Information Technology Adoption and Operational Performance of Small and Medium Enterprises in Rivers State, Nigeria

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Abstract
This study investigated information technology adoption (IT adoption) and operational performance of Small and Medium Enterprises in Rivers State, Nigeria. Data was collected from 103 SMEs owners and managers. Three hypotheses were tested with the Partial Least Squares-Structural Equation Modeling (PLS-SEM), with the aid of SmartPLS 3.2.6, while ordinal regression was used to determine the combined effect of the exogenous variables on the endogenous variable. Results indicated that Information Technology Adoption promotes Operational Performance, wherein information technology infrastructure and technology alignment moderately amplify operational performance, while individual learning had a weak effect. The study recommends that SMEs should invest more on information technology hardware and software, and also see modern internet applications as a gateway to operational performance. They should also have a mechanism that strengthens customer service and improve process management. Furthermore, quality training should be given to employees in order to learn and adopt modern IT systems and applications.

Keywords: Individual Learning, Information Technology Adoption, Information Technology Infrastructure, Technology Alignment, Operational Performance

1.0 Introduction
Organisations are very much interested in operational performance (Kazakov, Ruiz-Alba & Munoz, 2020) because that is the means by which they efficiently utilize resources (Ali, Younus, Khan & Pervez, 2020), manufacture products or deliver services that meet expected requirements and standards, and take these products or services to the market on a timely basis, while responding to uncertainties and environmental changes within acceptable costs. Operational performance (OP) is the backbone of organisational performance (Salem, 2003). Operational performance refers to the ability of a company to reduce management costs, order-time, lead-time, improving the effectiveness of using raw material, and distribution capacity (Heizer, Render & Weiss, 2008). Furthermore, Chavez, Yu, Gimenez, Fynes and Wiengarten (2015) posited that operational performance is a strategic dimension that enables firms to gain competitive edge.

A better operational performance is known to improve effectiveness of production activities, create high-quality products, services and processes (Kaynak, 2008), satisfy more customers or clients (Ou, Liu, Hung & Yen, 2010) and, increase revenue and profit (Markus Bottcher, 2015). Operational performance enhances organisations’ ability to maintain the standards of their products and services and adjust to timely delivery in accordance with associated costs (Hill, 2000; Slack, 2004).

Information Technology Adoption (IT adoption) is a basic field of study in several types of organisations, and small and medium-sized enterprises (SMEs) are of no exception. Due to the numerous advantages of IT, most Small and Medium Enterprises (SMEs) are adopting IT applications to support their businesses and improve performance (Karakara & Osabuohien, 2020). IT adoption by SMEs differs from larger organisations because of their specific characteristics, such as resources constraints. Due to IT adoption, the implementation and application of IT is a significant driving force behind many operational performance (Dierckx & Stroecken, 1990). According to Venkatraman (1989), IT adoption helps to strengthen customer service and improve product
and service quality. It is also a source to modern internet applications (Bharadwaj, 2000), and helps employees to quickly learn and adopt new technologies/applications (Chonko, Dubinsky, Jones & Roberts, 2003). Moreover, IT adoption leads to costs reduction, while enhancing the value of products and services, business process and the competitive position of firms (Corso, Martini, Pellegrini & Paolucci, 2003; Acar, Koc,ak, Sey & Arditi, 2005; Nguyen, Sherif, & Newby, 2007; Nguyen, 2009).

In this study, IT adoption is viewed as a construct that comprises Information Technology Infrastructure (Bharadwaj, 2000), Technology Alignment (Venkatraman, 1989; Palmer & Markus, 2000), and Individual Learning (Chonko, Dubinsky, Jones & Roberts, 2003).

Information Technology Infrastructure is significant in the use of modern internet applications by organisations (Bharadwaj, 2000). It is also significant to firms by supplying the required infrastructure, which is necessary in providing appropriate types of information (Sircar, Turnbow & Bordoloi, 2000). It also enables different departments or units share information as well as adoption of new internet applications (Weill, Subramani & Broadbent, 2002). IT tools significantly assist SMEs through supplying required infrastructure necessary for providing appropriate types of information at the right time (Bhagwat & Sharma, 2007).

Technological alignment serves as a network for information technology adoption and operational performance (Venkatraman, 1989). It is also an avenue to actualize design and improvement of products, customer service, and high operational performance (Chan, Huff, Barclay & Copeland, 1997). Furthermore, it aids the updating of information technology applications for business strategic goals and business processes (Palmer & Markus, 2000). MacGregor and Vrazalic (2005) submitted that in spite of exponential growth of IT within SMEs, the rate of IT adoption and technology alignment by these businesses have remained relatively low.

Thong (1999) submitted that with a greater number of learned employees, there will be reduction of uncertainty associated with IT which will result in lower risk of IT adoption. Individual learning helps employees to acquire knowledge and proficiency in the use of IT adoption/applications and the overall building of human capacity (Zahra & George, 2002, Looi, 2005).

