Interrelationships of organisation and E-business strategies with E-business readiness, intensity and impact in Nigerian Universities

Rafiat A. Oyekunle a,*, Mutawakilu A. Tiamiyu b

a Department of Information and Communication Science, Faculty of Communication and Information Sciences, University of Ilorin, Ilorin, Nigeria
b Department of Data and Information Science, Faculty of Multidisciplinary Studies, University of Ibadan, Ibadan, Nigeria

ARTICLE INFO

Keywords:
Organisational strategy
Technology strategy
E-business readiness
E-business intensity
E-business impact
Nigerian Universities

ABSTRACT

Electronic business, which involves deploying information technologies to drive business processes, promises substantial gains for institutions like universities. However, the gains can be realized only when universities invest strategically in appropriate e-business resources and processes that sync with their institutional goals and strategies. Nigerian universities have over many years been implementing several networked information resources used to support their usual, research, teaching, administration as well as public outreach activities. However, they need to know how well such investments are helping to achieve their goals. The study adopted the Technology, Organisation and Environment framework (TOE) as its research model, while descriptive survey design was implemented to collect data. Eighteen universities were selected using stratified random sampling, this comprised one private, state and federal from each of the six geo-political zones in Nigeria, data were collected from 160 management and 90 Information Technology staff using a structured and validated questionnaire which was subjected to Pearson correlation analyses and Partial Least Squares Structural Equation Modelling (PLS-SEM). The correlation analyses revealed moderate positive relationship between organisational strategy (OS) and e-business strategy (ES), strong positive relationship between e-business strategy and e-business readiness (ER), moderate positive relationship between e-business readiness and e-business intensity (EI), weak positive linear relationship between e-business intensity and e-business impact (EM), and weak positive relationship between e-business impact and organisational strategy (OS). The estimated inner model of the PLS-SEM showed statistically significant path correlations between OS and ES (0.48), ES and ER (0.86), ER and EI (0.60), and EI and EM (0.43), while the hypothesised path relationship between EM and OS was negative and insignificant. The study concluded that the university management needs to better synchronize their organisational objectives and strategies with their e-business (technology) strategies to improve their e-business readiness and use the resources more intensively for greater impact on their institutional objectives.

1. Introduction

Organisations in various economic sectors worldwide continue to race to innovatively and strategically deploy newer technologies for competitive and other purposes. Nevertheless, a highly important critical success factor in this is that any investments or resources in information technologies or systems by an organisation must fit or sync properly with its well decided business or operational strategies, while also ensuring that its business strategies sync adequately with the information technologies or systems it selects to deploy. Theoretical and empirical research on this has been ongoing for decades, known as Organisational Strategy and Information Technology/Systems Strategy (OS -IT/IS) fit or sync research (Wu et al., 2015; Kihara et al., 2016; Firman and Said, 2016; Sibanda and Ramrath, 2017; Kahoro, 2018; Sейal, 2019; Sukri and Yusoff, 2019, 2021; Umar et al., 2020).

Organisational strategy is defined by Bhasin (2020) as a dynamic roadmap that explains how a company needs to evolve in order to meet its goal and vision. It is a plan that details how to allocate resources (e.g., labour, money and inventory) and support different business activities like inventory, production, marketing, and infrastructure. Henderson and Jason (2008) define IT strategy as an all-inclusive plan used by IT management specialists to structure and guide organisations. Information systems (IS) on the other hand is a wide concept that includes the human activities and technical components within the organisation, as well as...
defines the method of managing the life cycle of IS practices in organisations (Avergou and McGrath, 2007). For e-business strategies, it shares much in common with corporate, business and marketing strategies. It defines the short-term and long-term goals of e-business, involves careful and skilled planning and is considered part of an organisation’s corporate strategy and business plan interconnecting with other plans including organisational, marketing and IT strategic plans (Collier, 2021). E-business readiness refers to the state of preparedness of an organisation to embrace or adopt e-business technologies. It emphasizes technological, organisational, and environmental determinants of ICT adoption (Fuchs et al., 2010). E-business intensity is the level of use of available e-business infrastructures in an organisation. Fuchs et al. (2010) explains that e-business intensity measures actual usage levels of e-business technologies, while according to OECD (1999), e-business intensity indicators describe the volume, usage, value and nature of electronic transactions. E-business impact is measured by the value creation process induced by e-business applications (Fuchs et al., 2010). Value creation processes according to Zhu and Kraemer, 2005), are defined as positive company effects on both internal operations and external procurement processes (efficiency driven), and on sales processes (driven by growth or by improved quality of stakeholder relationships). These include impact on sale, efficiency, business relationships and customer satisfaction.

E-business readiness, intensity and impact have been regularly researched in different sectors and context (Ilil et al., 2017; Amassoma and Ayanda, 2013; Bordonaba-Juste et al., 2012; Akinyelue and Mbanefo, 2011; Fuchs et al., 2010; Lin and Lin 2008). Strategic management is concerned about determining the purpose and aims of an organisation, selecting the most suitable courses of action to achieve those aims, and achieving the aims over a fixed period of time. Thompson and Strickland (2001) described strategy as “consisting of the combination of competitive moves and business approaches that managers employ to please customers, compete successfully, and achieve organisational objectives”, while Mehta, Shah and Morgan (2005) defined electronic business (e-business) as the transformation of key business processes through the use of Internet technologies. For Kvavi (2002), e-business is the transformation of key business processes through the use of Internet technologies. It refers to conducting business electronically, both within an organisation and externally, with clients, partners and communities. E-business strategy from the foregoing can be summarized as the strategies governing e-business through calculated information dissemination. However, Beynon-Davies (2004) suggests that e-business connects ICT and the organisation. Therefore e-business must concern itself with the development of both organisational strategy and informatics strategy.

There is a general recognition of the need to properly document a plan and strategy to aid the successful deployment of e-business technologies. Chen, Ruikar and Carrillo (2013), for example, suggest that institutions need to take an all-encompassing approach to e-business implementation, which includes careful consideration of the expected benefits, management roles and which technologies to adopt. In a similar vein, Chaffey (2014) concluded that, lack of a clearly defined e-business strategy will result to waste of resources, missed opportunities, poor combination of e-business and back-end systems, and eventually, sub-optimal business performance when organisations adopt e-business. E-business approaches by organisations in their operations is inevitable in the digital world. Successful e-business strategies and services however depend on various mutually interacting factors, including nature of an organisation’s business environment motivations, and the effectiveness and sustainability of the actual integration and use of new technologies to transform and grow legacy business processes and services. It is clearly vital that business strategies and e-business strategies are always kept in sync, because emerging technologies do create newer operational business models that determine which e-business strategies would best suit which evolving business environments and imperatives.

