EVALUATING TECHNOLOGY ADOPTION MODEL ON AGRO-SMALL PERFORMANCE IN SELANGOR, MALAYSIA

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Abstract. This conceptual paper evaluates the impact of technology adoption on the operational efficiency of agro Small and Medium Enterprises (SMEs) in Selangor, Malaysia. Deploying a narrative literature review approach, the paper acknowledges the role of Information and Communication Technology (ICT) in improving service delivery and overall business performance, as well as highlights the constraints of Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). While the TAM model focuses on perceived usefulness and ease of use, it does not explain user behavioral intentions. Variables like knowhow, management agenda, culture and ownership influence providing contextual insights for the model's application. However, both TAM and UTAUT models still have methodological and theoretical constraints in addressing behavioral intentions of adoption and use. Equally, the model does not address risks associated with adoption and use despite contextual extensions and facilitating conditions. Therefore, absence of policy guidelines regarding ICT adoption necessitates further exploration as it concerns user attitudes as mere adoption and use does not assure success. Consequently, risks of adoption and cultural practices, expertise and individual needs limit practicality of the model. Hence, the paper proposes further studies with focus on risks associated with adoption and efficacy of use to understand behavioral intention to adopt and use ICT by SME.
Keywords: *ICT, SMEs, technology adoption, agro based business, business performance*

Introduction

Small and medium enterprises (SMEs) are essential to the economic development of nations particularly that of emerging and developing countries (Sana et al., 2020). By providing employment opportunities, reducing poverty, promoting trade and development of technological innovations, SMEs have become the spine of economies across the globe (Adan and Hussain, 2021; Yoshino and Taghizadeh-Hesary, 2019). In Malaysia SMEs are involved in almost every sector of the economy and they represent majority of business ventures across various sectors of the nation's economy. While various countries across the globe have specific standard and criteria that qualify a firm as SME, specification of SME in Malaysia emanates from the 14th meeting of National SME Development Council (NSDC) held in 2013. The NSDC meeting specified criteria to determine SMEs in Malaysia based on number of full-time employees (less than 200) and annual revenues of about 2.5millon (Razak et al., 2018). While the European Union describes SME as firms with 250 employees, the United States regard SME as firms with fewer than 500 employees (Razak et al., 2018). In recognition of the significant contribution of SMEs to economic development, governments across the globe in conjunction with agencies and ministries have developed various programs, plan and policies to empower and support the continuous development of SMEs. This is perhaps due to the fact that SMEs have evolved beyond being merely the backbone of a nation's economic development, but has also become an avenue to develop, shape, and refine

entrepreneurial skills and talents as well as opportunity for business expansion (Ngele and Nzelibe, 2023).

The concept of smart agriculture as an approach to farm management utilizes technologies to reduce spending while guaranteeing the preservation of resources which enables financial profits and at the same time protects the environment it operates on (Annosi et al., 2019). While strategy management enables organization effectiveness, the impact of SMEs lies on the ability of managers and leadership of these enterprise to effectively adopt and use technology and policies available to boost their performance over time (Madanchian and Taherdoost, 2019). On the other hand, national leadership plays a crucial role in initiation and implementation of policies programs to support the growth and overall output of agro-based industry in the agricultural sector. In order to avoid being a victim of resource curse, countries around the globe like Malaysia blessed with abundance of natural resources such as tin, rubber, forest, natural gas, arable land, petroleum, palm oil etc, have rigorously invested in agro sector for sustainable development, food security and self-sufficiency (Tapsir et al., 2019). Case in point of Nigeria's failure to develop its palm oil sector and instead depended solely on petroleum has further brought to light the crucial role national leadership plays in transforming a nation's natural resource resources into sustainable wealth by investing judiciously in agricultural and related sectors for the prosperity of the country (Emediegwu and Okeke, 2017).

Given that sustainable agriculture aims at food security and meeting the food needs of communities (Aliyu et al., 2021), it is equally important to note that this goes beyond mere combination of practices. Sustainable agriculture is geared at balancing between competing interests in terms of ensuring food production on the part of the farmers to protecting the environment and creating opportunities for SMEs to survive. Against the backdrop of SMEs contribution to economic development, evaluating the application of ICT in the face of existing governmental programs and incentives illuminates further the performance of SMEs as well as possible aspect for improvement on the part of policy makers and business owners. Information and communication technology (ICT) adoption and usage has become an imperative organizational strategy in the sense that it enhances performance. Prominently, it facilitates innovation, enables business growth and competitiveness with access to business information and knowledge management particularly for entities who can utilize them judiciously (Jalil et al., 2022). On the face of financial limitation facing SMEs perhaps due to the fact that most of them are privately owned by families, ICT has afforded SMEs the opportunity to venture into new market space, free publicity, improve customer relations and efficiency in daily activities and operations as well as reduction on operational cost (Jaish et al., 2023). The impact of ICT on SME development and business success is enormous, however there are challenges and hindrance still facing SMEs in their quest to adopt and use ICT in their operation. While numerous studies have identified various challenges facing SME adoption of ICT ranging from lack of incentives and access to funding, high cost of ICT adoption (internet connectivity), lack of skilled workforces, poor human and material management, to poor technological knowhow (Shaikh et al., 2021) evidently, the success stories of ICT usage in SMEs are equally enormous.

