Information and Communication Technology as a Determinant of Organizational Performance: A Study of Banks in Delta/Edo States

Dr. Vincent I. O. Odiri and ODOZI, Barbara Nneka
Department of Business Administration,
Faculty of Management Sciences,
Delta State University, Abraka
Barbs.nene@gmail.com
Corresponding author: godwinobonofiemro@gmail.com

DOI: 10.56201/ijssmr.v9.no10.2023.pg66.79

Abstract
This study investigated information and communication technology (ICT) as determinant of organizational performance of selected commercial banks in Delta and Edo States, Nigeria. Cross-sectional survey design was used and one hundred and eighteen (118) questionnaires were administered to employees of four (4) commercial banks in Delta and Edo States. Data obtained were analyzed using descriptive, diagnostic and inferential statistical tools. The regression results indicated positive and significant relationship between information and communication technology usage and improvements in organizational performance in areas of enhanced quality of service delivery, productivity, and customers' base. On the basis of the findings, it was recommended that commercial banks should expand the usage of information communication technology tools in their business processes in order to become more competitive and improve service delivery to customers, enhanced productivity and customers' base. More importantly, commercial banks should strengthen their policies and procedures on information and communication technology targeted at retaining IT staff. Also, commercial banks should ensure an up-to-date training of IT staff to keep them abreast of current trends in the ICT environment.

Key Words: *Information Communication Technology, Organizational and Performance*

Introduction

In the wake of the 20th century, the world experienced a revolution known as 'Information Communication Technology' (ICT), which in the 21st century it became known as the 'Fourth Industrial Revolution'(4IR). The 4IR refers to the speedy change to information technologies, and business process in the 21st century due to smart automations and interconnectivities of information technologies(Roblek, Thorpe, Bach, Jerman & Meško, 2020). Thus, ICT has been deemed as one of the most fascinating development since the industrial revolution in the 20th and 21st centuries. According to Herweijer, Combes, Jackson, Johnson, McGargow and Bhardwaj (2020), ICT has changed our daily lives at home and at work, in shops and banks, in

schools, colleges and universities such that it has made people think, communicate and behave differently.

Currently, the world has become a global village where organizations (including commercial banks) and their customers can now carryout business transactions via the internet, computers, mobile phones and satellite networks in most effective and efficient ways (Popovic, 2020). ICT is considered as a key growth area in this century, specifically, in a dynamic and highly competitive business environment which requires utilizing advanced ICT tools to improve efficiency, cost effectiveness, and deliver high quality products/services to customers (Sohail, Rextina, Ahmed & Tamimy, 2020; and Ally, 2019).

ICT refers to a different set of technological mechanisms and resources employed to transmit, store, create, and exchange information via a labyrinth of networks (Jia, Komeily, Wang & Srinivasan, 2019). On the other hand, organizational performance is the capability of an organization to realize its goals and optimize results; it is an organization's capability to realize goals in a circumstance of constant change (Hacker & Saxton,. 2017). Prior studies (see Pourmirza, 2016; Dennis, 2017; Hacker & Saxton, 2017; Harris & Katz, 2021; and Heinz, 2022) have shown that ICT serves as a major driver of organizational performance in both developed and developing countries.

In the Nigerian banking industry, ICT is seen as a tool of marketing, contacting customers and looking for possible customers, as well as presenting IT services like distinguished potential services for customers (United Nations Conference on Trade and Development: UNCTAD, 2018). Hence, commercial banks are increasingly using ICT to develop solutions to business problems, improve efficiency and effectiveness of decision-making, enhancing productivity and quality of service delivery, achieving dynamic stability, enhancing customers' base, as well as competing for the new market. Stock, Obenaus, Kunz and Kohl (2018); and Habanik, Grencikova and Krajco (2019) maintained that commercial banks have always sought and adopted technologies that enhance efforts of their manpower in production and management.

