East African Journal of Business and Economics
eajbe.eanso.org
Volume 7, Issue 1, 2024
Print ISSN: 2707-4250 | Online ISSN: 2707-4269
Title DOI: https://doi.org/10.37284/2707-4269

EANSO
EAST AFRICAN NATURE & SCIENCE ORGANIZATION

Original Article

Moderating Effect of Operating Environment on the Relationship Between Big Data Technology Capability and Performance of Commercial Banks in Kenya

Gyaviira Ogola[1*], *David Nzuki*[1] *& Morrisson Mutuku*[1]

[1] Kenyatta University, P. O. Box 43844-00100. Nairobi, Kenya.
* Correspondence Email: gyaviirabwana@gmail.com

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

Date Published:
04 September 2024

Keywords:
Operating Environment, Performance, Commercial Banks, Big Data Technology Capability

ABSTRACT

The banking sector is rapidly transitioning from traditional manual practices to advanced digital methods, generating significant volumes of customer data. Despite this shift, many commercial banks are struggling financially, with some even being placed under receivership due to declining performance. This study aimed to investigate how the operating environment moderates the relationship between big data technology capability and the performance of commercial banks in Kenya. In examining the moderating effect of operating environment (OE) on the connection between big data technology capacity and performance; the two-step approach postulated by Whisman and McClelland (2005) was used. Using an explanatory research approach, the study focused on all 39 commercial banks registered as of December 31, 2020. It highlights that the operating environment plays a crucial role in shaping how big data technological capabilities impact bank performance. The study recommended that policy makers and regulators of the banking sector to establish a friendly environment for commercial banks to operate in. CBK should also enact favourable regulations regarding banking that inspire commercial banks to be innovative and supply the market with state-of-the-art technology. Additionally, it is necessary to put in place updated ICT infrastructure and a solid legal framework within which commercial banks can operate.

APA CITATION

Ogola, G., Nzuki, D. & Ngatuni, M. (2024). Moderating Effect of Operating Environment on the Relationship Between Big Data Technology Capability and Performance of Commercial Banks in Kenya. *East African Journal of Business and Economics*, *7*(1), 426-435. https://doi.org/10.37284/eajbe.7.1.2182

CHICAGO CITATION

Ogola, Gyaviira, David Nzuki and Morrisson Mutuku 2024. "Moderating Effect of Operating Environment on the Relationship Between Big Data Technology Capability and Performance of Commercial Banks in Kenya". *East African Journal of Business and Economics* 7 (1), 426-435. https://doi.org/10.37284/eajbe.7.1.2182.

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

HARVARD CITATION

Ogola, G., Nzuki, D. & Ngatuni, M. (2024) "Moderating Effect of Operating Environment on the Relationship Between Big Data Technology Capability and Performance of Commercial Banks in Kenya", *East African Journal of Business and Economics*, 7(1), pp. 426-435. doi: 10.37284/eajbe.7.1.2182.

IEEE CITATION

G., Ogola, D., Nzuki & M., Ngatuni "Moderating Effect of Operating Environment on the Relationship Between Big Data Technology Capability and Performance of Commercial Banks in Kenya", *EAJBE*, vol. 7, no. 1, pp. 426-435, Sep. 2024.

MLA CITATION

Ogola, Gyaviira, David Nzuki & Morrisson Mutuku. "Moderating Effect of Operating Environment on the Relationship Between Big Data Technology Capability and Performance of Commercial Banks in Kenya". *East African Journal of Business and Economics*, Vol. 7, no. 1, Sep. 2024, pp. 426-435, doi:10.37284/eajbe.7.1.2182.

INTRODUCTION

Commercial banks play a crucial role as intermediaries in the financial sector, facilitating the transfer of funds (Li, Madura & Richie, 2013). In the aftermath of the global financial crisis, banks in the United States expanded their market share while their European counterparts saw declines (Goodhart & Schoenmaker, 2016). In Ghana, there is a growing adoption of technology among banks, leading to enhanced customer service, increased profitability, and heightened competition (Jushua, 2015). Similarly, the Kenyan banking sector has undergone significant transformation due to technological advancements (Kamau & Were, 2013).

