



BUSINESS INTELLIGENCE AND VALUE CREATION BY SELECTED BANKS IN SUB-SAHARAN AFRICA: TECHNOLOGICAL, ORGANISATIONAL, AND ENVIRONMENTAL THEORY

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AUTHOR'S CONTRIBUTION

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

As the demand for the quantification of the association between business intelligence and value creation continues to gain momentum, this parametric study empirically tests the relevance of technology-organisation-environment (TOE) theoretical framework on the correlation between business intelligence and value creation using data from the biggest banks in Ghana, Nigeria, and South Africa in terms of total assets. While Nigeria and South Africa are the two largest economies in Africa, Ghana is one of the pacesetters in parliamentary democracy in Africa since 1992. GBC Bank Ghana limited, Access Bank of Nigeria Plc, and Standard Bank of South Africa Limited are the three banks that made the study. Hardware and software proxied business intelligence technology, bank size proxied organisation, total deposit proxied environment, and value creation is measured with value added by the sampled banks. Pearson correlation analyses were carried out with the aid of the statistical package for social sciences (SPSS). Using audited data from annual reports of the sampled banks from 2010 - 2020 (11 years); the study established that: (i) all the TOE variables have significant positive associations with value creation in Ghana, Nigeria, and the Group while they have nonsignificant positive associations with value creation in South Africa. These groundbreaking empirical findings indicate the overall relevance of the TOE theoretical framework in banks in Sub-Saharan Africa (Group results), Ghana, and Nigeria. Practically and policy-wise, the findings calls on corporate policy makers to improve on hardware and software investments as they add on to their banks' value creation capacity. There is need for further study to test the relevance of the TOE framework in Banks in South Africa as well as other Sub-Saharan African countries.

Keywords: Business intelligence; computer hardware; computer software; employee cost; value creation; technology; organisation; environment.

1. INTRODUCTION

The fundamental underpin of this research is anchored on the premise that business intelligence (BI) technology brings about different processes of value

creation in an organisation via the instrumentality of data-driven business decision-making [1]. Business intelligence appears to be among the most promising technologies in recent years in terms of value creation to organisations that deploy it [2]. Despite the huge

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investment in business intelligence and the expected value perception originating there from, little empirical research has addressed the value creation processes unique to business intelligence systems [3]. Popovič, Turk and Jaklič [4] stated that one major aim of information technology managers is how to quantify the added value through investment in new technologies (business intelligence inclusive); and Grover, Teng, Segars and Fiedler (1998) added that this has become a problematic issue to information technology researchers and managers as a result of different varieties of computing value added, presence of multiple intervening variables, productivity measurement challenges, and the treatment of business intelligence infrastructure investments as a lump sum. It is equally very worrisome that there seems to be very insignificant discussions on the benefits of business intelligence investments to business and non-business organisations [5]. The deployment of business intelligence architecture costs huge resources in terms of money, time, and energy; but, the benefits thereof is not practically clear to businesses because of lack of empirical studies on the cost-benefit analysis of business intelligence deployment in quantitative. Reviewed literature by the author indicates that the two fundamental objectives of business intelligence quantification are to establish the worthiness of investing in business intelligence technology; and to manage the processes of business intelligence efficiently by ensuring that its products meet the needs of its multiple users.

While it is easier to compute the costs of business intelligence system, it is very difficult to compute its benefits in quantitative terms because they are not directly measurable in the market. It is the considered opinion of this study that business intelligence investments have the capacity to add higher business value if its economic dimension is incorporated before deployment in a sort of cost-benefit-analysis. Even though some efforts have been made to capture how business intelligence creates business value, it is better to end by saying that there is much to know about the value creation capacity of BI because its business value is yet to be fully studied [1].

The study wonders if investment in BI technology really worth it in terms of banks' optimization of their value creation functions. This parametric research primarily aimed at investigating the association between the TOE theoretical framework with value creation function of selected banks Ghana, Nigeria, and South Africa using data from the banks' audited annual financials from 2010 – 2020. Operationally, the study answered the following pertinent questions:

R1: Does computer hardware have significant association with value creation function of selected banks Ghana, Nigeria, and South Africa?

