

Integrating TAM and TOE Frameworks and Expanding their Characteristic Constructs for E-Commerce Adoption by SMEs

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Abstract

Electronic Commerce has increased the global reach of small and medium scale enterprises (SMEs); its acceptance as an IT infrastructure depends on the users' conscious assessment of the influencing constructs as depicted in Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), and Technology-Organization-Environment (T-O-E) model. The original TAM assumes the constructs of perceived usefulness (PU) and perceived ease of use (PEOU); TPB perceived behavioural control and subjective norms; and T-O-E firm's size, consumer readiness, trading partners' readiness, competitive pressure, and scope of business operation. This paper reviewed and synthesized the constructs of these models and proposed an improved TAM through T-O-E. The improved TAM and T-O-E integrated more constructs than the original TAM, T-O-E, TPB, and IDT, leading to eighteen propositions to promote and facilitate future research, and to guide explanation and prediction of IT adoption in an organized system. The integrated constructs- company mission, individual difference factors, perceived trust, and perceived service quality improve existing knowledge on EC acceptance and provide bases for informed decision(s).

Keywords: innovation, adoption, organization, environment, technology, e-commerce, SMEs.

Introduction

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Small and Medium Scale Enterprises (SMEs) are potent economic drivers as well as important sources of flexibility, innovations and employment creation (Mutula and Brakel, 2006; Metaxiotis, 2009; Federici, 2009; Ramdani, Kawalek, & Lorenzo, 2009). They account for between 96 and 99 percent of enterprises in most OCED nations (Scupola, 2009) and provide about 80 percent of economic growth. About 99 per-

cent of all businesses in North America and Europe are SMEs (Federici, 2009; Ramdani et al., 2009; Shiau, Hsu, & Wang, 2009) with their counterparts in Australia providing 1/3 of GDP and 70 percent employment (Scupola, 2009). Definitions of SMEs are often based on economy, employment figures and sometimes sales volumes and fixed assets. In many European countries, SMEs employ less than 500 persons (OECD, 2000); in Australia less than 200 (Scupola, 2009); in South Africa and Australia, between 100 and 200 persons (Scupola, 2009); and in Egypt, the classification is based on number of workers, fixed assets, and annual turnover (Rizk, 2004). Though governments and large corporations play dominant role in formal economy, SMEs drive the informal sector; hence, many developed and emerging nations aggressively pursue public policies designed to encourage SMEs. South Africa, for example, through its Enterprise Development Fund and in collaboration with United States Agency for International Development (USAID), provided funds to spur informal sector developments in the present knowledge economy.

In the knowledge economy, the strength of SMEs is essentially determined by their ability to wisely take advantage of human intellectual capital and technology even more than traditional resources. The core competence for SMEs' survival and growth involves creating and sharing knowledge and information, and innovating, learning and adapting to changes through strategic deployment of knowledge capital (Eikebrokk & Olsen, 2007; Federici, 2009). ICT, expeditious data processing models, configurable platforms, networking, and the internet provide SMEs with access to knowledge and foster inter/intra-organizational integration (Metaxiotis, 2009; Ramdani et al., 2009) with the promises of cost-effective operations and interactions. EC plays potent roles to SMEs in terms of building competitive advantage even at the global market; higher efficiency and effectiveness; improved product development and service quality, sales forecasting, customer analysis; and cost reduction (Eikebrokk & Olsen, 2007). Studies suggest that adoption of EC by SMEs is really growing in developed economies (Metaxiotis, 2009); in US and Europe, online business rose by triple digit percentage points between 1999 and 2003 (Rudraswamy & Vance, 2001) and the 2010-2015 Indian Brand Equity Foundation (IBEF, 2010) Newsletter opines that internet activities grew about 12 percent in 2009 to reach \$71.7 billion in aggregate revenue. In Asia, more businesses now favour e-commerce solutions whereas some African nations continue to lag behind.

South Africa, France, Italy, Belgium and Finland are the second-tier internet intensive nations each with more than 75,000 hosts (Laudon & Laudon, 1999). Its development in Nigeria is rather very slow though steady (Ayo, 2008), and like other nations, it is dominated by large firms. For instance, Banks through online banking and money transfer services seem to have made giant strides. Lack of experience and other infrastructural resources (Chuang, Nakatani, & Zhou, 2009; Shiau et al., 2009), size, organization form and methods (Federici, 2009), little awareness of the benefits of IT infrastructures (Esteves, 2009), and relatively low investment in website development explain the weak diffusion of EC amongst SMEs in Nigeria. Foreign firms such as Amazon have capitalized on these drawbacks to satisfy the growing consumer demand for Western shopping patterns. Since SMEs' increased access to global markets is crucial for economic development, there is a need to delineate and understand the factors affecting their adoption of EC solutions in Nigeria. Apparently the existing theories are insightful in understanding the IT adoption nature of SMEs but some seem a bit parochial in their constructs and so, can rarely be extrapolated to deal with SMEs in developing countries. Therefore, this research seeks to reduce these theoretical gaps by enlarging the constructs of TAM and T-O-E frameworks as they affect EC adoption by SMEs.