There has been a huge drive towards promoting and supporting the use of information technologies for e-business purposes in Nigerian universities since the beginning of the century in 2000, including the following major Federal government-sponsored ICT for education initiatives, among others:

- Nigeria Universities Management Information System (NUMIS) 1989
- Nigerian Universities Network (NUNet) Project
- Polytechnics Network (PolyNet) Project
- School Net Project
- Nigerian Education, Academic and Research Network (NEARNet)
- Teachers Network (TeachNet) Project
- National Open University 2002
- National Virtual (Digital) Library (Ministry of Education/NUC)
- National Virtual Library (Ministry of Science and Technology/NTDA) 2001
- National Information, communication and education programme of the Presidency

Nigerian universities have surely been grappling with determining what institutional goals each should pursue, what operating business strategies would be most appropriate to use to attain the goals, and how and what e-business strategies should be implemented to drive the business strategies. However, their domestic and global environments are becoming increasingly more competitive and challenging due to various existing situations and new developments. Firstly, most of the government owned Nigerian federal and state universities have been facing serious limited funding constraints over many years. Secondly, there has been government licencing of an increasing number of competing domestic private universities (Okocha, 2021). Thirdly, globally, Nigerian universities need to meet the various requirements to achieve respectable global university ranking and comparisons, along with emerging new service delivery requirements of the post-Covid-19 era for tertiary education institutions. Adequate investments in new technologies to meet these and other challenges will cost Nigerian universities much money, which makes it imperative for the universities to carefully make and periodically evaluate their investment in e-business resources, infrastructure and services to achieve their goals (Yushau and Audu, 2018). Many tertiary educational institutions in Nigeria now have websites and portals through which they publicize information about their programs and academic calendar and other events being offered, as well as provide interactive facilities for admissions processing, online course registration for students, online fees payment, downloadable coursework, and results checking by students and/or their parents or guardians (Oyekunle and Mejabi, 2012). Some of the websites also provide access to official publications and document repositories. Most of the universities also now provide mail box service to staff and students. However, many of these websites are static, inactive or have not been updated since first deployed, not to talk of being connected with automated backend processes within the owner institutions. The reasons for this situation include inadequate appreciation of diverse potential uses of the websites beyond merely providing the most basic institutional information and inadequate investments in e-business infrastructure, human resources and processes needed to support the websites. More recently, Oyekunle (2019) found that online ordering of transcripts, online student booking for accommodation, online access to university publications, online chat with officers of the universities and virtual delivery of e-learning and coursework are some e-business services that are yet to be provided by most Nigerian universities. That study also reported that the major e-business challenges faced are some online services not being available such as no responses to contact us mails sent to the websites and search facility not outputting any results. Moreover, some university portals are in most cases unable to cope with the typically heavy traffic during student registration periods, thus making the sites very problematic to connect to and frustrating to use during the periods.

However, despite these efforts by Nigerian universities and the associated challenges and limitations to deploy information technologies
for e-business approaches to their teaching, learning, research, external communications and collaborations, Internet searches of related published literature unearthed no previous studies that have assessed the nature of the interrelationships of Nigerian universities’ business strategies, e-business readiness, e-business intensity and e-business impact, as well as how previous impact has been transforming their institutional objectives and strategies. Literature on e-business potential and constraints in Nigerian universities has particularly focused on the use and impact of ICTs in general, as compared to the impact of actual e-business operations resulting from adoption and use. However, what tends to be lacking in research is, first, an empirical study to reveal the relationships or interdependencies among organisational strategy, e-business strategy, readiness, intensity and impact in Nigerian universities, and how they can more efficiently use their e-business resources to achieve greater return on investment on their e-business strategies, investment and resources. Understanding the interrelationships among these variables is clearly important for policy making by the universities collectively and individually in order for them to know where and how to improve their ongoing e-business investments. This identified knowledge gap motivated this study. The second gap focuses on the need to develop a theoretically grounded and practically-oriented understanding of how Nigerian universities can address or navigate around the institutional constraints and challenges in their contexts to achieve maximum e-business benefits. Thus, this study examined the extents to which the organisational objectives and strategies of Nigerian universities actually sync with their adoption, deployment, actual usage, impact of different information technologies and systems, as represented by the following variables: (1) organisational or business strategies; (2) e-business readiness (indexed by the quality of technical infrastructure, commercial infrastructure, social infrastructure and human resources and behaviours); (3) e-business intensity (volume of e-business, level of actual usage of e-business readiness resources, volume of input-output throughput); (4) e-business impact (effectiveness and efficiencies of e-business services, values and wealth created, and innovations and improvements in organisational objectives and strategies).

In this study, the interrelationships among these four variables are hypothesized cyclical with each serving in turn as antecedent and consequential variables. Accordingly, the following five hypotheses were postulated as follows:

H1. There is a significant relationship between organisational strategy and e-business strategy.

H2. There is a significant relationship between e-business strategy and e-business readiness.

H3. There is a significant relationship between e-business readiness and e-business intensity.

H4. There is a significant relationship between e-business Intensity and e-business Impact.

H5. There is a significant relationship between e-business impact and organisational strategy.

H6. There is a significant cyclical structural path interrelationships among organisational strategy, e-business strategy, e-business readiness, e-business intensity, and e-business impact.

The findings of this research are expected to provide insights on the relative strength or weakness of each of the four variables, the desired synchronization of organisational and IT/IS strategies of Nigerian universities. The findings would also provide insight and guidance to the university collectively and individually on what variables of the synchronization processes they need to focus attention on, as well as possible strategies to achieve adequate sync of the processes. Globally, the findings of this study would provide important lessons for universities and other tertiary education institutions in formulating policies and strengthening appropriate organisational capabilities and processes to ensure effective implementation and integration of e-business systems in their goals, activities and operations.

2. Literature review

In recent years, there has been a huge drive towards the use of Internet for business purposes in Nigeria. Many tertiary educational institutions in Nigeria now have websites through which they carry out activities like giving the searching public the opportunity to know about their institutions, advertising programs being offered by the institutions, processing of admission, serving as a means of communication to students and staff about academic calendar and other internal information (Oyekunle and Mejabi, 2012). E-business in higher education is far more about strategy and business redesign than technology (Kvavi, 2002). The Internet, the Web and web tools make e-business possible, but novel business strategies and service delivery models are needed to make them appropriate and effective to capture the loyalty and imagination of faculty members, students and staff members. Research has shown that e-business can affect how teaching is done and a wide variety of university services (Gwamba, 2016; Achugbue, 2014; Kvavi, 2002). Nimmanphatcharin (2003) is of the opinion that the university management team needs to implement processes that enable them adequately answer three key questions through the use of the tools shown in Figure 1.

In 1999, the framework for classifying e-business indicators proposed by the OECD is readability indicators which describe the technical, social and commercial infrastructures necessary to support e-business; intensity indicators which describe the usage, value and volume of electronic transactions; and impact indicators which describe the changes made by e-business in terms of efficiency and/or the creation of new value added. The readiness indicators encompass many factors. These include technical infrastructures like hardware and software; human resources, i.e. IT personnel; support services like consulting, website hosting and certification services; organisational culture elements like policies, structure, personnel attitudes and organisational goals. There are other yardsticks for measuring readiness, for example, the World Bank and Bui et al. (2003) instruments. However, the OECD classification was chosen because it does not only apply to governments, but also to organisations, households and other sectors. In addition, the OECD framework has advanced into the present-day standard for categorising e-commerce indicators and is widely used.

Fuchs et al. (2010) proposed an empirical approach that showed how infrastructural, organisational and environmental factors determine successful e-business adoption and use. Their research framework was based on Rogers’ Innovation Diffusion Theory and was tested with online survey data collected in the Austrian destination management organisation sector. The approach spelt out how the usage of e-business applications may affect positively the performance of tourism organisations, and the data were analysed using a SEM approach.

Another study by Zhu and Kraemer (2005) developed an integrative research model, which linked technological, organisational and environmental issues to e-business use and value, for evaluating the consequence and diffusion of e-business at the firm level focusing on post adoption actual usage and value creation. Structural equation modelling of the data collected from 624 firms in the retail industry from 10 countries was used to test the model. Additionally, two subsamples from developed and developing countries were compared to probe deeper into whether e-business use and value are influenced by economic environments. Findings indicated that technology competence, financial commitment, firm size, regulatory support and competitive pressure are very important antecedents of e-business use, and that whereas both front-end and back-end capabilities contribute to e-business value, back-end integration had much stronger impact. Thus, although front-end functionalities are now becoming valued commodities, the back-end integration of these functionalities are critical to achieving success. The findings also contributed to knowledge on innovation diffusion, revealing that careful attention must be paid to regulatory and
economic factors in different countries that may affect technology
diffusion by firms.