R2: What kind of association exists between computer software and value creation function of selected banks in Ghana, Nigeria and South Africa?

R3: How does organisational size correlate with value creation function of selected banks in Ghana, Nigeria and South Africa?

R4: Does the environment have significant association with value creation function of selected banks in Ghana, Nigeria and South Africa?

2. LITERATURE REVIEW

2.1 Theoretical Framework

The technology-organization-environment (TOE) theory underpins this particular research. Fig.1 captures the diagrammatical representation of this theory in this study. Its three elements (technology, organization, environmental) were empirically linked with banks' value creation function. Technological factors are hardware and software investments; organisational factor is bank size; and environmental factor is banks deposit mobilisation from its customers. Lautenbach, Johnston and Adeniran-Ogundipe [6] Lebid [7] and Micheni [8] also adopted the TOE framework in their studies. Ahlijah [9] defined business intelligence as an integrated concept covering computer hardware, computer software applications, organisational factors, and environmental factors.

2.2 Conceptual Framework

The conceptual framework (Fig. 2) is in sync with the TOE framework: net book values of computer hardware and software, bank size, and banks' deposit mobilization capacity are the independent variables. Value creation is the dependent variable.

2.2.1 BI Technology (hardware and software)

Wahua and Ahlijah [10,11] measured business intelligence technology with computer hardware and software. Fink, Yogeve and Even [1] stated that business intelligence infrastructure represents the physical aspect of BI assets; and the deployment of business intelligence hardware and software helps organisations to make optimize strategic decision-making with the aid of analytics. The combination of these infrastructural technologies and tools creates a technological environment that enables organizations

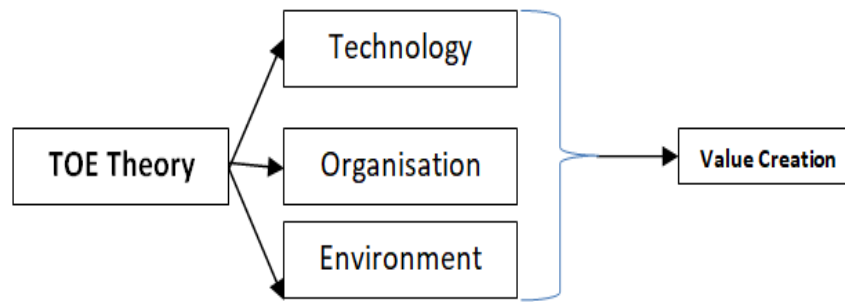


Fig. 1. The TOE theoretical framework (Source: Author)

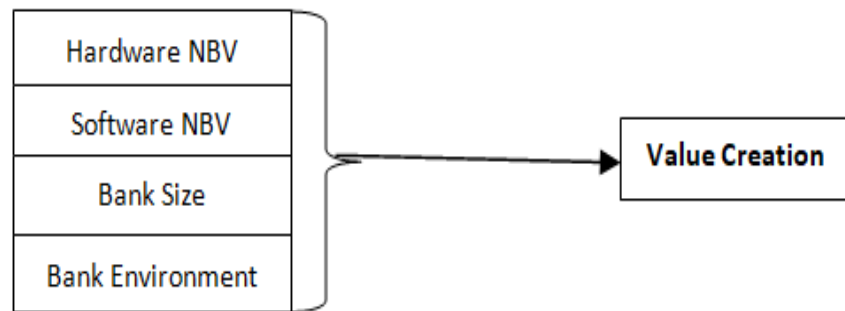


Fig. 2. The TOE conceptual framework diagram (Source: Author)

to develop business intelligence capabilities, leading to better decision making and improved organizational performance [1].

2.2.2 Bank size

The size of an organisation constitutes an integral part of organizational dimension of TOE [12]. Idowu and Osofisan [13] are of the view that the size of an organisation acts as a slack resource in their adoption and implementation of business intelligence technology. Oracle White Paper [14] asserted that larger firms possess more influencing authority to urge partners to adopt/implement business intelligence technology. Jain and Pandey [15] added that bigger firms have more capacities than smaller firms in achieving economies of scale derivable from business intelligence, and bearing the high risk associated with early stage investment in BI projects.