Electronic Commerce (EC)

Electronic commerce is a business innovation involving non-physical and electronic interactions, and maintenance of business relationships through sharing of information and knowledge. It is an

internet and worldwide application with new methods of communications, business transactions, market structures, education, and works (Doukidis, Poulymenakou, Terpsidis, Themisticleous, & Miliotis, 1998; Giaglis, Klein, & O'Keefe, 1999; Murison-Bowie, 1999). ECaTT (2000) refers to it as on-line interaction involving electronic pre-processing, performance, and post-processing of transactions between community members; it involves globalization of transactions and exchange of information with trading agents. These imply inter-firm alignment because digital data generated can be archived and utilized collectively by an organization and its trading partners to build competitive advantage (Parker & Castleman, 2008).

Internet assists SMEs to formulate EC strategies. Lai, Humphreys, and Sculli (2001) viewed EC's applications as Inter-Organizational Information Systems (IOIS) and virtual market within which computer networks optimize operations and enhance building of competitive advantages. The potential benefits of EC to SMEs include costs reduction typically in procurement, communications, inventory holding and search activities; improved quality outputs and customer service, value-added information; and new levels of innovation from network externalities and knowledge sharing (Esteves, 2009; Federici, 2009; Metaxiotis, 2009). In today's highly competitive markets, SMEs rarely have the cognate resources to compete with large enterprises (Shiau et al., 2009) and therefore IT opportunities turns the world flat and strengthens SMEs' competitive capabilities to overcome the challenges of size and distance in accessing global markets (Gengatharen & Standing, 2005). EC moves SMEs away from transactional to relational paradigms, where prospects/customers move progressively in the hierarchy of loyalty ladder.

However, emerging literature shows that irrespective of SMEs' assumed agility, flexibility, and more receptivity to novelty, they seem to lag behind in exploiting the opportunities of new ITC applications. The Sectoral e-Business Watch study reports that the over 1.9 million SMEs in UK connected to the internet, surpassing government's estimate of 1.5 million, tend to use the internet only to send mails, transfer files or gather information (European Commission, 2007). There is a dearth of evidence supporting that SMEs invest in IT to improve services, processes, business automation, and internal processing of business information and knowledge. Only about 15 percent of small firms and 30 percent of medium-sized firms employ ICT practitioners or have ICT department (Scupola, 2009). Often, SMEs' size reflects their inability to commit resources, to assign ICT infrastructures to long-term strategic issues, and to grasp the potentials. Various theoretical frameworks underpin the understanding of IT adoption behaviour in an organization. Amongst them, are Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), Innovation Diffusion Theory (IDT), Technology-Organization-Environment (T-O-E), and Decision Maker-Technology-Organization-Environment (D-T-O-E).

Technology Acceptance Model (TAM)

Technology Acceptance Model is about the first and the foremost traditional adoption theory in the field of IT (Awa, Eze, Urieto, & Inyang, 2011; Benbasat & Barki, 2007; Silva, 2007). It provides basis for unveiling the impacts of external variables on adoption decisions with its basic postulates resting firmly on economic, utilitarian, and attitudinal grounds. TAM proposes perceived usefulness (PU) and perceived ease of use (PEOU) as the fundamental determinants of IT adoption. An individual's intention to use an application is explained and predicted by his perception of the technology's usefulness and its simplicity. The proponents of TAM posit that perceived usefulness is influenced by perceived ease of use and both predict attitudes (Davis, 1993). Although TAM has received empirical validation, application, and replication (Gounaris & Koritos, 2008), the model provides less meaningful information on user's opinions about adopting specific systems by narrowing its constructs to only PU and PEOU. Hence, the need to expand the factors or integrate with other IT acceptance models to improve TAM's explanatory and pre-

dictive utilities. The strengths of Roger's (1995) diffusion of innovation and Ajzen's (1991) theory of planned behaviour (TPB) have been explored to enrich TAM by adding usage and placing premiums on specific settings and external variables that influence a technology's adoption process.

TAM and TPB are rooted to the theory of reasoned action (TRA). Though TAM and TPB neglected the influences of psychological, social, and interpersonal variables on IT adoption decision (Ukoha, Awa, Nwuche, & Asiegbu, 2011), TPB complemented TAM's constructs with subjective norms and perceived behavioural control to explain perceptions of ease or difficulty of performing an act given resource constraints. Taylor and Todd (1995) believe that TPB explanatory and predictive utilities are better enhanced by extending and integrating with TAM. The decomposed TPB implements TAM and provides more complete constructs for understanding usage. TPB assumes that action aligns with behavioural intentions, while intentions in turn are shaped by attitudes, subjective norms, and perceived behavioural control (Ajzen, 1991). Other researchers (e.g. Davis, 1993; Venkatesh & Davis, 2000) validated, modified, extended, and improved TAM under different situations to make for wider applicability in the novel knowledge economy.