According to Gitonga (2016), the ultimate reward for shareholders' investment is financial performance. Guerreiro (2015) recommends using financial terms, particularly Return on Assets (ROA), to assess the impact of Information System capabilities, such as E-commerce, on performance. ROA is widely recognized as a robust indicator of a commercial bank's financial health, adjusting for size and reflecting management's efficiency in generating revenue with available resources (Germann, Lilien & Rangaswamy, 2013).

Operating environment refers to aspects such as government regulations, ICT policies and ICT infrastructure that affect banks, customers, and suppliers (Hidayat & Akhmad, 2015). The link between other organizational characteristics and efficiency is influenced by the company's work environment, according to Wanjiru, Muathe, and Kinyua-Njuguna (2019). The external operating environment, according to the authors, moderates the link between business strategy and performance.

Problem Statement

The contribution of the monetary sector to Kenya's GDP declined from 9.2 percent in 2013 to approximately 7.4 percent by 2018, indicating a deviation from the financial targets outlined in Vision 2030 (CBK, 2018). Concurrently, the profitability of commercial banks, as measured by Return on Assets (ROA), has been dwindling. Starting at 3.99 percent in 2016, ROA declined to 3.6 percent in 2017, 3.5 percent in 2018, 3.3 percent in 2019, and further dropped to 2.07 percent in 2020 (CBK, 2020). These figures underscore a significant performance challenge within Kenya's commercial banking sector.

Big data plays a pivotal role in enhancing competitiveness and performance across industries, particularly in corporate environments seeking market expansion (Matthias et al., 2017). Modern organizations amass vast and dynamic datasets, which are crucial for strategic planning and operational decision-making. Previous studies have explored the impact of big data analytics on performance, but often with different operationalizations and contexts. For instance, Wamba (2016) focused on varied measures of big data capabilities compared to the current study, while Raguseo and Vitari (2018) examined the relationship between big data analytics spending and business outcomes in developed countries, not in Kenya. Mehandjiev's (2019) meta-analysis

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

approach synthesized existing literature, highlighting varying perspectives and biases.

In light of these gaps, this study aims to investigate how the operating environment moderates the relationship between big data technology capability and the performance of commercial banks in Kenya. This research seeks to provide insights tailored to the Kenyan banking context, addressing specific challenges and opportunities within the country's economic and regulatory environment between big data technology capability and performance of commercial banks in Kenya.

Research Hypothesis

H_0: Operating environment has no significant moderating effect on the relationship between big data technology capability and performance of commercial banks in Kenya.

Literature Review

Wamb et al. (2017) looked into the direct effects of big data adoption on corporate performance as well as the mediating effects of process-oriented dynamic capacities to examine the relationship between big data adoption and firm productivity. In our online survey, 297 Chinese IT managers and business analysts with expertise in big data and business analytics offered their opinions on our research methods. The findings support the importance of understanding the entanglement of hierarchical models for big data adoption, which affects company performance both directly and indirectly. The findings also show that process-oriented dynamic talents have an important mediating role in boosting insight and organizational productivity. The study however, did not utilize operating environment as the mediating variable.

The focus of Popovi, Hackney, Tassabehji, and Castelli's (2018) study was on how big data analytics affect excellent enterprise business performance. This study set out to look into the under-researched effects of BDA on operational management in the industrial sector. This empirical study employs an interpretive qualitative technique and a comparative case study of three industrial businesses with various BDA usage levels. The findings show that BDA capabilities (data retrieval, access, integration, and dissemination, as well as analytical skills and human competency) operate in combination with organizational readiness and design considerations to provide favorable outcomes. The main focus of the current study, relative advantage, observability, trialability, and complexity, are big data capabilities that were not covered in this study.

