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A Review of e-Commerce Adoption in Nigeria based on Security and Trust

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Abstract

Electronic commerce (EC) is an Internet-based technology that has gained wide acceptance by business operators and its usage has drastically increased over the years due to the transformation enabled by information technology. Despite the progress so far made in Information Technology (IT) including the e-Commerce, several factors still affect the services provided by e-commerce vendors that include security, privacy, trusts and perceived risks. This paper, therefore, investigated the adoption of e-commerce based on security and trust in Nigeria using a comprehensive review of literature in the related areas, and the methodology adopted was based on secondary data. The study also proposed theoretical models targeted at investigating the relationship between security issues, privacy and how they affect customers' behaviour and the trust degree in e-commerce. Findings reveal that improved security and trust are the bases of increase in the adoption threshold and the use of e-commerce in developing countries. The study, therefore, recommends that e-commerce platform developers should endeavour to build websites that are user-friendly and devoid of ambiguity as well as incorporate dynamic security systems to safeguard the personal information of the customers. Also, e-commerce platform developers need to interact frequently with consumers (or merchants) to establish a strong relationship that would engender trust.

Keywords: *e-commerce, adoption, security, privacy, trust.*

1. INTRODUCTION

Over the years, the Internet has revolutionized all human endeavours including businesses across the globe. Businesses are no longer confined within the traditional "bricks-and-mortar" method. The obvious benefits of e-commerce (EC) have opened up so many opportunities for companies and business experts to explore. The use of EC continues to grow rapidly and its merchants continually make concerted efforts to retain their customers amidst growing competitions in the EC industry.

According to Baroud [1], EC targets at achieving many objectives but the leading objectives attempt to improve the efficiency of business process, reduce the cost of marketing, replacing the traditional method of transactions with the electronic means, provide market information to the consumers, speed up service delivery and expand the geographical boundaries of delivering goods and services. Moreover, EC provides the ability to develop the correct imbalance power between the providers and the users [2].

Despite all the benefits accrued in the use of EC, the involving technology is still not at its ripe stage in developing countries, like Nigeria, as it is still a challenge for many Nigerians to adopt. This stems from the fact that diverse and enormous issues arise from its usage. Some of the issues highlighted in this paper include privacy, security concerns, trusts issues and perceived risks. Despite continued proliferation of EC businesses in Nigeria, lots

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of consumers still perceive EC transactions as risky method compares to the traditional face-to-face transaction. A research study conducted by Yaseen *et. al.*[3] in Jordan, a developing country with less penetration of EC, reveals that the technology-based business model is still facing diverse challenges among developing countries including Nigeria, noting that lack of adequate legislation has negatively influenced the adoption of EC. Researches have also revealed that mistrust and perceived risk are some of the other factors that hinder customer's behavioural intention and loyalty to the online transaction process. More so, privacy, security and trust as mentioned in this paper, are some of the major internal barriers that negatively affect the full adoption of EC in Nigeria.

There is no doubt that the barriers have prevented EC users to achieve a world of efficient and secure transactions, as unsolved security and privacy factors have affected the development and growth of the technology. The traditional bricks-and-mortar method of buying and selling in Nigeria face a lot of challenges such as security in the payment system [4], hence, EC providers in Nigeria should endeavour to create an online community that would reward customer's loyalty and fulfilment by developing a robust security measure that can, in turn, enhance privacy and trust. Therefore, security, privacy, trust, and perceived risk should be the utmost focus of any EC providers, particularly in Nigeria.

Most existing EC studies focus chiefly on western countries like the United States (US) and some European countries have seen it as a global phenomenon. In developing countries, Internet penetration is still not at its peak but still in a sharp downward curve, thereby making the adoption of EC as a grey area in developing countries. The developing countries do not always succeed in technology adoption and this accounts for the low level of EC acceptance. Therefore, the innovative performance of EC technology can effectively create a channel for acceptance and further generate employments, which in turn contribute to the economic growth of the country [5]. As agreed by both EC researchers and practitioners, there still exist some issue in terms of positive influences of EC in developing countries including Nigeria. There is no doubt that many studies have been conducted on EC adoption especially in developed countries. However, the large portions of these issues were not based on security and trust. Therefore, the benefits accrued to the use of EC have not been fully realized in developing countries. This implies that developing countries fall behind in the adoption of EC technology [6].

Unarguably, many studies on EC adoption have been conducted but only a few focused on security and trust. As EC environment becomes more uncertain because of privacy, security concerns and trust issues, a situation where intending users are very sceptical in disclosing their information due to identity theft and this has impeded the general growth that would have been recorded in the adoption of the technology. For example, in Yemen and Iraq as developing countries, there still exist transfers of foreign exchange restriction where EC consumers experience some difficulties while paying through online systems and portals [7], and this boils down to safety and trust. More so, previous studies on EC have established that shopping online depends largely on the evaluation and assessment of EC sites by the consumers. However, to build and maintain EC sites that will engender trust among the consumers is a hard process as this takes time to achieve. Hence, this remains the focus of this paper. This could be done by assessing the EC technology in terms of trustworthiness of the EC based on the quality of service delivery to the intended customers.

According to Zhang *et. al.* [8], security and trust remain the core issues in the development of EC sites as well as its adoption by the consumers. When the fears on security and trust are allayed among the consumers, it would increase the adoption rate of EC among the users. The perceptions of the customers on the issues of security and trust of e-payment systems being used by online trading companies have also become a serious thought since the evolution of EC. According to Agwu [9], some of the factors that influence the full adoption of EC in Nigeria include poor regulatory framework, consumer trust and safety, risks involved in online transaction and problems in a telecommunication system. Therefore, it is clear that the argument on the

safety of consumers as the end-users of the technology has to be taken into cognisance during online transactions to avoid identity theft and loss of funds. This paper, therefore, aims to comprehensively examine some specific determinants or barriers that influence the trust consumers have in online transactions and further present a theoretical user's behaviour model relating to EC adoption in Nigeria based on security and trust.