2.2.3 Firm environment

According to Ahmad [16] corporate social responsibility and sustainability concepts have little or no relevance on the environment if they do not improve the quality of human lives; and one way businesses better human dignity is by promoting the dignity of labour with appropriate pay. Firms shape and reshape their operating environments through policies, programs and practices aimed at improving

the aggregate environmental climate as well as human population [17].

2.2.4 Value creation /added

According to Velnampy [18] value-added as an economic term measures the difference between the gross receipts of a firm from good/services and the cost of materials/supplies used in providing them; and some of the examples of value added by firms includes wages and salaries paid to employees, interest paid to creditors, depreciation/amortization paid for the replacement of assets, taxes paid to governments, and profit retained by businesses for their expansion and growth. Hayes [19] defined value added as an economic value that a business adds to its products/services before offering them to customers; and he added that adding value to a product/service helps businesses attract more customers, boost revenue, and maximize profitability.

2.3 Empirical Review

The external technologies are made up of BI software, internet service providers, power supplies and security [8]. Awa, Ukoha and Emecheta [12] stated that the organizational dimension of Technology Organization Environment (TOE) theory includes the innovation, top-managerial assistance, human resource capacity/quality, culture and size of an organisation. Micheni [8] stated that the environmental dimension

of Technology Organization Environment (TOE) theory includes those factors that are related or inherent to an organizations' operating environment and consists of its stakeholders such as shareholders, government, the community, the press, the employees, the customers, the creditors, and other categories of stakeholders. Angeles [20] stated that the environmental dimension of Technology Organization Environment (TOE) theory has the capacity to engineer and re-engineer an organizations' interpretation of business innovation; the organizations' capacity to deploy the wherewithal needed for innovative purposes; and the organizations' strong-will to implement innovations based on business intelligence best practices.

Amoako [21] investigated if the adaptation of business intelligence systems can help the Electricity Company of Ghana (ECG) in its strategic decision-making. It was a qualitative research and based on no specific theoretical framework. Data was collected using interviews. The independent variable is business intelligence adoption while strategic decision making is the dependent variable. The study revealed that business intelligence or any similar system is not adopted by the Electricity Company of Ghana though the company creates huge data through its operations. It is the considered opinion of the author that business intelligence implementation at the Electricity Company of Ghana and its influence on decision-making and work culture of users should be studied.

Johansson and Nilsson [22] assessed business intelligence practices in large Swedish organizations using qualitative research method with interviews. The study was not theoretically grounded. The authors developed a Business Intelligence Assessment Framework (BIAF); and used it to establish that large Swedish organisations are generally at fair in implementing business intelligence best practices. They recommended that there is need to empirically establish business intelligence values and tangible benefits while integration external variables. They observed that many business intelligence publications are linked to institutions with commercial interest in BI (example BI consultancy firms or vendors); as such, these biased publications majorly focus on the description and promotion of business intelligence applications, and they summed up that business intelligence research is still at its developing phase.

Namisiko, Munialo and Nyongesa [23] stated that the technology dimension of TOE covers the cost of technology as well those of technological competence. The technology resources at the disposal of organisations reflect how competent they are technologically; these include the technical infrastructure, the technically-competent employees,

internet connections, and bandwidth [8]. The capability of an organisation to adopt and execute business intelligence architecture depends on the availability of computers with adequate physical memory, processors, middleware, and integrated tools for data gathering, processing, warehousing, and dissemination [2]. Business intelligence in internet based, as such, firms considering deploying BI technology should factor in internet connections with adequate bandwidth [24].

Micheni [8] examined the adoption of business intelligence in teaching/learning technique among institutions of higher learning in Kenya using exploratory-qualitative research approach. The study applied the technology-organisation-environment (TOE) theoretical model and based on extensive review of literature. The author established that the TOE framework is appropriate for the technological adoption of cloud computing in institutions of higher learning in Kenya, and recommended that further studies should combine the TOE framework with other existing theories on technology adoption. Oei [25] sought to find out the factors that determine acceptance of operational business intelligence by organisations in Netherlands using qualitative research approach and the Unified Theory of Acceptance and Use of Technology (UTAUT). The results of the investigation revealed that operational core, techno-structure and middle management are the key influencers of operational business intelligence acceptance among firms in Netherlands. The author advised that further studies should empirically apply the UTAUT model in order to establish generalization from its results.