Big data analytical capabilities and competitive performance are correlated, according to Mikalef, Krogstie, Pappas, and Pavlou (2020), and are influenced by dynamic and operational skills. According to the survey, having a strong BDAC might provide businesses a competitive advantage. Although this has an indirect effect, dynamic skills completely mediate it, positively impacting two operational skills: marketing and technology. In this study, the operational environment will be looked at as a mediator in investigating the link between big data capabilities and business success.

Laouiti et al. (2014) explored the influence of the business environment on Performance studies using the example of a Tunisian corporation. This research is based on a survey of the literature on the subject, followed by an empirical assessment of 96 firms to determine the relationship between theory and reality. Institutional and technological elements were shown to be the most favorably and significantly associated to corporate success, whereas the operational environment was found to be less essential. However, the operational environment is not considered an intermediary variable in the association between big data capabilities and business performance in this study.

Akpoviroro and Owotutu (2018) study examines how the external business environment affects organizational effectiveness. In this study, the organizational performance of frozen fish

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

enterprises in Nigeria is investigated in relation to the external business environment. He also presents an overview of the Nigerian business environment, as well as the business climate and organizational results. Second, a questionnaire was created with a sample size of 120 based on a sample of three organizations in order to gather data from respondents. The study concludes that the effectiveness of an organization is influenced by the external business environment, which is made up of political, economic, technological, and sociocultural factors. Instead of demonstrating a direct link between the business environment and performance, the current study focuses on establishing the operational environment's mediating role in the connection between big data capabilities and company success.

The impact of the regulatory environment and company performance in EU telecoms services was studied by Montolio, Trillas, and Trujillo-Baute (2014). Market share, revenue, and productivity are the three metrics used to assess a company's productivity. The influence on performance measures differs depending on whether the company is an invader or a participant, and this is given special emphasis. The study found that although access pricing has a negative impact on market share and customer revenue, it does have a positive impact on incumbent firm's market share, revenue, and productivity. This study focused on operating environment in terms of competitive dynamics while the current study will focus on operating environment in terms of regulatory framework and technology advancement.

Li (2014) used a structural equation modelling approach to investigate the influence of regulation on the financial performance of small businesses in Australia. The results show that the regulatory package measured against the existing literature has a positive impact on small business CSR, which can be explained by public interest theory. The findings challenge the “one size fits all” model and call for alternative policy regimes to address the unmet regulatory needs of small businesses in Australia. The results cannot be applied to the current study because it focuses on identifying the direct effects of the regulatory framework on the financial performance of small businesses.

Methodology

The study employed an explanatory research approach, focusing on all 39 commercial banks registered as of December 31, 2020. The unit of observation consisted of heads of the following four departments namely Information & Communication Technology, Project Management, Database Management, and Finance which translates to 156 respondents. Primary data was gathered using semi-structured questionnaires, designed to capture detailed insights from the department heads. These questionnaires allowed for a nuanced exploration of perceptions and experiences related to big data technology capabilities and bank performance. Additionally, secondary data was collected using a structured data collection template, ensuring comprehensive coverage of relevant information from each bank. Descriptive statistics were utilized to summarize and interpret the characteristics of the study variables, providing a clear understanding of their distribution and central tendencies. To establish deeper insights and relationships between variables, inferential statistics, particularly regression analysis, were employed. This method enabled the study to quantitatively assess how big data technology capabilities interact with various factors within the operating environment to impact the performance of commercial banks in Kenya.

Result and Discussions

Descriptive Analysis

Bank operating environment was used as a moderating factor in this study. The average responses on statements regarding operating environment are presented below.

