*Full length research paper*

# The adoption of electronic data interchange (EDI) technology by Nigerian SMEs: A conceptual framework

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In these days, the adoption of information technology (IT) in business operations is no longer privilege to large organizations; Small-Medium-Enterprises are also trying to adopt the IT in process of gaining the benefits of using it.   Nigerian SMEs have been slow to adopt EDI due to perceived high cost of implementation, lack of willing trading partners and lack of awareness of EDI benefits.   However, there has been little research conducted and published on the adoption of Electronic Data Interchange among SMEs in Nigeria.   Most previous researches done in the context of developed countries. This study aimed to examine factors affecting the adoption of EDI Technology in Nigerian SMEs and to proposed EDI Technology model to the Nigerian SMEs.   The study accepts three factors as determinants of the adoption of electronic data interchange (EDI): perceived benefits, organizational readiness and perceived pressure.  A model of Iacovou et al., (1995) used to test the adoption of EDI as was found to be influential in prior EDI research. The primary data was collected by distributing questionnaires to 306 SMEs out of 1500 SMEs in the Northern part of Nigeria their responses analyzed using   the SPSS software.  All three factors were found to be significant in SMEs EDI adoption, with direct benefits, financial resources, and external pressure being considerably more important than technological resources and internal pressure.

**Keywords:**  Technology adoption; EDI Technology; Nigerian SMEs

## INTRODUCTION

Electronic Data Interchange (EDI) is a technology, based on standards, which allow businesses to increase the speed and quality of their communication and decrease costs dramatically. This technology has been available for more than a decade, yet the adoption rate is extremely low.

Electronic data interchange (EDI) is the computer-to-computer exchange of data in standardized, electronic formats between companies. Computer to computer means "original application program to processing application program. EDI is also a business strategy utilizing technology to achieve business objectives and enhance business relationships. EDI transactions, can be

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exchanged between two companies (commonly referred to as Trading Partners) anywhere in the world within hours or minutes.

## Why adopt EDI?

EDI becomes useful when repetitive manual tasks are required to support a business relationship; Electronic Data Interchange simply eradicates them by automating the process and removing the paperwork element. It increases accuracy by eliminating the re-keying of data. The quality of data is enhanced by agreeing product codes, prices and location codes in advance. EDI also helps to cement customer/supplier partnerships by reducing the supply chain costs associated with manual processing. Adopting EDI makes trading relationships more cost effective and easier to deal with; with the introduction of EDI the following benefits are expected: Faster exchange of data without errors; reduced communication costs; streamlined logistic processes; reduction in turnaround times; inventory reductions; improved competitive position, e.g. by creating new kinds of services.

## Technology Adoption

Khasawneh (2008) defines the meaning of technology adoption as "…the first use or acceptance of a new technology or new product". Some researchers identify that the adoption process starts from election procedures when a firm is aware of the need to purchase a technology, while other scholars focus more on real usage when the technology is about to be utilized or implemented. Technology adoption is a voluntary individual behavior that is explained by behavioral theories such as: the theory of reasoned action (TRA) proposed by Fishbein and Ajzen (1975), theory of planned behavior (TPB) proposed by Ajzen (1991) technology acceptance model (TAM) proposed by Davis (1989), and Venkatesh et al. (2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT) which combines eight theoretical models including the TAM and TPB.

Technology adoption research has been studied for well over two decades (Venkatesh et al., 2003). Most of the recent studies on technology adoption are unavoidably context- specific, making the knowledge on innovation in SMEs still limited. The knowledge about

what types of innovation SMEs undertake, how they actually do it and the impact of their innovation efforts on different dimensions of firm performance remain limited (Oke et al., 2004). No study has attempted to investigate the extent of acceptance of EDI technology in Nigerian SMEs. The existing studies on EDI adoption however, do not investigate the EDI adoption by developing countries and do not attempt to determine the adoption of EDI by Nigerian SMEs.

## LITERATURE REVIEW

The review of past EDI adoption literature indicates that past studies have focused mainly on large businesses in developed countries. This is understandable, as EDI has been the privilege of large business organization because of the huge investment involved in the past. EDI required prior arrangements and dedicated lines, and it was often found to be costly and complex, especially by small- and medium-sized business. SMEs are the backbone of the economy in Nigeria. Despite the fact that small businesses represent such an important sector of the economy, few studies have been done on EDI adoption by small businesses. Since small businesses possess certain unique characteristics as compared with large businesses, the general applicability of past EDI adoption studies to small businesses is questionable. This paper extends the research by investigating the EDI Adoption research from Nigerian SMEs' perspective.

## SMEs' EDI Adoption

A few studies have been conducted to examine factors affecting the adoption or the success of the adoption of EDI. For example, O'Callaghan et al., (1992) performed an extensive survey study on EDI adoption in marketing channels. With a sample size of 1100 firms, their results show that among the five innovative attributes in Rogers's DOI framework, relative advantage and compatibility have significant relations with EDI adoption. In another study, examined Rogers's five innovative attributes in the context of EDI adoption. With 200 organizations in various industry groups surveyed, the study concluded that relative advantage, technical compatibility, and cost are significant factors in making the EDI adoption decision.