In the context of Nigerian universities, Anim et al. (2012) surveyed
the status of ICT deployment in four Nigerian universities and results
revealed that: (i) private universities were placing greater emphasis on
deploying ICTs more comprehensively compared to the public uni-
versities; (ii) private universities are geared towards investing more in
ICTs than public universities; (iii) the public universities in their
deployment of ICTs have a tendency to pay more attention to supporting
administration than teaching and learning; (iv) only private universities
demand that both staff and students own a laptop - as a policy strategy for
promoting adequate ICTs deployment and usage for teaching and learning;
(v) distance learning is yet to be considered as a serious
teaching and learning option in most universities. Also related to the use
of e-business approaches to drive teaching and learning processes,
Amassoma and Ayanda (2013) found out that not all the surveyed un-
dergraduate students had easy access to computer and Internet facilities
due to infrastructural deficiencies in the universities. Part of the recom-
mandation of the study is that stakeholders like government and private
proprietors of Nigerian universities, as well as other stakeholders in
quality university education and graduates, such as private firms, should
invest more on the provision of infrastructural facilities in Nigerian
universities.

To profile the e-business operations of six selected companies, Wynn
and Olayinka (2021) used an inductive approach to collect data with the
aid of questionnaires and interviews. The outcome of the study is that
there was lack of e-business strategy in the selected companies.
Furthermore, an interview material was utilized to back the development
and validation of a strategy framework, which is meant to provide both a
process and a checklist for those businesses in developing countries that
are not large but are embracing e-business initiatives. Rodríguez-Abitia
and Bribiesca-Correa (2021) carried out a study on assessing the
e-readiness and digital transformation in universities, they created and
validated an instrument to measure the resulting elements of an inte-
grated model which was then applied to some higher educational in-
stitutions. The outcome of the study is that although the education
market is suffering changes in the digitalization of processes to provide
innovative products and services, universities fall behind other sectors,
perhaps due to lack of changes in culture and effective leadership,
complemented negatively by an inadequate degree of financial support
and innovation.

Country-wide, Nigeria has been recording very fast growth in the
integration and uptake of new technologies since the beginning of
twenty-first century. Nigeria published its first National IT Policy in
2001, later updated into the National Draft ICT Policy (2012). The later
policy states that its vision is to make Nigeria a knowledge-based and
globally competitive society, and that its mission is to fully integrate ICTs
into the socio-economic development and transformation of Nigeria into
a knowledge-based economy (National Draft ICT Policy, 2012). Not long
after the first policy, the telecommunications sector was deregulated and
four private sector GSM networks were licensed. More recently, The
Nigeria Internet Group, a non-governmental organisation whose mission
is to promote full access to the Internet in Nigeria reported that, among
the noteworthy developments in Nigeria comprise the re-delegation of
.ng TLD (top-level domain) to the country, rapidly growing e-payment
platform services, and the development of international fibre cable
connectivity by SAT3, Globacom and MainOne, are indicators that
Nigeria is now investing and making appreciable efforts toward using e-
business strategies to accelerate its economic growth and development.

Evidence of Nigeria’s progress in uptake of information technologies
and specifically usage of Internet penetration and usage in its economy
and society can be found in the Internet World Stats (2021), where
Nigeria ranked first in Africa in terms of Internet usage with an
approximate population of 211, 400, 708 of which 154, 301, 195 actively
use the internet (73.0%), followed by Egypt with 54, 741, 493 users
(52.50%) out of a population of 104, 258, 327, then Kenya with 46, 870,
422 Web users (85.20%) and South Africa with 34, 545, 165 users
(57.50%). The Global Information Technology Report (GITR, 2009 to
date) reports the extent to which world economies leverage ICT advances
for increased growth and development using the Networked Readiness
Index (NRI) framework. The NRI identifies the most relevant factors
facilitating ICT readiness, providing business leaders, policymakers and
all other relevant stakeholders with a distinctive tool in drawing national
roadmaps toward increased networked readiness, one that can be used to
benchmark their country’s performance over time and with reference to
other economies, and is a valuable benchmarking instrument to deter-
mine national ICT strengths and weaknesses, evaluate progress and
highlights the continuing significance of ICT application and develop-
ment for the growth of the economy. Nigeria was rated 99th networked
ready nation (out of 133 nations) otherwise recognised as e-readiness in
the 2009–2010 edition of the report, and 112th out of 143 econo-
 mies/countries in the most recent 2015 report.

3. Conceptual framework

This study draws upon concepts and relationships from the tech-
nology–organisation–environment (TOE) framework, which highlights
the importance of synchronization or fit between attributes of technology
to be adopted, organisational attributes, and the demands of elements of
the organisation’s environment, such as competitors and competition,
customers, suppliers, government regulations, etc. Concepts and re-
lationships from the framework were adapted to build a conceptual
model for the study which, as illustrated in Figure 2, interrelates how an
institution can build its organisational goals and strategy to e-business
strategies, thence to e-business readiness, thence to e-business intensity, and thence to e-business impact in universities.

In the conceptual model, organisational strategy, which subsumes the vision, mission and goals/objectives of a university, is each university’s context that influences or should influence how it adopts and deploys what technological innovations, which defines its E-business Strategy (ES). In turn, the various implemented e-business strategies over time eventually builds up the university’s technological infrastructures comprising policies, hardware, software and human resources that determines its E-business Readiness (ER) (i.e. the preparedness to use technology to support and drive its activities). However, any built up technological infrastructure must be effectively and optimally used and maintained in order for a university to actually derive maximal possible return on its technological investments and infrastructures, captured in the model as E-business Intensity (EI). E-business intensity describes the effectiveness and efficiency with which the available technology is actually being harnessed and used to facilitate achieving e-business objectives, which is termed E-business Impact (EM) in the model. E-business Impact is defined as positive effects or transformations on both internal and external processes that can be measured based on the organisational strategic objectives that the university aims to achieve.

This conceptual framework guided the study’s methodology. Thus, in Figure 2, box 1 (organisational strategy) is expected to influence box 2 (e-business strategy), then box 2 (e-business strategy) is expected to influence box 3 (e-business readiness), while box 4 (e-business intensity) is expected to influence box 5 (e-business impact) and lastly, box 5 (e-business impact) is expected to influence organisational strategic objectives for the future. This sequential interrelationships are expected from box 1 in the figure through boxes 2, 3, 4 to box 5, and possibly and hopefully between box 5 back to box 1.

Organisational strategy is expected to drive any e-business strategies in the digital environment. E-business strategies involve the conscious planning and investment in technology resources and infrastructures such as hardware, software, networks, human and related resources for achieving organisational strategy. The realized effectiveness of the e-business strategies should in turn improve E-business Readiness. E-business readiness indicators include availability of constantly maintained technical and commercial infrastructures, including adequate available computers that are readily accessible to staff and students, continuous update of appropriate technology development and use policies, training programmes to enhance staff and students’ capacities for innovative uses of technology, adequate Internet connectivity and reliable power supply and backup systems, dynamic and interactive front-end institutional websites linked to efficient e-business backend processes and databases, and so on, to support such activities as institutional administration, physical and virtual teaching and learning interactions with students, research work, collaborations and publications, institutional repositories, Open and Distance Learning (ODL), online examinations, Massive Open Online Courses (MOOC) delivery and access, collaborations with various institutional stakeholders and supporters, including the private sector and governments, etc.
4. Methodology

The pragmatic research paradigm was deemed appropriate for this study as it borrows and combines some concepts from positivism and interpretivism, hence making it more flexible and comprehensive enough to address the research problem of this study. The research approach employed in this study is the quantitative approach as it involves the collection of data in order to quantify and subject information to statistical treatment to back or disprove existing claims.