2. LITERATURE REVIEW ON TECHNOLOGICAL ADOPTION

2.1 Concepts and History of E-Commerce

EC is an instrument that enhances the delivery of goods and services over the Internet. With EC, funds are sent and received via the electronic network. The transactions of business over the Internet occur in one of the three scenarios: (i) business-to-business (B2B), (ii) business-to-consumer (B2C) or (iii) consumer-to-consumer (C2C). Austrade [10] explains that EC as a tool that integrates online transactions with Internet-based activities like exchanging and monitoring of information as well as selling directly to other businesses and consumers. EC also share resources like surplus inventory. Turban [11] defined EC as "the process of buying, selling, transferring, or exchanging products, services, and/or information via computer networks, mostly Internet and intranets". Moreover, EC according to Shahriari [12] involves products or services using computer networks, such as the Internet.

Khan [13] opined that EC involves buying and selling of goods and services on the Internet. Aside these, consumers of the technology use the platform for searching for the latest products on offer and compare the prices of the products before making a purchase online. Rainer and Cegielski [14] also defined EC as a worldwide technology that enhances the process of buying and selling of goods and services, transfer or exchange of funds via online computer networks, thereby providing an uninterrupted flow of information before and after the transaction. In the same vein, MacGregor Kartiwi [15] considers EC as "an electronic mediated technology that facilitates how online business managers perform their tasks and interact with their online customers". EC is dated back in the 1960s through the incorporation of Electronic Data Interchange (EDI) into businesses which helped in sharing business plans and documents electronically across different companies. Consequently, as the 1980s witnessed a high increase of users sharing electronic documents, companies like eBay and Amazon emerged in 1990s to revolutionize and revitalize the EC industry. This means that consumers at their convenience started purchasing unlimited amounts of items via online rather than the traditional physical presence technically referred to as "bricks-and-mortar".

2.2 The Rate of E-Commerce Adoption in Nigeria

Recently, Nigeria has started experiencing the emergence of robust and articulated EC sites such as Konga, Jumia, Jiji, Yudala, Amazon etc. that have helped in creating a platform for the advancement of Information Technology (IT) in the country and thereby creating employment opportunities and adding a huge boost to the economy of the country. According to Ibiam *et. al.* [16], many more EC sites are still evolving. This is because some of the traditional store owners are upgrading to online shopping platforms thereby affording millions of Internet users in Nigeria the opportunity to perform online shopping and access business services. However, judging by overestimated 200 million Nigerians predominantly dominated by the young people (youths), the adoption rate of EC is expected to increase in a proportionate order with the population explosion.

Based on Societe Generale [17] report, Nigeria's EC sector was estimated in 2018 to worth US$13 billion. But due to the fall of oil prices at the global market, the economy of the country has been contracting thereby impeding greatly on the EC business. It is not an understatement that EC has become very popular in Nigeria especially among the youths, making Nigeria a leading hub of EC domain in Africa. The EC sector in Nigeria relies heavily on the consumer's consumptions for survival and higher income. Products like electronics, fashion wears, groceries are some of the most popular EC-based products consume in Nigeria that is mostly the demands of young people in the country. The EC payment system has also been upgraded in

Nigeria, whereby before now, cash on delivery was used as the most popular payment system among Nigerian EC users, but now, many stores do not trade with such payment system again. Rather, they have opted for other options like the webcard and Paypal mostly used for international online purchases.
Nigeria as a nation is not immune to Internet threats and challenges. One of the problems faced by Nigerians concerning the issue of EC adoption is the fear on the trust and security threat to their accounts during making e-payments such as the point-of-sale (POS) and mobile money transfer. Other challenges include the high cost of services and the genuineness of the business and the business partners involved in the online transaction [16]. Furthermore, a study conducted by Johnson [18] found out that perceived ease of use of the payment system is a major predictor of EC adoption in Nigeria.

The Nigerian government has been paying good attention to the EC business in recent years through the enactment of the Cybercrime Law 2015 that aims at prohibiting and preventing Internet frauds in the country. The Economic and Financial Crimes Commission (EFCC), as an agency of the government, is charged with the task of curbing financial crimes and Internet frauds. EFCC has had its fair share of leading the war against Internet fraudsters popularly known in the country as "Yahoo Boys". It is based on this background, therefore, that EC providers in Nigeria should endeavour to consider all the aforementioned issues to be able to create an EC environment that would increase trust and security and further build customer's loyalty and intention.

EC has experienced tremendous growth worldwide. It has greatly grown from $1.3 trillion in 2014 to $3.5 trillion in 2019, and it's predicted to reach $6.5 trillion in 2023 [19]. In 2018, an estimated 1.8 billion people globally purchased goods online. In the same year, the global e-retail sales amounted to $2.8 trillion [19].

A report published by UNCTAD [20] in 2015 showed that African continent with a developing economy recorded the lowest penetration of EC. The report further acknowledged that Africa and the Middle East accounted for a paltry 2.2% of global EC with a total of $25 trillion online sales taking place in 2013 among the developed economies with the exemption of China. Figure 1 shows the growth of EC worldwide from 2014 to 2021.