Several studies have focused on the influence of inter organizational factors on EDI adoption. For instance,

Bouchard examined the influence of trading partners in EDI adoption decisions by retail suppliers. Based on responses from 175 suppliers, the influence of trading suppliers was found to be a significant factor in the adoption decision. Neo et al., (1994) using Trade Net in Singapore as the case examined the significance of peer influence and coercive influence in addition to relative advantage and trial ability on the EDI adoption decision. They found that both group influence and trial ability were significant factors in the adoption decision. In another study, Premkumar and Ramamurthy (1995) examined the role of several inter organizational factors in the decision mode for EDI adoption. The results suggest that exercised power and competitive pressure are significant to discriminate between adoption decision modes.

Factors related to the internal environment of an organization and the EDI adoption decision have also been examined in several studies. For example, Drury and Farhoomand used an administrative innovation approach to examine EDI adoption in organizations. Based on responses from 379 respondents, lack of knowledge of and training in EDI were found to be major impediments to adoption.  McGowan and Madey investigated the impact of organizations' structural characteristics and organizational learning factors on EDI adoption and use. The level of EDI knowledge and technical expertise were found to have positive influence on EDI adoption and use.

There has been little research specifically studying SMEs' EDI adoption. To address the issue of the major factors that influence the adoption of EDI in the SMEs' Enterprise context, Iacovou et al., (1995) formulated a small business EDI adoption model and tested it based on a multi-case study. The authors argued that small firms resisted becoming EDI-capable because of the (a) Limited impact that IT had on small firms due to under-utilization and lack of integration; (b) Low levels of IT sophistication and (c) Weak market positions of small firms and the network nature of the technology. Based on a review of the past conceptual and empirical research on EDI adoption and small businesses, three major factors that influence the EDI adoption practices of small firms were identified. These factors included
(a) Perceived benefits; (b) organizational readiness and (c) external pressure.

Perceived benefits refer to the level of recognition of the relative advantage that EDI technology could provide to the organization. As such, they were divided into two categories. The first one was direct benefits, which were mostly operational savings related to the internal efficiency of the organization. The second one was indirect benefits, which were mostly tactical and competitive advantages that had an impact on business processes and relationships. It was argued that small firms that recognized the benefits of EDI would be more likely to adopt EDI than those firms that had a lower level of recognition of the technology's perceived benefits would.

Organizational readiness referred to the level of financial and technological resources of the firm. There were two dimensions in organizational readiness. Financial readiness referred to the financial resources available to pay for EDI installation costs, for implementation of any subsequent enhancements, and for ongoing expenses during usage. Technological readiness referred to the level of sophistication of IT usage and IT management in an organization. It was argued that small firms with higher levels of organizational readiness for EDI would be more likely adopt the technology than firms with lower levels of readiness would.

External pressure referred to the influences from the external business environment. There were two main sources of external pressure: competitive pressure and imposition by trading partners. The former referrers to the level of EDI capability in the firm's industry and of its competitors while the latter referrers to the potential power and the chosen influence strategy of the trading partners who sought EDI adoption. It was argued that small firms that encountered pressure from their partners or from their competitors would be more likely to adopt EDI than those firms that did not encounter such pressure.

Broadly speaking, Iacovou et al., (1995) study investigated EDI adoption in small businesses by focusing on factors at the technological (perceived benefits), organizational (organizational readiness) and environmental (external pressure) contexts, which is very similar to the general framework in innovation studies suggested by Tornatzky and Fleischer (1990). According to Tornatzky and Fleischer (1990), there are three contexts that may influence the process by which technological innovations are adopted and implemented: the technological context, the organizational context and the environmental context. This framework has been empirically tested and has been found useful in understanding the adoption of technological innovations. A recent example is Chau and Tam's (1977) study on the adoption of open systems. The study reported here

integrates the work by Iacovou et al., (1995) and Tornatzky and Fleischer (1990), and examines small business EDI adoption from the technological, organizational and environmental contexts.

## What are SMES?

There is no single universally accepted definition of SMEs. For instance, SME is define along three dimensions: in terms of either employment or investment or turnover, or a combination of any two, or all of the above (Bala-Subrahmanya, 2005). Specifically, in Nigeria, ministries, research institutes, agencies, private sector institutions, etc. use different definitions that involve the above three dimensions (Oyefuga et. al, 2008). Notwithstanding, Ramachandran (2002) argued that SMEs in the Nigerian context are best defined as those with fewer than 100 employees and below 50 million naira in assets. The lower limit for this characterization (in terms of employment) beyond which a firm is regarded as a micro enterprise is 10 employees (Oyefuga et al, 2008).

In Nigeria – SMEs are the backbone to the economy; 97% of all businesses in Nigeria employ less than 100 employees. (Federal Office of Statistics) Looking at our earlier definition of SMEs, it means that 97% of all businesses in Nigeria are "small businesses". The SME sector provides, on average, 50% of Nigeria's employment, and 50% of its industrial output.

## The nature of Nigerian SMEs

Nigeria is a developing country in sub Saharan Africa where SMEs account for 60 to 70 per cent in terms of employment according to Ojukwu (2006). Lal (2007) stated these SMEs currently represent about 90 percent of the industrial sector in terms of Number of enterprises. A study conducted by the International Finance Corporation (IFC) in 2001, estimated that 96 per cent of all businesses in Nigeria are SMEs Compared to 53 per cent in USA, 65 per cent in the EU (European Union) with SMEs In both places accounting for over 50 per cent of their respective country's Gross Domestic Product (GDP).