The population of the study comprised all the one hundred and twenty-eight (128) universities in Nigeria at the time of this study. There are three categories of universities in Nigeria i.e. federal, state and private universities, and six geo-political zones i.e. north-west, north-central, north-east, south-east, south-south and south-west. All the Nigerian universities registered by the National Universities Commission were initially stratified by two variables—geo-political zone of location (there are six in the country) and ownership (federal government, state government, private sector), after which one university was selected randomly from each of the 18 resulting substrata, for a total of 18 sampled universities for the study (see Table 1).

Two separate questionnaire instruments were developed, validated and used for data collection for the study. A total of one hundred and sixty administered on top level management staff (principal officers, directors and deans of faculties) of the sampled universities, while ninety questionnaire was administered on IT staff of the sampled universities, including Directors of ICT units, web designers, programmers, system analysts, network administrators, database administrators, computer operators, etc., with an equal number of respondents aimed for each university for each questionnaire. Both questionnaires were validated as follows: Professors and doctoral students in information science were asked to face review the content of each questionnaire to assess how well items in each would be able to collect the desired data for the study, and necessary modifications were made according to their various comments. In addition, a pre-test of the questionnaire was implemented, from which Table 2 shows Cronbach’s Alpha statistics that were computed with the collected data to measure the internal consistency/reliability of the multiple questionnaire items used to collect data on each key variable of the study.

The questionnaire used for data collection titled “Relationships among Organisational Strategy and E-business Strategy, Readiness, Intensity and Impact in Nigerian Universities” stated as part of the introduction that “information provided will be treated as confidential and only aggregated data from all respondents will be used and reported for this study”, which specifies informed consent for using questionnaire to collect data. In addition, consent was obtained from the University of Ibadan Science & Technology Review Committee to carry out the study.

Table 1. Sample selection.

| S/N | Geo-political Zones | Sampled Federal Universities | Sampled State Universities | Sampled Private Universities |
|-----|---------------------|-------------------------------|-----------------------------|-----------------------------|
| 1   | North-East          | Abubakar Tafawa Balewa University, Bauchi | Bauchi State University | Kwararafa University, Wukari |
| 2   | North-West          | Ahmadu Bello University, Zaria | Kaduna State University | Al-qlam University, Katsina |
| 3   | North-Central       | University of Abuja | Kwararafa University, Maitre | African University of Science and Tech. |
| 4   | South-South         | University of Benin | Delta State University | Benson Idahosa University |
| 5   | South-East          | University of Nigeria | Abia State University | Paul University, Awka |
| 6   | South-West          | University of Ibadan | Ladode Akintola University of Technology | Fountain University Osogbo |

Table 2. Reliability results of the questionnaire.

| Construct                  | No. of Items | Cronbach’s Alpha |
|----------------------------|--------------|------------------|
| Organisational strategy    | 10           | 0.817            |
| E-business Strategy        | 15           | 0.810            |
| E-business Readiness       | 15           | 0.789            |
| E-business Intensity       | 8            | 0.892            |
| E-business Impact          | 13           | 0.679            |

5. Results and findings

5.1. Hypothesis 1: there is a relationship between organisational strategy (OS) and E-business strategy (ES)

Hypothesis 1 concerns whether there is a relationship between organisational strategies and e-business strategies across the sampled universities. The Pearson correlation test at $\alpha = 0.05$ (2-tailed) showed that there is a moderate positive significant relationship between organisational strategy and e-business strategy ($r = 0.514$, $p = 0.029$). The null hypothesis is therefore rejected. This result suggests that across all the universities, there is a significant moderate alignment of the universities’ organisational strategies with their e-business strategies (see Table 3).

Additionally, in order to find out the relationship between the variables but within the different type of universities, further separate correlation analyses of the data for the federal, state and private sector owned universities showed that the correlation coefficients for federal ($r = 0.666$, $p = 0.149$), state ($r = 0.882$, $p = 0.200$) and private universities ($r = 0.824$, $p = 0.044$) means that only private universities have a significant high correlation between their organisational strategies and e-business strategies.

5.2 Hypothesis 2: there is a relationship between E-business strategy and E-business readiness

This hypothesis is intended to investigate how well the universities were able to implement their e-business strategies to achieve commensurate and adequate e-business readiness resources. Table 4 reveals that there is a strong positive linear relationship between e-business strategy and e-business readiness ($r = 0.989$, $p = 0.000$). The null hypothesis is therefore rejected. This result suggest that collectively all the universities were translating their e-business strategies into e-business readiness. However, the separate correlation analyses of the data for the federal, state and private sector owned universities provided the following results: federal ($r = 0.989$, $p = 0.000$), state ($r = 0.802$, $p = 0.055$) and private universities ($r = 0.646$, $p = 0.166$), which showed that only federal

Table 3. Correlation of organisational strategy and E-business strategy.

| Organisation Strategy | All Universities | Pearson r | N  |
|-----------------------|------------------|-----------|----|
| Federal Universities  | Pearson r        | .666      | N  |
| State Universities    | Pearson r        | .882      | N  |
| Private Universities  | Pearson r        | .824      | N  |

| E-business Strategy   | All Universities | Pearson r | N  |
|-----------------------|------------------|-----------|----|
| Federal Universities  | Pearson r        | .200      | N  |
| State Universities    | Pearson r        | .044      | N  |
| Private Universities  | Pearson r        | .824      | N  |

Table 4. Correlation of e-business strategies and E-business readiness.
Table 4. Correlation of E-business strategy and E-business readiness.

| E-business Strategy | All Universities | Pearson r | P  | N  |
|---------------------|------------------|-----------|----|----|
| Federal Universities| Pearson r        | .989      | .000| 6  |
| State Universities  | Pearson r        | .055      | .802| 6  |
| Private Universities| Pearson r        | .166      | .646| 6  |

5.3. Hypothesis 3: there is a relationship between E-business readiness and E-business intensity

Hypothesis 3 was intended to ascertain whether the e-readiness resources established by the universities were being used optimally and intensively to generate value for the universities, because being e-business ready may be not necessarily translate into actual optimal continuous use of the resources, possibly due to inadequate investment of running costs to maintain and sustain effective usage of the resources, an issue connected with the so-called ‘endemic poor maintenance culture’ of facilities in developing countries, often due to the focus by decision makers on initial but neglect of sustainability investments. Results in Table 5 shows that there is a moderate but positive linear relationship between e-business readiness and e-business intensity (r = .488, p = .040). The null hypothesis is therefore rejected. In addition, the separate correlation analyses of the data for the federal, state and private sector owned universities provided the following results: federal (r = .989, p = .000), state (r = .055, p = .802) and private universities (r = .166, p = .646), which showed that out of all the three types of universities, private universities are the only ones whose e-business readiness translate into actual optimal continuous use of the resources due to the very strong positive significant relationship between the two variables.

5.4. Hypothesis 4: there is a relationship between e-business intensity and e-business impact

Hypothesis 4 concerns whether there is a relationship between e-business intensity and e-business impact. Table 6 reveals that there is no significant relationship between e-business intensity and e-business impact (r = .455, p = .058). The null hypothesis is therefore accepted. The result shows that the intensity of use of deployed e-business related infrastructure (captured by e-business intensity) does not translate effectively into e-business impact in the sampled universities and further analysis of a separate correlation analyses of the data for the federal, state and private sector owned universities revealed the same insignificant relationship.

5.5. Hypothesis 5: there is a relationship between E-business impact and organisational strategies

This hypothesis concerns whether there is a significant relationship between e-business impact and organisational strategies. The result of the test of this hypothesis, as shown in Table 7 reveals that there is no significant relationship between the two variables (r = .412, p = .090). The null hypothesis is therefore accepted. This result implies that, at least among the sampled universities, the impact of the intensity of use of the deployed e-business resources does not connect effectively to the organisational strategies that are expected to drive the chain of positive causal relationships from organisational strategy to e-business strategy to e-business readiness to e-business intensity to e-business impact, and then back to organisational strategy.