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

Table 1: Descriptive Results on Operating Environment

Statement	1	2	3	4	5	M	SD
The operating environment in Kenya Banking sector is friendly	0.0%	4.2%	14.6%	64.6%	16.7%	3.94	0.69
CBK policies on banking support the commercial banks to be innovative	2.1%	2.1%	29.2%	41.7%	25.0%	3.85	0.89
The Kenya banking industry has experience high technological advancement	2.1%	4.2%	20.8%	41.7%	31.2%	3.96	0.94
There is proper legal framework upon which the commercial banks in Kenya operates	0.0%	0.0%	12.5%	47.9%	39.6%	4.27	0.67
ICT infrastructure in the banking sector has improved over time	0.0%	2.1%	6.2%	45.8%	45.8%	4.35	0.70
Average						**4.08**	**0.78**

Table 1 shows that most participants, 64.6 percent and mean score of 3.94, agreed that the operating environment in Kenya Banking sector is friendly. A mean of 3.85 also implies that most participants agreed that CBK policies on banking support the commercial banks to be innovative whereby the largest percent of 41.7 agreed and a further 25 percent strongly agreed. On whether the Kenya banking industry has experienced high technological advancement, 41.7 percent agreed followed by 31.2 percent who strongly agreed and 20.8 percent who were neutral. A mean of 3.96 also confirms that most participants agreed with the above assertion.

A mean score of 4.27 denotes that most participants agreed that there is proper legal framework upon which banks in Kenya operates as was the case with the statement that ICT infrastructure in the banking sector has improved over time with a mean score of 4.35. An overall mean value of 4.08 shows that most participants agreed that performance of commercial banks is contingent not only on big data technology capability but also upon the existing operating environment. The findings are in line with those of Popovi, Hackney, Tassabehji, and Castelli (2018), who found that organizations operate in conjunction with organizational readiness and design considerations to produce favorable results. According to Akpoviroro and Owotutu (2018), the external business environment, which is made up of political, economic, technological, and societal elements, affects an organization's effectiveness.

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 2 presents average responses for statements regarding bank performance.

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

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.

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

Figure 1: The mean scores for bank performance indicators.

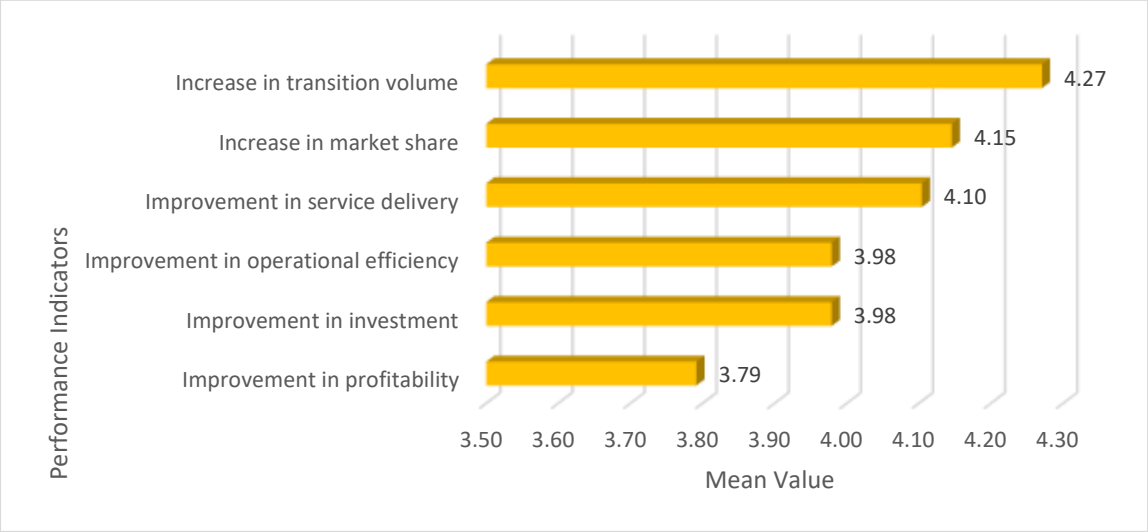
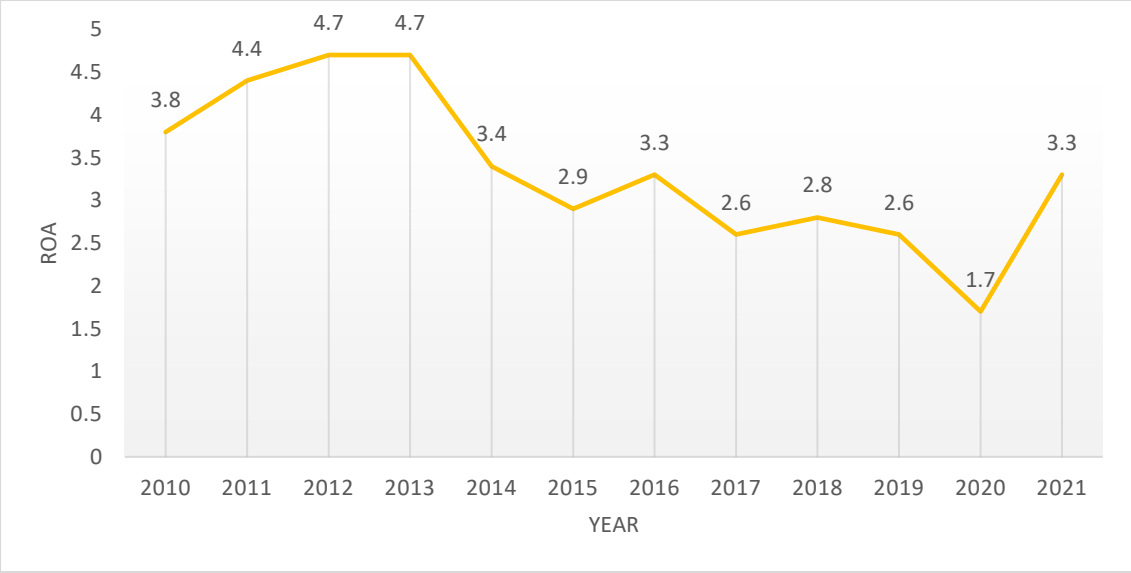