Given the above figures, it is important for such businesses to be prepared to take full advantage of any benefit offered by EDI, the adoption of the technology can give SMEs a better opportunity to compete in their markets and soon this will be a competitive necessity for survival in all organizations. In both developed and developing countries, governments are turning to small scale Industries as a means of economic development. SMEs can be considered as the driving force for the economy in Nigeria they assist in promoting the growth of the country's economy; hence, all the levels of government at different times have policies that promote the growth and sustenance of SMEs.

In Nigeria, SMEs are the driving force behind job creation and wealth creation. The future of the economy relies heavily on ensuring that SMEs improve their competitiveness by their performances. SMEs also play a vital role in enhancing the economic development of Nigeria, having contributed greatly by the provision of employment opportunities, marketing of goods and services, supplying the needs of larger industries and in terms of growth and development of the rural areas. They have also brought about the growth of indigenous entrepreneurship in Nigeria and increased local participation.

Henderson (2002); Salami (2003) and Oyefuga et al., (2008) argued that SMEs create jobs; increase wealth and incomes within their host domains; and promote industrial and economic development through the utilization of local resources, production of intermediate goods and the transfer/transformation of rural technology. Henderson (2002) additionally noted that SMEs connect the community to the larger, global economy. Hadjimanolis (1999) and Oyefuga et al., (2008) highlighted the role of government policies and interventionist schemes for SMEs to overcome barriers to their innovativeness and/or productivity.

## Factors affecting the development of Nigerian SMEs

Costello and Sloane (2003) also stated that SMEs are hindered in adopting technologies because of the barriers that arise in the organizations. The factors includes lack of awareness among owner-managers, management, access to finance, infrastructure, government policy inconsistencies and bureaucracy, environmental factors, multiple taxes and levies, access to modern technology, unfair competition, marketing problems and non-availability of raw materials locally. Lack of skills and training, cultural factors, lack of government policies that support IT adoption and integration in SMEs, electricity constraints among others (Adenikinju, 2005; Akpan-Obong, 2007; Ihua, 2009). The state of infrastructures,

especially telecommunications infrastructures, poses a major hindrance to the use of IT in Nigeria (Akpan – Obong, 2007). In addition, Dike (2005) stresses that while the issue of corruption is a global phenomenon and not peculiar to Nigeria alone. (Folorunsho et al., 2006) identified cost of implementation of the technology, (Kuteyi, 2009) identified lack of funding and non-utilization of IT as another factor that affect the developments of Nigerian SMEs.

## Conceptual Model of the Research

A number of theoretical models have been proposed to facilitate the understanding of factors affecting the acceptance of information technologies (Davis, 1989; Chau, 1996; Venkatesh and Davis, 2000). Among these studies, the Technology Acceptance Model (TAM) is one of the most influential and robust in explaining IT/IS adoption behavior. The key purpose of TAM was to provide a basis for discovering the impact of external variables on internal beliefs, attitudes, and intentions. TAM assumes that beliefs about usefulness and ease of use are always the primary determinants of information technologies adoption in organizations. According to TAM, these two determinants serve as the basis for attitudes toward using a particular system, which in turn determines the intention to use, and then generates the actual usage behavior. Perceived usefulness is the extent to which a person believes that using a system would enhance his or her job performance. Perceived ease of use refers to the extent to which a person believes that using a system would be free of mental efforts (Davis, 1989). However, the original TAM model was to examine IT/IS adoption in business organizations.

The Technology Acceptance Model (TAM) is an information systems theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it, notably:
Perceived usefulness (PU) – This is defined by Fred Davis, as "the degree to which a person believes that using a particular system would enhance his or her job performance".

Perceived ease-of-use (PEOU) - Davis defined this as "the degree to which a person believes that using a particular system would be free from effort" (Davis 1989). The TAM have been continuously studied and expanded, the two major upgrade being the TAM 2 (Venkatesh and Davis 2000; and Venkatesh 2000) and the Unified Theory of Acceptance and Use of Technology or UTAUT, (Venkatesh et al., 2003). A TAM 3 has also been proposed (Venkatesh and Bala 2008).
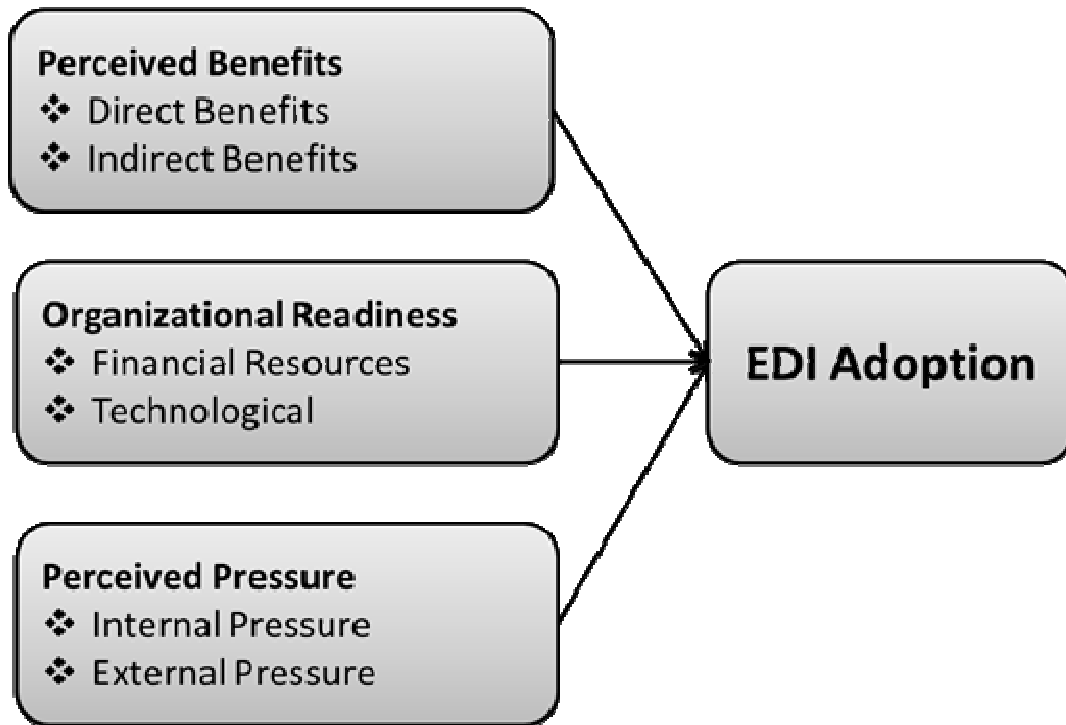
TAM is one of the most influential extensions of Ajzen and Fishbein's (1975) theory of reasoned action (TRA) in the literature. Fred Davis and Richard Bagozzi (Davis 1989, Bagozzi and Wars 1992) developed the TAM. TAM replaces many of TRA's attitude measures with the two-technology acceptance measures ease of use, and usefulness. TRA and TAM, both of which have strong behavioral elements, assume that when someone forms an intention to act, that they will be free to act without limitation. In the real world, there will be many constraints, such as limit the freedom to act (Bagozzi and Wars haw 1992).