Moreover, the separate correlation analyses of the data for the federal, state and private sector owned universities provided the following results: federal (r = .438, p = .385), state (r = .237, p = .652) and private universities (r = .726, p = .103), which showed that federal universities have a positive but insignificant relationship between their organisational strategies and e-business strategies, while both state and private universities have a negative relationship between the two variables.

5.6. Hypothesis 6: there is a significant cyclical structural path interrelationship among organisational strategy, e-business strategy, e-business readiness, e-business intensity, and e-business impact

Structural equation modelling of the collected data was performed to assess holistically the relative strengths of the relationships between variables in the cyclical conceptual model that guided the methodology of this study. The modelling was done using SmartPLS 3 software developed by Ringle et al. (2015) and the PLS algorithm procedure was executed for all the calculations.

From the structural model diagram constructed through the PLS-SEM and reported in Figure 3, the outer loadings (x) reveals that organisational strategy and e-business impact have no indicator with less than 0.4. While e-business strategy, e-business readiness and e-business intensity have 3, 1 and 5 indicators respectively that are below 0.4. Manifest variables that have outer loading of 0.7 or more are considered very satisfactory (Henseler et al., 2009). Meanwhile, Halland (1999) argued

Table 5. Correlation of E-business readiness and E-business intensity.

| E-business Readiness | All Universities | Pearson r | P  | N  |
|---------------------|------------------|-----------|----|----|
| Federal Universities| Pearson r        | .650      | .162| 6  |
| State Universities  | Pearson r        | .62       | .907| 6  |
| Private Universities| Pearson r        | .851      | .031| 6  |

Table 6. Correlation of E-business intensity and E-business impact.

| E-business Intensity | All Universities | Pearson r | P  | N  |
|---------------------|------------------|-----------|----|----|
| Federal Universities| Pearson r        | .755      | .083| 6  |
| State Universities  | Pearson r        | .695      | .695| 6  |
| Private Universities| Pearson r        | .449      | .372| 6  |
that loading value of 0.4 should be acceptable. The indicator reliability values ($x^2$), except for a few, are larger than the least acceptable level of 0.4 (Hulland, 1999), and the values of the composite reliability (which is replacement for Cronbach’s alpha) are larger than the acceptable 0.7 level (Wong, 2013). Therefore, there is high level of internal consistency reliability among all five reflective latent variables. Furthermore, to check the convergent validity, each latent variable’s Average Variance Extracted (AVE) was evaluated. The threshold for this, according to Bagozzi and Yi (1988), is acceptable from 0.5 upwards for exploratory research. All of the AVE values except for one are greater than 0.5, confirming that there is convergent validity.

The inner model of the PLS-SEM that was estimated suggests significant hypothesized path relationships between organisational strategy and e-business strategy (0.479), between e-business strategy and e-business readiness (0.862), between e-business readiness and e-business intensity (0.600) and between e-business intensity and e-business impact (0.427). This implies that Nigerian universities are formulating organisational strategies that are consistent with their e-business strategies which in turn strengthen their e-business readiness and intensity. Statistically, e-business strategy is seen to strongly predict e-business readiness than other variables predict one another. This means that when the management culture, motivations and policies of a university promotes e-business adoption (e-business strategy indicator), then there will be deployment of ICT hardware/software for teaching and learning (e-business readiness indicator). However, the hypothesized path relationship between e-business impact and organisational strategy is not statistically significant. This is because it’s standardized path coefficient ($0.299$) is lower than 0.1.

As described in Hair et al. (2014), the coefficient of determination ($R^2$) provided along with the above results is a measure of the model predictive accuracy as shown in Table 8, Cohen, Cohen et al. (2003) clarified that for a good model, $R^2$ value of the endogenous latent variable of the SEM should be more than 0.26. The reported $R^2$ value for the developed model is 0.458, which is higher than the recommended value.
Hence, the model is thus considered to have substantial degree of explained cumulative variance of e-business impact by e-business intensity, e-business intensity by e-business readiness, e-business readiness by e-business strategy and e-business strategy by organisation strategy.

In terms of the values of the different reported coefficients of determination ($R^2$), it is 0.230 for the e-business strategy variable as predicted by organisation strategy variable. This implies the organisational strategy variable explains 23.0% of the variance in e-business strategy. In turn, e-business strategy explains 74.3% of the variance in e-business readiness, while e-business readiness explains 36.0% of the variance in the e-business intensity, and e-business intensity explains 42.7% of the variance in e-business impact. Table 9 shows the significance of the path coefficients. A T-Statistic $> 1.96$ is significant with a two-tailed test, and $>0.98$ is significant for a one-tailed test (Wong, 2013). All of the T-statistics are greater than 1.96, thus it can be concluded that the outer model loadings are significant.

6. Discussion

Rowley (2002) emphasizes that e-business strategy needs to be integrated with corporate and functional area objectives. The positive linear relationships between organisational strategies and e-business strategies of the sampled universities suggests that Nigerian universities are making efforts to connect their e-business strategies with their organisational objectives and strategies as required. The revealed moderate strength of the relationship also suggests that there is only moderate degree of alignment of their organisational strategies with the e-business strategies, and this indicates more scope for improvement. More revealing, separate correlation analyses of the data for the federal, state and private sector owned universities revealed that only the private universities had a significant high correlation between their organisational strategies and e-business strategies.

The strong positive linear relationship between e-business strategy and e-business readiness of the universities shows that the e-business strategies being implemented by the Nigerian universities tend to be associated with the strengthening of their e-business readiness indicators. Investments in hardware, software, human and related operational resources are the e-business strategies which, when correctly planned and deployed should result to improved technical and commercial infrastructures for e-business services. Inadequate correlation of e-business strategies with e-business readiness indicators may imply either that the e-business strategies are not leading to improved e-business resources and infrastructure or that the resources and infrastructure have since deteriorated which may result from lack of maintenance or sustainability, this finding support previous empirical studies on e-business readiness (Amassoma and Ayanda, 2013; Akinuye and Mbanefo, 2011). In this regard, separate correlation analyses of the data for the federal, state and private sector owned universities showed that it is only for the federal universities that the implemented e-business strategies are correlated strongly with commensurate e-business readiness indicators.

E-business readiness indicators only tell how ready an organisation is with resources and infrastructure for the delivery of e-business services. But there is no guarantee that the acquired resources and infrastructure are adequate and also adequately integrated to existing business activities to ensure maximal intensity and reliability of use of the resources and infrastructure, which is what the e-business intensity variable measures in this study. In this regard, the strong positive linear relationship between e-business readiness and e-business intensity that was found from the analyses means that, generally, higher readiness or preparedness for e-business in terms of deployed investments in hardware, software, human and related resources, tend to be strongly associated with e-business intensity. This finding is consistent with the previous empirical studies on e-business readiness and intensity (Fuchs et al., 2010; Ilin et al., 2017).

Nevertheless, subsequent separate correlation analyses with the data for the federal, state and private sector owned universities showed that private universities are those wherein e-business readiness indicators are best associated with more intensive use of the resources to provide e-business services. In other words, e-business readiness (measured by the quality of deployed technical, commercial and social infrastructures) in private universities tend to be better correlated with actual usage and increased volume of e-business services. This finding may be due to the mainly profit seeking orientation of the private universities, which gears them to always profit-rationalize any investments in e-business resources and then also intensively use any such resources when deployed. The finding also means that for federal and state universities which are mainly funded through public sector grants, investments in e-business resources and infrastructures may not benefit from adequately rigorous cost-benefit analyses, which might lead to poorly planned, misaligned and unbalanced e-business investments, and also leading to ineffective and inefficient use of the deployed resources and infrastructures.