Technology-Organization-Environment (T-O-E)

Technology-Organization-Environment (TOE) framework of Tornatzky and Fleischer (1990) assumes a generic set of factors to predict the likelihood of EC adoption. The theory suggests that adoption is influenced by technology development (Kauffman & Walden, 2001), organizational conditions, business and organizational reconfiguration (Chatterjee, Grewal, & Sambamurthy, 2002), and industry environment (Kewtha and Choon, 2001). Technological context describes that adoption depends on the pool of technologies inside and outside the firm as well as the application's perceived relative advantage (gains), compatibility (both technical and organizational), complexity (learning curve), trialability (pilot test/experimentation), and observability (visibility/imagination). Organizational context captures firm's business scope, top management support, organizational culture, complexity of managerial structure measured in terms of centralization, formalization, and vertical differentiation, the quality of human resource, and size and size related issues such as internal slack resources and specialization (Jeyaraj, Rottman, & Lacity, 2006; Sabherwal, Jeyaraj, & Chowa, 2006; Tornatzky & Fleischer, 1990).

Environmental context relates to facilitating and inhibiting factors in areas of operations. Significant amongst them are competitive pressure, trading partners' readiness, socio-cultural issues, government encouragement, and technology support infrastructures such as access to quality ICT consulting services (Al-Qirim, 2006; Jeyaraj et al., 2006; Scupola, 2009; Zhu, Kraemer, Xu, 2003). TOE framework underscores Rogers' (1995) three groups of adoption predictors- leader characteristics relating to change; internal characteristics (centralization, complexity, formalization, interconnectedness, organizational slack and size), and external characteristics (system's openness). The major snag of T-O-E is that some of the constructs in the adoption predictors are assumed to apply more to large organizations, where clients are sure of continuity and less complaints, than to SMEs. However, integrating T-O-E with other models such as TAM, with each adoption predictor offering larger number of constructs than the original provides richer theoretical lenses to the understanding of adoption behaviour.

Propositions Expanding TAM and TOE Frameworks

EC adoption is a high involvement decision and thus, the need for conscious search effort, using Bass model, to reduce perceived technical, financial, and social risks. Figure 1 integrates the constructs of TAM into T-O-E and added individual different factors (IDFs), facilitating conditions

(FCs), organization mission (OM), perceived trust (PT), and perceived service quality (PSQ) to bring the entire constructs to eighteen (18). TAM is accused of illusion of accumulated tradition (Benbasat & Barki, 2007), technological determinism, and techno-centric predictions (Venkatesh, Davis, & Morris, 2007) implying that technology, rather than individuals, determines organization's structure and behaviour. The integration of constructs of TAM, TPB, and T-O-E frameworks as well as the new ones proposed in the model, somewhat social and behavioural constructivism is enrolled to bring both human and non-human actors into the network. The postulate of this model is similar to Actor Network Theory (ANT) since it emphasizes dynamic and mutual interplay of technical and social systems.

