

Factors influencing electronic commerce adoption in developing countries: The case of Tanzania

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Electronic commerce is rapidly replacing the old ways of doing business. Although many studies have been conducted on the adoption of various forms of e-commerce, there are few on this topic in African countries; in particular, there is no research on Tanzania. Therefore, this paper analyzes the factors determining e-commerce and their impact on its adoption in Tanzania. This paper extends the technology acceptance model (TAM) to an empirical study analyzing the factors influencing e-commerce adoption in Tanzania. A survey involving 111 respondents including Tanzanian government officers was conducted, and structural equation modeling was used to assess the model for the influence of three new factors: national policy initiatives, technology infrastructure, and trust in e-commerce adoption. The results show that technology infrastructure is an important factor in e-commerce adoption, and national policy initiatives are important in building online trust and improving technology infrastructure in Tanzania. Therefore, government policy makers need to encourage the presence of good technology infrastructure and build trust in e-commerce through national policy initiatives such as e-commerce promotion. Limitations of this paper are that the respondents are limited to people who have access to the Internet and some might not have enough knowledge about e-commerce. Further, the survey is conducted only in Tanzania; therefore, the results may differ in other African countries.

Key words: E-commerce, e-commerce adoption, TAM, Tanzania.

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Introduction

In recent years, research interest in new bottom of the pyramid (BOP) (Prahalad & Hart, 2002) markets such as Africa and India has been growing, leading to many studies on this topic across the world. Accessing BOP markets requires a different approach because they are unlike the traditional markets in many aspects (Chironga *et al.*, 2011). Many research efforts focus on activating BOP markets, and electronic commerce (in short, e-commerce) is one such effort (Chironga *et al.*, 2011, Eyring, Johnson & Nair, 2011). Therefore, in this study we attempt to identify the factors that can activate e-commerce in Tanzania, which is a part of Africa and accounts for a large share of the African BOP market.

E-commerce is defined as “the process of buying, selling, transferring, or exchanging products, services, and/or information via computer networks, mostly through the Internet and intranets” (Turban *et al.*, 2012). There are various types of e-commerce models, for example, business-to-consumer (B2C), e-banking, business-to-business (B2B), consumer-to-consumer (C2C), peer-to-peer (P2P), and mobile commerce (Laudon & Traver, 2010). Mobile

commerce, which is a subset of electronic commerce, delivers e-commerce capabilities directly into the consumer’s hands via wireless technology (Lu *et al.*, 2003). The many benefits of e-commerce are product promotion, cost saving, timely information, information consistency, better customer service, better customer value, customization of the products, competitive advantage, and convenience of doing business (Alwahaishi, Nehari-Talet & Snasel, 2009). E-commerce not only benefits individual customers and businesses, but also improves the general economy of the country owing to the efficient use of resources. Murphy (1998) stated that the use of e-commerce can reduce costs for both buyers and sellers in completing transactions and can boost economic growth in the medium and long term by improving market development and efficiency. In this manner, e-commerce replaces the old ways of doing business as it increases efficiency in business transactions in terms of cost, time, and effort.

Since China is the most populated country in the world, it is expected to have many potential customers for e-commerce. However, e-commerce in China is facing several challenges such as lack of customer services and trust on account of poor Internet security and privacy (Efendioglu & Yip,

2004). Therefore, certain requirements and conditions are necessary for the growth of e-commerce. The presence of information and communication technology (ICT) infrastructure is the foundation of e-commerce in any country (Aaron, Decina & Skillen, 1999). According to Aaron *et al.* (1999), the technological enablers of e-commerce include the Internet, electronic mail, World Wide Web, intranet, and extranet. Liu (2008) found that the main determinants of e-commerce development are human capital with ICT skills and technological support.

Although e-commerce is growing in most developed countries, many African countries are yet to realize the benefits from e-commerce. While e-commerce was introduced in Africa more than ten years ago, the survey by Molla and Heeks (2007) revealed that only 30% of businesses in South Africa using e-commerce felt satisfied with its performance. Developing countries need to identify the problems that slow down the adoption of e-commerce. E-commerce in Tanzania is lagging behind and can be traced in very few areas, such as mobile commerce, Internet banking, online shopping malls, and the travel industry. The government is also yet to begin e-government services.

In Africa, some countries have taken steps to develop ICT, which is essential for the development of e-commerce. Some African countries like South Africa use e-commerce in sectors such as travel (airline) and agriculture. In addition to South Africa, the North African countries and Mauritania have secured top positions in ICT rankings of the Global Competitiveness Report 2011, which is a good sign for e-commerce development in those countries. Even though the Tanzanian government has not yet introduced e-governance, some government institutions such as the National Examinations Council of Tanzania (NECTA) have online registrations and online visa applications. These might encourage and familiarize people to the use of online services.

This study analyzes the factors affecting e-commerce adoption in developing countries, especially in Tanzania. In order to make an appropriate model for Tanzania, we first analyzed the status of the Internet and e-commerce in Tanzania. We realized that factors such as policy initiatives, technology infrastructure, and trust are more important in developing countries than in developed countries. Therefore, the study focuses on national policy initiatives, technology infrastructure, perceived ease of use, trust, and perceived usefulness as the five factors that affect people's intention to transact online in Tanzania.

Technology infrastructure is the foundation of online business and comprises computers, Internet connections, software, web applications, and telecommunication. National policy initiatives are also important in changing the behavior of people. Governments can improve technology infrastructure through national policy initiatives offering incentives to electronic products, ICT service providers, and science institutions. Governments can also build trust and perception about e-commerce through awareness and education.