There are compendia of studies on the link between IT adoption and other constructs in various sectors, including SMEs (e.g. Ghobakhloo, Hong, Sabouri, & Zulkifli, 2012; Hassan & Ogundipe, 2017; Agwu, 2018) and in service and manufacturing firms (Ghobakhloo, Benitez-Amado & Arias-Aranda, 2011). Links have been established between IT adoption and innovation (Chen & Tsou, 2007), and employee productivity (Al-Nashmi & Amer, 2014). However, prior studies have shown that only a small number of studies focused on the operational performance benefits of IT adoption in SMEs (Grandon & Pearson, 2004), and in Nigerian environment (Olusola & Oluwaseun, 2013). In addition, the few empirical studies on IT adoption and operational performance in developed countries have mixed/ conflicting findings.

More recently, in the Nigerian business context, Okundaye, Fan and Dwyer (2019) researched on the role of information and communication technology adoption in SMEs and its inhibiting factors, but the study was not empirical in nature. We believe that a study on such critical variable should pass through empirical scrutiny. Our study fills these gaps by granularly investigating the relationship between information technology adoption and operational performance in Small and Medium Enterprises, using robust statistical tools such as Partial Least Square Structural Equation Modeling (PLS-SEM) and Ordinal Regression.

Small and Medium Enterprises (SMEs) are major players in the development of many nations (Eniola & Olorunleke, 2020). Specifically, they are useful in employment generation, provision of goods and services, creating a better standard of living as well as immensely contributing to the Gross Domestic Products (GDP) of countries (Aremu, 2010). According to Božić and Radas (2009), SMEs account for 60% - 70% of employment in developed and developing economies, while those in developing nations provide about 45% of total
employment and 33% of Gross Domestic Product (Toluyemi, Mubarak & Temitope, 2016). In developing countries, almost a hand full (90%) of business firms are SMEs.

In a bid to boost and stimulate the ailing SMEs sector, the Federal Government of Nigeria provided funds to sustain small businesses and their operations. These funds were provided through agencies such as the Bank of Agriculture (BOA), Small and Medium Enterprises Equity Investment Scheme (SMEEIS), Bank of Industry (BOI), and Small and Medium Enterprises Development Agency (SMEDAN) (Kayode & Ilesanmi, 2014). These agencies and specialized institutions have provided fiscal incentives, grants, human capacity trainings and aids geared towards stimulating the operations of SMEs in Nigeria.

Despite these interventions, SMEs in Nigeria still wallow in the pit of underperformance in terms of their operations. Manifest signs of lackluster operational performance of SMEs include (i) inability to respond to uncertainties and environmental changes, (ii) slow response to requisition from stakeholders, (iii) inability to produce quality goods or services, and (iv) inability to minimize operational cost/activities (Toluyemi, Adigbole & Kasum, 2015).

Onugu (2005) averred that the operational performance of SMEs in Nigeria has been slow due to a number of challenges confronting the sector. Some of the problems highlighted include: insufficient technology applications; deplorable infrastructural facilities; inadequate managerial and entrepreneurial skills; recruitment of incompetent employees; financing challenges; limited demand for their products and services; limited capacity for research and development; as well as lack of interest and focus from government in addressing the specific factors responsible for the abysmal performance of the sector.

Following the above, we posit that IT adoption will promote operational performance of SMEs because it will assist employees and managers to be acquainted with modern internet operations, improved products and service, and the adoption of new information technology applications/software. This argument is reinforced by the submission of Chen and Tsou (2007) that in adopting information technology, a firm begins to use it in a comprehensive and integrated manner to support its operations. It is therefore expected that higher levels of IT adoption could increase the operational performance of SMEs in Rivers State. This study, therefore, investigates the operational performance of SMEs in Rivers State through the explanatory lens of information technology adoption.
Conceptual framework of the study

Based on the foregoing, a conceptual framework is developed as shown below

![Conceptual Framework Diagram]

**Figure 1.1:** A conceptual framework on the relationship between Information Technology Adoption and Operational Performance. Information Technology Adoption (independent variable) - adapted from Bharadwaj (2000), Venkatraman (1989), and Chonko, Dubinsky, Jones and Roberts (2003). Operational Performance (Dependent variable) – adapted from Hill, 2000; Slack, 2004.

The following hypotheses are formulated for this study.

**H₀₁:** There is no significant relationship between information technology infrastructure and operational performance.

**H₀₂:** There is no significant relationship between technology alignment and operational performance.

**H₀₃:** There is no significant relationship between individual learning and operational performance.

The rest of the paper follows a trajectory as given below:

i). A literature review on the theories that explain IT adoption, the concepts of IT adoption (and its dimensions), operational performance, and empirical review.

ii). The methodology which comprises population and sampling, data collection, questionnaire design and operational measures of variables, and data analysis techniques.

iii). Results and Discussion which consists of the outputs on demographic aspects, descriptive and tests of hypotheses and discussion of the findings in line with findings of previous studies.

iv). Conclusion, recommendations, limitations of the study and suggestions for future research.