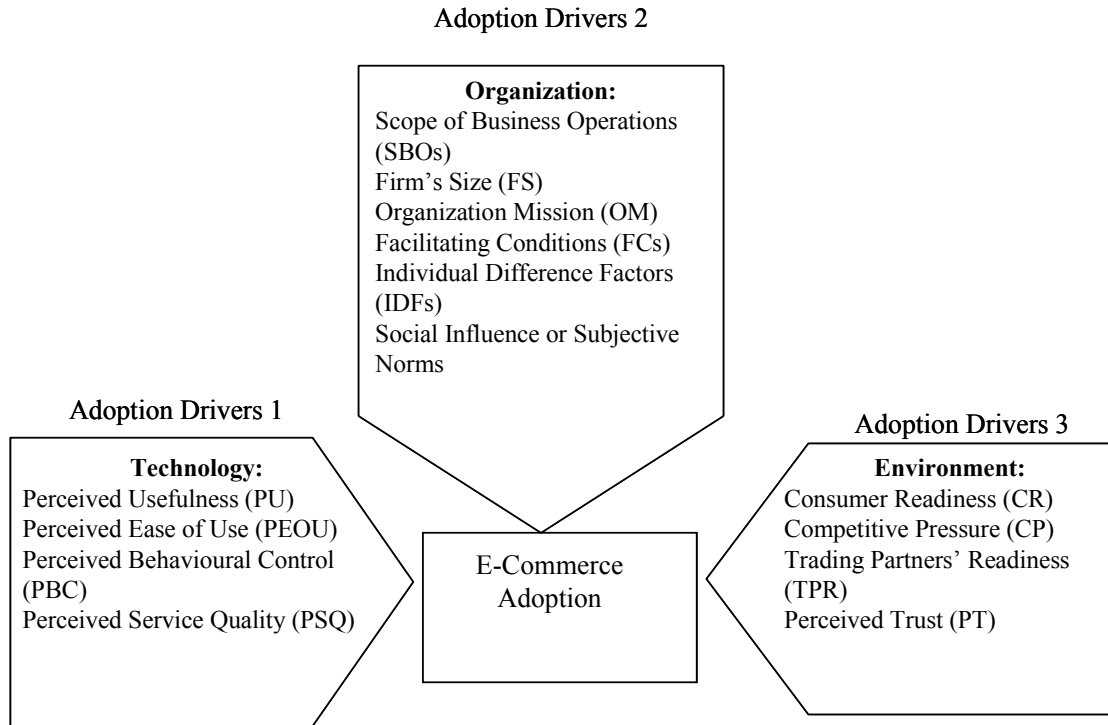


Figure 1: Integrated TAM, TPB, and T-O-E frameworks of Innovation Adoption

Technology

Studies (e.g., Kwon & Zmud, 1987) show that the successful adoption of IT depends on the importance of internal technology resource- infrastructure, technical skills, developers, and user time; therefore firms with higher levels of technology competence show more likelihood to adopt e-commerce. Technology relates to IT platforms, internet skills/technical know-how, and e-commerce know-how (business and managerial skills) to apply the e-commerce facilities effectively (Zhu & Kraemer, 2002; Zhu, Kraemer, & Xu, 2002). Technology competence goes beyond physical assets; it includes intangible resources, which perhaps generate competitive advantages for innovators since skills and know-how complement physical assets and are more difficult to imitate by rivals (Metaxiotis, 2009; Scupola, 2009). Perhaps TAM is likened to the above construct on the grounds of the postulates of PU and PEOU. However, a more integrated approach adds perceived behavioural control (PBC) and perceived service quality (PSQ).

Perceived usefulness (PU)

PU defines prospective user's subjective probability that using a specific application improves operations (Lu, Yu, Liu, & Yao, 2003). It provides diagnostic lenses into how actual use and intention to use are influenced. PU domiciles in Vroom's expectancy theory since the decision to adopt an innovation is driven by its near-term and long-term expected results (Triandis, 1980). The near-term results are synonymous with postulates of PU; and the long-term consequences refer to consequential results in one's career or social image, which reflects Rogers' (1995) most important motivation for adoption of innovation. The attainment of perceived near-term usefulness paves way for long-term usefulness. Chau (1996) did a similar work in decomposing the construct of PU into perceived near-term and perceived long-term in his modified TAM and hypothesized that behavioural intentions are dependent upon the above two variables and perceived ease of use. Decomposing PU as Triandis and Chau did explicitly provides more specific lenses into understanding user perception of IT's usefulness. Jiang, Hsu, Klein, and Lin (2000) further expanded PU by developing utilization of the internet technology model to explore user acceptance of internet and proposed that internet is positively related to perceived near-term and perceived long-term usefulness. Therefore, the following proposition is formulated below.

1. Perceived usefulness will have significant effects on the adoption of EC by SMEs.

Perceived ease of use (PEOU)

PEOU measures the prospective user's assessment of the mental efforts required of the use of the target applications (Davis, 1993). Mental effortlessness demanded by an IT attracts more adoption behaviour; thus, innovations with perceived complexities of user interface and steep learning curve are thought risky to adopt (Opia, 2008). PEOU is a distinct but related construct to PU; it impacts on near-term usefulness since improvement in it contributes positively to outcomes and ultimately defines PU. Studies undertaken by scholars to assess observed usefulness and ease of use trade-off and to determine the impacts of external variables on these two mental determinants show mixed findings (Chau, 1996; Davis, 1993). Nevertheless, empirical findings confirm the positive relationships between ease of use and attitude towards use (Venkatesh & Davis, 2000) and show that PEOU is a proven key determinant of users' intention to accept IT (Venkatesh, 2000). Clarke (2000) supported this when his survey of 800 professionals ranks ease of use amongst the five factors that determine the use of wireless handheld devices. Thus, ease of use is a powerful determinant of intention to accept innovation(s).

2. Perceived ease of use will have a significant positive effect on the adoption of EC by SMEs.

Perceived behavioural control (PBC)

The theory of planned behaviour (TPB) extends the theory of reasoned action (TRA) by including perceived behavioural control. This accounts for users' agility shaped by cognate resources needed to exploit the potentials of planned applications (Yi, Jackson, Park, & Probsf, 2005). The skills, opportunities, and resources for operating the systems must be strategically analyzed before adoption is finalized. This therefore theorizes perceived behavioural control as a determinant of behaviour though prior research shows that it might influence perceived ease of use. Venkatesh (2000) found perceived behavioural control (both internal and external) to be very strong determinants of perceived ease of use and intention to use an innovation.

3. Perceived behavioural control is a significant determinant factor of SMEs' adoption of EC.

Perceived service quality (PSQ)

Perceived service quality is a crucial adoption determinant; it reflects EC's image in customers' eyes, the overall customer judgment of the superiority or excellence of an EC or customer comparison between the actual and ideal performances of an application. Literature shows that balance or very favourable outcomes of this comparison move the accounts upward in the hierarchy of customer loyalty ladder. Relationship marketing applies here in terms of its cost effectiveness via customer satisfaction and customer retention. Actual performance short of ideal performance throws the customer into psychological tensions (Zaltman & Wallendorf, 1983); feelings of tension and anxiety to balance cognitive elements and pains inflicted by anxiety. Avoiding exaggerated product claims or insisting on understating product claims assists in making informed decisions leading to dissonance free exchanges. Parasuraman, Zeithaml, and Berry (1988) postulated five measures used by consumers to evaluate perceived service quality of an innovation. They are tangibility, reliability, responsiveness, assurance, and empathy. Though these measures have been regularly updated, they do not hold equal rating in decision making processes but assist to make informed decisions.

