malaysia, which is a business environment from that of Kenya, hence generalization of the findings may be impractical.

Shabir and Gardezi (2020) looked at how knowledge management techniques in Pakistani SMEs mediated the relationship between big data analytics and organizational performance. The results demonstrated that big data analysis significantly and favorably affects organizational effectiveness. Additionally, knowledge management strategies have partially tempered the association between big data analytics adoption and organizational success. The data collection, however, is limited to Pakistani SMEs and may not mirror findings from other locations. As a result, the results' generalizability is limited.

Ochieng (2015) investigated the rate of big data analysis acceptability in Kenyan businesses, focusing on supermarkets in the Kisumu District. Data was collected using a cross-sectional design and a quantitative approach. To collect primary data, five large grocery chains and three independent retailers in Kisumu District delivered closed questionnaires to senior managers, middle managers, and lower-level personnel. The findings show that all supermarkets have a significant level of computer usage, yet many have not deployed unstructured data management software. Big data analytics was seen favorably by many respondents; however, it is clear from the responses to the questions about infrastructure and skills that big data analytics and big data are not well understood. The study also discovered that a number of obstacles are prohibiting retailers in Kenya from using analytical technologies on a broad scale. The current study will focus on big analytics technology within commercial banks.

3. METHODOLOGY

The study used an explanatory research approach. The target group consisted of all 39 commercial banks that were registered as of December 31, 2020. The unit of observation were 156 heads of the following departments from each bank: Information & communication technology, project management, database, and finance. Semi-structured questionnaires were used to

collect primary data, while a data collection template was used to obtain secondary data. Descriptive statistics were used to explain the nature of the study variables. Through the use of inferential statistics like linear regression research, the relationship between the study variables was determined.

4. RESULT AND DISCUSSIONS

4.1 Descriptive Analysis

4.1.1 Big Data Relative Advantage

The study's goal was to ascertain how big data's comparative advantage affected Kenya's commercial banks' performance. Seven assertions were utilized in the study to gauge how big data's comparative advantage affected output. The results for each statement used to gauge the relative advantage of big data are shown below.

Table 1: Descriptive Results on Big Data Relative Advantage

| Statement | 1 | 2 | 3 | 4 | 5 | M | SD |
|---|------|------|-------|-------|-------|-------------|-------------|
| Use of big data technology capability increase bank's operating efficiency | 0.0% | 0.0% | 8.3% | 39.6% | 52.1% | 4.44 | 0.65 |
| Decision making is faster using big data capabilities | 0.0% | 2.1% | 0.0% | 43.8% | 54.2% | 4.50 | 0.62 |
| Decision making is accurate using big data capabilities | 0.0% | 2.1% | 6.2% | 39.6% | 52.1% | 4.42 | 0.71 |
| Our bank is able to reduce risk exposure by using big data capabilities | 0.0% | 0.0% | 12.5% | 35.4% | 52.1% | 4.40 | 0.70 |
| The bank is able to avoid falling into adverse selection and moral hazards by leveraging on big data capabilities | 2.1% | 6.2% | 6.2% | 54.2% | 31.2% | 4.06 | 0.90 |
| Information collected using big data capabilities make the work easy and enjoyable | 0.0% | 4.2% | 14.6% | 31.2% | 50.0% | 4.27 | 0.86 |
| Big data capabilities can help the bank to archive critical data for future decision making | 0.0% | 0.0% | 10.4% | 37.5% | 52.1% | 4.42 | 0.68 |
| Big data capabilities offer our banks a competitive edge | 0.0% | 0.0% | 4.2% | 41.7% | 54.2% | 4.50 | 0.58 |
| Average | | | | | | 4.38 | 0.71 |

Source: Research Data (2023).

Table 1 indicates that 52.1 percent of participant strongly agreed that use of big data technology capability increases bank's operating efficiency followed by 39.6 percent who strongly agreed while 8.3 percent were neutral. A mean value of 4.44 shows that most participants agreed that big data technology capability increases bank's operating efficiency as a SD of 0.65 shows low variation of responses to the above statement. On whether decision making is faster using big data capabilities, 54.2 percent representing most of the respondents strongly agreed, 43.8 percent agreed while only 2.1 percent disagreed. Only the items having Eigen values greater than 1.0 and loadings greater than 0.4, as stated by Tabachnick and Fidell (2013) and shown in table 4.2, were retrieved for the analysis.

With regard to the statement that decision making is accurate using big data capabilities, most of the respondents, 52.1 percent, strongly agreed followed by 39.6 percent agreed and 6.2 percent were neutral. A mean value of 4.42 implies that majority of the respondents agreed that decision making is accurate using big data capabilities as SD of 0.71 indicates low spread of individual responses from the mean. The majority of respondents, or 54.2 percent, indicated agreement with the statement that the bank can minimize moral hazard and adverse selection by utilizing its big data capabilities. Another 31.2 percent strongly agreed. Most participants indicated by a mean of 4.06, concur that the bank can minimize moral hazard and adverse selection by utilizing big data capabilities.