2.0 Literature Review

2.1 Baseline Theories
2.1.1 Technological Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was advanced by Davis (1985) to explain computer usage behavior. It is an adaptation of Fishbein and Azjen’s (1975) Theory of Reasoned Action (TRA), which has been successful in predicting and explaining behavior in general (Yi & Hwang, 2003). There are two major determinants in TAM, namely Perceived Usefulness (PU), which refers to “the degree to which a person believes that using a particular system would enhance his or her job performance” and Perceived Ease of Use (PEOU), which refers to “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p. 320). This model helps organisations to predict, explain, analyze and exploring factors influencing the adoption of information technology (Liao, Hong, Wen, Pan & Wu, 2018). The theory suggests that decision to adopt IT or use a given technology in an organization depends on the discretion of the potential user, who considers factors such as perceived ease of use and usefulness (Manueli, Latu, & Koh, 2007). In this study, the managers or owners of SMEs will adopt IT if they perceive that the IT to be adopted will bring about desirable outcomes and will be easy to use.

2.1.2 Goal Setting Theory

Locke (1968) - the originator of the Goal Setting Theory - opined that goals and objectives which employees establish motivate them to perform at work. According to him, employees who set goals go an extra mile to see that their goals are achieved and objectives are met. If these objectives are not achieved, they will either modify the objectives to make them more achievable, or they will step up their level of performance. Bratton, Callinan, Forshaw and Sawchuk (2007) submit that “achieving goals is a basic expectation of every human activity” (p. 6). The goal concept encompasses the specific destination of service delivery, which is the purpose of effort being made at every organisational level, whether done by a single employee, a team, a department or the whole organisation (Oracle, 2012).

Operational Performance is improved by specific and ambitious goals in comparison to easy or general goals. If an enterprise manager accepts a set goal, has the capability to attain it and is not disoriented by conflicting goals, the expected outcome is a positive linear relationship between goals and performance (Locke 1968). The theory is significant to this study because it explains the relationship between IT adoption (goal) and operational performance.

2.2 Information Technology Adoption

Information Technology (IT) is a vital factor behind many socioeconomic changes (Dierckx & Stroeken 1999). Carr and Smeltzer (2002) defined IT as the use of automated purchasing systems, supplier links through electronic data interchange (EDI), computer-to-computer links with key suppliers and finally information systems. Information Technology Adoption (IT adoption) is viewed by Tan, Chong, Lin and Eze (2009) as application of Information and Communication Technologies (ICT) tools including computer hardware, software, and networks required for connecting to the internet. Similarly, Yan, Yingwu and Changfeng (2007) postulated that IT adoption is the application of information, computing and communication infrastructure such as computer hardware, software, and networks as a means for connecting to the global village.

The adoption of IT helps to generate new business opportunities and also enhances the competitive position and profitability of organisations (Premkumar & Roberts, 1999). According to Olusola and Oluwaseun (2013), IT adoption increases efficiency and productivity in diverse ways leading to lower transaction cost, better resource allocation and technical improvements. According to Chen, Wang, Nevo, Benitez and Kou (2015), firms adopt IT because “it supports firms’ rapid product development, and collection and dissemination of market, product and process information to respond effectively to unanticipated changes in the business environment” (p. 2). Furthermore, the significance of IT adoption include: improvement in decision-making (Molloy & Schwenk, 1995), organisational flexibility (Sambamurthy, Bharadwaj & Grover, 2003), reduction of production and
2.2 Dimensions of Information Technology Adoption

2.2.1 Information Technology Infrastructure

Information Technology Infrastructure (ITI) is a set of shared IT resources that are technical/physical (hardware, software, technological resources for communications, data, and core applications) or human (skills, knowledge, aptitude, attitudes, competencies, commitments, values, and norms) geared towards creating hard-to-copy IT services for a firm (Byrd & Turner, 2000). For Davenport, Hammer and Metsisto (1989), IT infrastructure comprises electronic data interchange and shared databases, networks, and research and development to identify emerging technologies. According to Weill and Broadbent (1998), a huge part of an organisation’s information technology budget is spent on information technology infrastructure. The significance of ITI includes: sharing of information and linking activities across different departments, and adoption of new internet applications. (Weill et al., 2002). Moreover, IT infrastructure enables firms to execute tasks with speed and flexibility, generate requisite varieties, acquire relevant knowledge to seize emergent opportunities and briskly respond to customers’ tastes and preferences. For a successful adoption of information technology, sufficient investment and management of information technology infrastructure is paramount (Tallon & Pinsonneault, 2011).