Finally, the weak positive and insignificant relationship between e-business intensity and e-business impact found out in this study is a source of concern. On the surface, it suggests that although Nigerian universities tend to use their deployed e-business infrastructure to provide services, they are not deriving maximal or optimal impact from such activities in terms of levels and quality of e-business services commensurate with their investments. The findings is however somewhat not surprising because, as highlighted in the statement of research problem section of this paper, e-business services in most Nigerian universities are currently mainly patchy and often inadequately integrated across their different platforms or coordinated with back-end support operations, which means that the universities are yet to reap the transformational benefits of complementary and combined e-business services. Following previous empirical studies on e-business impact (Amassoma and Ayanda, 2013; Gwamba, 2016), the same results are obtained. However, this finding is contrary to the findings of Bordona-Juste et al. (2012) that higher level of e-business use had greater impact on strategy and

---

Table 8. Model summary.

| Model | $R$ | $R^2$ | Adjusted $R^2$ | Std. Error of the Estimate |
|-------|-----|-------|----------------|---------------------------|
|       | 0.677 | 0.458 | 0.450 | 0.74273 |

* Predictors: (Constant), EM, ES, ER, EI

Table 9. T-statistics of path coefficients.

|               | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (O/STDEV) | p Values |
|---------------|---------------------|-----------------|-----------------------------|------------------------|----------|
| Organisational Strategy | 0.479              | 0.485           | 0.038                       | 12.558                 | 0.000    |
| E-business Strategy | 0.862              | 0.863           | 0.022                       | 39.966                 | 0.000    |
| E-business Readiness | 0.600              | 0.610           | 0.048                       | 12.575                 | 0.000    |
| E-business Intensity | 0.427              | 0.433           | 0.057                       | 7.434                  | 0.000    |
| E-business Impact | -0.299             | -0.300          | 0.052                       | 5.779                  | 0.000    |
| E-business Impact | -0.299             | -0.300          | 0.052                       | 5.779                  | 0.000    |
management. Nevertheless, correlational analyses between the component sub-variables of the e-business intensity and the component sub-variables of the e-business impact revealed that some e-business intensity sub-variables were significantly correlated with some e-business impact sub-variables. For instance, advertisement of programmes, services and products was found to correlate with improved marketing of education programmes and increased researchers’ collaborations with other researchers abroad, while web-based business-to-customers (B2C) transactions correlated positively with improved collaborations between departments and faculties with industry, and use of online collaboration tools among staff correlated positively with improved research activities in the universities.

Although the European Commission (2008) emphasizes that e-business promises substantial impact for institutions and firms, however, the result of the test revealed that intensity of use of the deployed e-business resources does not associate with fundamental impact in the universities or in terms of generating positive feedback to organisation strategies and e-business strategies to continue the cycle of interrelationships between the different e-business variables in the conceptual framework of this study, Dos Santos and Sussman (2000) had also found similar low level of connection between e-business intensity to impact to organisational strategies among surveyed firms in the United States because they fail to prepare or respond well to structural changes of the firm caused by IT deployments. Thus, the significant potential gains from e-business highlighted by the European Commission (2008) can only be realized when each organisation adequately strategizes and invest in appropriate and complementary e-business infrastructures, human and other resources and processes, effectively and efficiently integrates the resources with its operations, and actually utilizes the deployed resources intensively and optimally to create values that transforms how the organisation re-gears for further use of technology to transform the organisation. Thus, much depends on the nature and dynamism of organisational strategy in its sequential and cyclical interconnections with e-business strategy, readiness, intensity and impact.

Noteworthy from the results reported above though is that the strength of the interrelationships between adjacent variables in the research model of this study varied among the federal, state and privately owned universities. Specially, the private universities tended to have greater correlation of organisation strategy with e-business strategy than federal and state universities; federal universities tended to have greater correlation of e-business strategy with e-business readiness than state and private universities; private universities tended to have greater correlation of e-business readiness with e-business intensity than federal and state universities; although the relationship between e-business intensity with e-business impact was not significant, federal universities tended to have greater correlation between the two variables than state and private universities; and the federal universities are the only ones that have a positive insignificant correlation of e-business impact with organisation strategy, while both state and private universities have negative correlation between the two variables. These results show which categories of universities need more effort in strengthening their e-business variables to ensure optimal impact of their investments.

The results further reveal that Nigerian university administrators and other human resources need to: (a) constantly review their organisation objectives to sync them both with the demands of their dynamic digital internal and external environment, as well as with their e-business strategies, and (b) thereafter effectively implement, continuously maintain and improve, intensively use, and periodically review the impact of whatever e-business resources and systems they are able to invest in and deploy. This is imperative in order to achieve and sustain needed strong chain of positive interrelationships from their organisation objectives, to e-business strategies, to e-business readiness, to e-business intensity, and to e-business impact. In other words, university administrators must realize that in line with rapid changes in their external environments, there is need to adopt dynamic programming approaches to syncing their organisational objectives and their e-business strategies, readiness and intensities in order to derive maximum transformational benefits from their e-business investments and services.

7. Policy and research implications

Understanding the plan to change from a current condition to a future preferred status through actions in diverse business dimensions is vital for defining e-business strategies and its effective implementation. E-business strategy in this study represents part of an organisation’s business plan and corporate strategy, and also intersects with other plans including organisational, marketing and IT strategic plans. It defines the short-term and long-term goals of e-business and involves skilled and careful planning.

In e-business investments, higher investments may not necessarily lead to greater organisational efficiency and transformative impact. Imperative instead are carefully planned, focused, integrated and intensively used investments. The various findings of this study suggest that Nigerian private universities appear to be more systematic in ensuring that their e-business investments are consistent with their visions and objectives, and also more systematic and strategic in planning for deploying and using new technologies to drive their operations likely due to their small initial sizes, motivation for profit, and need to borrow funds commercially for their e-business investments, than their usually much older government owned and mostly grant-aided public federal and state universities. Therefore, government owned Nigeria universities may need to consider borrowing and adapting global best and successful e-business strategies from the private universities within Nigeria and across Africa and the world to drive their institutional strategies to achieve their goals.

This generally low correlations between the different e-business variables focused upon this study for the federal and state universities may reflect both the lack of strong synchronization of the strategic objective of promoting quality teaching and learning in academic departments and the e-business objective of acquiring and deploying e-business applications. It may also reflect lack of or inadequate connectivity or integration of the various previous e-business strategies, investments and applications that have been implemented. And, there may also be inadequate periodic assessments of the strength and weaknesses of the needed synchronizations, connectivity and integrations. These are the potential constraints that this study was essentially conceptualized to explore. For instance, university administrators (heads of department, deans of faculty, and university management) in today’s big data world need business data analytics applications that enable them to monitor, coordinate and evaluate teaching and learning processes and outcomes in the academic departments. Such applications presuppose that various e-business front-end applications have collected or are collecting data on the processes and outcomes into well managed backend databases. The implication is that even if the universities aim to promote and may be investing in e-business applications to support teaching and learning, they are however not deploying and integrating applications to help their administrators to effectively monitor and improve the teaching and learning strategic objective. There is need for proper alignment of all e-business strategies with organisational strategic objectives in line with Kvavil's (2002) proposition that new e-business strategies would radically transform and alter the service culture of educational institutions and improve greatly the effectiveness and efficiency of service delivery.