4. Perceived service quality will influence the adoption of EC by SMEs

Organization

Organization contexts for E-Commerce adoption measure principally descriptive factors. Besides the incumbent constructs (see Jeyaraj et al., 2006; Sabherwal et al., 2006; Tornatzky & Fleischer, 1990), this paper brought in individual difference factors, organization mission, facilitating conditions, and subjective norms.

Scope of business operations (SBOs)

The greater the scope of business, the more likelihood a firm invests in EC (Hitt, 1999). Zhu et al. (2003) describe the role of scope of business operation as an adoption predictor on three stands. First, digitalization of operations reduces internal co-ordination costs, administrative complexities and information processing. Second, relates to external co-ordination costs (search costs and stock holding costs), which, though ambiguous to determine, increase with firm's business scope. Firms with larger scope of business glamour for E-Commerce to reduce search costs for both buyers and sellers (Bakos, 1998) and to achieve demand aggregation and improved inventory management (Chopra & Meindl, 2001). Finally, firms with greater scope of business have more latitude of benefiting from synergy of EC and traditional business. Zhu et al. (2003) observe that web connectivity and knowledge sharing may help consumers to locate physical stores.

5. The scope of business operations of an SME will significantly determine the possibility of adopting Electronic Commerce facilities.

Individual difference factors (IDF)

Every organization is idiosyncratic to the extent of decision makers' 'givens' reflecting their cognitive assumptions concerning future, alternatives, and consequences attached to each alternative (Hambrick & Mason, 1984). A firm's strategic and tactical focus is largely shaped by the peculiarity of minds of key actors. The adoption of enterprise level innovations such as EC solution depends largely on the functional, and/or emotional feelings of decision makers, which reflect their attitudes, perceptions, psychographics, motivation, and other individual difference factors. Individual difference factors are further measured by one's functional track/education, age, gender, and experience. Experience rates a significant individual difference factor in technology acceptance research (Zmud, 1979); favourable experience about an innovation influences adoption of similar ones perhaps on accounts of stimulus generalization (Dabholkar, 1992). People with prior

experience about EC are more skilful and can simplify its complexities to improve perceived usefulness. Studies (Agarwal & Prasad, 1999; Chau, 1996) from MIS reported internet use experience as influencing actual use of specific systems.

Studies (Becker, 1970; Hambrick & Mason, 1984) show that education influences personal innovativeness, belief/value systems, risk-taking, cognitive preferences, and receptivity of an innovation. Weak education attracts risk aversion, threats to change and imitating the innovators, who may be more educated, more cosmopolitan in their social relationship, more exposed to mass media, and more active outside their community (Bass, 1969). Rogers' (1995) recognizes that highly innovative persons are aggressive seekers of new ideas; they are able to use their advanced and rigorous knowledge and experience to advantageously manage uncertainties of the business environment. Agarwal and Prasad (1999) postulated that persons with higher innovativeness with respect to EC are expected to have more positive perceptions to the five characteristic constructs of Rogers' diffusion theory.

Further, age and gender of the decision-maker(s) influence the propensity to seek and try out novelties. In most technology-led markets, early adopters are commonly young and perhaps males (Lu et al., 2003); the German market for mobile phone is 60 percent male and 40 percent female (Target Group Index Europa Survey, 2000). Age directly impacts on usefulness perception and on workers' performance of computer-based tasks; younger executives appear much more associated with corporate growth (Czaja & Sharit, 1998; Venkatesh & Morris, 2000) since they take much risk. The conservative stance of the older executives is explained by their premiums on social circle and spending traits, retirement benefits, and career and financial security (Carlsson & Karlsson, 1970); lack of mental and physical stamina to grasp novelties; greater psychological commitment to corporate status-quo (Alutto & Hrebiniak, 1975); and lack of social enabling environment for novelties (Spry Foundation, 2005). Therefore, the likelihood of EC adoption is more profound in organizations managed by young executives than those managed by older executives. Based on these, we formulate four propositions.