2.2.2 Technology Alignment

Technology alignment is the degree to which the information technology adopted is integrated with the all functional domains of the business. It is the extent to which the Information Technology supports or stifles business processes, mission, objectives and plans. Palmer and Markus (2000) submitted that the impact of information technology on the performance and success of a firm depends on how well Information Technology coincides with business strategy, structure and processes. Similarly, Byrd, Lewis and Bryan (2006) submit that profitability and revenue of firms can only improve not by embracing IT, but by ensuring a congruence between IT and business strategies. Henderson and Venkatraman (1993) argue that firms can be successful in aligning their information technology and business goals by complementing their business and information technology domains (Henderson & Venkatraman 1993). Furthermore, Venkatraman (1989) averred that technology alignment aids in updating applications for business strategic goals, deploy information for business processes, and is positively associated with effective operational performance (Chan et al., 1997).

2.2.3 Individual Learning

Individual learning could be viewed as “self-driven learning activities that are undertaken by individuals without directly interacting with others. These reflect a more private, introspective and independent learning process, and are strongly dependent on individual’s experience, motivation and ability” (Chen, Nunes, Ragsdell & An, 2019, p. 936). It is an “exclusive and habitual manner of acquiring knowledge, skills and attitude development” (Kusemererwa, Munene, Laura and Balunywa, 2020, p. 374). Enterprise managers have to inculcate individual learning behavior in order to adapt and respond to the dynamic and multifaceted business environment (Kusemererwa, et al., 2020). Several scholars revealed that for organisations to effectively take advantage of information technology, both end-users as well as information technology personnel must acquire modern information technology-related skills and knowledge (Scott Morton, 1995; Grover, Fiedler & Teng, 1999). Individual Learning (IL) requires organisations to adapt and provide employee support and training. It is an avenue to quickly learn modern IT applications (Van Riel, Lemmink & Ouwersloot, 2004), improve personal skills and competences, aid work effectiveness (Chonko, Dubinsky, Jones & Roberts, 2003) and optimize enterprise performance.

2.2.4 Operational Performance

Operational performance (OP) is a basic component of organisational performance (Nkrumah, Apam & Boadu, 2020). According Schroeder, Shah and Xiaosong Peng (2011), OP is the level of achievement (competitive

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The observable properties of operational performance border on the capacity of the organisation to improve in terms of quality of products and services, cost, inventory minimization productivity, timeliness and flexibility of delivery, procurement lead time, schedule attainment, efficiency, dependability, innovation, customer satisfaction, new product development and time-to-market for new products (see Corbett & Van Wassenhove, 1993; Samson & Terziogski, 1999; Frohlich & Westbrook, 2001; Rosenzweig, Roth & Dean 2003; Hallgren & Olhager, 2009; Slack, Chambers & Johnston, 2010; Fawcett et al., 2011; Danese, 2013; Devaraj, Ow & Kohli, 2013; Jabbour et al., 2013; Nawanir, Teong & Othman, 2013; Wiengarten, Humphreys, McKitrick & Fynes, 2013; Abdallah, Anh, & Matsui, 2016; Moyano-Fuentes, Sacristán-Díaz & Garrido-Vega, 2016). In this regard, Heizer, Render and Weiss (2008) posit that operational performance is the ability of an organization to reduce operational costs, optimally utilize resources, and meet order cycle and delivery time. Benefits of Operational performance include is efficiency and effectiveness of production process, improvement of quality of products and services, higher level of customer satisfaction, profits and revenue (Truong, Sampaio & Fernandes, 2014).

2.2.5 Empirical Review
Abdullahi, Shehu and Usman (2019) investigated the impact of information technology adoption on organizational productivity in the Nigeria banking industry. Questionnaire was employed with 140 respondents as the sample size, while multiple regression analysis was used to test the hypotheses. Results indicated that hardware, software and network components have significant and positive impact on organizational productivity in the Nigeria banking industry ($\beta = 0.269, t = 5259, P < 0.000$); ($\beta = 0.82, T = 2485, P < 0.000$). The study recommends that banks should acquire or make use of modern software, hardware, and network in order to increase organizational productivity and customer satisfaction which will eventually resulted to diversification of the organization.

Jabbouria and Zaharib (2015) investigated the influence of information technology infrastructure on organizational performance through capabilities of information technology, core competencies and organizational performance in Iraqi private banks. Samples of 55 middle managers were used for the study. Data was analyzed with SPSS version 20 and Analysis of Moment Structure (AMOS) version 20. The result shows that all the variables are significantly related with each other. IT infrastructure on organizational performance ($\beta = 0.498, p < 0.001$), core competence and organizational performance ($\beta =0.304, p = 0.002$), and IT infrastructure and core competence. The relationship was positive significant in the model ($\beta = 0.363, p < 0.001$). It was found that infrastructure components of information technology can help individuals acquire skills and knowledge.