Besides, most Nigerian universities are not doing or achieving enough on some of the basic and very essential e-business strategies and services yet. Findings from this study on this underscore the need for Nigerian universities to improve on the computerization of their various internal and external processes so as to advance their state of preparedness to e-business applications and services. Other findings showed that regarding e-business readiness, there is adequate administrative readiness, but infrastructural readiness needs much improvement. Moreover, e-business intensity levels in the universities is fairly adequate in terms of diversity/variety, but rather inadequate in scope.
Significant moderate positive relationship was found between e-business readiness and e-business intensity for all the universities together, and strongly for only the private universities. These findings imply that e-business readiness often resulted to modest actual usage and volume of e-business services in the universities. The finding for the private universities is in consonance with the findings of Anim et al. (2012) that private universities were placing greater emphasis on and deploying ICTs more comprehensively compared to the public universities, and that private universities are geared towards investing more in ICTs than public universities. Adequate deployment and use of technology resources and infrastructure are always critical for the effective delivery of e-business services, for which special plans for technology infrastructure development would be a boon to the universities. These include improved telecommunication lines, network equipment and personal computers which should be supplied by both federal and state governments at a flexible cost. Government and the National Universities Commission (NUC) need to setup new research & development centres in the universities to encourage innovations, provide enough funds to substantiate the innovations and create an enabling environment for the universities to embrace these innovations for an enhanced e-business development in their universities. Improvements in human capital resources also enriches the technological readiness, so universities should always balance investments in technical infrastructure with investments in development of commensurate IT human resources. The weak positive but insignificant relationship found between e-business intensity and e-business impact suggests that on the surface, although Nigerian universities tend to use their deployed e-business infrastructure to provide services, they are not deriving much or maximal impact from such efforts commensurate with the intensity of their e-business services. However, an inter-correlation among component variables of the main constructs revealed that email communication within the university which is an e-business intensity (EI) indicator correlates moderately with nine out of eighteen e-business impact (EM) indicators. This finding supports that of Bynoe (2002) who hinted that one of the major benefit of using an email as part of an organisation’s e-business is that it helps to remove geographical constraints that formerly existed, and that by using online communication tools (including email), organisations can broaden their customer base and gain access to new markets globally at relatively minimal additional costs.

There was insignificant positive feedback linear relationship between e-business impact and organisational strategy in the universities, suggesting that any impact of the intensive or otherwise use of e-business resources and infrastructure being deployed in the universities does not provide any substantial positive feedback to sharpen or re-shape the organisational strategies of the universities. This is not surprising because the low impact of use of the deployed e-business resources and infrastructure to begin with, is reported and discussed above. Nevertheless, some significant positive relationships were revealed between some of the component variables of the e-business impact and some of the component variables of the organisational strategy. This is in agreement with the findings of Gholami et al. (2009) who reported that while the internal administration and communication aspects of e-business services affect performance outcomes positively, the other high-profile activities related to e-procurement and online order taking do not.

In terms of research implications, the proposed and validated model of this study provides not insubstantial explained variance of organisational strategy by e-business strategy, e-business strategy by e-business readiness, e-business readiness by e-business intensity, and e-business intensity by e-business impact in the Nigerian universities. The proposed model and the findings of this study is therefore a useful step towards theory building on needed simultaneous interrelationships and synchronization of organisational strategy with e-business strategy, readiness, intensity, and impact as a novel application of the TOE framework in the context of universities. Also importantly, no study was found that had used the TOE framework as guide to investigate e-business development status, prospects and challenges in the setting of Nigerian universities. This research is one of the pioneer studies that uses TOE framework to analyse e-business development in Nigerian universities.

Moreover our proposed model in Figure 2 can be used or improved upon by other researchers to deepen universal understanding of the status, interconnections, prospects and constraints of e-business variables and services in different types of organisations. There is a dearth of such studies, and the contributions of this study provides a good starting point. Other studies could also use a longitudinal approach to collecting and analysing data on the e-business variables, in place of the cross sectional approach used in this study.

8. Conclusion and recommendations

On the whole, Nigerian universities appear to be making efforts in aligning their organisational and e-business strategies, while the e-business strategies also appear to be improving their e-business readiness. However, much still needs to be done by the universities to improve the interrelationships of these variables. Moreover, e-business readiness resources appear not being used intensively to generate much e-business value and impact, possibly due to lack of adequate technology resources and inadequate management drive or capabilities to effectively monitor, supervise and periodically evaluate actual usage of the resources to identify and correct any systemic weaknesses. For instance, e-business services in Nigerian universities are currently mostly erratic, which translates to the fact that the benefits of the integrated and complementary e-business services are not yet gained by the universities. It is clear that university administrators need to more effectively strategize their organisational and e-business objectives based on assessments of the impact of previous and ongoing e-business investments and services. Nevertheless, Nigerian universities are likely being constrained more by inadequate technical and human resources to upscale their commercial e-business infrastructures for higher e-readiness than by their inability to use the deployed infrastructures to provide e-business services. To overcome this challenge of inadequate resources for e-business investments, Nigerian public and private universities may need to adopt and leverage on public-private partnership frameworks, as already done by some Nigerian private universities. However, such approach may be easier for the private than the public university because the latter are likely to be constrained by opposition from governments and most citizens to passing much of the costs of traditional and modern e-business services to the fees charged from students and other beneficiaries of the services.

This paper concludes with the following policy recommendations based on the findings of this study:

- Nigerian universities need to strengthen the sync and synergy between their institutional goals and strategies and their e-business strategies.
- Nigerian universities also need to institutionalize periodic reviews and assessments on how well their e-business strategies and investments are improving their e-business readiness resources, how well such resources are being effectively and intensively used, and how their use of the resources are bringing positive transformative values and impact to their institutions.
- Nigerian universities needs to employ adequate information technology personnel in the various cadres, and effectively retrain, motivate deploy and assess performance of the personnel to ensure consistent and reliable delivery of quality e-business services and values to their institutions.
- Nigerian universities need to adopt a dynamic programming approach to synchronizing their organisational objectives and their e-business strategies, readiness and intensity for maximal e-business impact.
- The National Universities Commission (NUC), which is a governmental regulatory agency for Nigerian universities need to initiate and implement programmes to assist Nigerian universities with
frameworks, funding, matching grants and human experts from within and outside the universities to assist universities on effective integration and use of information technologies for the delivery of various e-business services.

- Federal and State Ministries of Education and the National Universities Commission (NUC) need to motivate and drive universities in Nigeria towards integration of innovative technologies in their various activities, including curriculum design and delivery; development of institutional repositories and networks for theses, dissertations, project and technical reports; online research collaborations among Nigerian universities and researchers; interlibrary cooperation among university libraries; open and distance learning (ODL) programmes and virtual learning platforms; as well as information systems that harvest and aggregate data automatically into centralized databases, especially from the public universities.

**Declarations**

**Author contribution statement**

Rafiat A. Oyekunle: Conceived and designed the experiments; performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Mutawakkilu A. Tiamiyi: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

**Funding statement**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Data availability statement**

Data will be made available on request.

**Declaration of interests statement**

The authors declare no conflict of interest.

**Additional information**

No additional information is available for this paper.

**References**

Achugbue, E.I. 2014. E-Business in education: the case of delta state university. In: Zhaohao, S. (Ed.), Handbook of Research on Demand-Driven Web Services: Theory, Technologies, and Applications. IGI Global, Pennsylvania, USA, pp. 356-375.

Akinwale, S.T., Mbonele, C. 2011. The Role of E-Business in Optimising Performance in Nigerian Banks. Chisinau, Republic of Moldova: Lap Lambert Academic Publishing.

Amassoma, Ayanda, 2013. A comparative analysis of E-readiness assessment in Nigerian universities towards integration of innovative technologies in their various e-business services. In: Oyekunle, R.A., Tiamiyu, M.A. (Eds.), Electronic Business in Nigerian Universities: A Status Report. Journal of Academic Research in Business Studies, 31 (4), 425–447.