Several researchers have replicated Davis's original study (Davis 1989) to provide empirical evidence on the relationships that exist between usefulness, ease of use and system use (Adams et al., 1992; Davis 1989) much attention has been focused on testing the robustness and validity of the questionnaire instrument used by Davis. Adams et al., (1992) replicated the work of Davis (Davis 1989) to demonstrate the validity and reliability of his instrument and his measurement scales. They also extended it to different settings and, using two different samples, they demonstrated the internal consistency and replication reliability of the two scales.

Perceived benefits of EDI, Organizational readiness, and external pressure considered as constructs that could explain the EDI Technology adoption by SMEs. Iacovou et al., (1995) considered the same factors readiness, perceived benefits, and external pressure that affect adoption of EDI Technology in 206 SMEs. Their results suggested that a major reason that SMEs become EDI capable is due to external pressure (trading partners)

## EDI Adoption Framework

Iacovou et al., (1995) developed a model formulating three aspects of EDI adoption influences, technological factor (perceived benefits), organizational factor (organizational readiness), and environmental factor (external pressure) (see Figure 1) as the main reasons for EDI adoption, and examined the model by seven case studies. This model will further investigate different antecedents of EDI adoption within the three contexts (perceived benefits, organizational readiness and environmental factors by the Nigerian SMEs.

**Figure 1.** Conceptual Model; extended from Iacovou et al. (1995)

To study the adoption of technological innovations in general, Tornatzky and Fleischer (1990) developed the technology-organization-environment TOE framework to describe the organizational components that affect the firm's adoption decisions. Tornatzky and Fleischer's (1990) TOE framework asserts that three principle contexts Technological, organizational, and environmental influence the process by which an organization adopts and accepts a new technology. The technological context considers the available technologies important to the firm, both internal and external, that might be useful in improving organizational productivity. The organizational context is defined in terms of resources available to support the acceptance of the innovation. These criteria include firm size and scope; the centralization, formalization, and complexity of the managerial structure; and the quality and availability of the firm's human resources. Technological context describes both the internal and external technologies relevant to the firm. This includes existing technologies inside the firm, as well as the pool of

available technologies in the market. The environmental context represents the setting in which the firm conducts business, and influenced by the industry itself, its competitors, the firm's ability to access resources supplied by others, and interactions with the government.

The adoptions of electronic data interchange (EDI) examined by Iacovou et al., (1995) reveals many factors that were demonstrated as significant adoption drivers and barriers in previous studies. Following Tornatzky and Fleischer (1990), Iacovou et al., (1995) developed a model formulating three aspects of EDI adoption influences, technological factor (perceived benefits), organizational factor (organizational readiness), and environmental factor (external pressure) as the main reasons for EDI adoption, and examined the model by seven case studies. Their model was further tested by other researchers using large samples. For example, Kuan and Chau (2001) investigated different antecedents of EDI adoption within the three contexts: perceived direct benefits; technological context; perceived financial cost and perceived technical competence, organizational

context; perceived industry pressure and perceived government pressure environmental context and demonstrated similar support for the utility of the TOE framework to investigate factors impacting acceptance and adoption of technologies. Ramamurthy et al., (1999) investigated the impact of EDI on firm performance as a consequence of technological, organizational, and environmental contexts. Their empirical results indicated that the effect of EDI on operational and market-oriented performance was significantly linked to these factors. Although specific elements identified within the three contexts may vary across different studies, the TOE framework has shown consistent empirical support. Drawing upon the empirical evidence of other scholars, the current study uses the TOE framework as theoretical foundation for investigating the factors affecting EDI adoption by Nigerian SMEs.

The proposed research model, organizes the potential adoption determinants into Iacovou et al., (1995) model where they considered (readiness, perceived benefits, and external pressure that affect adoption of EDI Technology in 206 SMEs. Their results suggested that a major reason that SMEs become EDI capable is due to external pressure (trading partners).