Lakodu, Osunwole and Olaoye (2013) investigated factors affecting IT adoption by SMEs in Nigeria. A questionnaire was used to collect data from 70 respondents. Data was analyzed with correlation coefficient and multiple regressions while estimation was done through Ordinary Least Squares (OLS) with the aid of STATA software. The result indicates that Infrastructure ($\beta = 0.714; t = 11.396; P <.05$) investment cost ($\beta = 0.083; t = 2.406; P <.05$) maintenance cost ($\beta = 0.150; t = 2.293; P <.05$) management support ($\beta = 0.222; t = 3.787; P <.01$) were significant joint predictors of IT adoption by SMEs in Nigeria. They concluded that SMEs in Nigeria have been slow in adopting IT as they face major constraints such as poor IT infrastructure, limited IT literacy, inability to integrate IT into business processes, high costs of IT equipment. The study recommends that management should play an important role in guiding and completing projects relating to IT adoption, by providing resources for the purchase of the infrastructures required for the new IT.

Sirirak, Islam and Ba Khang (2011) investigated the nexus between ICT adoption and performance of 152 hotels in Thailand. Multiple regression analysis was deployed in testing the hypotheses. It was found that that ICT adoption promotes operational performance of the hotels. Specifically, availability of IT components

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(infrastructure) amplified hotel performance ($R^2 = 0.416$, $p < 0.05$ for operational productivity; $R^2 = 0.046$, $p < 0.05$ for customer satisfaction). Also, integration (alignment) of ICT components enhances hotel performance ($R^2 = 0.371$, $p < 0.05$ for operational productivity; $R^2 = 0.037$, $p < 0.05$ for customer satisfaction). The study recommended that ICT should be adopted along with specific technologies that would improve hotel performance.

3.0 Methodology

3.1. Population and Sampling Method

The population of the study consists of all registered SMEs in Rivers State. Their addresses were retrieved from Rivers State Yellow Pages (a handbook of the Rivers State Ministry of Commerce and Industry, Block B, State Secretariat Complex, Port Harcourt, Rivers State). For convenience, we used the SMEs in Obio/Akpor Local Government Area as sample frame. The document reveals that a total of 434 registered SMEs operate in Obio/Akpor Local Government Area. We further reduced the scope to SMEs that have survived for 10 years and above. Also SMEs that have annual turnover between N5 million and N10 million were considered for the study. This resulted in having one hundred and three (103) registered SMEs that are still in business. Hence, a sample size of one hundred and three (103) owners/managers was used for this study. The sectors and numbers of owners/managers of SMEs considered for this study include: Fast Food Operators (14), Fashion Designers (15), agripreneurs (10) Laundry/Dry Cleaning Services (12), Supermarkets (33), Table Water Producers (9), and Telecommunication SMEs (10).

3.2. Data collection, Questionnaire Design and Operational Measures

We collected primary (responses of the questionnaire administered on the respondents) and secondary (journal articles and association records) data. We administered questionnaire through direct mode, email and survey monkey. Of the one hundred and three (103) copies of the questionnaire that were administered, 26 were rejected due to conflicting and incomplete information. The remaining 77 copies were used for analyses to determine the impact of information technology adoption on operational performance. The questionnaire has three sections. Section A contains six items concerning demographic information of the respondents (e.g., gender, age, marital status). Section B has eleven indicators on Information Technology Adoption. Information Technology Infrastructure has three indicators. Examples is “Has adopted modern internet applications” (Bharadwaj, 2000), Technology Alignment has four indicators; e.g. “Updates applications for business strategic goals” (Venkatraman, 1989), and Employee Learning has four items; e.g. “Adopt new applications for their work” (Chonko, Dubinsky, Jones & Roberts, 2003). Section C has 7 items that pertain to operational performance. Items 1-5 were adapted from Fawcett, Wallin, Allred, Fawcett and Magnan (2011), with “our company delivers products and services On-time and at due-date” as a sample item. The last two items (6 and 7) for operational performance were adapted from Devaraj, Ow and Kohli (2013) - e.g. “our company has minimal error during production or service delivery”. Apart from the demographic variables, all other indicators on the survey instrument were anchored on a five-point Likert scale of 1=Strongly Disagree to 5=Strongly Agree.