Regardless of the fact that ICT has evolved over a considerable period, it has emerged as an important tool in management of commercial banks operations. As the banking industry harnesses its growth, it also largely depends more on ICT for its survival and sustainability (Feeny & Willcocks, 2018; Sanchez, 2019; and Hughes, Dwivedi, Misra, Rana, Raghavan & Akella, 2019). Thus, management of commercial banks need to obtain an overall application and appreciation of the potential of ICT and link its utilization to their organizational goals (Hacker & Saxton, 2017). More so, whether ICT drives commercial banks' performance in Nigeria (particularly Edo and Delta States) seems to be under-researched in the management literature. Given the above, this study seeks to examine whether ICT is a determinant of organizational performance, with special focus on some selected commercial banks in Delta and Edo States, Nigeria.

Statement of the Problem

Organizational performance has always been a topical issue in the literature covering various aspects like efficacy, efficiency, competitiveness, relevance and financial viability. Marmouse (2017); and Porter and Millar (2022) contended that organizational performance depicts the way in which organizations strive to reach their goals and how they manage to reach the goals. Over the years, commercial banks in Nigeria have witnessed dramatic changes in their

operations and processes due to the several bank reforms coupled with the tremendous growth in the number of IT devices used by customers and employees.

The use of ICT by commercial banks became necessary to reduce the duration in processing critical tasks, elimination of repetitive tasks, increasing service and product qualities as well as harnessing efficiency in their operations. Researches in ICT have empirically shown that investment in ICT would enhance organizational productivity, management capabilities and comparative advantage. While Pourmirza (2016) found that the use of ICT results to increased organizational performance, there are other studies (Wilson, Iravo, Tirimba & Ombui, 2015; Hacker & Saxton, 2017; Odiri, 2020; and Wachira, Muturi & Sirma, 2022) established similar results that ICT leads to enhanced organizational performance.

Given the plethora of empirical studies on the research theme, studies on ICT as determinant of organizational performance using Delta and Edo States in a single is unobtainable in the management literature; thus there is literature gap on ICT as determinant of organizational performance in Delta and Edo States, Nigeria. Hence, there is a need to find out if the use of ICT by commercial banks contributes positively and significantly to their performance (using dimensions of organizational performance, namely quality of service delivery, productivity, and customers' base).

Objectives of the Study

The general objective of this study is to examine the effect of information and communication technology on organizational performance of commercial banks in Delta and Edo States. The specific objectives are:

1. To ascertain whether information and communication technology influence the quality of service delivery of commercial banks in Delta and Edo States.
2. To determine the effect of information and communication technology on productivity of commercial banks in Delta and Edo States.
3. To ascertain the relationship between information and communication technology and customers' base of commercial banks in Delta and Edo States.

Hypotheses of the Study

The following research hypotheses were formulated and tested at 0.05% level of significance:

$H0_1$: Information and communication technology has no significant influence on the quality of service delivery of commercial banks

$H0_2$: Information and communication technology has no significant effect on productivity of commercial banks

$H0_3$: Information and communication technology has no significant effect on customers' base of commercial banks

Literature Review

Review of Concepts

Information and Communication Technology (ICT)

ICT refers to anything related to computing technology, such as networking, hardware, software, the Internet, or the people that work with these technologies (lyadi, 2022). According

to Butler-Adam (2018), ICT can be defined as the hardware, software, telecommunications, database management, and other information-processing technologies used to store, process, and deliver information. ICT is commonly used to assist managers with direct control over business functions, personnel and other resources. As managers oversee resource coordination and allocation, it can be difficult to coordinate business functions across various projects (Carvalho, Chaim, Cazarini & Gerolamo, 2018). ICT is one of the key innovations that is frequently implemented to assist in this process (Hobday, 2018).

Peansupap and Walker (2015) asserted that ICT is often implemented as it is believed to facilitate communication, improve integration, enhances productivity and service delivery. Currently, organizations have traditionally contributed significantly to a country's future, however, to continue this work effectively in today's technological age, they need not only the technology but the skills to use and gain value from applications from which the technologies have enabled (Donaires, Cezarino, Caldana & Liboni, 2018; and Hidayatno, Destyanto & Hulu, 2019). In Nigeria, commercial banks have been behind their counterparts in adopting ICT and have been relatively slow to take advantage of emerging information technology development. According to Kohnová, Papula Salajová (2019), most organizations adopt the traditional (manual) methods by using computers for word processing, spreadsheet and accounting applications, and managing a patchwork of old and new elements that often do not work well together. These inhibiters as observed by Luthra and Mangla (2018) includes but not limited to lack of budget to invest in the latest and greatest systems and IT tools, lack of sustainable capital for IT investment, an inability to pay competitive salaries to technical personnel, and inability to build the needed technical skills.