**METHODS AND MEASURES**

Earlier studies on manufacturing industries have revealed a tendency to focus more attention on the big companies to the neglect of small and medium sized industries. This study is therefore intended to assist in filling the gap through an in-depth study of the business conditions, problems, constraints, challenges and management practices of small and medium industries (SMEs) in the Northern part of Nigeria. For this study, 306 questionnaires were distributed to Nigerian SMEs. These SMEs were selected from different parts of Northern Nigeria. From these 306 questionnaires, 204 questionnaires were returned
after pilot test, and the final questionnaire designed. The questionnaire consists of four sections. First section is general questions that consist of demographic information of the respondents and section B company background information and section C is consisting of the factors affecting EDI adoption by Nigerian SMEs related questions and the last section consisted of questions regarding the intention to adopt EDI. The first section of the questionnaire gathers demographic information that includes gender, age, and highest level of education,

position in the current company, marital status and working experience. These questions were designed in multiple choice and respondents could choose the option more applicable for them. The third part of questionnaire was designed in 5-point Likert scale. This kind of scaling includes strongly agree, agree, neutral, disagree, and strongly disagree. Respondents were allowed to choose just one of the options from "1" strongly agree to "5" strongly disagree. The last section of the questionnaire consisted of questions regarding the intention to adopt EDI by Nigerian SMEs respondents showed their level of agreement from "1" within the next 3 months to "5" within the next 18 months.

**Analysis of Pattern of Lodgments and Retrievals of Questionnaire among the States in the Northern part of Nigeria**

The pattern of lodgments and retrievals of questionnaire (see Table 1), in accordance with the different industrial classes, i.e. small and medium scale industries, provides very useful insights into the most dominant types of industries and the spatial concentrations of such industries in Nigeria.

**Reliabilities of the Constructs**

The reliabilities of the constructs used in this study were assessed using Cronbach's alpha coefficients. The results indicated that five of the six variables achieved an alpha value greater than the suggested cutoff value of 0.7 (Premkumar, 2003). The Cronbach's alpha for external pressure 0.682, which was slightly lower than the cutoff (See table 2). Usually the values, which are above .6, are acceptable Premkumar, 2003 and Valid for the study to infer conclusion.

**The Factors Affecting EDI Adoption**

Table 3 shows the descriptive statistics of EDI adoption by Nigerian SMEs which exhibit 100% adoption by the SMEs and at the same time provides the correlation coefficients among the dependent and independent variables. All variables exhibited high correlations with other variables.

A multiple regression analysis was performed to examine the significance and relationships between the

**Table 1.** Distribution and retrieval of Questionnaires: Small and Medium Enterprises

| | | Small and Medium Enterprises | | |
| --- | --- | --- | --- | --- |
| No. | States | Lodgments | Retrieval | % Response |
| 1. | Katsina | 50 | 45 | 22.1 |
| 2. | Kano | 120 | 73 | 35.8 |
| 3. | Zamfara | 30 | 20 | 9.8 |
| 4. | Kaduna | 80 | 48 | 23.5 |
| 5. | Jigawa | 26 | 18 | 8.8 |
| TOTAL | | 306 | 204 | 100 |

Source: Survey Report 2011

**Table 2.** Cronbach's Alpha Reliability Analysis – Independent Variables

| Factor | Questions (see appendix) | Alpha |
| --- | --- | --- |
| Direct benefits | Q.(12 -21) – 10 items | 0.765 |
| Indirect benefits | Q.(22 -29) - 8 items | 0.740 |
| Financial resources | Q.(30 – 31)- 2 items | 0.726 |
| Technological resources | Q.(32-33) - 2 items | 0.717 |
| External pressure | Q.(34-36) - 3 items | 0.682 |
| Internal pressure | Q.(37-38) - 2 items | 0.718 |

factors affecting EDI adoption by the SMEs and the level of EDI adoption. The dependent variable was the intention to adopt EDI and the independent variables, Perceived benefits, Organizational readiness and Perceived pressure.

## Intention to adopt EDI by Nigerian SMEs

The intention to adopt EDI by Nigerian SMEs was measured using a combination of three items as outlined by Tan and Teo (2000). Participants who had the intention to adopt EDI were asked to indicate on a five-point Likert-type scale: "How likely is it that your company intends to have EDI?: (1) within the next 3 months, (2) within the next 6 months, and (3) neutral, (4) within the next 12 month, (5) within the next 18 months. The responses for the time periods 3, 6, and 18 months were then weighted by 3/6, 2/6, 1/6 respectively. The summation of the weighted responses produced a number between 1 = within the next 3 months and 2 = within the next 6 months, that represented the intention to adopt EDI by Nigerian SMEs.