3.3 Data Analysis Techniques

We utilized the Statistical Package for Social Sciences (SPSS) version 27 to compute descriptive statistics (frequencies and percents). We also computed the means of the latent variables and assessed the validity and reliability of the instrument based on the sample observations. In addition, ordinal regression is used to determine the combined effect of the exogenous variables on the endogenous variable. This tool is suitable because the model fulfills the following conditions: (i) The endogenous variable is measured on an ordinal level, (ii) One or more or all of the exogenous variables are continuous, categorical or ordinal. Furthermore, multi-collinearity is tested before the final analysis (McCullagh, 1980). Finally, we evaluated the three hypotheses (Ho1- Ho3) using Partial Least Square-Structural Equation Modelling (PLS-SEM), with the aid of
4.0 Results and Discussion

4.1 Demographic Characteristics of respondents

A total of 103 copies of the questionnaire were administered to owners/managers of the registered SMEs that indicated interest in the study. Seventy seven (77) copies of the questionnaire were correctly filled and were used for analysis. Below is table 4.1 showing the demographic characteristics of the respondents.

<table>
<thead>
<tr>
<th>Table 4.1: Demographic Characteristics of the respondents</th>
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</thead>
<tbody>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>20-35</td>
</tr>
<tr>
<td>36-50</td>
</tr>
<tr>
<td>51-above</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Marital Status</td>
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<tr>
<td>Single</td>
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<tr>
<td>Married</td>
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<tr>
<td>Separated</td>
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<tr>
<td>Divorced</td>
</tr>
<tr>
<td>Total</td>
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<tr>
<td>Educational Qualification</td>
</tr>
<tr>
<td>WAEC-OND</td>
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<tr>
<td>HND/Bachelor</td>
</tr>
<tr>
<td>Masters above</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Position in the Organisation</td>
</tr>
<tr>
<td>Owners</td>
</tr>
<tr>
<td>Managers</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Research Data (SPSS Output) 2020

Table 4.1 shows the demographic details of the 77 respondents that participated in the study. For gender distribution, result shows that 69 respondents (89.6%) were males and 8 (10.4%) females. For age, respondents within 20-35 age brackets were the least with only 6 respondents (7.8%), while 51 years and above were the highest with 53 (68.8%). Respondents between the age brackets of 36-50 were 18 (23.4%) representing the total number of respondents. For marital status, 62 respondents (80.5%) were married, 12 (15.6%) were single, 2 (2.6%) were separated, while 1 (1.3%) was divorced. On highest level of educational attainment, 58 respondents (75.3%) have Higher National Diploma and Bachelor Degree, 14 respondents (18.2%) have Master Degree and above, while 5 respondents (6.5%) have The West African School Certificate and Ordinary National Diploma. Furthermore, for position in the organisation, there are 26 owners, representing 33.8% of the total number of respondents, while 51 (66.2%) are managers.

Next is table 4.4 which shows the output for means of the variables with validity and reliability

<table>
<thead>
<tr>
<th>Table 4.2: Descriptive analysis and Test of Validity, Reliability</th>
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</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>ITI</td>
</tr>
<tr>
<td>TA</td>
</tr>
<tr>
<td>IL</td>
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<tr>
<td>OP</td>
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</table>

SmartPLS 3.2.6 (Ringle, Wende & Becker, 2015). There is no issue using PLS-SEM because it is approachable for small sample size and is distribution free (Hair Jr., Babin & Krey, 2017).
Results from table 4.2 show that all dimensions of IT adoption (Information Technology Infrastructure, Technology Alignment and Individual Learning) manifest moderately in the enterprises. Also, the managers and owners perceived a low level of operational performance.

In addition, internal consistency reliability values are not below 0.7 or above 0.9 (Hair Jr., Babin & Krey, 2017) as Cronbach's alphas range from 0.734 to 0.813 thus satisfying condition for reliability (Hair et al., 2017). Furthermore, the Average Variance Extracted (AVE) – the measure of convergent validity - is above the recommended 0.50 threshold (Fornell & Larcker, 1981). Also, since the square roots of the AVEs (diagonal values in bold) are higher than 0.70, and are far greater than the correlations between the constructs (the off-diagonal figures), it is could be inferred that the model exhibits discriminant validity. Thus, each construct is sufficiently distinct from any other one (Fornell & Larcker, 1981).

Table 4.3 shows the output for the ordinal regression test.

Table 4.3: Ordinal Regression Test

<table>
<thead>
<tr>
<th>Dimension factor</th>
<th>Wald Statistic</th>
<th>Sig.</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Technology Infrastructure</td>
<td>13.34</td>
<td>0.002</td>
<td>3.742</td>
</tr>
<tr>
<td>Technology Alignment</td>
<td>8.267</td>
<td>0.001</td>
<td>3.313</td>
</tr>
<tr>
<td>Individual Learning</td>
<td>9.142</td>
<td>0.000</td>
<td>4.093</td>
</tr>
</tbody>
</table>

Source: Research Data (SPSS Output) 2020

Table 4.4 shows that there is no problem of multi-collinearity since the Variance Inflation Factors (VIF) for all the latent variables are less than 5 (Craney & Surles, 2002) (ITI = 3.742, TA = 3.313, and IL = 4.093). Moreover, -2 Logistic Likelihood for Intercept Only (61.211), Final score (106.334), Chi-Square (67.374), and p-value of 0.01 report a good fit model between the dimensions of IT Adoption and Operational Performance. Also, the Goodness-of-Fit indices: Pearson (p = 0.763) and Deviance (p = 1.203) reveal p-values are greater than 0.05, signifying that there is a fit between the proposed model and the data. The table also shows Nagelkerke’s Pseudo $R^2$ of 0.454, indicating that all the dimensions of IT adoption jointly IT explained 45.4% of the variability in operational performance.