We expect that our research will help the government in setting up the necessary policies for improving e-commerce in the country so that it can serve as a facilitator of economic activity. Moreover, our research can guide other e-commerce stakeholders such as businesspersons and entrepreneurs in recognizing the important factors for the growth of e-commerce, thus increasing their cooperation with the government in minimizing obstacles to e-commerce.

This paper is organized as follows. In Section 2, we review previous e-commerce adoption studies and assess the status of e-commerce in Tanzania. Section 3 presents our research model and develops our hypotheses, and Section 4 describes our research methodology. The results and analysis of our study are described in Section 5, and discussions including contributions and limitations are presented in Section 6.

Literature review

E-commerce adoption

There are numerous studies explaining e-commerce in organizations or firms and in various countries. E-commerce research spans topics such as technology readiness, factors for adoption, critical success factors, challenges and barriers, e-commerce solutions, and other factors influencing e-commerce. While most of the studies in developed countries focus on e-commerce success factors, payment methods, and institutions, studies in developing countries still focus on e-readiness and e-commerce adoption factors.

Molla and Licker (2005a) have developed a framework for e-readiness that is necessary for initial adoption of e-commerce in developing countries. The model has two major factors—perceived organization e-readiness (awareness, resources, commitment, and governance) and perceived external e-readiness (e-readiness of the government, market forces, and support industries). Tan, Tyler and Manica (2007) extended the model to include business typology, sector, firm size, education level of employees, and technological resources when analyzing B2B e-commerce adoption in China. Other factors for e-readiness of small and medium size enterprises (SMEs) according to Fathian, Akhavan and Hoorali (2008) are ICT infrastructure, organizational features, ICT availability, and security and legal environment. Educational awareness, strong ICT infrastructure, and government support are still significant factors according to a recent study in Saudi Arabia (AlGhamdi, Drew & Al-Ghaith, 2012). Recently, some studies investigated the factors influencing e-commerce adoption in a strategic view. Li and Xie (2012) suggested a strategic framework for determining e-commerce adoption and showed that managerial attitudes, corporate strategies, external pressures and technological strength of the firms are the main factors of significance in China. Moreover, Saffu, Walker and Mazurek (2012) showed that perceived strategic value, which consists of organizational support, managerial productivity and decision

aids, positively affects e-commerce adoption among the SMEs in Slovakia.

Some studies have revealed the barriers to e-commerce in different countries and organizations. Among them, one study by Alwahaishi *et al.* (2009) in Saudi Arabia identified education (illiteracy and lack of computer related skills), cultural factors (such as confidence on the product and availability of reimbursement) and technical factors (such speed and efficient payment) as obstacles to e-commerce adoption. Other factors that hinder e-commerce adoption include lack of regulations and legislations; lack of awareness and education about e-commerce, cultural factors such as social approval security, availability of standards, resistance to change, negative attitude, and lack of management commitment; economic issues such as cost, social infrastructure, wage, and interest rate; taxation system; Internet security and privacy issues such as absence of laws on consumer protection, copyright, and digital signature; issue of trust infrastructure in online payment; lack of customer services; preference for actual shops; and cognitive factors such as lack of awareness and knowledge of e-commerce, and lack of valuable and useful content for consumer (Al-Gharbi, Khalfan and Al-Kindi, 2006; Farhoomand, Tuunainen & Yee, 2000; Mingqiang & Xiang 2010). Financial problems and uncertainty in the e-commerce market were also suggested as two of the most important barriers in e-commerce adoption in a recent study (Solaymani, Sohaili & Yazdinejad, 2012).

Apart from studying e-commerce adoption in general, researchers have also studied factors influencing adoption of e-commerce technology in online shopping, Internet banking, B2B transactions, B2C transactions, e-marketplace, websites, mobile commerce, electronic data interchange (EDI), and electronic payment. Factors that have been found to influence the above forms of e-commerce have been discussed by Al-Qirim (2007), Iacovou, Benbasat and Dexter (1995), Jiang & Sun (2009), Wang, Archer and Zheng (2006) and others. A recent study on the Internet banking of developing countries (Varaprasad, Sridharan & Unnithan, 2013) identified a new factor called conspicuousness as the determinant of Internet banking in India. Another recent study on online trust in a B2C e-commerce context (John, 2012) showed that vendor familiarity, system/service quality, perceived security and perceived privacy are significant antecedents of online trust and affect user's intention to engage. Moreover, AlGhamdi, Nguyen and Jones (2013) insisted that businesses, customers, environmental and governmental support should be considered in B2C e-commerce infrastructure, and that Saudi Arabia lacks governmental support.

Tourism is an important area of business in most developing countries and experienced significant changes in the market structure due to e-commerce. Abou-Shouk, Megicks and Lim (2012b) examined the perceived benefits of e-commerce adoption by Egyptian travel agents. The study showed that marketing, strategic, and business efficiency benefits influence e-commerce adoption. Moreover, the suppliers and competitive pressures were the strong drivers

whereas resource limitations, business environments, and technology attributes were key barriers for e-commerce adoption among Egyptian travel agents (Abou-Shouk, Lim & Megicks, 2012a). Herrero and San Martín (2012) proposed a new approach to examine the influence of perceived risk on e-commerce adoption. The results show that technology risk is the main determinant of the online purchasing intention, and technology and vendor risk have a negative influence on the attitude towards website use.

There are also studies that compare the e-commerce adoption between the two countries. Kurnia and Ali (2012) compared B2B e-commerce adoption by the grocery industry in Indonesia and Bahrain. The results showed that the differences in the social, economic, technological and political conditions do not create barriers to adoption. As for one of the barriers, the study pointed out that there is very little government intervention to encourage adoption. Asare, Gopolang and Mogotlhwane (2012) compared the adoption of ICT in B2B and B2C e-commerce in Botswana and Ghana. The study showed similarities and differences in the challenges in the adoption in both the countries. For example, frequent power disruption was a barrier in both the countries, but the lack of technical knowhow was not. A study compared the adoption of e-commerce in China and Malaysia (Ooi *et al.*, 2012) and showed that organizational readiness, innovation attributes, and cultural factors significantly influenced the e-commerce adoption in China, but the cultural factors were not as significant for e-commerce adoption in Malaysia.