## Regression Analysis and Results

A linear model estimated using the ordinary least squares method. The regression was estimated so that inferences could be made regarding the linear relationships existing between an SME's intent to adopt EDI and the three proposed factors Perceived benefits, organizational readiness and perceived pressure that influence the intention to adopt EDI. The factor analysis indicated that six independent variables related to the three proposed factors as independent constructs. The model estimated was operational zed using the following linear form:

$$Y = A_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6$$

Where,
$Y$ = Intent to Adopt EDI
$X_1$ = Perceived direct benefits
$X_2$ = Perceived indirect benefits
$X_3$ = Financial resources
$X_4$ = Technological resources
$X_5$ = Perceived external pressure
$X_6$ = Perceived internal pressure

**Table 3.** Descriptive statistics and Correlations among Independent Variables

| Measures        N=204 | Mean | Std. Dev | Perceived Benefits | | Organizational Readiness | | Perceived Pressure | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 |
| 1. Direct Benefits | 39.6078 | 4.77608 | 1.00 | | | | | |
| 2. Indirect Benefits | 31.1422 | 3.59726 | .676 | 1.00 | | | | |
| 3. Financial Resources | 7.9265 | 1.49201 | .178 | .229 | 1.00 | | | |
| 4. Technological Resources | 7.8873 | 1.50599 | .178 | .239 | .983 | 1.00 | | |
| 5. External Pressure | 10.1127 | 2.18189 | .100 | -.053 | .298 | .314 | 1.00 | |
| 6. Internal Pressure | 7.8775 | 1.51826 | .184 | .249 | .975 | .991 | .310 | 1.00 |

Correlation is significant at the 0.01 level (2tailed); Correlation is significant at the 0.05 level (2tailed).

**Table 2.** Model Summary of Multiple Regression Analysis

| R | R2 | AdjR2 | Std. Error of the estimate | F | Sig F |
|---|---|---|---|---|---|
| 0.518 | 0.268 | 0.246 | 3.01005 | 12.009 | 0.000 |

Predictors: (Constant) PB, OR, PP; Dependent Variable: Intention to adopt EDI

**Table 3.** Multiple Regression Results for Independent and Dependent Variables

| Independent Variables | Unstandardized Coefficients | | Standardized Coefficients | t-value | Sig p-values |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | 10.121 | 2.222 | | 4.555 | .000 |
| Direct Benefits | .165 | .064 | .228 | 2.573 | .011 |
| Indirect Benefits | .240 | .086 | .249 | 2.786 | .006 |
| Financial Resources | .786 | .770 | .338 | 1.020 | .309 |
| Technological Resources | -.663 | 1.309 | -.288 | -.507 | .613 |
| External Pressure | .478 | .101 | .301 | 4.709 | .000 |
| Internal Pressure | -.599 | 1.070 | -.262 | -.560 | .576 |

a. Dependent Variable: Intention to adopt EDI

Results of the estimation provided in Table 4 The results indicate the set of independent variables linearly influence the intent to adopt EDI (F= 12.009, p= ..000, n=204) with a R2 = 0.268 and an adjusted R2 = 0.246. The regression analysis (see Table 5) revealed the level of a SME's EDI adoption is significantly related to its Perceived benefits, Organizational readiness and Perceived pressure and moderately related to perceived pressures. The effects of Perceived direct and indirect benefits, financial resources and External pressure were positive, and the effect of Technological resources and internal pressure was negative.

Table 6 shows that the result of the analyses shows that R2 is statistically significant, with F=12.009 at p < 0.00. Thus, the general expression in the form of the regression equation stated as follows:

Intention to adopt EDI = (10.121) + 0.165 (Direct benefits) + 0.240 (Indirect benefits) + 0.786 (Financial

**Table 4.** ANOVA (F-test)

|            | Sum of Squares | df  | Mean Square | F      | Sig.  |
|------------|----------------|-----|-------------|--------|-------|
| Regression | 652.848        | 6   | 108.808     | 12.009 | 0.000 |
| Residual   | 1784.897       | 197 | 9.060       |        |       |
| Total      | 2437.745       | 203 |             |        |       |

resources) + 0.478 (External pressure) + (-0.599) (Internal pressure) + (-0.663) (Technological resources).

The result of the multiple regression analysis indicated that all variables have a positive relationship with EDI adoption. However, financial resources and external pressure to adopt EDI only have a strong significant relationship with EDI adoption by Nigerian SMEs. According the $R^2$ value, the combination of these six variables (direct benefits, indirect benefits, financial resources, technological resources, external pressure and internal pressure) can only predict 26.8% of EDI adoption, while 73.2% predicted by other variables need to be identified. Based on F statistics (12.009) at p value 0.00, we can conclude that the model used is appropriate.

## DISCUSSION OF FINDINGS

The SMEs' sector is, without doubt, the key to unlocking the economic potentials of Nigeria. However, the results of the findings of this study are quite revealing. Until recently, government policies, strategies and programs have laid undue emphasis on large-scale enterprises and in a number of notable cases, have even discriminated against SMEs especially micro-scale enterprises. The SMEs are mostly owned and run by "small" people especially Small and micro scale enterprises for local markets and using mostly materials from the locality of the businesses. A viable means of promoting self-reliance in economic development as well as introducing diversity into regional, national and local economies is through the deliberate promotion of SMEs and encouraging entrepreneurial spirit and skill in business venture. Apart from the superior employment generating capacity and potentiality of the SMEs, there are the added advantages of their being flexible and easily adaptable to changing market opportunities and conditions. The SMEs require limited capital, can more easily combine simple, and advanced technology as may be appropriate.

One of the objectives of this study was to identify the factors affecting EDI adoption within Nigerian SMEs. Perceived benefits found to be important predictor for SMEs. The plausible reason for the relevant importance of this variable in SMEs is due to the better management structure and policies. The management of these SMEs considered the perceived benefits as an important pre-requisite to decide on technology adoption. If the benefits are not viable, they might not decide on the technology. This might be because decision-making process in SMEs is always short-term (Fink, 1998). The organizations may pay more attention to the viable benefits. Perceived benefits can act as motivators to encourage the adoption of an innovation because direct benefits are more viable and are easier to measure. Therefore, this study supports the prior studies of (Moore, 1996) and Chwelos et al., (2001) that perceived benefits were the most influential determinants of the technology usage. In this study of EDI adoption among Nigerian SMEs, perceived direct and indirect benefits were found to be important for Nigerian SMEs in EDI adoption.