Přikrylová [26] analyzed selected scientific research papers related to business intelligence framework in order to establish the role of BI in marketing decision-making processes in Czech Republic. The study was a qualitative research; had no theoretical underpin; and applied content analysis as a data gathering technique. The independent variable is business intelligence models while marketing decisions is the dependent variable. The research found out that well-structured business intelligence models support effective marketing decision-making processes in Czech Republic firms. The author is of the view that further studies should incorporate external variables in studying business intelligence implementation for effective decision-making. Rama, et al. [27] examined the role and implication of Big Data analytics on business intelligence among selected Chinese firms using questionnaire as a data collection tool. The study was an exploratory-qualitative one but has no specific theoretical framework. Big data analytics is the independent variable while business intelligence is the dependent variable. They researchers found out

that Big Data analytics offers multitude of opportunities to enhance business value and productivity for Chinese firms. They suggested that further studies should apply quantitative approach to this study using longitudinal data.

Fink, Yogev and Even [1] attempted to bridge the gap between information technology (IT) value creation and business intelligence (BI) using three (3) Israeli firms. The research was an exploratory-quantitative research and based on resourced-based theoretical framework. Data was collected using survey questionnaire and interview. The independent variables are general information technology asset and specific business intelligence assets (hardware, software, business intelligence employees) while the dependent variable is value creation. The study established that business intelligence (hardware, software, and BI employees) create business value for Israeli firms. It is the recommendation of the authors that further studies should be objective and use longitudinal data, specific industry/firm factors, and more sample size.

Lautenbach, et al. [6] examined the factors influencing the use of business intelligence and data-driven decisions (analytics) within organisations in South Africa. The study adopted a positivist paradigm and quantitative research methodology. They used survey (questionnaire) in gathering data and the study applied technology-organisation-environment (TOE) theoretical framework. The independent variables are data infrastructure, data management, talent management, external market, and regulatory compliance while the dependent variables are business intelligence and analytics usage extent. The result established that data infrastructure, top management support, and external market have significant influence on South African organizations' adoption of business intelligence in data driven decision making. They recommended that further studies should empirically test the impacts of data Infrastructure, top management support, and external market influence on organisational performance.

Above review reveals dearth of empirical studies on the value creation capacity of banks based on investments on business intelligence technology. Again, the quantitative relevance of the TOE theory in business intelligence deployment is silent in literature. The question of whether or not Bi technology adds value to value creation of banks is either unanswered or poorly answered in quantitative terms. Another segment of the empirical review is that there is dearth of quantitative comparative inquiry on the relevance the TOE theory in BI studies. This research addressed all of these observations.

3. RESEARCH METHODOLOGY

3.1 Research Design and Methods

Descriptive quantitative research design was applied in this study in order to establish the association between different proxies of TOE framework used in this study with the value creation function of selected banks in Ghana, Nigeria, and South Africa with 2010 – 2020. This is in sync with the position paper presented by USC Libraries [28]. Babbie [29] and Kefas [30] are of the view that pure quantitative researches (such as this one) seek correlation, relationships and attempt to control the environment in which the data is collected (in order to avoid the risk of non-studied variables accounting for the relationships identified).

3.2 Population and Sampling Procedures

This research covers data from all branches of the sampled banks (Access Bank Nigeria Plc, GCB Bank Ghana Limited, and Standard Bank South Africa Limited). The audited annual financial statements of these banks from 2010 – 2020 are the sources of the data. Therefore, the study covered the entire population (application of census sampling method). Ankomah [31], Wahua [10] Wahua and Ahlijah [11] and Ahlijah [32] adopted this approach.

3.3 Data Collection Process and Analysis Technique

Data were collected from the audited annual reports of the banks within the period 2010 – 2020; and documented in a Checklist for completeness. Audited annual reports imply that the validity and reliability of the data is confirmed by the external auditors, who placed seals of independence on the annual reports. Wahua and Yonney [10,11] Roozitalab and Sayadi [33] and Lautenbach, et al. [6] followed this method. Pearson correlation analysis was used in testing the research questions.