Background of study

In an effort to convert its long-term vision into action, the Malaysian government in conjunction with its various ministries and agencies initiated both long- and short-term

policies to ensure successful implementation of its national economic and agricultural plans (Low, 2018). The various national development and economic plans in the country allocated funding for every sector of the economy including the agro sector by encouraging public and private partnership necessary for shaping the direction of development in the agro sector of the nation's economy (Radzi and Yaacob, 2022). On the premise that SMEs account for 99% of firms in economies of nations across the globe and contribute over 60% of business sector employment and drive the majority of value-added and new job creation (OECD, 2023). SMEs have become crucial sources of innovation even though they don't enjoy the economies of scale like larger companies. However, their smaller size allows them to be more flexible, reactive, and responsive to changes and shocks. As a result of this, SMEs are the lifeblood of communities, offering essential goods and services, often in areas too small for larger companies to operate, thus having a significant social impact on communities globally (Manzoor et al., 2021).

In Malaysia, almost 98.5% of business establishments are SMEs (Ahmad et al., 2020). While the overall employment figure from informal SMEs has not been established, formal SMEs have been recorded as contributing to about 60% of total employment globally (OECD, 2023; Naradda Gamage et al., 2020). The role of the government in initiating and implementing policy programs for SMEs success includes privatization of agricultural sector to ensure a level playing field for healthy competition, and increase agricultural production (Arif and Abdullah, 2020). However, the viability of these policy initiatives has been repeatedly called into question due to the fact that a significant number of SMEs in the country still experience failure and closure (Low, 2018). Kee-Luen et al. (2013) attest that a significant number of SMEs in Malaysia fail within the first five years of existence while about 80% of SMEs do not survive the first three years (Bernama, 2017). The quest to ascertain the impact of state intervention programs and incentives on SMEs adoption of ICT even as provided for in the various Malaysian developments plan brings to bear entrepreneurial culture, individual action and governmental influence in the implementation of programs to support SMEs. While theories and models have clarified the influential factors that facilitate the adoption and use of Information and Communication Technologies (ICTs) by firms, including Small and Medium Enterprises (SMEs), further elaboration is essential to gain a clearer understanding of their practical applicability within different contexts. However, there are no generalized standards of applicability of ICTs given the needs, nature, size, and environment a firm operates on (Sunday and Vera, 2018). Thus, the lack of universal standards of ICT adoption and usage of ICT by SMEs further explains theoretical limitation of ICT adoption considering individual attitude and capacity to adopt and use ICT as well as organizational behavior towards ICT usage (Mittal et al., 2018).

Materials and Methods

This conceptual paper review mainly reviews past literature on ICT acceptance, adoption and usage by SMEs from the perspective of TAM model. A narrative literature review approach is deployed for this study to ensure inflexibility in the process. Coughlan and Cronin (2017) as well as Conner (2014) stated that a narrative review need not follow a systematic approach of locating and analyzing selected studies on a particular topic of study. Rather, narrative review (NR) is summary of main issues of the study in which selected evidence on a given topic is presented to support reviewer's

opinion, views or a prior supposition of an issue. Similarly, Ferrari (2015) argued that there is no consensus or standard structure for narrative review approach. However, a narrative review process of selecting articles for review must be such that reduce bias, so that the common steps in such process must summarily include introduction, methods, results, and discussion (IMRAD). In addition, author preferences, journal style, summary of previous studies to avoid duplications must also be considered as well and this is geared at highlighting new issues the study seeks to address. Consequently, the narrative review process critically evaluates and highlights specific issues in a research study (Ferrari, 2015). However, Hopkinson and Blois (2014) as well as Greenhalgh et al. (2005), both argued that narrative literature review must followed the procedure of the following five-step: (1) search, (2) mapping, (3) appraisal, (4) synthesis, and (5) evaluation and recommendation. Conversely, Greenhalgh et al. (2018) noted that although narrative literature reviews are often contrasted with and preferred over systematic reviews, it is essential that narrative reviews be equally systematic in identifying areas of literature relevant to the issue under study. Additionally, narrative reviews should trace the development of the issue in a chronological manner, allowing the reviewer to explore the links between studies and reinterpret fields of enquiry.