According to the Nigerian Communications Commission [21] annual report in 2019, Internet users in Nigeria hit 122 Million in 2019. The data breakdown also showed that the overall Internet users in Nigeria increased by 122 Million in March 2019 from 98,391,456 in December 2018, showing an increase of 24,608,544. This means that there is a tremendous opportunity for EC growth in developing countries, including Nigeria. Figure 2 shows the indicator of active Internet users in Nigeria from April 2019 to March 2020.

The adoption of EC in each country varies based on infrastructure and readiness of the users. In developing countries like Nigeria, the obstacles against the adoption of EC technology differ from those in developed countries because the Information and Communications Technology (ICT) grows tremendously in developed countries as compared to those of the developing countries that are still battling with the affordability of Internet connectivity.

Reiner *et. al.* [23] describe the adoption of EC as a process of integrating all company's processes, activities and services towards buying and selling of products and exchange of information and funds with the company's partners via computer networks and electronic devices. According to William and Fraser [24], developing countries like Nigeria face surmountable obstacles that include internal and external barriers that affect the growth of EC and that it has the potential to provide many unprecedented opportunities based on its positive impacts on business transactions, investment, trade, and market penetration.

A study conducted by Arnifield [25] on World Pay showed that Africa and the Middle East accounted for only 3.6% of the EC payment. Nigeria being the leading country is followed by Kenya and South Africa respectively. Figure 3 shows the number of Internet users by African countries as of June 2019, where Nigeria and Egypt were the leading countries.

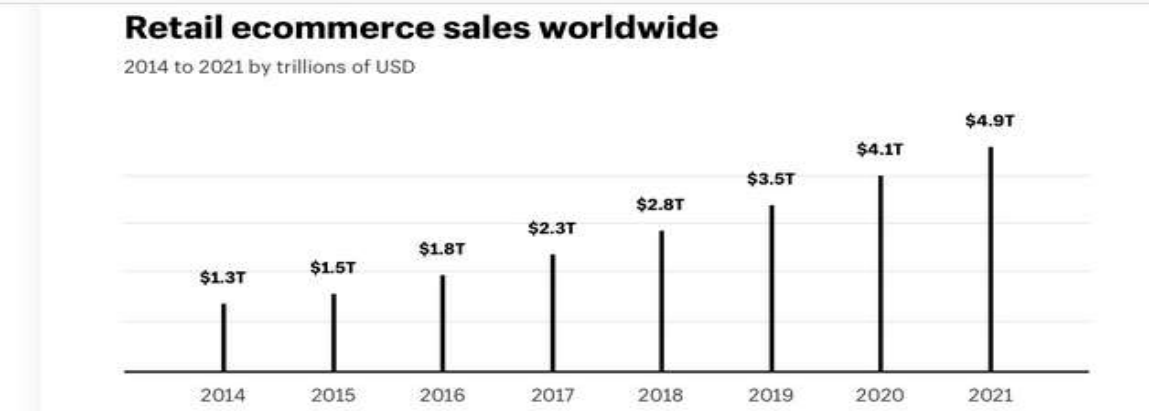

Figure 1: Retail e-Commerce sales worldwide from 2014 to 2021 [19]

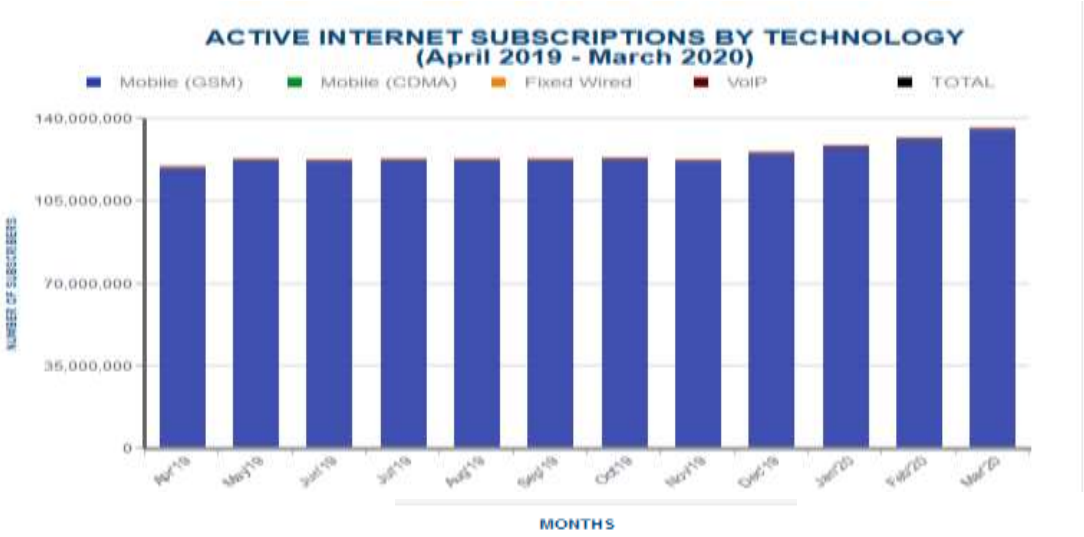

Figure 2: Active Internet subscription in Nigeria from April 2019 to March 2020 [22]