In organizations, there are those factors which influence ICT adoption including anticipated benefits and barriers. An organization will adopt the new technology if it perceives there will be savings of inputs, general efficiency, gains, higher flexibility and improvement of product quality (Brynjolfsson & Hitt, 2016; and Luthra &Mangla, 2018). An organization will often fail to adopt the new technology if it perceives that it is faced with unfavorable financial conditions, human capital restrictions (e.g. lack of IT specialists and multi-skilled workers), information and knowledge barriers and managerial barriers like resistance to the new technology within the firm (Heinz, 2022; and Xue, Weng & Yu, 2018)

Organizational Performance

Organizational performance is the fundamental measure in the human resource management (HRM) literature. While major success stories exist, so do equally impressive failures (Bhattacherjee & Hirschheim, 2017). The lack of accurate quantitative measures for the output and value created by information technology has made information systems manager's job of evaluating organizational performance difficult (Iyadi & Edeme, 2022). Organizational performance in the views of Kinuthia and Rotich (2015) is the capability of organizations to effectively and efficiently use all available resources to become productive. Similarly, Kinuthia (2022) sees organizational performance as not only connected with outcomes but relates with employees' behaviour, and activities that organizations uses to realize their goals in the most effective and efficient ways. Notably organizational performance is a vital aspect in strategic management as it enables organizations plan their processes so as to help them understand their goals, what needs to be done, why and how it should be done (Loveman, 2022).

In the HRM literature, several measurements of organizational performance has emerged; however, this study used three of the measures: quality of service delivery, improvements in customers' base and productivity. More recently, researchers began to find positive and significant relationships between ICT and various measures of organizational performance. For instance, Diewert and Smith (2022); and Feeny and Willcocks (2018) looked at the association between ICT and organizational performance. They found a positive relationship between ICT and various performance ratios although at times the relationship was quite weak.

Consequently, ICT contribution to output and performance is well documented in the HRM literature, but whether this is beneficial in areas of quality of service delivery, productivity and customers' base of commercial banks in Edo and Delta State is yet unclear. Also, some researchers still believe that the full power of ICT in increasing organizational performance has not yet been unfolded; in this sense, organizational performance paradox still awaits further explanation, which this study seeks to satisfy.

Theoretical Framework

The study relies the Technology Acceptance Model (TAM) as advocated by Davis in 1989. TAM is one of the most successful measurements for computer usage effectively among practitioners and academics (Davis, 1989). Two particular beliefs are addressed via TAM; perceived usefulness and perceived ease of use. First, perceived usefulness is defined as being the degree to which a person believes that the use of a system will improve his performance. Second, perceived ease of use refers to the degree to which a person believes that the use of a system will be effortless. TAM attempts not only for prediction but also for explanation to help researchers and practitioners identify why a particular system may be unacceptable and pursue appropriate steps. This framework was chosen for this study because it covers many critical issues that could lead to a comprehensive understanding of the relationship between ICT and the performance of organization. The critical issues that could lead to organizational performance embodies the perceived usefulness and ease of use of ICT by commercial banks in enhancing their business processes which invariably results to increased performance for banks.

Empirical Studies

Wachira et al. (2022) examined the relationship between ICT and organizational performance. First, the study showed that ICT improves the level of coordination between various firms within the supply chain network in effect lowering inventory cost. Second, ICT improves external communication between the firm and its supplier leading to reduced inefficiencies that could be caused by lack of coordination; and lastly, ICT increases the speed as well as the reliability of transfer and processing of information between members of the supply chain in effect leading to reduced transaction costs and coordination costs.