3.4 Operationalization of Research Variables

Table 1 captures the key variables used in this study. The independent variables are computer hardware (a component of property, plant and equipment in the audited annual financials of the banks); computer software (a component of intangible assets in the audited annual financials of the banks); bank size (a measure of the banks by their total assets in their audited financials); and total deposit (the banks' share of the financial markets in their respective countries). The dependent value is value added (the value creation capacity of the banks in line with their operating models and efficiencies).

3.4.1 Test of normality assumption

This descriptive quantitative research requires parametric test (example, Pearson correlation analysis); as such, the dependent variables should be drawn from a normal distribution [34]. The Shapiro-Wilk Tests is the normality test that fits into this study as it is the most appropriate when the sample size is not more than 2000 [35]. Table 2 contains the results of the Shapiro-Wilk Normality test carried out; and it shows that all the variables have nonsignificant p-values (all the significance values are greater than 0.05). Therefore, the basic parametric assumption is met [36,37]. The df is a measure of number of dataset. This study has data from all the banks for the period 2010 – 2020 (11 years).

3.5 Data Analysis

3.5.1 Test of specific research questions

R1: Does computer hardware have significant association with value creation function of selected banks Ghana, Nigeria, and South Africa?

R2: What kind of association exists between computer software and value creation function of selected banks in Ghana, Nigeria and South Africa?

R3: How does organisational size correlate with value creation function of selected banks in Ghana, Nigeria and South Africa?

R4: Does the environment have significant association with value creation function of selected banks in Ghana, Nigeria and South Africa?

Table 1. Summary of research variables operationalization

Variable	Proxies	Measurement	Sources
Independent	Hardware	Yearly net book balance	Lasi and Tessin (2012)
	Software	Yearly net book balance	Wehner (2020)
	Bank Size	Total assets of the bank	Beridze (2016)
	Total Deposit	Annual total deposit	SBSA (2020)
Dependent	Value Created	Gross earnings – (cost of materials and services)	Wahua and Ahlijah (11)

Source: Compiled by the Author

Table 2. Test of normality

Variable	Bank	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Deposit	GCB Ghana	.210	11	.192	.907	11	.226
	ACCESS Nigeria	.240	11	.075	.893	11	.151
	SBSA S/Africa	.212	11	.180	.913	11	.263
Hardware	GCB Ghana	.119	11	.200*	.985	11	.989
	ACCESS Nigeria	.176	11	.200*	.914	11	.270
	SBSA S/Africa	.237	11	.185	.825	11	.120
Software	GCB Ghana	.206	11	.200*	.858	11	.154
	ACCESS Nigeria	.175	11	.200*	.959	11	.755
	SBSA S/Africa	.227	11	.119	.897	11	.170
Size	GCB Ghana	.271	11	.123	.853	11	.147
	ACCESS Nigeria	.240	11	.175	.893	11	.151
	SBSA S/Africa	.164	11	.200*	.967	11	.857
Value Added	GCB Ghana	.187	11	.200*	.950	11	.650
	ACCESS Nigeria	.155	11	.200*	.932	11	.434
	SBSA S/Africa	.222	11	.136	.905	11	.215

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Source: Author (2021)

Table 3. Pearson correlation analysis

Variable	Statistic	Value Added (Group)	Value Added (GCB Ghana)	Value Added (AB Nigeria)	Value Added (SBSA South Africa)
Hardware	Pearson Correlation	.926**	.773**	.898**	.440
	Sig. (2-tailed)	.001	.005	.001	.176
	N	33	11	11	11
Software	Pearson Correlation	.951**	.769**	.837**	.118
	Sig. (2-tailed)	.001	.006	.001	.730
	N	33	11	11	11
Size	Pearson Correlation	.986**	.668*	.835**	.414
	Sig. (2-tailed)	.001	.025	.001	.205
	N	33	11	11	11
Deposit	Pearson Correlation	.980**	.612*	.835**	.331
	Sig. (2-tailed)	.001	.045	.001	.321
	N	33	11	11	11
Value Added	Pearson Correlation	1	1	1	1