Although research studies on e-commerce in developing countries have become popular, most of the research in Africa tended to be concentrated on South Africa (Barnard & Wesson 2003; Molla & Heeks, 2007; Molla & Licker, 2005b; Moodley, 2003; Pather, Erwin & Remenyi, 2003). However, the number of recent studies on e-commerce adoption in other parts of Africa has been growing (Boadi *et al.*, 2007; Maswera, Dawson & Edwards, 2008; Migiro 2006; Nasri & Charfeddine, 2012; Asare *et al.*, 2012, Mashanda, Cloete & Tanner, 2012; Taylor, Dorothy & Owusu, 2012).

Some of the studies on e-commerce adoption in African countries investigated and described the status of e-commerce adoption using descriptive surveys and statistics (Boadi *et al.*, 2007; Maswera *et al.*, 2008; Migiro, 2006; Molla & Heeks, 2007). Maswera *et al.* (2008) compared Web pages of travel and tourism organizations in South Africa, Kenya, Zimbabwe, and Uganda with those of USA and Western European organizations in order to identify the differences in features of Web sites such as product information, reservation, and payment. The results showed that the African websites generally lacked interaction for online transactions. Migiro (2006) analyzed e-commerce adoption in manufacturing SMEs in Kenya and identified specific barriers using descriptive statistics. The study found the barriers to be high cost funds and lack of technical expertise. Another study that analyzed e-commerce adoption in South Africa from the perspective of benefit (Molla & Heeks, 2007) did not find any benefits related to transaction cost and strategic management. They suggested some

possible causes of this finding; however, more systematic analysis would be required to accurately identify them. Taylor et al. (2012) examined the factors that affect Internet and e-commerce adoption in Ghana. The result showed that perceived benefits of the technology, lack of qualified staff, and limited resources were the internal factors whereas the limited number of Internet Service Providers (ISP), lack of online payment process, and limited availability of online banking services were the external factors that influenced e-commerce adoption in Ghana. Another recent descriptive study on the African countries is Mashanda *et al.* (2012) that explores the factors that influence B2C e-commerce adoption by SMEs in Zimbabwe. It showed that environmental factors such as unreliable network infrastructure and the unreliability of electrical power have a huge impact on the decision to adopt e-commerce.

Other studies on e-commerce adoption in African countries are based on models that explore factors determining e-commerce adoption (Molla & Licker 2005b; Nasri & Charfeddine, 2012). Molla and Licker (2005b) suggested factors that affect e-commerce adoption in South Africa from the perspective of e-readiness. They used factors based on perceived organizational e-readiness (POER) and perceived environmental e-readiness (PEER) as determinants of e-commerce adoption. The results showed that both organizational and environmental considerations were important. Furthermore, Nasri and Charfeddine (2012) explored the factors affecting Internet banking adoption in Tunisia based on the technology acceptance model (TAM) and the theory of planned behavior (TPB). The paper suggested that banks should improve security and privacy in order to increase trust, and the government should provide a clear and solid law. Another interesting study on e-commerce of Africa is about m-commerce adoption in Ghana (Boadi *et al.*, 2007). Through the survey on m-commerce adoption practices of farmers and fishermen they concluded that m-commerce facilitated cost reduction and afforded opportunities for deepening business relationships. Despite the fact that many researchers have conducted e-commerce studies in various countries and organizations, this type of study has never been conducted in Tanzania. Therefore, this paper aims to identify factors that are relevant for e-commerce adoption in Tanzania from those mentioned in other studies.

Theoretical background

A lot of research has focused on determining factors affecting adoption of new innovation/technology and behavior. Some of the popular theories used by researchers to determine the factors affecting the adoption of new behavior owing to e-commerce are the theory of planned behavior (TPB) (Ajzen, 1991), the technology acceptance model (TAM) (Davis 1989), and the diffusion of innovation theory (DoI) (Rogers, 1995). TPB and TAM form the basis of the theory of reasoned action, and their central argument is that behavior intention leads to actual behavior. TPB uses three constructs to determine behavior intention, namely attitude, subjective norm, and behavioral control. It

predicts and explains human behavior. According to the theory, intentions are assumed to capture motivational factors that influence behavior. They are also indicators of how hard people are willing to try and how much effort they are willing to exert (Ajzen, 1991). The theory emphasized that the more people intend to do a particular task, the higher their chances of performing the tasks.

Attitude is defined as the degree to which a person has a favorable evaluation or appraisal of a behavior. Perceived behavioral control refers to the perceived ease or difficulty in performing the behavior and it is assumed to reflect past experience as well as anticipated impediments or obstacles (Ajzen, 1991), while subjective norm has been defined as the perceived social pressure to perform or not perform the behavior.

TAM uses two main constructs to determine intention to actual behavior, specifically perceived ease of use (PEU) and perceived usefulness (PU). PEU refers to the degree to which an individual expects that working with the particular IT will be simple, while PU refers to the degree to which someone believes that adopting a particular technology will have a performance benefit (Davis, 1989).

DoI uses five constructs to determine the diffusion of a certain technology. These are its relative advantage, compatibility, trialability, complexity, and observability. Relative advantage is the degree to which consumers perceive a new product or service as different from, and better than, its substitutes. Compatibility is the extent to which a new product or service is consistent and compatible with consumers' need, beliefs, values, experiences, and habits. Simplicity or complexity is the extent to which consumers perceive a new innovation as easy to understand or use. Observability is the extent to which an innovation is visible and communicable to consumers, and trialability is the ability of consumers to experiment with a new innovation and evaluate its benefits (Rogers, 1995). All of these theories have also been applied to e-commerce technology to determine factors influencing its adoption.