Similarly Heinz (2022) examined the determinant of ICT as a predictor of organizational performance. The organizational performance variables used were quality of product, service delivery quality, and customers' based. Primary data (questionnaire) was used and regression results established that ICT contributes significantly and positively to the performance of organizations both small and large.

Loveman (2022) investigated the relationship between ICT and organizational performance using primary data. The organizational performance measures employed were customers' base, and productivity. The regression result indicated that ICT significantly affects all the variables of organizational performance investigated in the study.

Namusonge (2016) examined the impact of ICT infrastructure in procurement on organizational performance revealing the ICT infrastructure plays a very important role in enhancing organizational performance. The findings of the research revealed that the use of ICT infrastructure reduces administrative overheads, enhances efficiency in the procurement processes in addition to improve the speed of delivery of goods to purchasers. Therefore, ICT infrastructure enhances the procurement function. The research also established that the use of ICT infrastructure improves information sharing among supply chain partners enabling them to maintain long term relationships that bring forth enhanced trust and delivery of high quality inputs.

Research Method

Research Design

This study used a cross-sectional survey research design. Cross-sectional survey design is used to describe the behaviour of a given subject crossectionally. In this context, we used the cross-sectional survey design in describing the relationship between ICT and organizational performance, as it sought to describe data and characteristics about a population/phenomenon being studied using diverse participants.

Study Population and Sample

The population of the study comprised of the entire workforce of four (4) commercial banks in Edo and Delta State. In this regards, two (2) commercial banks were obtained from each of the States (Delta: First Bank Nigeria Plc. and United Bank for Africa; Edo: Guaranty Trust Bank and Zenith Bank Plc.). As at the time of the study, there were a total of one sixty eight (168) employees (Human Resource Department, 2021). To ensure true representation of the population, the sample size of this study is 118 respondents drawn from the population using Taro Yamane's formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = sample size; N = Population under study; e = the error margin (0.05)

$$n = \frac{168}{1+168(0.05)^2}$$

$$n = \frac{168}{1.42}$$

$$n = 118$$

Method of Data Collection

The study used primary data (questionnaire) which was collected by means of face-to-face basis. The questionnaire had two sections, the first part captured demographic information of the respondent and the second part entailed the use and impact of Information and communication technology on organizational performance. The questionnaire was anonymous as no personal information of the respondents was collected, to facilitate data collection

approval from the supervisor and human resources director was obtained. The questionnaire was designed on a 5-Point Likert Scale of Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) and Strongly Disagree (SD).

Method of Data Analysis

The objective of this study was to assess the relationship between ICT and organizational performance. Data collected for the study was imported into a computer programme such as STATA 16.0 software for analysis. The study employed descriptive statistics (frequency distribution, simple percentage, charts, mean, standard deviation, and Pearson correlation) and inferential statistic (simple regression). The dependent variable is organizational performance (measured using quality of service delivery, productivity and customers' based) while the independent variable is ICT; The model of the study is given as follows:

$$Qsd = f(Ictcomp) \quad \text{eq. 1}$$
$$Prod = f(Ictcomp) \quad \text{eq. 2}$$
$$Cub = f(Ictcomp) \quad \text{eq. 3}$$

Equations 1-3 were estimated in their explicit forms to capture the regression coefficients as shown in equations 4-6:

$$Qsd = \alpha_0 + \beta_1 Ictcomp_i + \varepsilon_t \quad \text{eq. 4}$$
$$Prod = \alpha_0 + \beta_1 Ictcomp_i + \varepsilon_t \quad \text{eq. 5}$$
$$Cub = \alpha_0 + \beta_1 Ictcomp_i + \varepsilon_t \quad \text{eq. 6}$$

'Where: *Qsd*=Quality of service delivery; *Prod*=Productivity; *Cub*=Customers' base; *Ictcomp* = Information communication technology; ε_t = Error term; and α_0 , β_1 = Regression coefficients. The significance level was set at 0.05 % for the inferential statistical tests while a mean benchmark of 2.50 was for the descriptive statistics.