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Author (2021)

Table 4. Parameter estimate (Group)

Parameter	B (USD)	t	Sig.	Partial Eta Squared
Intercept	178,770,614	3.218	.003	.270
Hardware	6.791	4.078	.001	.373
Software	1.967	6.116	.001	.572
Size	-.064	-2.556	.016	.189
Deposit	.094	3.461	.002	.300
R.	.989			
R. Squared	.987			
F-Statistic	612.397 (.001)			

Computed using alpha = .05
 Dependent variable = Value added
 Source: Author (2021)

Research Questions 1 – 4 were tested simultaneously with the aid of Pearson correlation analysis (a parametric quantitative test); and the results are contained in Table 3. It contains the results of the Pearson correlation analysis carried out to test the research questions put forward in this study. Research Questions 1 – 4 were tested simultaneously; and it contains the associations between the independent variables and the dependent variable in relation to the three banks studied as well as their aggregate data (Group).

3.5.2 Test of research 1

R1: Does computer hardware have significant association with value creation function of selected banks Ghana, Nigeria, and South Africa?

Table 3 indicates that:

- i. Computer hardware has significant association with value creation function of GCB Ghana Plc (77%) and Access Bank Nigeria Plc (90%); but not with Standard Bank of South Africa Ltd (44%).
- ii. On the aggregate, the Group result indicates that computer hardware has 93% significant association with value creation function of commercial banks in Ghana, Nigeria, and South Africa.

3.5.3 Test of Research 2

R2: What kind of association exists between computer software and value creation function of selected banks in Ghana, Nigeria and South Africa?

Table 3 indicates that:

- i. Computer software has significant association with value creation function of GCB Ghana Plc (77%) and Access Bank Nigeria Plc (84%); but not with Standard Bank of South Africa Ltd (18%).

- ii. On the aggregate, the Group result indicates that computer software has 95% significant association with value creation function of commercial banks in Ghana, Nigeria, and South Africa.

3.5.4 Test of Research 3

R3: How does organisational size correlate with value creation function of selected banks in Ghana, Nigeria and South Africa?

Table 3 indicates that:

- i. Bank Size has significant association with value creation function of GCB Ghana Plc (67%) and Access Bank Nigeria Plc (84%); but not with Standard Bank of South Africa Ltd (41%).
- ii. On the aggregate, the Group result indicates that Bank Size has 99% significant association with value creation function of commercial banks in Ghana, Nigeria, and South Africa.

3.5.5 Test of Research 4

R4: Does the environment have significant association with value creation function of selected banks in Ghana, Nigeria and South Africa?

Table 3 indicates that:

- i. Bank Environment (proxied by total deposit mobilization) has significant association with value creation function of GCB Ghana Plc (61%) and Access Bank Nigeria Plc (84%); but not with Standard Bank of South Africa Ltd (33%).
- ii. On the aggregate, the Group result indicates that Bank Environment has 98% significant association with value creation function of commercial banks in Ghana, Nigeria, and South Africa.

3.6 Confirmatory Test of the TOE Theory

A univariate analysis of variance (which is an advanced form of ordinary least square multiple regression analysis) was carried out to test the relevance of the TOE theory in this study. Table 4 contains the results of the analysis.

Model: $V = C + H + S + Z + D$

$V = \$178,770,614 + \$6.791H + \$1.967S - \$0.064Z + \$0.094D$

Where:

V = Value added

H = Computer hardware (Technological factor 1)

S = Computer software (Technological factor 2)

Z = Bank size (Organisational factor)

D = Bank deposit mobilization (Environmental factor)

Table 4 further establishes that all the TOE variables have significant effect on value creation of banks (the relevance of the TOE theory is once again established); and that when all of them are held constant (equal to zero), that the aggregate sampled banks could add value to the tune of \$178,770,614. The Table 4 also reveals that when bank grows too big, that its value creation is significantly negative (this is so much so when there is increase in computer hardware, computer software, and deposit mobilization).