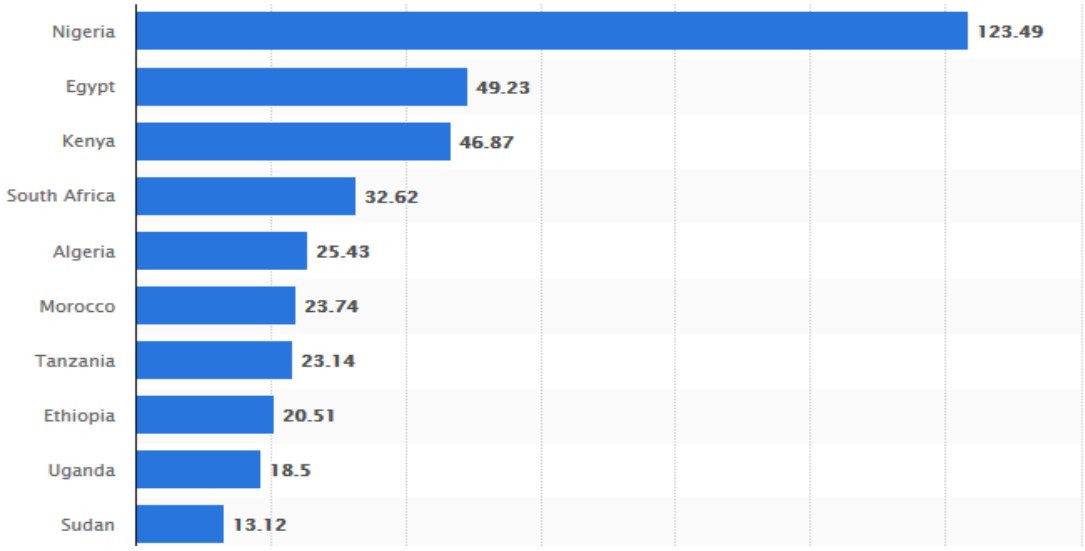

Figure 3: Top Ten (10) Active Users of Internet by African Countries [28]

This means that the use and availability of the Internet can help ameliorate all the processes required for the implementation and adoption of EC technology [26].

According to Lianos and Botwright [27], during the World Economic Forum (WEFORUM), trust between EC merchants and consumers is always a bigger issue to resolve online than it is offline. Therefore, the full adoption or acceptance of EC in developing countries requires paying attention to the security and poor levels of consumer trust that are still holding it back. Figure 4 shows the different phases of EC adoption. Understanding EC adoption in developing countries seems very challenging and tasking. According to Kofi Annan in UNCTAD [29], countries where there is a failure in the adoption of EC risk falling behind both in social and economic developments. Notwithstanding these opportunities, the adoption of EC technology has not been at its best, particularly in developing countries. In 2002, the developed countries made a contribution of 95% in EC while Africa and Latin America accounted for less than even 1% [29]. Figure 4 shows the phases of EC adoption incorporated as the framework of the study.

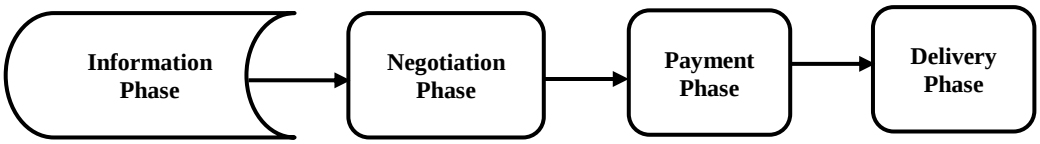

Figure 4: Modified Framework for E-Commerce Adoption [30]

3. METHODS

The methodology used for this study focused on secondary data. That is surveying journals from authors in diverse disciplines related to EC research on security and trust. The survey includes journal articles, conference papers, masters and doctoral dissertations, published and unpublished books, research papers, magazines, daily newspapers, Internet and official statistical documents.

To make the survey concrete, information was collected from various sources. Although it is understood that secondary data may be biased and hence, not reliable, the study presented here is descriptive and qualitative.

3.1 Theoretical Models

Several studies have examined the factors militating against the adoption of EC by individuals and organizations around the world. However, these studies lack a theoretical model of EC adoption based on security and trust. Therefore, after a critical review of the existing literature focusing on the factors determining EC adoption in developing countries, the theoretical review will give a conceptual analysis and discussion of the technology's adoption models based on security and trust. Thus, in this paper, the following three (3) theories: Theory Reasoned Action (TRA); Theory of Planned Behaviour (TPB); and Technology Acceptance Model (TAM) were considered for review.

3.1.1 Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (TRA) as developed by Fishbein and Ajzen [31], states that an individual's behaviour is predominantly determined by his intention to perform the behaviour (Figure 5) and this intention is invariably a function of his attitudes toward the behaviour and subjective norms. This means that intention or its instrumentality (a belief that the behaviour will lead to an expected outcome) is the best predictor of behaviour.

Three factors determine an individual's intention: attitude towards precise behaviour, subjective norms, and perceived behavioural control. If the attitude is more favourable, the norms are more subjective and greater the perceived control, then the stronger the person's intention to perform the behaviour. Simply stated, the TRA can be expressed mathematically as:

$$(B \sim BI) = (W_1)\, AB + (W_2)\, SN$$

where, B = Behaviour, BI = Behavioural Intention, (AB) = one's attitude towards behaviour, W_1 = Weight for AB, W_2 = Weight for SN, SN = one's subjective norm.

$$AB = \sum_{i=1}^{n} Bi\, ai$$

Bi = believe that the behaviour will result in the outcome (i), ai = evaluation of the outcome "I",
n = number of outcomes.

$$\boldsymbol{SN = \sum_{i=1}^{n} \; NBi\, MCi}$$

$\boldsymbol{NBi}$ = normative belief related to outcome ($\boldsymbol{i}$), $\boldsymbol{MCi}$ = motivation to comply with $\boldsymbol{NB}$,
n = number of outcomes. Therefore, Figure 5 further explains the TRA Model.