E-commerce in Tanzania

We analyzed the status of the Internet and e-commerce in Tanzania in order to figure out important factors of e-commerce adoption. The results show that policy initiatives, technology infrastructure, and trust are more important in Tanzania as compared to developed countries.

Even though the number of Internet users in Africa grew exponentially by 3,606.7% during 2010-2012, the penetration (% population) was still low at 15.6% when compared to the developed countries (Miniwatts_Marketing_Group, 2012a). On the other hand, the world total grew only by 566.4% during the same period while the penetration was 34.3% in 2012. The percentage of individuals using the Internet in Tanzania grew to 784.6% from 1.3% in 2009 and 11.5% in 2011 (Miniwatts_Marketing_Group, 2012b). Considering that the

wired broadband penetration in Africa was still low at 0.2% by the end of 2011 (ITU, 2012), the growth of the Internet users is remarkable. We can expect more growth if the technology infrastructure is enhanced.

The number of digital buyers in the Middle East and Africa region increased by 36.3% from 30 million in 2011 to 40.9 million in 2012 (Fredricksen, 2013). B2C e-commerce sales per digital buyer in the same region also grew by 5% from \$480 in 2011 to \$504 in 2012. Consequently, B2C e-commerce sales share of the same region grew to 1.9% in 2012 from 1.6% in 2011.

Mobile commerce, which is a subset of e-commerce (Lu *et al.*, 2003), accounted for almost one-third of the e-commerce traffic over the 2012 holiday season in the United States (Perez, 2013). According to Traxler(2013), the total share of e-commerce traffic from smart phones was 21% in 2012. It shows that m-commerce is growing rapidly. Recently, Tanzania has also experienced growth in the mobile commerce transactions. Mobile users in Tanzania can conduct financial transactions and other related services through their mobile. In March 2009, Zain, the second largest mobile operator in Tanzania, introduced Zap services that include receiving and sending money, cash withdrawal, payment for goods and services, and payment of school fees.

In addition to m-commerce, the other popular e-commerce activities in Tanzania are online shopping, tourism, and internet banking. Customers can buy products such as books, clothing, mobile phones, and computers online from websites including www.kivuko.com and www.lete.com. However, as the online payment system is still not fully exploited in Tanzania, the two web portals accept both online and offline payment. At the Kivuko web portal, the payment methods include bank deposit, cash on delivery for goods below \$200, and mobile payment using Vodacom M-pesa, Zain Zap, and PayPal. On www.leteonline.com, the payment method is cash on delivery. However, Bank of Tanzania (BOT) does accept non-cash payments such as debit and credit cards, electronic funds transfers, ATM cards, and prepaid cards.

Online activities are also growing in Tanzania, especially in travel and tourism sectors. People can book major hotels as well as plane tickets online. For example Travelstart, the South African online travel pioneer, opened an operation in Tanzania in 2010 to leverage the country's emerging online capability. Travelstart Tanzania is the company's first office in Africa outside South Africa. Further, a foreigner can make a visa application online. Some government institutions have introduced online registration processes. For example, NECTA has an online registration process.

Some banks have already introduced online banking services, for example, Stanbic Bank, CRDB, and the National Bank of Commerce. Customers can make online bank transactions at any time on any day without going physically to the bank. E-commerce gives SMEs the ability to access international markets that used to be difficult to enter owing to high transaction costs and other markets

access barriers (UNCTAD, 2002). For example, Africa Online Tanzania offers the small, medium, and large businesses a wide range of Internet and related products and services that address almost all their demands.

The Ministry of Communication, Science and Technology regulates ICT in Tanzania. The Ministry is in charge of policy formulation, monitoring and evaluation, and regulatory and legal matters pertaining to communication, ICT, science, technology, and innovation.

The Ministry has a number of institutions that help in ICT improvement and development in the country such as Dares Salaam Institute of Technology (DIT), Mbeya Institute of Science and Technology (MIST), Nelson Mandela African Institute of Science and Technology (NM-AIST), Tanzania Telecommunication Company Limited (TCCL), Tanzania Commission for Science and Technology (COSTECH), and Tanzania Communication Regulatory Authority (TCRA).

Tanzania has policies regarding science, technology, and communication such as the national ICT policy of 2003; National Telecommunication Policy of 1997; and National Science, Technology, and Innovation Policy which is being prepared from the Science and Technology Policy. In 2009 and 2010, there was heavy investment in ICT infrastructure after the first ever laying of fiber optic international submarine cables in the country.

In order to promote and develop the e-commerce market, the government has introduced the following National Information and Communications Strategy (NICS) policy statement on e-commerce:

- Establishing an environment conducive for e-commerce transactions and competition
- Encouraging more usage of ICT in financial services (banking, insurance, etc.)
- Promoting the use of ICT to enhance efficiency, effectiveness, and continuity in the provision of services and basic utilities, especially in billing and payment systems
- Developing and deploying a nationwide e-tourism system (Mensah, Bahta & Mhlanga, 2003)

Research model and hypothesis development

Based on the theoretical background and the extensive literature review described in Section 2, we developed the model shown in Figure 1 that extends the TAM by including three additional factors, namely national policy initiatives, technology infrastructure, and trust.