4. DISCUSSION AND SUMMARY

4.1 Discussion of the Findings

This study holds that net book value of computer hardware has significant negative association with the performance of Standard Bank of South Africa. This is in agreement with the work of Wahua and Ahlijah [10,11] who also established that computer hardware cost (measured by annual depreciation cost) had significant negative effect on the performance of top banks in the Economic Community of West African States (ECOWAS). This finding also aligns with that of Owusu [38] who empirically established that computer hardware cost has significant negative impact on the performance of firms in Ghana.

The aggregate finding of this work has established that computer hardware has significant positive association with value added by commercial banks in Ghana, Nigeria, and South Africa within the period under review. This agrees with the findings of Ahlijah [9,32] which revealed that computer hardware (measured by net book value) has significant positive effect on the performance of GCB Bank (Ghana)

Limited. Conversely, Ahlijah [32], Wahua and Ahlijah [10,11] and Owusu [38] established that computer hardware has significant negative association with value creation by banks using data from banks in Ghana, Nigeria, and South Africa.

Also, Ahlijah [9,32] and Wahua and Ahlijah [10,11] agree that computer software cost/investment, organisational size, and organisational environmental variables do have significant positive effects on firm performance. This position also holds in this study as it has been empirically established that computer software investment, bank size, and bank personnel quality (environmental variable) do have significant positive effects on the performance of Standard Bank of South Africa Limited. In conclusion, Kaplan and Norton [39] specifically established that business intelligence helps firms in significantly optimizing their operating efficiencies; and this is This is strongly supported by Lyke-Ho-Gland [40] and Sclater, Webb, and Danson [41].

4.2 Implications of the Findings

The findings of the study has re-echoed the relevance of the TOE theoretical framework in analysing business intelligence in general. The work established that all the dimensions of the TOE framework has positive significance associations with value creation function of sampled banks in Sub-Saharan Africa. It is therefore appropriate to conclude that the Technology-Organisation-Environment theory is relevant in this study as all the variables have significant positive associations with the dependent variable (value creation) [42-44].

Practically, the banks should focus on how to sustain their optimization of the three elements of technology, organisation, and environment for the purposes of creating quality value addition for expansion and growth and meeting the interests of their multiple stakeholders.

The policy implication of this study demands that banks in Sub-Saharan Africa should improve on their adoption of business intelligence for enhanced data-driven decision making process for the purpose of optimizing their overall corporate performance for the good of all stakeholders.

5. CONCLUSION

As the demand for the quantification of the association between business intelligence and value creation continues to gain momentum, this parametric study empirically tests the relevance of technology-organisation-environment (TOE) theoretical framework on the correlation between business

intelligence and value creation using data from the biggest banks in Ghana, Nigeria, and South Africa in terms of total assets. While Nigeria and South Africa are the two largest economies in Africa, Ghana is one of the pacesetters in parliamentary democracy in Africa since 1992. GBC Bank Ghana limited, Access Bank of Nigeria Plc, and Standard Bank of South Africa Limited are the three banks that made the study. Hardware and software proxied business intelligence technology, bank size proxied organisation, total deposit proxied environment, and value creation is measured with value added by the sampled banks. Pearson correlation analyses were carried out with the aid of the statistical package for social sciences (SPSS). Using audited data from annual reports of the sampled banks from 2010 - 2020 (11 years); the study established that: (i) all the TOE variables have significant positive associations with value creation in Ghana, Nigeria, and the Group while they have nonsignificant positive associations with value creation in South Africa. These groundbreaking empirical findings indicate the overall relevance of the TOE theoretical framework in banks in Sub-Saharan Africa (Group results), Ghana, and Nigeria. There is need for further study to test the relevance of the TOE framework in Banks in countries outside Sub-Saharan Africa (SSA) just like Wahua (2015) studied D-8 countries.

6. DISCLAIMER

Ethically, the results of the study are true reflections of the data analysed with the aid of the statistical package for social sciences (SPSS). No data manipulation was carried out. The Author has declared that no competing interests exist. The secondary data used in this research are commonly and predominantly used in Author's area of research and country. There is absolutely no conflict of interest between the Author and the sampled banks to warrant any litigation as the data is purely used for the advancement of knowledge. Also, the research was executed and funded by solely by the Author.

ETHICAL APPROVAL

As per international standard, this study adhered to ethical best practices.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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