Initial analysis of the reasons surrounding the adoption of EDI by the SMEs in Northern Nigeria found that the factors related to perceived pressures, financial resources and technical barriers have positive influence on the adoption of EDI by Nigerian SMEs. However, further analysis showed that the factors related to external pressures have significant positive influence on the adoption of EDI by the SMEs in Northern Nigeria. The findings seemed to imply that most SMEs have not overcome other barriers particularly those that are technological and internal in nature. In addition, there was also evidence that the government has not done enough to help the SMEs in the north to adopt EDI. The preceding findings are good news for the SMEs and policy makers; because it means that the SMEs only need to deal with environmental barriers to adopt EDI, and the policy makers need to provide support for the SMEs in terms of EDI adoption.

These results suggest that SMEs adopt EDI more because of external pressure from customers and

suppliers than internal pressure from employees. It is difficult to separate internal and external reasons for adoption. For example,(Elsammani et al., 2004) identified "need pull" versus "technology push" SMEs. The presence of these two groups of SMEs suggest differences in executives' perception of external and internal pressure and may be based on the type of change being considered by the executive. In other cases, a company may adopt a technology due to influences exerted by its business partners and/or competitors(Neo et al., 1994). A firm may feel pressure to adopt the technology if its business partners request or recommend it to do so.

The responses obtained from the participants have enabled the researcher to identify some drivers linked to factors affecting EDI adoption in Nigerian SMEs. Technology adoption has changed the manner in which enterprises market and sell their products. The respondents indicated that a major driver for their adoption of EDI is to have some sort of competitive advantage. Internet technology is a strategy for keeping at pace with current global developments. Apulu and Latham (2009) state that appropriate use of IT can assist SMEs in gaining competitive advantage by reducing costs and improving core business processes. This is a true as most of the SMEs lack proper organizational structure due to the strong owners /managers' influence on the business.

## Conclusions

The model in this research is thus consistent with prior empirical work predicting EDI adoption, and makes novel contributions at three levels. First, at the conceptual level, the refined model of EDI adoption presented here incorporates the factors identified separately in previous studies as influencing adoption into a consistent and parsimonious predictive model. This model combines the three primary theoretical approaches, namely the technological, organizational, and inter-organizational that were used to study EDI and IOS in general. Secondly, we have empirically validated the model in that we found strong support for the factors leading to intent to adopt. These results support the findings of previous research, particularly Grover, (1993). The use of Factor analysis, multiple regressions has allowed for an examination of the relative importance of all of the sub-constructs to the overall intent to adopt EDI. Furthermore, because this study is the first empirical test

of the Iacovou et al., (1995) model in Northern part of Nigeria it completes the cycle of generating-theory and testing-theory.

The development of SMEs and their effective promotion has not been approached seriously in Nigeria; hence, the lack of their impact in the economy. In Nigeria, various governments instituted various programs aimed at developing SMEs sector but most of the programs were not given the appropriate backing and as such, the impact of the programs could not be felt in the economy.

The objective of this study was to examine the state of EDI adoption, which includes the factors affecting the adoption of EDI among the SMEs in Northern Nigeria, as well as to build a model of EDI adoption to Nigerian SMEs. A conceptual model developed to assess the possible influence of various factors on the adoption of EDI by the SMEs. The model was designed based on the study by Iacovou et al. (1995) and other literatures. The research method was questionnaire survey where the questionnaires were distributed by hand to all the respondents in the designated sampling Areas. The data gathered then analyzed using various statistical tools in order to provide answers to research questions that rose earlier. The research questions were (a) To examine factors affecting the adoption of EDI Technology in Nigerians SMEs (b) To propose an EDI Technology adoption model to Nigerian SMEs.

A number of conclusions were drawn from these results and implications discussed: Firstly, SMEs with a strong support and commitment to EDI from the SMEs management are more likely to adopt EDI at a faster rate. The non-commitment of management of SMEs is overcome through education. The management of all SMEs should be motivated towards personal learning that will create the awareness of the need and importance of EDI adoption in Nigeria. If this done, there is that likelihood for Nigerian SMEs management to develop interest and embrace EDI.

Secondly, SMEs that have the requisite IT and business skill competence will stand a better chance at adopting EDI. The solution here is also education. Nigeria government need to be willing to invest in IT education on her citizens, SMEs also should encourage training of staff to meet current trends in technology required knowledge, with this the needed IT skills could be improved upon hence SMEs could have the motivation to adopt EDI. IT skills made compulsory at work; it could be a basis for promotion and even gaining employment into work and contract.

Thirdly, SMEs that have sound IT technologies in place are in a better position to adopt EDI. Technology is the bedrock of a nation's development, without which a nation will continue to leave behind in terms of development. Therefore, there is the need for Nigerian SMEs to go with technological trends of the day. SMEs should open up to acquiring needed technology that will move them forward.