Another statement sought to determine whether information collected using big data capabilities make the work easy and enjoyable whereby most of the participants, 50 percent strongly agreed and 31.2 percent agreed. A mean value of 4.27 indicates that most participants agreed that information collected using big data capabilities make the work easy and enjoyable. Moreover, a mean of 4.42 indicates that most participants agreed that big data capabilities can help the bank to archive critical data for future decision making with low variation from the mean as confirmed by SD of 0.68. On whether big data capabilities offer banks a competitive edge, majority of the respondents, 54.2 percent strongly agreed and this is supported by a mean value of 4.5.

An average value of 4.38 for all the assertions indicates that most of the study participant agreed that big data relative advantage is crucial in enhancing bank performance. According to Bandara and Amarasena (2018), adoption of technology for increased organizational performance benefits from relative advantage. Before making a wise adoption decision, an organization must consider the potential benefits of the new technology to the business, according to Mndzebele (2013). An organization will adopt a technology when it is required in the hopes that it will enable them to close a performance gap or take advantage of a business opportunity. Businesses are more likely to adopt a technology if they believe it would facilitate the interchange of business information within an organization.

4.1.2 Performance

This section contains the descriptive results on banks' performance in Kenya. Performance was measured using both primary and secondary data on ROA. Whereas primary data on performance was obtained from respondents using a structured questionnaire, secondary data on profitability was collected using a collection template for a period of 11 years between 2010 and 2020. Table 4.11 presents average responses for statements regarding bank performance.

Table 2: Descriptive Results on Performance

| Statement | 1 | 2 | 3 | 4 | 5 | M | SD |
|--|------|------|-------|-------|-------|-------------|-------------|
| Big data technologies may be to blame for the bank's increase in profitability. | 4.2% | 4.2% | 25.0% | 41.7% | 25.0% | 3.79 | 1.00 |
| The use of big data technology by the bank has led to an increase in investment. | 0.0% | 4.2% | 22.9% | 43.8% | 29.2% | 3.98 | 0.83 |
| Big data technologies may be to thank for the increase in operational efficiency that the bank has seen. | 2.1% | 2.1% | 25.0% | 37.5% | 33.3% | 3.98 | 0.93 |
| Big data technology may have contributed to an improvement in service delivery at the bank. | 0.0% | 4.2% | 12.5% | 52.1% | 31.2% | 4.10 | 0.77 |
| The use of big data technology by the bank has resulted in a gain in market share. | 0.0% | 0.0% | 16.7% | 52.1% | 31.2% | 4.15 | 0.68 |
| Big data technologies may be to blame for the bank's increased volume of transitions. | 0.0% | 0.0% | 14.6% | 43.8% | 41.7% | 4.27 | 0.70 |
| Average | | | | | | 4.05 | 0.82 |

Source: Research Data (2023).

A mean of 3.79 from above results indicate most participants agreed that the bank has experienced improvement in profitability and this could be attributed to big data technology. Regarding assertion that the bank has experienced improvement in investment and this could be attributed to big data technology, 43.8 percent and mean score of 3.98 implies that most participants agreed, 29.2 percent strongly agreed while only 4.2 percent disagreed. On whether the bank has experienced improvement in operational efficiency and this could be attributed to big data technology, the largest percentage of respondents, 37.5, agreed while a further 33.3 percent strongly agreed. A mean score of 3.98 indicates that the majority of respondents concurred that big data technology has improved the bank's operational efficiency. The majority of respondents, according to mean scores of 4.1 and 4.15, both agreed that big data technology has helped the bank deliver better services and that this improvement can be attributed to it. They also agreed that big data technology has helped the bank gain market share. An overall mean score of 4.05 implies that most participants agreed that the commercial banks in Kenya have recorded improved performance and this could be attributed to big data technology.

Figure 1 shows the mean scores for bank performance indicators.