Data Presentation and Analysis

4.1 Presentation of Results

Table 4.1: Demographic Variables of Respondents

S/No.	Parameters	Categories	Frequency N=112	Percent (%)
1	Educational Qualification	Ordinary Level	19	16.96%
		OND/NCE	39	34.82%
		B.Sc./HND	47	41.96%
		M.Sc./MBA	7	6.26%
		PhD/Others	-	-
			112	**100%**
2	Gender	Male	91	81.25%
		Female	21	18.75%
			112	**100%**
3	Age	16-25years	5	4.46%
		26-35years	39	34.82%
		36-45years	36	32.14%
		46-55years	13	11.61%
		56 & above	19	16.97%
			112	**100%**
4.	Marital Status	Single	14	12.5%
		Married	98	87.5%
		Divorced	-	-
			112	**100%**

Source: Field Survey, 2022

Presented in Table 4.1 are the demographic variables of one hundred and twelve (112) employees of the four (4) commercial banks sampled from Edo and Delta States. The result indicated that 19(16.96%) and 39(34.82%) of the respondents possessed O' Level and OND/NCE certificates respectively while 47(41.96%) and 7(6.26%) with B.Sc./HND and M.Sc./MBA respectively. However, none of the respondents had PhD and other degrees. Furthermore, it was found that 91(81.25%) of the respondents are males while 21(18.75%) are females. The study revealed that 5(4.46%) and 39(34.82%) of the respondents were within the age brackets of 16-25years and 26-35years respectively while 36(32.14%) and 13(11.61%) of the respondents are within the age brackets of 36-45years and 46-55years respectively. Only 19(16.97%) of the respondents are within the age bracket of 56years and above. On marital status of the respondents, it was found that 14(12.5%) and 98(87.5%) of the respondents are single and married respectively while none are divorced; at a glance, the results are represented in charts.

International Journal of Social Sciences and Management Research E-ISSN 2545-5303
P-ISSN 2695-2203 Vol 9. No. 10 2023 www.iiardjournals.org

Table 4.2: Analysis of Organizational Performance Measures and ICT of Commercial Banks in Edo and Delta State

S/N	Items	Mean	Std. Dev	Obs.
1	ICT	3.5058	1.0061	112
2	Quality of Service Delivery	3.4024	1.0048	112
3	Productivity	3.1024	1.0072	112
4	Customers' Base	3.5035	0.0642	112

Source: Field Survey, 2022

Table 4.2 showed the descriptive statistics analysis of organizational performance measures and ICT of the sample commercial banks in Edo and Delta States. The result revealed that all the four (4) items scored above 2.50 cut off point of the mean. This implies that all the items on ICT and organizational performance are well supported by the respondents as good basis for assessing the relationship between ICT and organizational performance of commercial banks.

Test of Research Hypotheses

Table 4.3: Regression Result for Relationship between ICT and Quality of Service Delivery

```
. regress perf ictcomp
```

Source	SS	df	MS
Model	20.0409376	1	20.0409376
Residual	43.3362053	110	.393965502
Total	63.3771428	111	.570965251

Number of obs	=	112
F(1, 110)	=	50.87
Prob > F	=	0.0000
R-squared	=	0.3162
Adj R-squared	=	0.3100
Root MSE	=	.62767

perf	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
ictcomp	.5172809	.0725265	7.13	0.000	.3735504	.6610113
_cons	[illegible]	[illegible]	[illegible]	0.000	[illegible]	[illegible]

Source: Field Survey, 2022

Table 4.3 showed the regression results of the relationship between ICT and quality of service delivery of the selected commercial banks in Edo and Delta States. The R-Squared is 0.3162, suggesting that the independent variable explains about 31.62% of the systematic variations in the dependent variable. The f-ratios indicate that there is significant relationship between information and communication technology and quality of service delivery of the selected commercial banks in Edo and Delta States (F = 50.87) and the relationship is positive (t=7.13; p-value=0.0000).

Based on the results, the null hypothesis was rejected while the alternate hypothesis was accepted, suggesting that Information and communication technology (ICT) has significant influence on the quality of service delivery of commercial banks. Findings are well corroborated with the results of Bhattacherjee and Hirschheim (2017); Odiri (2020); Heinz (2022); and Herweijer, Combes, Jackson, Johnson, McGargow and & Bhardwaj (2020) who found that ICT contributes significantly and positively to organizational performance.