The data analysis showed that EDI characteristics have major effect on the intention to adopt. SMEs with more positive attitude towards EDI are more likely to adopt EDI. This result provides support for Roger's innovation theory (1995). There are three essential attributes of innovation that affect the formation of attitude, perceived benefits, complexity of innovation and risk tolerance If EDI is viewed as beneficial, then there is a greater chance that a favorable attitude towards EDI will be formed; a lack of knowledge as to the benefits of EDI domestically made the SMEs not to adopt EDI. Awareness of why SMEs need EDI in Nigeria and what they actually stand to gain by its adoption will speed up EDI adoption in Nigeria.

With this understanding of our research analyses, we now have the actual factors that affect Nigerian SMEs to adopt EDI. We believe that this understanding will help us to promote the spread of EDI in the Northern part of the Nigerian market environment in order to achieve the objectives of this research' which is to motivate people and SME owner/managers in Nigeria to adopting EDI. The researcher believes that EDI adoption will change the way business is conducted, goods and services, and business strategies are developed.

**Implications for Research**

As pointed out in the statements of problems of this research on EDI adoption, particularly in the context of SMEs businesses in Nigeria, the study is rare although needed. This study addressed the issue by integrating the EDI adoption model developed by Iacovou et al. (1995) with findings in other related studies. The results indicate that like other IT adoption, adoption of EDI by SMEs is not primarily based on the characteristics of the technology itself but also dependent on other factors. Future work is needed, however, to re-examine the proposed model in other EDI adoption settings, particularly in SMEs EDI context or in other IT innovations. As indicated by Dennis et al., (1991), it is necessary to test a research model in different contexts.

By doing so, additional knowledge on the issue may be gathered.

This study suggests that EDI adoption is positively affected by the perceived direct and indirect benefits. Managers of SMEs should strongly pursue opportunities to understand how other SMEs are using EDI effectively, in order to maintain an up to date idea of the perceived benefits from the adoption since perceived benefits change along with new technology, SME managers should aggressively pursue an understanding of how EDI adoption can help in improving their business.

The focus of this study was on EDI adoption, which considered as part of a broader issue of management of technology. As adopting a technology should eventually lead to some form of positive impacts or advantages which can be direct and indirect in nature for an organization, evaluation and assessment of the adoption and implementation of the technology are important. Additional work done to extend the model examined in this study to include integration and impact, as suggested in Iacovou et al. (1995). It would be interesting to investigate how SMEs, move from using an old technology to a new technology, which provides the same services, from a technology adoption perspective.

**Recommendations**

In recent times, most African Nations in general and Nigeria in particular are now realizing the importance of Small and Medium Scale Enterprises as being crucial to their economic development strategies. It is therefore, important to consider conditions that would ensure sustained growth in this sector. See the SMEs as an important sector of the economy requiring specific incentives to assist its development. The problems of the SMEs are characteristic of the basic features of underdevelopment in the economy. From the findings of the study, the following recommendations were made to promote and develop a vibrant SMEs sub-sector in Nigeria:

It recommended that Nigerian SMEs develop better organizational capabilities by integrating EDI in their day-to-day activities as it could enable them effectively benefit from the opportunities that are associated with the use of EDI in the current knowledge based economy. In addition, in order for SMEs in the Northern Nigeria to keep up with competitions in the present era of technological advancements, IT awareness be increased

and the Nigerian government should put in place a viable framework that could support these SMEs.

There is the need for clear national development objectives to meet the needs of the SMEs sector. Sound policies and regulations pronouncement do not guarantee achievement of anticipated results because of what is encountered during execution, such as inconsistency of policy implementation.

There is a need for the government to intensify the efforts of promoting the use of IT in Nigerian SMEs, since IT is known to improve managerial practices in SMEs and assist SMEs to grow and become more innovative.

Finally, the Nigerian government must invest largely in the SME sector by making more funds available to SMEs and putting structures in place to ensure a successful investment. The integration of IT in Nigerian SMEs would help integrate these SMEs into the world IT village.

## Limitations and Suggestions for Future Research

This is the first study of SMEs' EDI adoption in Northern Nigeria, which has some limitations. The small sample is the major hindrance in generalizing the results to the entire Nigerian SMEs; however, the study has provided a base for further investigation and need to address in the forthcoming studies. Secondly, around half of the percentages of EDI adoption variance remain unexplained. It further suggests that future work should focus on more variables.

The study was limited to only 306 SMEs in the Northern part of Nigeria hence further research involving more case studies will be beneficial. In addition, further research could focus on collecting and analyzing empirical data from SMEs and comparing the results with the findings of this study.

My suggestions for further research into this study would be of a great importance to SME owners and those who have the desire to start up a small business in Nigeria. The researcher should make use of bigger sample size and extend the research to other geographical parts of Nigeria. The aspiring researcher should not limit the research to the factors affecting EDI adoption in SMEs business in Nigeria but try to extend the research to knowing if SMEs or small businesses in Nigeria are active in Internet technology for a more insight into the research work.

Future research could proceed in several directions. First, because we believe that, the core of this model has

applicability to IOS beyond the scope of EDI; the model applied to other forms of IOS, particularly business-to-business electronic commerce. Further research is needed on the variables that are found to be significant in this study by using different instruments or measurements to confirm the findings of this study. Firms' need for advanced technology adoption may depend upon the environment or contextual conditions. This study found that competitive pressure might have played a significant role in technology adoption. To gain competitive advantage, there is a constant need for firms to observe advances in technology and adopt them External, environmental variables investigated further to better understand firm's technology adoption activities.

This study raises question for future research. One emerging question is how more widespread EDI adoption is facilitated among SMEs owner/managers and individuals generally in developing countries?

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