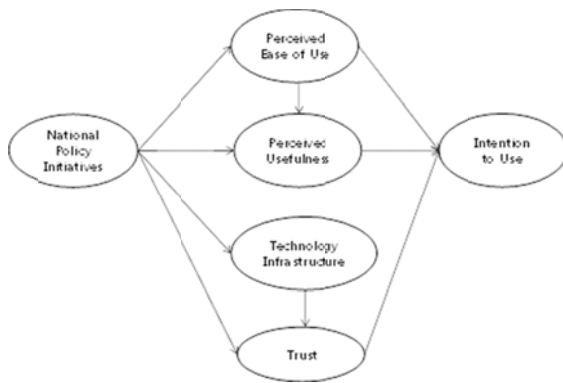


Figure 1: Research Model

National policy initiatives

National policy initiatives are government procedures to set principles and rules that guide decisions and achieve rational outcomes. National policies to promote e-commerce may include telecom liberalization, e-commerce promotion policies, general commerce policies, ICT policies, and e-commerce legislation.

The government is supposed to facilitate and provide good environment in the political, economic, social, or technological context that are important to the development of the country. As e-commerce has been proven to improve the economy of the country, the government needs to create conducive environment for its growth. Zhu, Kraemer and Xu (2006) showed that the social and economic contributions and the potential of e-commerce provide incentives for policy makers. They also suggested that the basic technology infrastructure is highly important for e-business initiation and assimilation in developing countries. Therefore, it is necessary for any government to set up good policies for the growth of e-commerce. A policy program should be designed to motivate, reproduce, or attempt to create changes in social behavior because policy comes out of the intent of one group to change the behavior of their own group, another group, or society as a whole (Corbitt & Thanasankit, 2002). Government initiatives for e-commerce in many countries have proven to have positive effects. For example, government initiatives have been the major contributing factors shaping the diffusion of e-commerce in Denmark. They increased acceptance and adoption of e-commerce in the public and private sectors, increased e-commerce training and education, expanded use of ICT by the public, and promoted telecommunication competition (Andersen, Björn-Andersen & Dedrick, 2003). National policies to promote e-commerce may include telecom liberalization, e-commerce promotion policies, general commerce policies, ICT policies, and e-commerce legislation (Jamwal, Jamwal & Padha, 2009). By analyzing firms from 10 countries, Zhu *et al.* (2006) proved that the regulatory environment plays a greater role in e-commerce initiation, adoption, and routinization.

The empirical findings from a survey of computer based software training to undergraduate IS students suggest that an IT user's usefulness and attitude perceptions fluctuate

with time across technological and usage contexts (Bhattacharjee & Premkumar, 2004). The study suggests that creators of IT can devote more resources to user training programs in order to create a positive user experience. Furthermore, a study about enterprise resource planning (Salam *et al.*, 2005) proved that training allows users to obtain firsthand information and experiences. It allows them to explore the perceived ease of use of the system. Training can therefore be considered as important for user experiences. Consequently, the government can formulate policies on e-commerce education and awareness to create a good perception of e-commerce. Based on the above discussion, we suggest the following hypotheses:

H1: National policy initiatives will positively affect perceived ease of use.

H2: National policy initiatives will positively affect perceived usefulness of e-commerce.

In addition to the above, national policies to promote e-commerce may include telecom liberalization, e-commerce promotion policies, general commerce policies, ICT policies, and e-commerce legislation, which will create a good environment for e-commerce growth when properly implemented, leading to a positive perception about the usefulness of e-commerce in the minds of people (Jamwal *et al.*, 2009). Therefore, we suggest the following hypothesis:

H3: National policies initiatives will positively affect the nation's technology infrastructure.

Policies can build trust when they put a good legal and institutional environment in place. As quoted from the OECD working paper, 2002, p. 19, "When businesses are operating within well-functioning legal and institution environment, they may have incentives to be trusting." This leads us to the next hypothesis:

H4: National policies initiatives will positively affect trust in e-commerce.

Perceived ease of use, perceived usefulness, and behavioral intention

The TAM posits that behavioral intention is the determinant of actual system use and this is determined by the two main behavioral beliefs, perceived usefulness (PU) and perceived ease of use (PEU). PEU refers to the degree to which an individual expect that working with a particular IT will be simple while PU refers to the degree at which someone believes that adopting a particular technology will have a performance benefit (Davis, 1989).

According to the research done by Taylor and Todd (1995), PEU and PU influence behavioral intention. Although our model does not incorporate actual use of behavior, many previous studies have confirmed that behavioral intention leads to actual behavior. The theory of reasoned action (TRA) posited that individual behavior is driven by behavioral intentions (Ajzen & Fishbein, 1973). Moreover,

the tests for all the three models, TAM, TPB, and the decomposed theory of planned behavior have confirmed that behavioral intention leads to behavior (Taylor & Todd, 1995). Therefore, we did not incorporate actual behavior in our model. The same study has also confirmed that perceived ease of use influences perceived usefulness. This may be because when a person perceives something to be easy, he or she might perceive it to be useful as well since it uses less energy to operate. Based on the above facts, we suggest the following hypotheses:

H5: Perceived ease of use will positively affect perceived usefulness of e-commerce.

H6: Perceived ease of use will positively affect intention to use e-commerce.

H7: Perceived usefulness will positively affect intention to use e-commerce.

Technology infrastructure and trust

Technology infrastructure consists of the Internet, World Wide Web, personal computers, hand held cell phone/computers such as iPhone, relational databases, cloud computing, client/server computing, and fiber optic switches (Laudon & Traver, 2010). It may also include science, engineering and technical knowledge available to private industry, generic technologies, infra-technologies, technical information, and research and test facilities as well as less technically explicit areas including information relevant for strategic planning and market development, forums for joint industry government planning and collaboration, and assignment of intellectual property rights (Tassey, 1991).