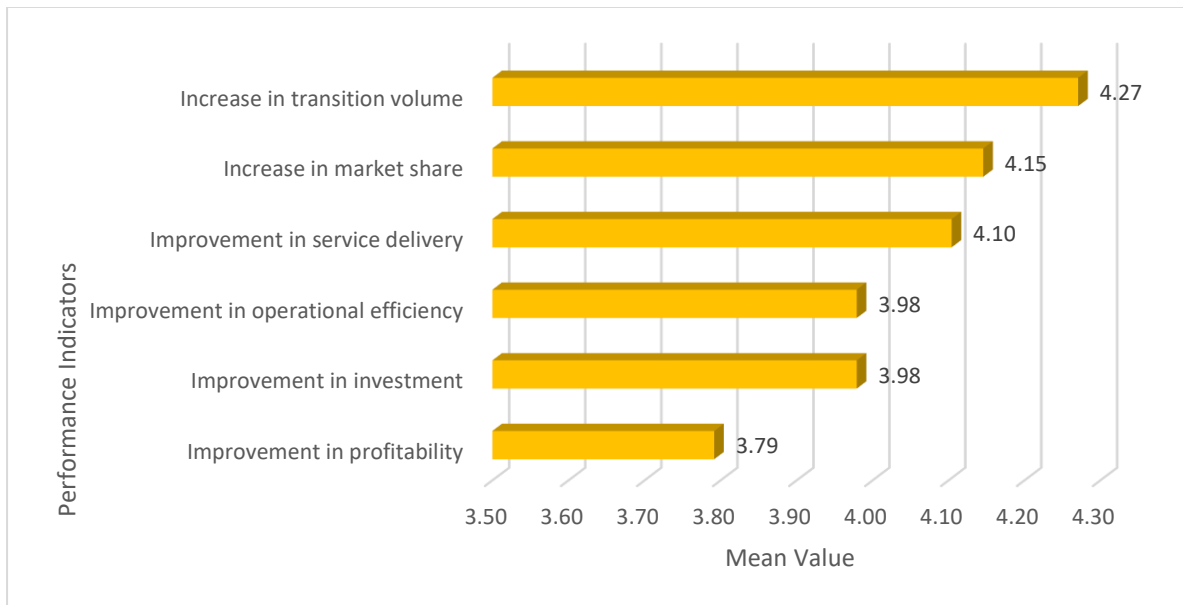


Figure 1: Mean scores for Bank Performance Indicators

Figure 1 shows that majority of respondents agreed that commercial banks recorded improvement particularly in transition volume (M=4.27), market share (M=4.15), service delivery (M=4.1) and operational efficiency as well as investment (M=3.98) and this could be attributed to big data technology.

4.1.3 Trend Analysis

The Return on Assets (ROA) financial metric was used in the study to gauge bank performance. The study gathered information on banks' financial performance through ROA during an 11-year period from the years 2010 to 2020. The ratio of net profits to total assets was used to measure return on assets. As illustrated in figure 4.8, the trend for ROA was created to highlight change between the years.

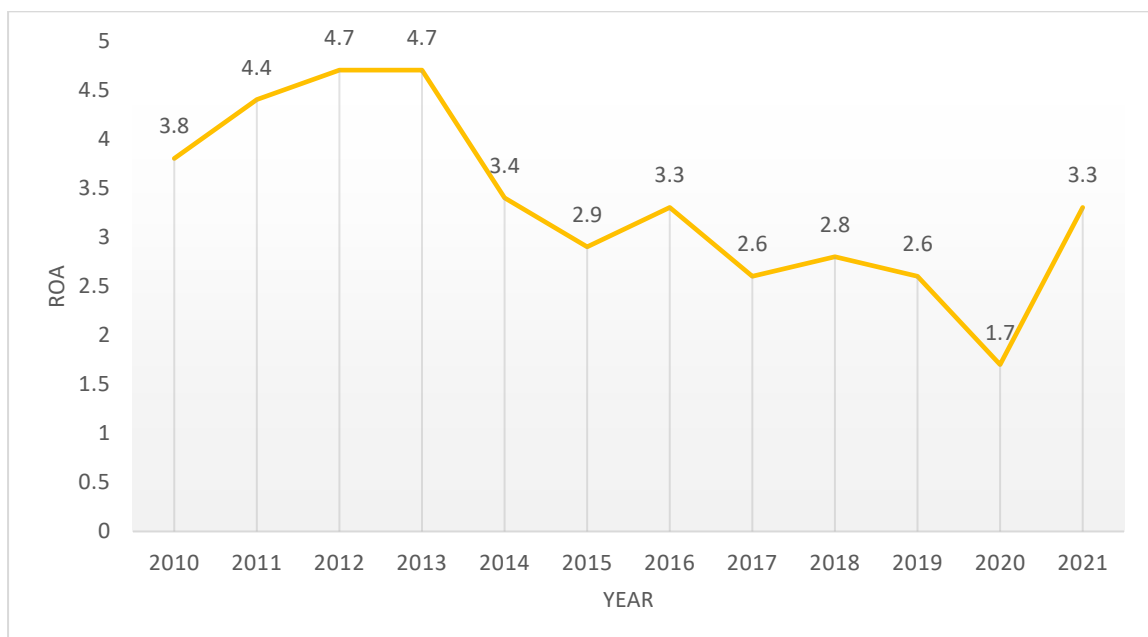


Figure 2: Trend Analysis of ROA

Source: Financial Accounts for the period 2010-2021.