6. *The age of decision makers significantly determines SMEs adoption of EC.*
7. *The gender composition of decision makers significantly determines SMEs adoption of EC.*
8. *The level of education of decision makers significantly determines SMEs adoption of EC.*
9. *The experience of decision makers significantly determines SMEs adoption of EC.*

Organization mission (OM)

Organizations have larger accomplishments; the essential and distinctive purpose that specifies its overall goals and operational scope as well as general guidelines for future managerial actions (Boone & Kurtz, 2004). While some firms pursue prime mover-ship role in an industry; others sit back in established markets without any intention of rocking the boat. Innovative organizations seek opportunities to upset industry equilibrium; pursue strategies to disrupt normal course of industry events and to forge new industry conditions to the disadvantage of competitors (Macmillan, 1982). A firm's strategy plays a primary role in EC adoption (Bakos & Treacy, 1986) and is intertwined with business strategy, be it to reduce costs and reengineer business processes, to increase product differentiation, to achieve growth by developing new products and entering into new markets, or to develop strategic alliances (Porter & Millar, 1985). Although little or no empirical enquiries on this construct have been undertaken it is believed that mission determines EC adoption. For instance, the learning and experience curve effects of low-cost leadership show how firms focus obsessively on costs and ignore trends, fail to innovate, end up with obsolete

products. Such firms take up EC only when it contributes to cost reduction and demands no much operational changes that disrupt learning and experience curve.

10. The company mission of an SME significantly determines the possibility of adopting EC.

Firm's size

Much exists in literature, which supports that firm size is a major factor affecting the adoption of a technology (see Jeyaraj et al., 2006; Sabherwal et al., 2006) and that size makes for resilience to environmental shocks. The uptake of internet and its infrastructures in business is slower in smaller than in larger firms (OECD, 2000), which supports reports from OECD countries that a strong correlation exists between the rate of adoption of internet/ its infrastructures and firm's size. Densmore's (1998) study shows that the proportion of EDI adoption amongst larger firms is about 95% and only about 2% in small firms. Similarly National Statistical Resources from some OECD countries report that diffusion of internet and its infrastructures amongst large firms in 1999 was between 80 percent and 86 percent; for firms with 20 employees and more, 61-95 percent; and for very small firms, between 19 percent and 57 percent (OECD, 1999). Adoption is slower amongst smaller institutions perhaps because of resistance to change, lack of education about EC's potentials, lack of trust in the security of its transactions (Papazafeiropoulou, Pouloul, & Doukidis, 2002), lack of technological expertise and uncertainty about its benefits (Gengatharen & Standing, 2005), and lack of economy of scale advantage and facilitating slacks as well as the strengths to bear the associated risks and to encourage trading partners to adopt technology with network externalities (Zhu et al., 2003).

Most SMEs use internet facilities mainly for communications and research and EC seems underplayed in their business processes (European Commission, 2007; Metaxiotis, 2009). However, the absence of awareness models to encourage SMEs to adopt it shows that the superlative enthusiasms of on-line business is still under-utilized (Zhu et al., 2003) perhaps because of the obstacles of transcending significant technical, managerial, and cultural issues (IBM, 2001). These ordeals have caused governments of some countries to take up direct roles in uptake of e-commerce by sponsoring Regional Electronic Marketplaces (REMs), especially for SMEs in the hope that they will spearhead the creation of e-business communities and contribute to regional economic development. REM represents a regionally focused virtual marketplace that fulfils both commercial (supply, demand and pricing mechanisms) and communication functions, and is created to accelerate diffusion and acceptance of modern telematic services and applications amongst participants in a region (Zimmerman, 1998).

11. The size of SMEs will significantly determine the possibility of adopting IT.

Facilitating conditions (FC)

Initially, facilitating conditions were treated as external controls but enabling environment must be created to avoid firms facing extinction (Triandis, 1980; Thompson *et al.*, 1994). Studies (e.g., Mische, 2001) opine that high-performing firms exhibit institutionalized aggressive innovation; show industry leaderships in creativity, novelty, and collaborative learning; hire, develop and reward innovative employees; and focus on definite targets. The decision maker must strategically engage in environmental analysis and diagnosis in order to critically measure the influences of policies, regulations, and other internal and external variables on his firm's acceptance of, and decreasing technical incompatibility of, technology with network externalities.

12. The facilitating conditions existing in SMEs will significantly influence the possibility of adopting an EC.

Social influences

Social influences were rated equivalent to subjective norms (Taylor & Todd, 1995) though scholars drew from Rogers' (1995) diffusion model to extend it to enhancement of one's image/social status as well (Venkatesh & Davis, 2000). Much scholarship in psychology theorizes subjective norm as an important determinant of intention and practically epitomizes the perception of others about behaviour(s). Social influences are more of moving from functional to psychological motives of behaviour(s) perhaps because they define other peoples' opinions, superior influences, and peer group opinions (Taylor & Todd, 1995). The sociologists believe that often group members exhibit cohesiveness even against their own feelings in order to show commitment to group norms. Samson and Hornby (1988) report that in China, 73 percent of the executive class in big cities owned mobile phones early 1998 not solely for communications but also for social status. Further, Ling, and Yttri (2002) suggest that younger users of communication interfaces are more subject to social influences because they are at social development and learning stage of life. The work also suggests that young users' social networks are more dynamic and thus exposed to more influences than other users.