Trust is the level of expected reliability that players place on each transaction within the economy. Online trust has been defined as the trust of an individual person toward a specific transactional or informational website (Corritore, Kracher & Wiedenbeck, 2003). Friedman, Khan and Howe *et al.* (2000) suggested that trust depends on people's ability to perform three types of assessments. The study pointed out that the some characteristics that might affect online trust are reliability and security of technology, knowing what people online tend to do, performance history and reputation, insurance, and accountability.

As e-commerce involves online commercial transactions, which might involve varieties of activities from product or services display and searching for information from a website to giving personal information and online payments, the system should inspire trust. Trust is important when financial transactions and personal information is involved (Kini & Choobineh, 1998). Kini and Choobineh (1998) suggested four factors that influence development of trust, specifically "person making transactions," "online system," "task," and "information environment." Many additional factors assist in building online trust. As online commerce depends on technology infrastructure such as hardware and websites, it becomes more important for people to trust

these infrastructures. Kim *et al.* (2005) mentioned that technology is the ingredient of trust formation in B2C e-commerce adoption. Based on this review, we suggest the following hypothesis:

H8: Nation's technology infrastructure will positively affect trust in e-commerce.

Hoffman, Novak and Peralta (1999) pointed that almost 95% of web users have declined to provide personal information to websites at one time or another when asked while 40% who provided demographic data had fabricated it. This is due to the lack of trust in the websites. If this trend continues, then e-commerce will not realize its maximum potential and leads us to the following hypothesis:

H9: Trust will positively affect intention to use e-commerce.

Research methodology

This research required participants to have at least heard about e-commerce before the survey because we believed that a participant would not be able to fully understand and answer the questions about the perceived ease of use and usefulness without any prior knowledge of e-commerce. Datta (2011) also requested that the participants thoroughly understood the definition of e-commerce. The participants of the survey were selected based on the researcher's convenience, personal experience, and judgment. The probability of any participant being included is unknown, thereby implying non-probability sampling.

We administered the first pilot survey to 12 African graduate students in Korea to evaluate the overall questionnaire design. The students were private employees and unemployed full-time students. Then, we administered the second pilot survey to 10 government officers of Tanzania to supplement the questionnaire items on the government policies. We were concerned whether the questionnaires might be ambiguous for the participants in Tanzania to comprehend, which would lead to inappropriate answers. Based on the analysis of the data from the pilot study, we further clarified the questions about technology infrastructure, national policy initiative, and trust.

Data collection

This research targeted students pursuing higher education and workers from both private and government institutions in Tanzania. We collected data through an online survey using a web link and MS Word. The surveyor contacted the participants through email, Facebook account, and mobile phone. The participants were chosen from existing friends and contacts from Facebook. In addition, the surveyor identified participants through their Facebook profiles. The participants were requested to participate by sending emails with the required survey information. The questionnaires and information about the purpose of the study were sent to those who confirmed to participate through emails and

Facebook messages. Consequently, all the participants were regular Internet users. This could be a limitation of our study, because non-Internet users are not included in the sample. However, we believe that the results of our study are still valid. Firstly, the participants should know about Internet and e-commerce to answer the questionnaire adequately. Secondly, the Internet users do not always imply e-commerce users (Datta, 2011).

Around 92% of all the participants had heard about e-commerce prior to the survey and 90% of them had been involved in at least one kind of e-commerce transaction. Out of the 200 questionnaires sent out, only 111 participants answered all questions. Table 1 summarizes the demographic characteristics of the participants.

Table 1: Demographic variables of 111 Participants (Tanzania)

Measure	Items	Frequency	Percentage (%)
Gender	Male	90	81,98
	Female	21	18,01
Age	20-29	49	44,14
	30-39	48	43,24
	40-49	12	10,81
	50-59	2	1,80
Employment Status	Government Employee	35	31,53
	Private Employee	37	33,32
	Retired	1	0,90
	Unemployed	2	1,80
	Student	36	32,43
	PhD	4	3,60
Education Level	Master	21	18,91
	Post Graduate	12	10,81
	Undergraduate	62	55,85
	Advanced Level	5	4,50
	Diploma	6	5,40
	Other	1	0,90

Measurement

The questionnaire used to collect the data for this study consisted of the following two major parts:

Part I: This part intended to collect demographic information of participants such as gender, age, and education level. It also intended to collect information about e-commerce usage and familiarity. The survey asked the participants about their familiarity with e-commerce and some specific questions on the e-commerce transactions in which they had participated. The questionnaire comprised multiple-choice questions and participants were supposed to choose only one answer for each question from the given responses.

Part II: This part used the 7-point Likert scale. The participants were asked to rate their level of dissatisfaction or satisfaction for each statement given under the six constructs, namely national policy initiatives, technology infrastructure, perceive ease of use, perceive usefulness, trust, and intention. Table 2 shows the questionnaires of the constructs.

Table 2: Questionnaire of constructs

Constructs	Description
Perceived Ease of Use (PEU)	I believe that it is/would be easy for me to learn e-commerce operation. I believe that e-commerce usage would improve trade performance in the country. I believe that my transaction in e-commerce is/would be clear and understandable. I believe that it is/would be easy for me to become skillful at using e-commerce operation.
Perceived Usefulness (PU)	E-commerce would be useful to an organization that uses it. E-commerce increases effectiveness of the commercial transactions. E-commerce accomplishes tasks (sales, payment) more easily. E-commerce usage would increase people's productivity.
Trust (TR)	I believe that trusting a person (or thing) in e-commerce is/would be not difficult for me. I believe that I can trust e-commerce transactions (e.g., buying, selling, and paying online). I (would) feel confident giving my personal details for e-commerce.
Technology Infrastructure (TI)	I believe that there are sufficient technology resources (e.g., software, computers, information) to implement e-commerce. I believe that many organizations are well computerized with LAN and WAN (Internet connection) for e-commerce support. I believe that the country's Internet penetration is good for e-commerce support. I believe that many organizations have sufficient business resources (e.g., financial, payment processes) to support e-commerce. I believe that many people have sufficient experience with network based applications (e.g., email, Web browsing, word processing, spreadsheet processing).
National Policy Initiatives (NP)	I believe that the government has taken action (e.g., training, publicity on mass media) to promote e-commerce. I believe that policy initiatives for telecommunication competition promote e-commerce. I believe that the government incentives and subsidies (e.g., zero tax to electronic products) facilitate e-commerce. I believe that the government's support for science (scholarship for science studies, research and development in science field) promotes e-commerce.
Intention to Use (INT)	Given that I have access to the e-commerce system, I predict that I would use it. Assuming that I have access to the e-commerce system, I intend to use it.