Table 4.4: Regression Result for for Relationship between ICT and Productivity

Source	SS	df	MS		
Model	16.0067719	1	16.0067719	Number of obs =	112
Residual	47.370371	110	.430639736	F(1, 110) =	37.17
				Prob > F =	0.0000
				R-squared =	0.2526
				Adj R-squared =	0.2458
Total	63.3771428	111	.570965251	Root MSE =	.65623

perf	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ict	[illegible]	[illegible]	6.10	0.000	[illegible]	[illegible]
_cons	[illegible]	[illegible]	[illegible]	0.000	[illegible]	[illegible]

Source: Field Survey, 2022

Table 4.4 showed the regression results of the relationship between ICT and productivity of the selected commercial banks in Edo and Delta States. The R-Squared is 0.2526, suggesting that the independent variable explains about 25.26% of the systematic variations in the dependent variable. The f-ratio indicates that there is significant relationship between ICT and productivity (F = 37.17) and that the relationship is significant and positive (t=6.10; p-value=0.0000).

On this note, the null hypothesis was rejected while the alternate hypothesis was accepted, suggesting that information and communication technology has significant effect on productivity of commercial banks. Findings are well corroborated with the results of Bhattacherjee and Hirschheim (2017); Odiri (2020); Heinz (2022); and Herweijer, Combes, Jackson, Johnson, McGargow and & Bhardwaj (2020) who found that ICT contributes significantly and positively to organizational performance.

Table 4.5: Regression Result for Relationship between ICT and Customers' Base

Source	SS	df	MS		
				Number of obs =	112
				F(1, 110) =	78.70
Model	26.4315897	1	26.4315897	Prob > F =	0.0000
Residual	36.9455531	110	.335868665	R-squared =	0.4171
				Adj R-squared =	0.4118
Total	63.3771428	111	.570965251	Root MSE =	.57954

perf	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
[illegible]	[illegible]	[illegible]	[illegible]	0.000	[illegible]	[illegible]
_cons	[illegible]	[illegible]	6.92	0.000	[illegible]	[illegible]

Source: Field Survey, 2022

Table 4.5 showed the regression results of the relationship between ICT and customers' base of the selected commercial banks in Edo and Delta States. The R-Squared is 0.4171, suggesting that the independent variable explains about 41.71% of the systematic variations in the dependent variable. The f-ratio indicates that there is there is significant relationship between ICT and customers' base of the selected commercial banks in Edo and Delta State (F =78.70) and that the relationship is positive (T=8.87; p-value=0.0000).

Based on the results above, the null hypothesis was rejected while the alternate hypothesis was accepted, suggesting that information and communication technology has significant effect on the customers' base of commercial banks. Findings are well corroborated with the results of Bhattacherjee and Hirschheim (2017); Odiri (2020); Heinz (2022); and Herweijer, Combes, Jackson, Johnson, McGargow and & Bhardwaj (2020) who found that ICT contributes significantly and positively to organizational performance.

Conclusion and Recommendations

This study investigated whether ICT serve as a determinant of organizational performance of some selected commercial banks in Edo and Delta States. In this study, three (3) dimensions of organizational performance (quality of service delivery, productivity and customers' base) were employed. Primary data (questionnaire) was the major instrument of data collection and the simple regression was used in analyzing the data obtained in the field survey. On the basis of the regression results, the study concludes that there exist, a positive and significant relationship between information and communication technology (ICT) and the performance of organization. From the findings the study the following recommendations were made:

1. That commercial banks should expand information communication technology (ICT) tools usage in their business processes so as to become more competitive and improve service delivery to customers, enhanced productivity and customers' base.
2. That commercial banks should strengthen their policies and procedures on information and communication technology targeted at retaining IT staff.
3. That commercial banks should ensure an up-to-date training of IT staff to keep them abreast of current trends in the ICT environment.