13. Social influences or subjective norms will strongly create room for SMEs to adopt EC.

Environment

Organization's propensity to innovate is shaped by environmental opportunities and threats. Strong correlation exists between a firm's decision to use EC and such industry factors as peer influences, rate of technical change, market volatility and coercive influences perhaps from customers (Raymond & Blili, 1997). Tornatzky and Fleischer (1990) discussed environment in terms of consumer readiness, competitive pressure, and trading partners' readiness, while this paper adds perceived trust.

Consumer readiness

Consumer readiness as a major determinant of firm's decision to adopt EC reflects potential market volume, consumers' understanding of the applications, and the associated pay-offs. Zhu et al. (2002) define consumer readiness in relations to consumer willingness and internet penetration. Consumer willingness measures customer appreciation of, and engagement in, on-line shopping; and internet penetration focuses on diffusion of personal computers and internet infrastructures amongst user publics. Ayo (2008) records the greatest impediment to the growth of e-commerce in Nigeria to be low PC penetration. But, thanks to the cheap Asian branded PCs, which perhaps encourage improved uses of internet facilities in Nigeria and other developing nations. Customer willingness is further expressed in terms of limitations of what can be bought on-line, rigours of the system, restrictions in global markets, literacy rates, and safety and security of online transactions (Ayo, 2008). Sawhney and Prandell (2000) note that consumer readiness could be improved upon by the firm developing a common language or technological networks that enhance learning capability, trust, and motivation to shop on-line effortlessly. For instance, interactive relationships between firms and their customers through virtual space may reduce consumers' expended time and efforts, as well as their willingness, to obtain and share business knowledge.

14. The extent of consumer readiness/exposures to EC determines SMEs' speed of adoption.

Perceived trust (PT)

Perceived trust is strongly linked with customer readiness in adoption of innovation. Privacy, safety and security are essential in digital interactions especially when transactions move beyond

the confines of simple concept. Ample surveys (e.g., Clarke, 1999; Swan, Bowers, & Richardson, 1999) suggest a negative relationship between lack of trust in online transactions and customer attitude, intention to buy, and purchase behaviour. Trust is perceived as feelings of security when relying on an entity. This definition is expressed in terms of frauds, non-access to many stores, personal information privacy, data mining and data security. Studies (Benassi, 1999; Greene, 1997) show that people leave websites when personal information is requested for. Personal information privacy appears in two facets, environment control and secondary use of information control, the absence of which inhibits the release of customers' personal information (Hoffman, Novak, & Chatterjee, 1996). While the former refers to customers' ability to control the action of virtual stores, the latter relates to consumers' ability to exert control over what virtual stores make of the information afterward.

Most economies have promulgated regulatory frameworks to protect information privacy of on-line shoppers and many have exploited the age-long Transborder Data Flows (TBDFs) laws to regulate and/or deny access to strategically important data and information on personal, non-personal, and economic. Further, Passport USA (PUSA) in partnership with MasterCard introduced an on-line shopping card, which guards against internet frauds and gives a typical on-line shopper an unrestricted access to millions of stores. Security concern surfaces because information supplied online travels through many unsecured systems and stands the risk of being intercepted and/or misused. However, encryption converts consumer data into cipher, which makes it difficult for the data to be intercepted or accessed unless the programmer authorizes it. At least two aspects of security are often observed in relational paradigm (Boone & Kurtz, 2004).

First, security during actual transaction, which is to ensure yahoo boys do not hijack it. The need for credit card numbers and other critical information on the internet expose the customer to risks beyond current transaction, and therefore requires the marketer's prove of trust that goes beyond just probity and punctuality of the current transaction and heighten the relational nature of digital interactions. To ensure privacy and secured payment systems, EC sites demand passwords as a form of authentication or authorization to an internet user to access an account/information. Recently e-signature turns a viable way to enter into legal contract by permitting a person to obtain a form of e-identification and install it in his web browser so that sellers can verify and authenticate on their screen in the event of transaction. Second, involves security of individual customer's database to dissuade a third party breaking into it. Of course signing policy with Internet Privacy Organization like TRUSTe helps.

15. Perceived trust in terms of safety and security of transactions will affect the adoption of EC by SMEs.

Competitive pressure (CP)

Competitive pressure as a driver of EC adoption operates on the basis of retaliatory and endless vicious circle. Analyzing the significance of competitive pressure on EC adoption, Porter and Millar (1985) suggest that EC alters the rules of competitive games, restructures the industry make-ups, and unravels novelty in outperforming rivals. Perhaps EC adoption transforms industry practice, ushers in new cast of competitors (who may use competencies developed outside to exploit the leapfrogs of incumbent players, see Cooper, Demuzzio, Hatten, Hicks, & Tock, 1974, for details), and repositions competitive grounds to reflect as such in an effort for the prime mover to hold market pace against rivals. IT authorities document that EC perhaps induces change in industry structure such as disintermediation and intermediation (Bailey & Bakos, 1997), offers new means of competing and alters competition rules via lock in (Shapiro & Varian, 1999), electronic integration (Venkatraman & Zaheer, 1990), and brick-and-click synergy (Steinfeld, Adelaar, & Lai, 2002). In general, firms that dreams to exploit the environment to their own advantage must be proactive in decision-making.