Chaffey, D., 2014. Digital Business and E-Commerce Management. Pearson Education Limited, London, UK.

Chen, Y., Bui, K.D., Carrillo, P.M., 2013. Strategic e-business framework: a holistic approach for organisations in the construction industry. J. Inf. Technol. Construct. 18, 306–320.

Cohen, J., Cohen, P., West, S.G., Aiken, L.S., 2003. Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences, third ed. Lawrence Erlbaum Associates, Mahwah, NJ, USA.

Collier, D.M., 2021. E-Business strategy definition. Retrieved from https://www.cohertedi.com/e-business-strategy-definition.html.

Dos Santos, B., Susman, L., 2000. Improving the return on IT investment: the productivity paradox. Int. J. Inf. Manag. 20 (6), 429–440.

European Commission, 2008. E-business in Europe-2008, Industry Perspectives on E-Business Development and ICT Impact. E-Business Watch, Brussels.

Firman, A., Said, S., 2016. Linking organisational strategy to information technology strategy and value creation: impact on organisational performance. J. Bus. Manag. Sci. (3), 60–67.

Fuchs, M., Höpfen, W., Föger, A., Kunz, M., 2010. E-business readiness, intensity, and impact: An Austrian destination management organisation study. J. Trav. Res. 49 (2), 166–178.

Gholami, R., Al-Somali, S.A., Clegg, B.T., 2009. E-Business adoption and its impact on performance. J. Acad. Market. Sci. 37 (4), 425–447.

Gwamba, G., 2016. The role of e-business in the education sector: are e-business IS creating any added business value in the delivery of e-Learning by HEI in developing countries? https://www.researchgate.net/publication/311861737_The_role_of_e-business_in_the_education_sector_Are_e-business_IS_creating_any_added_business_value_in_the_delivery_of_e-Learning_by_HEI_in_developing_countries.

Hair, J.F., Sarstedt, M., Hopkins, L., Kuppelwieser, V.G., 2014. Partial least squares structural equation modeling (PLS-SEM): an emerging tool in business research. Eur. Bus. Rev. 26 (2), 106–121.

Henderson, R., Jason, D., 2008. Technology Strategy. MIT Open Courseware. Retrieved from https://ocw.mit.edu/courses/sloan-school-of-management/15-921-technology-strategy-fall-2008/.

Hentzerer, J., Ringle, C.M., Sinkovics, R.R., 2009. The use of partial least squares path modeling in international marketing. Adv. Int. Market. 20, 277–319.

Hulland, J., 1999. Use of Partial Least Squares (PLS) in strategic management research: a review of four recent studies. Strateg. Manag. J. 20 (2), 195–204.

Ilin, V., Ivetic, J., Simic, D., 2017. Understanding the determinants of e-business adoption in ERP-enabled firms and non-ERP-enabled firms: a case study of the Western Balkan Peninsula. Technol. Forecast. Soc. Change 125, 206–223.

Internet World Stats, 2021. Internet users in Africa. Retrieved from. http://www.internetworldstats.com/stats1.htm.

Kahoro, P., 2018. Developing information technology strategy for business & IT value. Retrieved from. https://www.researchgate.net/publication/328289860_Developing_information_Technology_Strategy_for_Business_IT_Value.

Khara, P., Bwisa, H., Kihoro, J., 2016. The role of technology in strategy implementation and performance of manufacturing small and medium firms in thika, Kenya. Int. J. Bus. Soci. Sci. 7 (7), 156–165.

Kravi, R.B., 2002. E-Business in higher education. Retrieved from. http://neteducation.com.au/edr/library/pdf/pub5006h.pdf.

Lin, H.F., Lin, S.M., 2008. Determinants of e-business diffusion: a test of the technology diffusion perspective. Technovation 28, 135–145.

Mehta, M.R., Shah, J.R., Morgan, G.W., 2005. Merging an e-business solution framework with CRM. Service Supply Chain Management, 1 (12), 20–37.

Nimmanphatcharin, N., 2003. Strategic management at new economy in university. Available at. https://www.siam.edu/siamedu_thai_mainpage/images/stories/articel/e-baz.doc.

OECD, 1999. The economic and social impact of electronic commerce - Preliminary findings and research agenda. OCED, Paris.

Oyekunle, R.A., Mejabi, O.V., 2012. An evaluation of the websites of Nigerian universities. Int. J. Inf. Process. 1 (1), 62–77.

Okossa, S., 2012. Licences to expand Nigeria’s private higher education sector. University World News: Africa Edition. https://www.universityworldnews.com/post.php?story=20120526070831044&text=The%20A%20Software%20Company%20has%20developed%20an%20online%20university%20technology-strategy-fall-2008/.

Oyekunle, R.A., 2019. Electronic business in Nigerian universities: a status report. Journal of Information Science, Systems and Technology 3 (2), 1–21.

Ringle, C.M., Wende, S., Becker, J.-M., 2013. SmartPLS 3. SmartPLS GmbH, Boeningstedt.

Rodríguez-Abitia, G., Bribiesca-Correa, G., 2021. Assessing digital transformation in public administration for the delivery of e-Learning by HEI in developing countries? https://www.researchgate.net/publication/311861737_The_role_of_e-business_in_the_education_sector_Are_e-business_IS_creating_any_added_business_value_in_the_delivery_of_e-Learning_by_HEI_in_developing_countries.

Rowley, J., 2002. Synergy and strategy in E-business. Market. Intell. Plann. 20 (4), 82–92.

Sibanda, M., Ramrathan, D., 2017. In the Digital Economy. Retrieved from. https://www.intechopen.com/chapter/92385.

Seyal, A.H., 2019. Evaluating information technology strategic planning process: lesson learnt from Britneian small businesses. In: Orlando, B. (Ed.), Strategy and Behaviors in the Digital Economy. Retrieved from. https://www.intechopen.com/chapt en/457570.

Sibanda, M., Ramrathan, D., 2017. Influence of information technology on organisation strategy. Foundations of Management 9 (1), 191–202.

Sokt, S., Yusoff, R.Z., 2019. Technology strategy: literature review and issues. Int. J. Innov. Creativity Chang 8 (6), 67–84.

Sokt, S., Yusoff, R.Z., 2021. Effect of technology strategy on organisational performance of manufacturing companies: a note on how to conduct a data screening and preliminary analysis. Int. J. Business Economics 11 (2), 51–68.

Thompson, A.A., Strickland, A.J., 2001. Strategic Management, Concepts and Cases. McGraw-Hill, New York.
Umar, A.A., Muhammad, N., Hassan, I., 2020. Strategic planning process and organisational performance in Nigerian public sector: a review of literature. Int. J. Acad. Res. Bus. Soc. Sci. 10 (7), 368–382.

Wong, K.K., 2013. Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. Market. Bull. 24, 1–32.

Wu, S.P., Straub, D.W., Liang, T., 2015. How information technology governance mechanisms and strategic alignment influence organisational performance: insights from a matched survey of business and IT managers. MIS Q. 39 (2), 497–518.

Wynn, M., Olayinka, O., 2021. E-Business strategy in developing countries: a framework and checklist for the small business sector. Sustainability 13, 7356.

Yusuf, B., Audu, F., 2018. ICT facilities and their utilization for educational purpose in Nigerian universities: a review of literature from 2004 to 2018. ATBU J. Sci. Educ. Technol. (JOSTE) 6 (1), 237–263.

Zhu, K., Kraemer, K.L., 2005. Post-adoptions variations in usage and value of e-business by organisations: cross-country evidence from the retail industry. Inf. Syst. 16 (1), 61–84.