Contributions to Knowledge

This study contributes to management literature by showing that ICT serve as a determinant of organizational performance among commercial banks in Edo and Delta States. In addition, the study contributes to knowledge by revealing that when commercial banks adequately and incessantly use ICT in their business processes, quality of service delivery, productivity and customers' base would increase, which in turn contributes to their aggregate performance.

References

Ally, M. (2019). Competency profile of the digital and online teacher in future education. *International Review of Research in Open and Distributed Learning, 20*(2), 302-318.

Bhattacherjee, A., & Hirschheim, R. (2017). IT and organisational change: Lessons from client/server technology implementation. *Journal of General Management*; *23*(2), 31-46.

Bostwick, T. & Kyte, F. (1985). Research methods: Quantitative and qualitative approaches. *African Centre for Technology Studies* Nairobi

Brynjolfsson, E. & Hitt, L. (2016). IT as a factor of production: The role of differences among firms. *Economics of Innovation and New Technology*, *1*(3) 183- 199.

Butler-Adam, J. (2018). The fourth industrial revolution and education. *South African Journal of Science, 114*(5/6), 1–1.

Carvalho, N., Chaim, O., Cazarini, E., & Gerolamo, M. (2018). Manufacturing in the fourth industrial revolution: A positive prospect in sustainable manufacturing. *Procedia Manufacturing, 21,* 671-678

Davis, F. D. (1989), Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly, 13* (3), 319-340

Dennis, E. (2017). Information systems for sustainable competitive advantage. *Information and Technology.*

Diewert, W.E. & Smith, A.M. (2022). Productivity measurement for a distribution firm. *Journal of Productivity Analysis*, *5*(4), 335-347.

Donaires, O.S., Cezarino, L.O., Caldana, A.C.F., &Liboni, L. (2018). Sustainable development goals – an analysis of outcomes. *Kybernetes, 48*(1), 183–207.

Feeny, D. F., & Willcocks, L. P. (2018). Core capabilities for exploiting information technology. *Sloan Management Review*, Spring, *39*(3), 9-21.

Habanik, J., Grencikova, A., &Krajco, K. (2019). The impact of new technology on sustainable development. *Engineering Economics, 30*(1), 41–49.

Hacker, D., & Saxton, G.D. (2017). The strategic use of information technology by nonprofit organization: Increasing capacity and untapped potential. *Public Administration Review*, *67*(3), 474-487.

Harris, S. E. & Katz, J. L. (2021). Organizational performance and information technology investment intensity in the insurance industry, *Organizational Science*, (3), 263-296.

Heinz H, (2022). Determinant of information and communication technology; An empirical analysis based on firm-level data for the Swiss Business Sector. *Journal of Technology, 3,* 125-134.

Herweijer, C., Combes, B., Jackson, B., Johnson, L., McGargow, R. & Bhardwaj, S. (2020). Enabling a sustainable fourth industrial revolution: How G20 countries can create the conditions for emerging technologies to benefit people and the planet. *G20 Insights,* pp.1-17

Hidayatno, A., Destyanto, A.R., & Hulu, C.A. (2019). Industry 4.0 technology implementation impact to industrial sustainable energy in Indonesia: A model conceptualization. *Energy Procedia, 156,* 227–233.

Hobday, M. (2018). The project-based organisation: An ideal form for managing complex products and systems*? Research Policy*, *29* (7-8), 871-893

Hughes, L., Dwivedi, Y.K., Misra, S.K., Rana, N.P., Raghavan, V., &Akella, V. (2019). Blockchain research, practice and policy: Applications, benefits, limitations, emerging research themes and research agenda. *International Journal of Information Management, 49,* 114–129.

Iyadi, R. C. & Edeme, N. C. (2022). Organizational culture and consumer buying behaviour: A focus on fashion industry in Nigeria. *Journal of Xidian University, 16*(12), 663-674.

lyadi, R. C (2022). Customer Relationship Management and Its Effect on Business Growth: A Focus on Microfinance Banks in Delta State, Nigeria. *International Journal of Academic Accounting, Finance & Management Research(IJAAFMR), 6*(7), 33-44.