Figure 1 shows that majority of respondents agreed that commercial banks recorded improvement particularly in transition volume (M=4.27), market share (M=4.15), service delivery (M=4.1) and operational efficiency as well as investment (M=3.98) and this could be attributed to big data technology.

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 2, 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

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

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 stabilized 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.

Moderated Regression Analysis

To evaluate the moderating effect of operating environment on the connection between big data technology capacity and performance; the two-step approach postulated by Whisman and McClelland (2005) was used. The first model in the moderation was used to analyze the combined influence of the big data technology capabilities on bank performance.

Table 3: Step One in Testing for Moderating Effect of Operating Environment

	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	-0.283	0.52		-0.544	0.588
Big Data Technology Capability	1.045	0.125	0.653	8.36	0.000
R = .653					
R^2 = .426					
Sig. = 0.000					

a Dependent Variable: Performance

Big data technology competency has a p-value of 0.000, which is less than 0.05, according to the results in Table 3. This demonstrates that the power of big data technology to forecast business performance is considerable. The second step involved regression analysis of organizational performance on big data technology capabilities, operating environment, and the interaction term between big data technology capabilities and operating environment.

Table 4: Step Two in Testing for Moderating Role of Operating Environment

	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	-2.806	2.327		-1.206	0.231
Big Data Technology Capability	1.467	0.591	0.917	2.48	0.015
Operating Environment	0.807	0.583	0.743	1.383	0.17
BDC*Operating Environment	-0.148	0.144	-0.801	-1.024	0.308
R = .68					
R^2 = .462					
Sig. = 0.000					

a Dependent Variable: Performance

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

Operating environment modifies the relationship between big data technological capabilities and organizational performance, as evidenced by the difference in coefficient of determination (R-squared) before moderation (0.426) and after interaction (0.462). Importantly, even after moderation, the impact of big data technology on performance remained significant (Sig.=0.015), confirming that the relationship between big data technology and organizational performance is moderated.