One idea behind the TRA is that formulation of one's intentions through the measuring of one's attitude while exhibiting the behaviours and subjective norm (how people would view the behaviour) towards performing a certain voluntary behaviour. TRA also suggested three conditions that affect the relationship between behavioural intention (BI) and behaviour. The first condition measures the degree of intention which must tally with their levels of specificity. That is, to predict a specific behaviour, the BI must be equally specific.

control of the individual. These conditions have to do with the transition from verbal responses to actual behaviour. Beliefs and other external factor are the other factors regarding TRA. The former plays an important role in attitude formation while the latter does not directly cause changes in intentions. Rather, it is through AB and SN and general attitude towards an object is a summation of the attitudes related to different behaviours related to the particular object.

Fishbein and Ajzen [31] developed the TRA for the health field to understand some health behaviours. TRA is applied in different contexts to understand and predict any human behaviour relating to the acceptance of any technological innovation. Even though the scope of TRA is wide, it cannot be ignored to say that the theory presents its limitations and criticism like any other theory. Some of these limitations are: it needs constant refinement and revision particularly when extending to choice and goals, it only works

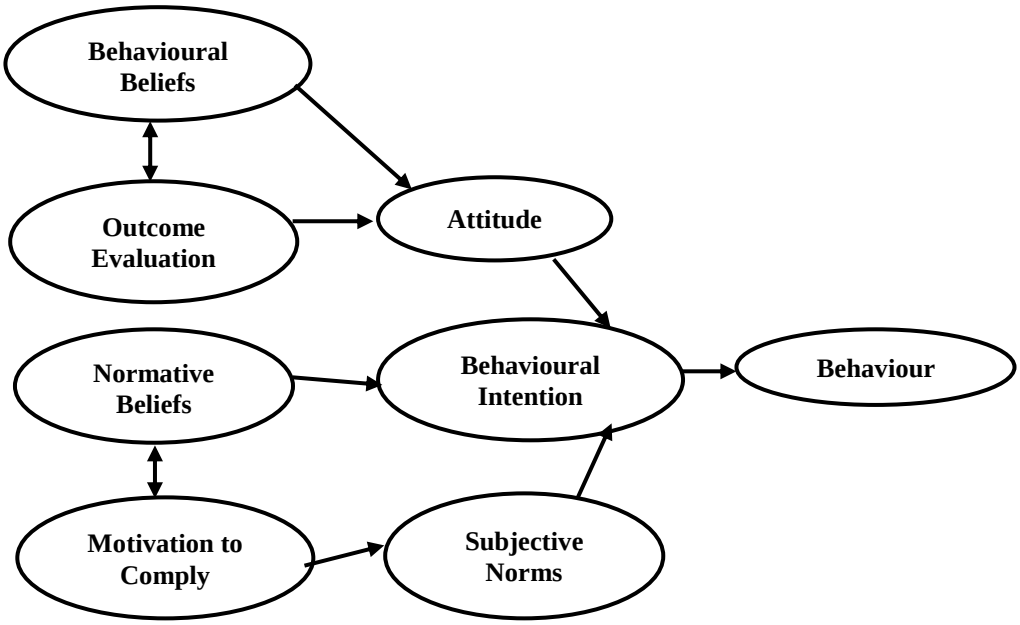

Figure 5: The Theory of Reasonable Action [31]

The second condition focuses on the firmness of intentions between the time of measuring the BI and performance of the behaviour. The intention must remain the same between the given time and the time of exhibiting the behaviour. The third condition states the level of carrying out the intention under the volitional control of the individual. Whether or not to perform the behaviour is under the

when the individual has volitional control, difficulty in differentiating attitudes and social norms and does not take factors such as skills, unconscious habits and restricted environment into account. Hence, TRA has these limitations and criticisms that the theory was refined and by developing the next theory called the Theory of Planned Behaviour (TPB).

3.1.2 Theory of Planned Behaviour (TPB)

1) Theory of Planned Behaviour (TPB) is as an extension of TRA formulated by Ajzen [32]. The theory majorly connotes the notion of behavioural intention. It suggests that the best predictor of whether or not the person will perform the behaviour is the person's intention. That is, the theory premises that the best predictor of actual behaviour is the behaviour the person intends to exhibit. The theory makes use of three (3) variables: an attitude that deals with the specific act or behaviour, a normative component that focuses on the belief about what others value and perceived behaviour control which is the *degree a person can control the behaviour.* In a simple form, behavioural intention for the TPB is expressed as the following mathematical functions:

$$A\ \alpha \sum_{i=1}^{n} \boldsymbol{bi\ ei}$$

$$SN\ \alpha \sum_{i=1}^{n} \boldsymbol{ni\ mi}$$

$$PBC\ \alpha \sum_{i=1}^{n} \boldsymbol{ci\ pi}$$

where:
*bi is a b*ehavioural intention;
A is an attitude towards behaviour;
b: is the strength of each belief concerning an outcome or attribute,
e: the evaluation of the outcome or attribute,
SN: Subjective norm,
n: is the stability of each normative belief of each referent,
m: the motivation to comply with the referent,
PBC: Perceived Behavioural Control,
c: the strength of each control belief,
p: the perceived power of the control factor.

TPB covers people's non-volitional behaviours that TRA cannot explain. TPB posits that an individual's BI is not the main determinant that can influence such behaviour. This means that a stronger intention to engage in a given behaviour indicates exhibiting such behaviour [33]. By incorporating perceived behavioural control in TPB, the theory can explain the relationship between volitional control and actual behaviour. Several studies found that the TPB performs creditably well in the area of predicting health-related BI such as identity theft, depression, drug abuse than TRA. Like other theories, TPB has its limitations and criticism. Scholars criticized the theory for involving so many factors. More so, that subjective norms, attitudes and perceived behaviour should have interacted with each other rather than function as three separate models.