Jia, M., Komeily, A., Wang, Y., & Srinivasan, R.S. (2019). Adopting internet of things for the development of smart buildings: A review of enabling technologies and applications. *Automation in Construction, 101,* 111– 126.

Kinuthia S.M. & Rotich G. (2015). Influence of information and communication technology implementation factors on procurement performance in public sector: A case of Kenya power and lighting company limited. *International Journal of Social Sciences Management and Entrepreneurship,2*(1), 248-261

Kinuthia, J., (2022). *Information technology investment and performance of NGOS in Kenya*, (unpublished Master's Thesis).University of Nairobi.

Kohnová, L., Papula, J., &Salajová, N. (2019). Internal factors supporting business and technological transformation in the context of Industry 4.0. *Business: Theory & Practice, 20,* 137–145.

Loveman, G.W (2022). An Assessment of the organizational performance Impact on information technologies. *MIT Management, 1*(1), 88-054.

Luthra, S., &Mangla, S.K. (2018). Evaluating challenges to Industry 4.0 initiatives for supply chain sustainability in emerging economies. *Process Safety and Environmental Protection, 117,* 168–179.

Marmouse, C. (2017). Performance în Encyclopédie, *Les Editions d'Organisation*, Paris. London: Macmillan Publishers

Namusonge, G.S. (2016). Influence of information technology practices in procurement on organization performance in public institutions in Kenya: a case of Jomo Kenyatta University of agriculture and technology. *International Journal of Economics, Commerce and Management, 4*(5), 484-502

Odiri, V.I.O. (2020). Information communication technology and organizational performance: Experience from Nigerian manufacturing subsector. *Journal of Social and Management Sciences, 15*(1), 92-98

Peansupap, V. & Walker, D. H. T. (2015) Factors affecting ICT diffusion: A case study of three large Australian construction contractors. *Engineering Construction and Architectural Management, 12*(1), 21-37

Popovic, A. (2020). Implications of the fourth industrial revolution on sustainable development. *Society of Economist, 4*(2), 45-60

Porter, M.E. & Millar, V.E. (2022). How information gives you competitive advantage. *Harvard Business Review*, July-August, 63(4), 149-160.

Pourmirza, A (2016). Adoption of internet banking by Iranian customers. *Department of Business Administration and Social science,* Lulea University of Technology, Masters Theses.

Roblek, V., Thorpe, O., Bach, M.P, Jerman, A. &Meško, M (2020). The fourth industrial revolution and the sustainability practices: A comparative automated content analysis approach of theory and practice. *Sustainability, 12,* 1-27

Sanchez, D.O.M. (2019). Sustainable development challenges and risks of industry 4.0: A literature review. *2019 Global IoT Summit (GIoTs),* pp.1-6.

Sohail, A., Rextina, G., Ahmed, T. &Tamimy, M.I. (2020). The fourth industrial revolution in the developing nations: Challenges and road map. *Research Paper,* No. 102, South Centre, Geneva, pp. 1-45

Stock, T., Obenaus, M., Kunz, S., & Kohl, H. (2018). Industry 4.0 as enabler for a sustainable development: A qualitative assessment of its ecological and social potential. *Process Safety and Environmental Protection, 118,* 254-267

United Nations Conference on Trade and Development (UNCTAD, 2018). The 'fourth industrial revolution' can power sustainable development if we get it right. *Thomson Reuters Foundation News,* 3rdMay, pp.1-2

Wachira, D.M., Muturi, P.N. & Sirma, J. (2022). An evaluation of the perceived effect of ICT's on the performance of Sacco's in Kenya: Case of licensed Sacco's, Nairobi county. *Information and Knowledge Management, 4*(12), 14-32

Wilson, M.N., Iravo, M.A., Tirimba, O.I. & Ombui, K. (2015). Effects of information technology on performance of logistics firms in Nairobi county. *International Journal of Scientific and Research Publications,* 5(4), 1-26

Xue, L., Weng, L., & Yu, H. (2018). Addressing policy challenges in implementing sustainable development goals through an adaptive governance approach: A view from transitional China. *Sustainable Development, 26*(2), 150–