Conclusion

The study comes to the conclusion that the association between big data technology capabilities and bank performance is significantly moderated by the operating environment. Performance would be improved by having a friendly working environment in the industry, supportive CBK banking regulations that encourage commercial banks to be creative, and the banking sector getting experience with cutting-edge technology. Additionally, a sound legislative framework within which commercial banks can function as well as upgraded ICT infrastructure will increase performance.

Recommendations

The study recommended that policy makers and regulators of the banking sector to establish a friendly environment for commercial banks to operate in. CBK should also enact favourable regulations regarding banking that inspire commercial banks to be innovative and supply the market with state-of-the-art technology. Additionally, it is necessary to put in place updated ICT infrastructure and a solid legal framework within which commercial banks can operate.

REFERENCES

Akpoviroro, K. S., & Owotutu, S. O. (2018). Impact of external business environment on organizational Performance. *IJARIIE*, *4*(3), 498-506.

Germann, F., Lilien, G. L., & Rangaswamy, A. (2013). Performance implications of deploying marketing analytics. *International Journal of Research in Marketing*, *30*(2), 114-128.

Gitonga, A. G. (2016). Talent Management Strategies for Generation Y and Competitive Advantate of Commercial Banks in Kenya.

Goodhart, C., & Schoenmaker, D. (2016). The global investment banks are now all becoming American: does that matter for Europeans?. *Journal of Financial Regulation*, *2*(2), 163-181.

Guerreiro, A. (2015). Does IS/IT Investments Impact on Firm Financial Performance: "Stake holder" versus "Shareholder" Orientation.

Hidayat, R., & Akhmad, S. (2015). Effects of environmental factors on corporate strategy and performance of manufacturing industries in Indonesia. *Journal of Industrial Engineering and Management (JIEM)*, *8*(3), 763-782.

Jushua, A. (2015). Technological innovations and banking: An evaluation of customers' perceptions. *Academic Leadership Online Journal*, *8*(4), 45-59.

Kamau, A., & Were, M. (2013). What drives banking sector performance in Kenya. *Global Business and Economics Research Journal*, *2*(4), 45-59.

Laouiti, R., Gharbi, S., & Liouane, N. (2014). The effect of business environment on Performance Exploratory Study: Case of Tunisian enterprises. *International Journal of Management & Information Technology*, *8*(3), 1430-1439.

Li, S., Madura, J., & Richie, N. (2013). Bond market response to the collapse of prominent investment banks. *Financial Review*, *48*(4), 645-670.

Article DOI: https://doi.org/10.37284/eajbe.7.1.2182

Mehandjiev, N. (2019, December). The Effect of Big Data Analytics Capability on Performance: A Pilot Study in China. In *European, Mediterranean, and Middle Eastern Conference on Information Systems* (pp. 594-608). Springer, Cham.

Mikalef, P., Krogstie, J., Pappas, I. O., & Pavlou, P. (2020). Exploring the relationship between big data analytics capability and competitive performance: The mediating roles of dynamic and operational capabilities. *Information & Management*, *57*(2), 103-119.

Montolio, D., Trillas, F., & Trujillo-Baute, E. (2014). Regulatory environment and Performance in EU telecommunications services. *Review of Network Economics*, *13*(3), 271-302.

Popovič, A., Hackney, R., Tassabehji, R., & Castelli, M. (2018). The impact of big data analytics on firms' high value business performance. *Information Systems Frontiers*, *20*(2), 209-222.

Raguseo, E., & Vitari, C. (2018). Investments in big data analytics and Performance: an empirical investigation of direct and mediating effects. *International Journal of Production Research*, *56*(15), 5206-5221.

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J. F., Dubey, R., & Childe, S. J. (2017). Big data analytics and Performance: Effects of dynamic capabilities. *Journal of Business Research*, *70* (8), 356-365.

Wanjiru, A. I., Muathe, S. M., & Kinyua-Njuguna, J. W. (2019). Moderating Effect of External Operating Environment on the Relationship Between Corporate Strategies and Per