Furthermore, the parameter estimates for the dimensions of IT adoption as reported by Wald statistic showed the p-values are all less than 0.05 (ITI < 0.002, TA < 0.001, and IL<0.000), meaning that each dimension has significant effect on operational performance. Finally, Test of Parallel Lines for Proportional odds (PO) assumption (p = 0.117 > 0.05) reveals that the location parameters (slope coefficients) in the model are the same across response categories. This means that the correlation between IT adoption and operational performance does not change for operational performance categories, and parameter estimations do not change for cut-off points.

Next is the test of hypotheses using the path coefficient and t-statistic criterion. As a rule, path coefficients ($\beta$ values) of .10 to 0.29, .30 to .49 and .50 to 1.0 are weak, moderate and strong correlations, respectively (Cohen, 1988). Also, for a two tailed test, t values greater than 1.96 are significant, while t values less than 1.96 are non-significant (Hair, Hult, Ringle & Sarstedt, 2014). Table 4.4 shows the results of test for hypotheses.

Table 4.4: Test of Hypotheses

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The results above suggest that improvement in information technology infrastructure will moderately promote operational performance of SMEs in Rivers State. Thus, as owners/managers adopt new internet applications, it helps them to promptly meet delivery schedule and provide a better understanding for the required standard and specification of their products/service. All these are attainable because of the huge investment on software and hardware which has also helped to reduce operational cost and make the organisation withstand any disturbance that may occur. This finding is in accord with Bhagwat and Sharma (2007) who submitted that IT infrastructures significantly assist SMEs through supplying required applications or tools necessary for providing appropriate types of information at the right time.

According to the results above, an improvement in technology alignment will moderately promote operational performance of SMEs in Rivers State. This means that as owners/managers strive to maximize profit, they must update their IT applications and ensure that products and service meet the required specification, in order to maintain customer relation by ensuring quick delivery of products. This is in congruence with MacGregor and Vrazalic (2005) who found that in spite of exponential growth of IT within SMEs, the rate of IT adoption and technology alignment by these businesses has remained relatively low.

Furthermore, the results suggest that improvement in individual learning will strongly promote operational performance of SMEs in Rivers State. This means learning and adopting new IT applications gives employees the ability to responding to environmental uncertainties, deliver products/service as at when due, and also vital for maximization of profit. This is in tandem with Thong and Yap (1995) who demonstrated that owners and managers who are more knowledgeable about IT are more probable to adopt IT. Similarly, Thong (1999) submitted that with a greater number of learned employees there will be reduction of uncertainty entangled with IT which will result in lower risk of IT adoption.

5.0 Conclusion and Recommendations

This study investigated the nexus between information technology adoption and operational performance of Small and Medium Enterprises in Rivers State. The study empirically demonstrates that information technology adoption positively and significantly influences operational performance. Based on the findings, the study concludes that higher levels of information technology adoption amplify operational performance.

This study appears to be first to empirically investigate the relationship between Information Technology Adoption and operational performance of SMEs in Rivers State. The study concludes that information technology infrastructure and technology alignment moderately amplify operational performance of SMEs in Rivers State, while individual learning has a weak impact.

It means that the three dimensions of information technology adoption (information technology infrastructure, technology alignment and individual learning) are all germane. However, managers should be aware that IT Infrastructure has greater impact. Thus, in order for SMEs to maximize profit, they should understand that there...

Table 4.

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Path (Relationship)</th>
<th>Path (β)</th>
<th>Coefficient Standard Deviation</th>
<th>r-Statistic</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>H01:</td>
<td>ITI -&gt; OP</td>
<td>0.476</td>
<td>0.076</td>
<td>2.131</td>
<td>Not supported</td>
</tr>
<tr>
<td>H02:</td>
<td>TA -&gt; OP</td>
<td>0.463</td>
<td>0.064</td>
<td>2.223</td>
<td>Not supported</td>
</tr>
<tr>
<td>H03:</td>
<td>IL -&gt; OP</td>
<td>0.226</td>
<td>0.055</td>
<td>1.982</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

Source: SmartPLS 3.2.6 output on research data, 2020

Table 4.4 shows that there is a moderate, positive and significant relationship between information technology infrastructure and operational performance (β = 0.476, t = 2.131); a moderate, positive and significant relationship between technology alignment and operational performance (β = 0.463, t = 2.223); and a weak, positive and significant relationship between individual learning and operational performance (β = 0.246, t = 1.982). Therefore, H01, H02 and H03 were not supported.