Analysis and results

This study used LISREL 8.52 for data analysis. LISREL, a structural equation modeling technique, allows simultaneous comparison of fit of both the structural and measurement components of the model and tests theoretical relationships in a concise manner (Volkan, 1987).

Validation

In order to validate our measurement model, validity and reliability analyses were performed. As shown in Table 3, Cronbach's alpha of all the constructs attained more than the minimum reliability coefficient of 0.7 as recommended by Nunnally (1978). This proved that the question set for each constructs were internally consistent. Moreover, factor loadings ranging from 0.685 to 0.825 in Table 7 confirm the presence of convergent validity. Two-item scales were used to measure intention to use (INT) in this study while most information system studies use more than two items per construct. However, there are several studies that used two items in their model (Chang & Cheung, 2001; Soliman & Janz, 2004). In the most recent example, Hovav and D'Arcy (2012) used two items for measuring perceived certainty of sanctions, perceived severity of sanctions, and IS misuse intention. Therefore, the current model is unlikely to have any serious problems on this account.

Table 3: Factor loadings and Cronbach's alpha of constructs

Construct	Indicator	Factor Loading	Cronbach's Alpha
Perceived Ease of Use (PEU)	PEU1	0,818	0,836
	PEU2	0,793	
	PEU3	0,734	
	PEU4	0,761	
Perceived Usefulness (PU)	PU1	0,679	0,811
	PU2	0,685	
	PU3	0,855	
	PU4	0,793	
Trust (TR)	TR1	0,694	0,790
	TR2	0,835	
	TR3	0,783	
Technology Infrastructure (TI)	TI1	0,806	0,871
	TI2	0,843	
	TI3	0,734	
	TI4	0,717	
	TI5	0,765	
National Policy Initiatives (NP)	NP1	0,571	0,787
	NP2	0,784	
	NP3	0,712	
	NP4	0,795	
Intention to Use (INT)	INT1	0,685	0,801
	INT2	0,687	

Table 4 shows the evaluation of the structural model's fitness using LISREL 8.52 with various fit indices, such as

normed chi-square ($\chi^2/d.f.$), normed fit index (NFI), non-normed fit index (NNFI), goodness of fit index (GFI), and root mean-square error of approximation (RMSEA). The fitness of the overall model was found to be satisfactory as all the indices fall within the recommended range.

Since single respondents were used in this study, we performed Harman's single-factor test for common method variance to examine the possible effects of common-method bias (Harman, 1976). Harman's single-factor test is a widely known approach used for checking whether there is a single general factor accounting for the majority of covariance among measures (Podsakoff *et al.*, 2003; Podsakoff & Organ, 1986). Five factors with an eigenvalue greater than one emerged from the unrotated factor analysis, and the first factor in our analysis accounted for 36.8% of the total variance. Therefore, we concluded that common method bias is unlikely to be a serious problem in this study.

Table 4: Measures of the model fitness

Fit Statistics	Structural Model	Recommended Range
χ^2	282.27 (0.000)	Significant ($p < 0.01$)
Normed χ^2 ($\chi^2/d.f.$)	1.41	≤ 3.0 (Chau 1997)
Normed Fit Index (NFI)	0.88	≥ 0.80 marginal fit and > 0.90 good fit (Jöreskog & Sörbom 1998)
Non-Normed Fit Index (NNFI)	0.96	≥ 0.90 (Jöreskog & Sörbom 1998)
Goodness of Fit Index (GFI)	0.82	≥ 0.90 (Jöreskog & Sörbom 1998)
Adjusted Goodness of Fit Index (AGFI)	0.77	≥ 0.80 (Gefen <i>et al.</i> 2000)
Root Mean Square Error of Approximation (RMSEA)	0.054	≤ 0.08 (Browne & Cudeck 1992)

Hypothesis testing

Figure 2 describes the path coefficients and t-values for hypothesis testing. The results reveal that there is a strong relationship between national policy initiative and technology infrastructure, hence supporting H3. The basis of any technological advancement is the presence of good technology infrastructure including computers and Internet connections that serve as primary reasons for people to be exposed to cyber space. Moreover, national policy initiative has a strong relationship with online trust, thus supporting H4. This signifies that people believe that the government can play a major role in changing behavior of the people toward online transaction through trust building. In addition, the results of the study show that there is a relationship between national policy initiatives and both perceived ease of use and perceived usefulness, thus supporting H1 and H2 respectively.

Similar to past research, this research also indicates that perceived ease of use has a strong relationship with perceived usefulness and intention to use e-commerce, thus

supporting H5 and H6 respectively. This proves that people may perceive something as useful when they perceive it as easy to use. Furthermore, a strong relation is shown to exist between perceived usefulness and intention to use e-commerce, thereby supporting H7. This implies that people are willing to use something when they perceive it as useful.