16. Competitive pressures from rivals positively affect the likelihood of adopting EC by SMEs.

Trading Partners' Readiness (TPR)

EC's adoption transcends the digitalization of business domain of individual organizations; its initiatives require network externalities with trading partners (customers, dealers, and suppliers) to ensure electronic interactions and transactions along the value chain. This entails an improved relationship and change in organizational structure and value chains as well as training and re-training of staff to exploit the opportunities of, and down play threats of, EC. The uptakes of EC require some measures of strategic planning and proactive decisions to eliminate surprises and to improve user firms' competitiveness. However, many of these trading partners are small outfits, who, perhaps, do not have the resources to fully adopt EC applications. The argument that EC demands integrated and electronically compatible trading systems that link firms and their trading partners to provide internet-enabled services for one another is often assumed worthwhile when the trading partners are big and can afford the associated costs. Therefore, governments of Nigeria should emulate other nations, even developing ones, by encouraging genuine SMEs to acquire modern technologies capable of improving operations. The acid test depends on many factors of which antecedent record is a significant part of.

17. Trading partners' (dealers, consumers, and suppliers) readiness to use EC facilities will significantly impact on SMEs' intention to adopt it.

Contributions and Conclusions

The digital age ushers in new cast of business ideals and ordeals, and specifically creates, though with some specific sacrifice, more meaningful relational accords between/amongst people/consumers, governments, and businesses. Competitive advantage is exploited when SMEs install social software platforms that overcome the challenges of distance and size and imply global and cost-effective platforms to communicate and conduct commerce. However, adoption of EC amongst SMEs is rather very slow principally on accounts of lack of experience and little awareness of the strengths of some IT infrastructures. TAM, TPB, and T-O-E provide worthy insights into how firms adopt EC but improving upon them as done by this paper provides SMEs with better latitudes to sustain and/or improve upon competitive advantage. The model proposed here assists TAM and T-O-E to enjoy huge fertility by integrating other constructs and/or combining with other IT acceptance models in order to deal with the techno-centric nature of TAM.

Systematically, the integration of the constructs of individual difference factors, facilitating conditions, organization's mission, perceived trust, and perceived service quality into different adoption drivers makes for a difference in literature, enrolls technical (non-human) and social (human) systems into the network, and offer richer theoretical bases for explaining and predicting adoption behaviour. However, the proposed relationships these new constructs bring upgrade original TAM and T-O-E models to a more comprehensive level to promote and facilitate improved explanatory and predictive lenses of IT adoption. Neither the adoption drivers nor the constructs are mutually exclusive; rather they are complementary in their relationship, with each construct/element attracting some measure of difference in weight of influence at one decision period or the other.

This expanded model provides pragmatic values, especially by providing that attitude is formed based on conscious assessment of the constructs/factors and can lead to behaviour if positive since EC is synonymous with high involvement behaviour. Feedbacks emanate in the form of post purchase behaviour and goes to reflect on experience and prior knowledge, which can be used to reduce perceived risks in subsequent behaviours. Apparently this new proposed model is

assumed not exhaustive in its constructs and thus, encourages modification and improvement through further studies. Nevertheless, it can favourably compare with other relevant models and hopefully adds to existing body of knowledge of user acceptance of IT. The paper integrates somewhat technological determinism and social constructivism to broadly make informed decisions amidst globalization of markets, growing interpenetration of economies, and increased interdependence of economic agents, which individually or severally combine to reshape competitive environments.

Operational Implications

This paper has some implications to scholars, governments and SME operators. Future researchers are stimulated to keep improving upon the constructs of the improved models suggested by this paper. However, scarcity of resources inhibits SMEs' adoption of IT infrastructure(s); and so governments and their agencies, as well as Non-governmental Organizations (NGOs) are encouraged by this paper to aid them via awareness creation on its cost-benefit analysis; and grants. Governments owe it a duty to improve upon governance by spurring economic development and growth in this digital age, especially through encouraging SMEs not just for their limited resources but also for their strategic position in economic building. Countries such as Botswana, Japan, China, Taiwan, South Africa, among others, had long appreciated the resource barriers of SMEs and went ahead to prepare grounds for SMEs readiness for the global knowledge economy. The paper presented EC as a socio-economic driving force through cost-effective operations beyond the traditional boundaries and encourages governments of Nigeria to borrow the Japanese Conspiracy Theory. Japan's success is expressed in terms of the very high degree of industrial co-ordination amongst SMEs, banks, and government.

The small Japanese firms can borrow for a long period with the aid of government loan guarantees and are typically financed on a ratio of 80% debts to 20% equity. This recommendation works only if, like Japan, Nigerians embrace Hazama's (1981) Risshin Shusse, which means launching a campaign to imbibe in every child the concept of genuine success. With governments' supports, SMEs will enjoy an almost equal level playing grounds with their larger counterparts, overcome the barriers of size and distance, and reposition operations to reflect global transaction and knowledge sharing in a community.

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