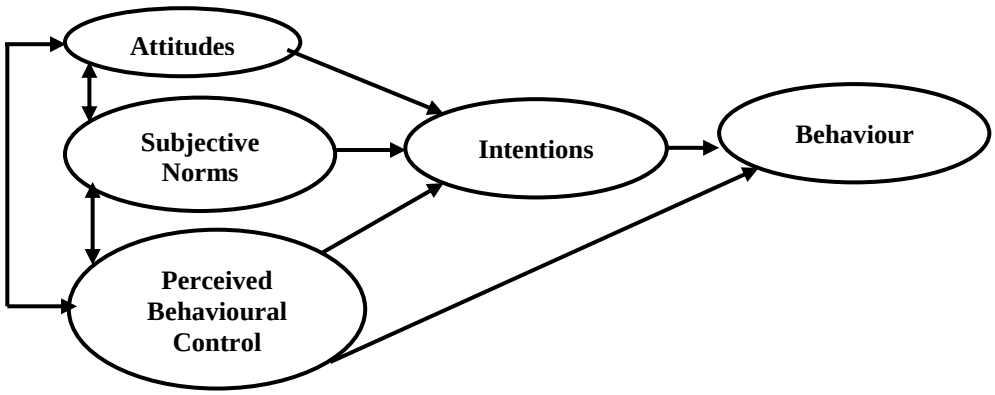

Figure 6: The Theory of Planned Behaviour [32]

Thus, Figure 6 shows a diagrammatic representation of the TPB Model.

3.1.3 Theory of Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis [34] is an information system theory that models the level of acceptance and actual usage by users of technological innovation. TAM is an adjustment of TRA to forecast the adoption of new technology. The TAM is made up of two main variables: *perceived usefulness* (PU) and *perceived ease of use* (PEOU) that focus on the decision to accept a new technology [34]. Even though TAM was earlier designed to explicate factors affecting intention and adoption of technology, studies have shown its successful application in the area of Internet consumer behaviour. PU conveys the possibility of prospective technology users with the assumption that the applications of new technological innovation are capable of

enhancing their work performance. PEOU (or simplicity) defines the degree measuring the potentials users expect to handle the technology effortlessly [35].

However, [36] posited that the current state of TAM cannot be fully used to explain the behaviours of online consumers because EC adoption substantially differs from new technology adoption in an organization. One of the major differences is that the decision to engage in online transaction is voluntary. On the other hand, the organizational policies informed the decision to use new technology. Though, as originally conceived, the use of TAM may not likely lead to a comprehensive explanation of EC, but extended TAM may turn out to be useful in explaining user's behaviour to accept an innovative technology. Based on this background, one can see that there is a need to upgrade the TAM to serve in the area of EC adoption model.

TAM has demonstrated to be an effective model to explain and predict usage intentions and acceptance behaviour [37]. TAM has been adjudged as an outstanding theory that seeks to look into the factors that influence technology adoption [38]. Despite its widely referencing by researchers, TAM has not existed without criticisms, with a leading proposal from researchers for its refinement and extension. El-Gohary [39] opined that TAM discounted the likely effects of some important internal and external factors in an organization. According to Durodolu [38], TAM is deficient in explaining the adoption of technology by disregarding the effects of societal influence on technology adoption. Based on the limitations of TAM, Khan and Woosley [40] recommended that TAM should be expanded to accommodate societal and human elements. TAM, according to Scherer *et al.* [41], remains a good choice to explain user adoption of EC technology to engage in an online business transaction. Generally, TAM is regarded as an information system (IS) aim at modelling how users can adapt and use new technology to enhance their organisational performance. Figure 7 shows the original Theory of Acceptance Model (TAM).

From these three theoretical models discussed above, TAM has exemplified itself as a useful theoretical model to enhance the understanding and explanation of users' behaviour concerning the implementation and use of information system. This is attested in many empirical studies as the tools used in the model have turned out to be of quality and yielding more concrete statistically reliable results. Furthermore, by reviewing the critical roles of TAM would also point researchers to design different virtual environment-based application interfaces for different online customers as this will consequently increase the usage level of technology in different application areas like EC.

This paper has figured out several factors that affect the customer's decisions regarding adopting EC technology. The degree of security (fear) and privacy (uncertainty) leading to anxiety among EC consumers are some of the risk aspects that in return affect the level of customers' trust. Hence, the paper has found out that it is expedient to explain each factor (i.e. security, privacy, trust and perceived risk) distinctively and establish relationships among them.

4. TRUST AND SECURITY IN E-COMMERCE ADOPTION

The Geo Poll survey in 2016 administered to 1,251 people from five African countries comprising of South Africa, Ghana, Kenya, Nigeria and Uganda revealed that the issues of security and trust, as well as payment problems via EC platform, are the two main principal causes of the reluctant use of EC in African countries [13]. According to Yaseen *et. al.* [42], another key obstacle impeding the acceptance and actual usage of EC in developing countries is due to deficiencies in the security and reliability of electronic payment system. According to Alyoubi [43], the fundamental measures to positively influence the adoption of EC in developing countries is to focus on the development of a supportive regulatory and legal framework to adequately protect the online customers, ensure the security of e-business and eliminate cybercrimes. It is worthy of note to mention in this paper that potential threats to EC is 24/7 and can be foreign or domestic, internal or external. This implies that the adoption of EC will increase provided the consumers trust the technology and have the assurance of both