Furthermore, the table shows that information technology infrastructure has the highest effect on operational performance followed by technology alignment, whereas individual learning is the lowest as revealed in their β-values (ITI=0.476, TA=0.463 and IL=0.226).
is need to acquire more hardware and software, adopt modern internet applications, and their products ought be of high quality, and deliveries should be prompt. Also, SMEs should be able to respond to environmental changes by updating their IT applications for organisational strategic goals, strengthened customer service as well as deploying information for business processes.

Furthermore, the study underscores the need for employees to undergo training to quickly assimilate and adopt modern methods of work to enhance distribution of products and service, with the sole aim to minimize cost.

Based on the study, the following recommendations are made.

1) SMEs should invest richly on information technology hardware and software, and also see modern internet applications as a gateway to operational performance.

2) There should be technology or applications that supports improved products designed in compliance with certified manufacturing standard. Furthermore, organisations should have a mechanism that strengthens customer service and improve process management.

3) Quality training should be given to employees in order to learn and adopt modern IT systems and applications.

5.1 Limitations and Suggestions for Future Research

As it is with studies in management sciences, our research is not free from certain limitations.

Since the study was cross-sectional in nature, we administered at a snap shot, and so did not allow for collection of data across a longer time interval. This limits the capacity of the result to reveal the dynamic relationship between the variables. Future studies should be longitudinal in nature to mitigate this limitation.

This study was restricted to SMEs. Moreover, the geographical scope was restricted to Rivers State. Therefore, captains of industries in other sectors should be cautious of generalizing the findings as this study. Thus, further research may be extended to other sectors such as manufacturing and telecommunication industry. Future studies should also extend the scope to SMES in other regions of the country.

The study did not explore all the indicators of the study variables available in literature. Rather, only some were considered, thus making the study limited in depth of the constructs. Thus, future research should capture more dimensions and indicators of both IT adoption and operational performance.

References


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SECTION A

Personal Data:
1. Name of organisation .................................................................
2. Gender: Male Male Female
3. Age: 20-35 36-50 51 Above
4. Marital Status: Single Married Separated Divorced
5. Educational Qualification: WAEC-OND HND/B.Sc MSc and above
6. Position in the organisation ...........................................................
SECTION B

The statements below describe the **Information Technology Adoption** construct. Please tick one choice for each of the following statement that is applicable to your organisation.

(1=strongly disagree, 2=disagree, 3=neutral, 4= agree, 5= strongly agree)

<table>
<thead>
<tr>
<th>INFORMATION TECHNOLOGY ADOPTION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

**Information Technology Infrastructure**

*In the past three years, our company […]*

| ITI_1 | Allocates a substantial budget for purchasing hardware and software. |   |   |   |   |
| ITI_2 | Share information across different departments. |   |   |   |   |
| ITI_3 | Has adopted modern internet applications. |   |   |   |   |

*Technology Alignment*

*In the past three years, our company has supported technologies that […]*

| TA_1 | Strengthens customer service. |   |   |   |   |
| TA_2 | Updates applications for business strategic goals. |   |   |   |   |
| TA_3 | Improves process management. |   |   |   |   |
| TA_4 | Deploy quality information for business processes. |   |   |   |   |

**Individual Learning**

*In the past three years, our employees […]*

| IL_1 | Learn new applications quickly. |   |   |   |   |
| IL_2 | Adopt new applications for their work. |   |   |   |   |
| IL_3 | Display little resistance to adopting new information systems and applications. |   |   |   |   |
| IL_4 | Are given sufficient training while implementing new information technology systems and applications. |   |   |   |   |

SECTION C

The statements below describe the **Operations Management Capabilities** construct. Please tick one choice for each of the following statement that is applicable to your organisation.

(1=strongly disagree, 2=disagree, 3= neutral, 4= agree, 5= strongly agree)

<table>
<thead>
<tr>
<th>OPERATIONAL PERFORMANCE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fawcett, Wallin, Allred, Fawcett and Magnan (2011); Devaraj, Ow and Kohli (2013).</td>
<td>Our company […]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 1 | Is responsive to customer requests or unexpected challenges |   |   |   |   |
| 2 | Delivers products and services On-time and at due-date |   |   |   |   |
| 3 | Has cost of production and service delivery that is lower than that of competitors |   |   |   |   |
| 4 | Ensures that distribution and inventory costs are minimized |   |   |   |   |
| 5 | Ensures that product/service quality is better than that of our competitors |   |   |   |   |
| 6 | Has processes that are flexible to accommodate changes |   |   |   |   |
| 7 | Has minimal error during production or service delivery |   |   |   |   |