The average ROA for commercial banks is shown in Figure 2 to be increasing from the years 2010 to 2013, but then gradually declining from 2013 to 2020. It is also clear that, from an average value of 4.7 in the year 2013, there was only a very minor improvement in the commercial banks' average ROA, which was recorded in the years 2016 and 2018, when it was 3.3 and 2.8, respectively. Most of the time, ROA has decreased steadily to 1.7 in 2020. Kenya's commercial banking industry held up well to the impact of COVID-19 pandemic experienced majorly in 2020. The banking industry was in sustained growth before the COVID-19 outbreak, supported by market-based consolidation, the repeal of the interest rate cap law, and gains from reforms implemented since 2015. Results showed that banks were adequately capitalized to survive adverse scenarios under the COVID-19 shock, despite the pandemic still evolving. According to Mathias (2021), Covid-19 reduced the profitability of Kenyan commercial banks compared to pre-Covid 19 period. However, the resilience of commercial banks in Kenya meant that they weathered the Covid-19 storm and stabilised in terms of profitability post-covid. This again explains the significant rise in ROA to 3.3 in 2021 as compared to 1.7 in 2020.

4.2 Influence of Big Data Relative Advantage on Performance

The research used a univariate regression model in the form of $Y = 0 + 1X_1 +$ where Y =performance and X_1 =Big Data Relative Advantage to determine how big data relative advantage influences performance of commercial banks in Kenya while holding other independent variables constant. Table 3 shows the model coefficients alongside model summary and ANOVA statistics.

Table 3: Regression Results on Big Data Relative Advantage and Performance

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|-----------------------------|-----------------------------|------------|---------------------------|-------|-------|
| | B | Std. Error | Beta | t | Sig. |
| (Constant) | 1.731 | 0.561 | | 3.089 | 0.003 |
| Big Data Relative Advantage | 0.534 | 0.129 | 0.394 | 4.152 | 0.000 |
| R | = .394 | | | | |
| R ² | = .155 | | | | |
| Sig. | = 0.000 | | | | |

a Dependent Variable: Performance

Table 3 model summary results reveal that, when all other variables are held constant, big data relative advantage explains 15.5% of the variation in bank performance (R-square =.155). Performance is also positively correlated with big data relative advantage, as indicated by the R value of 0.394. The ANOVA results demonstrate the statistical significance (sig=0.000) of the model connecting big data relative advantage and performance. The univariate regression model connecting big data relative advantage and bank performance was a good fit, according to this, which has important ramifications. The model coefficients show that big data relative advantage significantly and positively influenced bank success ($\beta = 0.534$, p-value=0.000). This implies that an improvement in big data relative advantage, all other factors held constant, results in significant improvement in bank performance. This result agrees with Yadegaridehkordi et al. (2020) who found that a company's performance is significantly affected by the relative advantage of the technology applied.

H₀₁ Big data relative advantage has no significant effect on performance of commercial banks in Kenya.

The study sought to test the null hypothesis that big data relative advantage has no significant effect on bank performance. The study rejects the null hypothesis that relative advantage has no significant impact on bank performance since model coefficient results show that big data relative advantage positively and significantly influenced bank performance while holding other factors constant. This implies that an improvement in big data relative advantage would result in significant increase in bank performance. The results in this section agree with Bandara and Amarasena (2018) that relative advantage and perceived ease of use have a positive impact with adoption technology for improved organisational performance. According to Mndzebele (2013), an organization must evaluate the possible advantages of the new technology to the company before making a sensible adoption choice. When a technology is needed, an organization will embrace it in the hopes that it will help them narrow a performance gap or seize a financial opportunity. When firms believe a technology would facilitate the exchange of business information within an organization, they are more inclined to adopt it.

5. CONCLUSION

This study comes to the conclusion that the relative advantage of big data positively and significantly affected bank performance. Big data technology has a positive impact on banks' operational efficiency. Decision-making is faster and more accurate when using big data, and it is also more accurate when using big data. Additionally, by utilizing big data capabilities, the bank is able to avoid adverse selection and moral hazards, information gathered using big data capabilities make the work easy and enjoyable, and big data capabilities can help the bank to archive critical data for future decision-making.

6. RECOMMENDATIONS

This study encourages commercial banks to evaluate the big data technology they have in place to ensure it gives them a relative advantage to improve their efficiency and overall performance. As a result, it's important to make sure that big data technology results in quicker and more accurate decision-making. Utilizing big data capabilities is also necessary to prevent moral hazards and adverse selection, to facilitate work by utilizing the information acquired through big data, and to archive crucial data for future decision-making.

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