In addition to the above, the nation’s technology infrastructure was shown to be strongly related to online trust, thus supporting H8. This result shows that technology infrastructure can increase people’s trust in online transactions, as technology infrastructure is the foundation of e-commerce.

Moreover, the results reveal that trust has a strong relationship with intention to use e-commerce, thereby supporting H9.

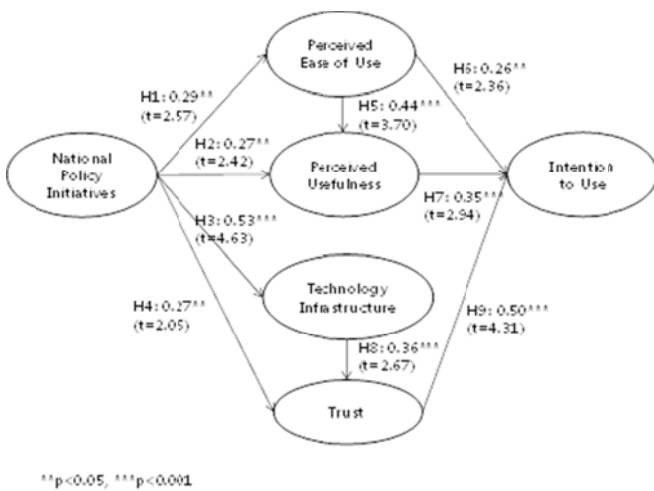


Figure 2: Results of the structural model

Conclusion

Contributions and implications

The research model in this paper extended TAM by including three new factors: national policy initiatives, technology infrastructure, and trust. The model developed in the study represents a significant improvement for TAM in the case of Tanzania that is a developing country. Moreover, the results show that the three factors are important in the improvement of e-commerce in Tanzania, although it is hard to find any study that showed that they were effective in developed countries. For example, Lederer *et al.* (2000) summarized 16 articles that tested TAM for different technologies; however, constructs of the old models did not include national policy initiatives, technology infrastructure, and trust. However, a recent study by Nasri and Charfeddine (2012) shows that security and privacy affect attitude, and government support and technology support affect perceived behavioral control. Although their proposed model was different from ours, they used similar constructs and showed that they were effective.

There are theoretical implications of the results for e-commerce adoption in developing countries. Firstly, the

empirical results show that national policy initiatives have a significant effect on both perceived ease of use and perceived usefulness. Moreover, national policy initiatives significantly affect both technology infrastructure and online trust for e-commerce transactions. This result means that national policy initiatives are important in building technology infrastructure and trust in developing countries while they are not significantly important in developed countries.

Secondly, the results show that technology infrastructure has a significant effect on trust and trust affects intention to use in Tanzania. This implies that good technology infrastructure (such as high quality broadband, security system, and websites) may increase the level of trust of the people because it creates a good perception of the competence of the system.

Thirdly, the study shows that trust is important in the decision to get involved in e-commerce transactions. Nasri and Charfeddine (2012) show that security and privacy have a significant effect on attitude toward Internet banking. Security and privacy are important factors determining online trust, and Internet banking is a representative application of e-commerce, therefore, their results are in accordance with ours.

There are practical implications for government policy makers and government departments as well. As the status of e-commerce in developing countries is still low, governments should take necessary actions and steps to increase the rate of e-commerce diffusion. The results show that national policy initiatives are important for the growth of technology infrastructure, so governments should undertake relevant national policy initiatives that facilitate and encourage the presence of good technology infrastructure for supporting e-commerce. Further, it shows that national policy initiatives can play a major role in building trust in online transaction. As online commerce is a new concept and people tend to hesitate to use it, the government needs to build trust in e-commerce through national policy initiatives such as e-commerce promotion and awareness.

The effect of technology infrastructure on trust has implications for system and service developers. By using the theoretical implication of technology infrastructure and trust, system and service developers can increase the level of trust with a good perception of the system. Moreover, good site policies and facilities on security and privacy can increase the intension to use e-commerce systems.

Although many studies similar to the present one have been conducted in developed and developing countries, especially in Asia, there are few studies on the topic in African countries, and no research of this kind in Tanzania. Therefore, the main purpose of this research was to identify the factors influencing e-commerce adoption in Tanzania. We expect that our study contributes primarily by suggesting a model for e-commerce adoption in Tanzania, and also by application of the model in other developing

countries similar to Tanzania. Moreover, the research targeted people in Tanzania, and 35% of them were government officers. Through their responses, we verified that the role of the government is very important. We expect that our research could guide other African countries at a similar economic level as Tanzania through the suggested implications in promoting e-commerce. For example, national policy initiatives are important in building technology infrastructure and trust in developing countries, therefore the governments of developing countries should develop and provide appropriate national policy initiatives to encourage the presence of good technology infrastructure and to build trust in e-commerce.

Limitations and future research

There are several limitations in this survey. First, the use of an online survey for data collection excluded people who did not have access to the Internet from participating in the study. There is a need for further research to collect data using both offline and online tools. Second, some people might not have enough knowledge about e-commerce because it is still in an infant stage in Tanzania. Therefore, further research can make participants aware of e-commerce so that they can properly assess the status of e-commerce in Tanzania. Third, the construct intention to use (INT) utilized two-item scales based on previous supporting literature. Research in the IS literature has generally utilized more than two items per construct in order to increase its content validity. Future studies need to develop and validate scales for intention to use with an appropriate number of items. Fourth, the factors considered to influence e-commerce adoption in Tanzania in this study may not be comprehensive. Therefore, additional factors may enhance our model and further study can help identify them. Last, the online survey for data collection was conducted in Tanzania. Although Tanzania is one of Africa's developing countries, the results of this study may differ in other developing countries. Therefore, generalizations to other developing countries from this study should be made carefully.

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