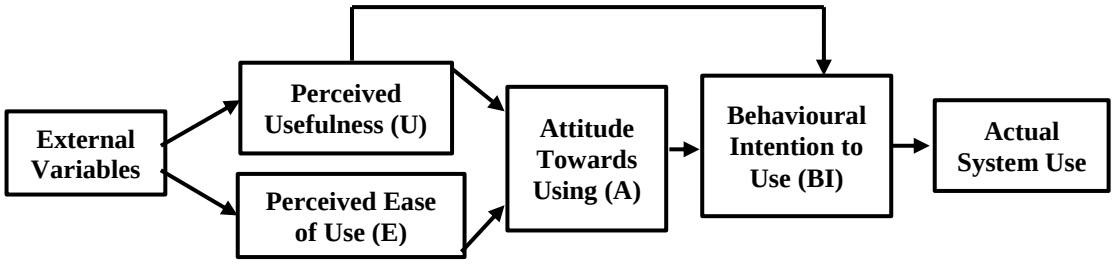

Figure 7: The Theory of Acceptance Model [34]

security and reliability of EC [44]. Security concerning EC is the protection of both the business and consumers against cyber threats and thefts. This means that implementing EC security will improve consumers trust and purchasing power.

4.1 Dimensions of e-Commerce Security

Several kinds of researches have revealed that well-implemented security would help to protect EC against cyber threats [8, 24, 30]. For clarity, this paper, therefore mentions some of the security measures that would help to maximally reduce EC cyber threats to include integrity, confidentiality, availability and non-repudiation.

i. **Integrity:** This aims at protecting data against deletion or modification by any unauthorized person. It ensures that reversal is done when authorised personnel makes a change that should not have been made.

ii. **Confidentiality:** This ascertains that only the authorized personnel access sensitive data and information and those unauthorised individuals are kept away from the database. Confidentiality is commonly enforced with the help of security mechanisms built into the EC platform such as access control lists (ACLs), encryption, usernames, and passwords. Also, it is common to classify information based on the possible level of damage that can be done in case the database falls into the wrong or unauthorised person.

iii. **Availability:** This makes both information and resources made available to the customers on real-time. Most of the threats to availability are usually non-malicious and are implemented through the use of methods like software patching, hardware maintenance, and network optimization. Processes like Redundant Array of Independent Disks (RAID), failover, redundancy and high-availability clusters are implemented to reduce grave consequences in case of the occurrence of hardware issues. The availability and responsiveness of an EC website and data are key to EC merchants, as disruption of website availability and data can be a serious challenge to a lot of EC users and thereby causing loss of revenue and reputation damages. Therefore, it would be important if EC providers should endeavour to provide sophisticated countermeasures to guard against malicious actions from hackers like Distributed Denial-of-Service (DDoS) attacks.

iv. **Non-repudiation:** Finjan [45] defines non-repudiation as the ability of an individual or organization to abnegate the receipt or authenticate user's signature on the contract documents or he is the originator of a particular message or transfer. This means that to repudiate is to deny. Non-repudiation therefore can be avoided by securing envelopes and digital signatures. Despite the extensive discussions of the dimensions of EC security, it is worthy to mention some other key elements of EC security to include access control, authentication, authorization, and encryption.

4.2 Privacy

Researches have revealed that lack of robust online privacy behaviour has led to customer's trust in the EC environment [46]. This means that consumers tend to be comfortable while engaged in traditional face-to-face transactions than online transactions. Several researchers conducted on online business privacy revealed that customers who need a high level of privacy are less likely to use EC for transactions [47]. According to Yao *et. al.* [48], privacy deals with the right of a customer to decide whether information should be disclosed or not. Trepte and Masur [49]

surveyed the "Need for Privacy". The study reveals that privacy consists of three factors: informational privacy (that is not wanting my data to be publicly accessible); physical privacy (that is not wanting unknown people to have access to my identity); interactional privacy (that is feeling awkward when others share publicly what is supposed to be private information for them). Therefore, the need for privacy cannot be overemphasized and, if taken seriously, would be a framework for restoring customer's intention and trust in EC.

4.3 Trust

Trust in EC is very germane because it helps to firmly hold the relationship between the EC merchants and the users. As a result of the complexity involved in online shopping as compared with traditional "bricks-and-mortar" method, EC requires more trust. Online transactions are not only characterized by uncertainty, but it also deals with anonymity, lack of control and potential opportunism making the risk and trust crucial elements of EC [50]. Therefore, based on the trust issue, consumers of EC can consider it by trying to reduce the uncertainty and complexity of transactions in electronic markets.

Lack of trust is the topmost identified reason discouraging consumers from purchasing products from Internet-based vendors [50]. EC merchants, therefore, must evaluate the factors that influence consumer's trust to maintain the consumers to use EC technology. The implication is that trust is the foundation for customer's behaviour and loyalty. Therefore, to earn the trust of customers, EC companies or merchants need to maximally protect data transmitted on their sites. EC customers experience various levels of trust phases in terms of EC services. To this effect, EC merchants need to properly understand the hidden issues as well as the characteristics that drive consumers as they approach each phase of their service. Petrovic *et. al.* [51] identified six elements, which when combined builds a "Trust Pyramid". Meanwhile, the six elements are displayed in Figure 8.

Petrovic *et. al.* [51] highlighted three core factors required for customers to stay in EC business: *security assurance*, *merchant legitimacy* and *enhanced or robust order fulfilment*. These factors form the bases of the trust pyramid. Other sub-factors are customer's control and collaboration. These sub-factors are used by businesses to distinguish their brands from other competing ones operating within the same market or industry. Altogether, these factors serve as important instruments to build and maintain customers' trust in all levels of EC or online services.

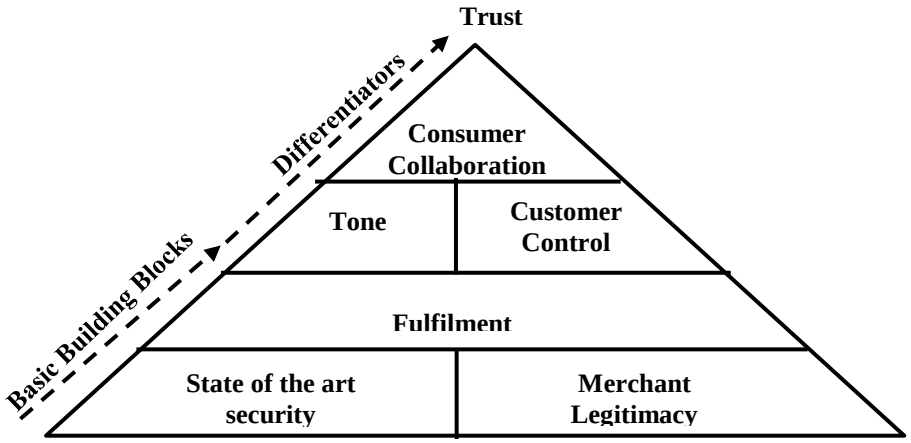

Figure 8: The Trust Pyramid [51]

5. DISCUSSIONS

This paper focused on the investigation of EC adoption based on security and trust in developing countries. Many business operators accept EC as an opportunity for economic development and gain a stronger recognition in the multilateral trading system. EC equally plays an instrumental role to help developing countries and boost their economies. The increase in the use of the Internet, Personal Digital Assistants (PDAs), Point-of-Sale

(POS) and larger consumers' confidence will invariably expand EC both in the developed and developing countries. To this extent, this paper arguably proposed theoretical foundations for the adoption of EC in developing countries.

The study is qualitative because the contents were based upon reviewing the literature of various researches that have conducted using them as inputs on subject matters that are related to this study. As earlier stated, the paper aims to get an overall understanding of EC adoption in developing countries based on security and trust. Hence, the literature review method was considered for this study for reviewing the general perspective of EC technology. Reviewing existing various research works on key issues in EC ultimately provide more insight on ideas and significant gaps for researches to explore.

During the conduct of this study, security, privacy, perceived risk and trust were identified as very critical issues in EC. Understanding the relationship between these concepts is more crucial. The study has also discussed some insights on security, privacy and trust concepts in EC, particularly in developing countries. Furthermore, the study also examined the importance of each of these concepts concerning EC and investigated the relationships between the mentioned three concepts. Also, the study reviewed EC adoption models as a preliminary theoretical model for EC and trust pyramid for maintaining and building customer's confidence at all level. The proposed model in this study provides a basis for further research on clarifying and understanding the relationship between security, trust and other concepts in EC. With appropriate validation methodology, the model will lead to a better understanding of the importance the security, privacy and trust in adopting EC in developing countries.

6. CONCLUSION

This paper investigated the significance of security and trust as it affects the adoption of EC in developing countries. The study found out that security is one of the most crucial issues affecting the development and adoption of EC innovation in developing countries. More so, the study also found out that trust has a significant impact on customer behaviour and loyalty and acts as an intermediary for each part of the quality of the user interface and data quality, and customer satisfaction. However, perceived risk and low consumer confidence in EC affect the purchasing and will decisions of such customer towards adopting the technology. Also, the risk level of security and confidentiality of customers perceived in EC are important matters for customer's confidence and therefore, are important for the development of EC in developing countries.

Moreover, the study has revealed that the developing countries face many challenges that affect the successful implementation and adoption of EC resulting from comparing the technology with the developed countries. Therefore, the effects of the current low level of adoption of EC in developing countries cannot be overemphasized and thus, their slow economic growth is attributed to the lack of benefits inherent in EC. This is due to some special constraints that developing countries face including security, confidentiality and trust concerns.

In terms of trust, the study has found out that one cogent reason for EC users not to purchase products online is lack of trust. That is, the absence of physical interactions in the online environment accounted for more difficult to establish trust amongst the EC users or customers in Nigeria. The study has also established that security and privacy remained factors of great importance for the customers exhibiting a low level of trust and feel reluctant to purchase products online. This study has, therefore, shown that developing countries can get the better of the militating factors against EC adoption and actual usage. The issues of security, privacy, confidentiality of data and trust can be addressed by implementing some sophisticated security measures during the design of the EC websites such as the CIA triad as discussed in the study. The study recommended the consideration and use of the models mentions to examine other likely factors that may portend barriers for the full adoption of EC Nigeria and other developing countries. A future study is suggested to be done in the area of using primary data to critically look into the

significance of trust in EC adoption in developing countries.

7. RECOMMENDATIONS

Based on the outcome of this study, this paper recommends that:

1. For full adoption (acceptance) of EC, there must be trust, trade policies and agreements between EC merchants to meet international standards.
2. EC merchants should endeavour to build websites that are user-friendly, devoid of ambiguity and as well incorporate hard nut to crack security systems by hackers into the websites to protect customers' personal information and loss of funds.
3. EC merchants should ensure that there exists frequent interaction with consumers to establish a strong relationship that would engender trust.
4. The findings of this study serve as a body of knowledge to the existing area of EC and as background information for EC website developers.
5. The study has some limitations, as it does not involve primary data. Hence, further research can be conducted to establish the issues earlier pointed out in this paper.
6. Furthermore, the study also recommends the use of the proposed model to conduct further studies on examining other factors or barriers that hinder the adoption and actual usage of EC in Nigeria and other developing countries.

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