Thus, a narrative literature review approach is adopted to collate past literature because the focus is on appraising existing scholarships on technology adoption on the performances of agro SMEs in Selangor Malaysia. According to Juntunen and Lehenkari (2021) narrative approach best answers the research question "How" which is essentially How does Technology Adoption impact on the performances of Agro SMEs in Selangor Malaysia? Although there are numerous studies on the impact of ICT on agro SMEs performance, evidently only a handful of such studies are carried out from the perspective of TAM perspective (Ahmad et al., 2020). As such, secondary data are the core data source from this study whereby journals, articles and online publication are used to answer and validate the research question of the study as well as adduce evidence to support the conceptualization of the TAM model with a contextual perspective. Evidently, studies (literature) with specific deliberations on ICT and SMEs from the perspective of TAM helps to elucidate issues with respect to how does technology adoption impacts on the performances of Agro SMEs. Thus, based on the TAM model, perceived ease of use and perceived usefulness are the two variables that enable technology adoption study (Dang and Pham, 2018). However, studies have also found that knowledge is an essential element in adoption and subsequent implementation of innovations especially new inventions and this is perhaps a limitation of the model which is the essence of this paper. Hence, risk of adoption, knowledge, cultural practices, business needs are important elements that enable as well as hamper the adoption and usage of ICT by small business.

Results and Discussion

Challenges facing SMEs in adopting ICT for business performance in Malaysia

Government-led initiatives, programs, policy regulations and incentives significantly shape the development and success of SME (Yatim et al., 2019). However, research on evaluation of governmental incentives on performance of agro based SMEs in Malaysia are limited amidst available incentives to SMEs (Bakar et al., 2020). Technology acceptance model stimulate user's intention, attitudes, and decision to adoption and use ICT, however the model is not robust enough to adequately explain user's behavior

prior to accepting, adopting or rejecting technology (Hai and Kazmi, 2015). This is because underlining factors such as social/societal norms and values, personal attributes, individuals/personality traits are subjective factors which may hinder individual's acceptance or rejection of ICT. As such, a sole proprietorship (SME) specializing in small scale production may not require ICT and as such may not be compelled to spend, adopt or use ICT due to personal/individual needs and wants. This notion is further elucidated by (Bakar et al., 2020) who found that owner's attitude significantly influences SMEs adoption and usage ICT.

Equally, Sunday and Vera (2018) noted that majority of studies on ICT adoption by firms utilized similar methodology which were basically tailored to test hypotheses, thereby lacking in-depth understanding of ICT adoption from the perspective of business owners. As a result, studies on SMEs adoption of ICT often indicate improved performance through ICT adoption and usage without specifically demonstrating areas through which firms benefited after adopting ICT. This is equally highlighted by (Ibrahim, 2017; Awang et al., 2010) who noted that most studies on ICT adoption by SMEs in Malaysia focus on factors influencing SMEs adoption of ICTs. On this premise, it is imperative to consider a firm's prior performance before ICT adoption and post adoption performance in order to justify the practicality of ICT adoption in view of TAM. Consequently, issues such as owners/management interest, informational behaviors and attitude are subjective factors that need to be considered when investigating SMEs adoption of ICT in view of TAM model. On the premise of available government intervention programs and incentives to SMEs, however, Bakar et al. (2020) noted that studies on the adoption of new technology innovation by Malaysian SMEs is very limited in view of identifying determinants impeding adoption of sustainable technology. As such, it is incumbent on managers and owners of SMEs to willingly adopt and use ICT that best suits their needs. Equally, existing models and theories on ICT adoption cannot grantee SMEs success even though the propensity of success may be there (Mkhomazi and Iyamu, 2013). Thus, the informational behaviors, attitude and interest of SMEs owners go a long way in shaping, acceptance, and adoption usage of ICT as well as success of a firm. Hence, it has become imperative to explore the impact of ICT adoption on the performance of the firms, taking to attitude to adopt ICT even in the face of available incentives.

Theoretical underpinning of technology acceptance model

This paper is appropriate for inquiry into technology adoption and specific performances of Agro SMEs given the fact that knowledge and affordability play important roles in adoption and usage of ICT by firms including agro SMEs. Equally, the fact that existing research notes that a significant number of SMEs cease operations within the first five years of their operations prompt's inquiry into agro SMEs adoption and use of ICT for better performance. Subsequently, Ajibade (2018b) suggests that for successful application of a theoretical framework, the researchers must be aware of limitations inherent in the framework. Such consideration enables the researcher to develop new concepts to strengthen or reinforce theories. In the same token, Maruping et al. (2017) argued that to better understand factors that promote or increased ICT adoption and uses, it is equally vital to have a theoretical and practical understanding of such frameworks or models through which the process of adoption and use of ICT can be examined. According to Mkhomazi and Iyamu (2013) "theories are intended to explain how and why things happen in the way that they do". Thus, a theory that

underpins a study is aimed at gaining greater understanding of the studied phenomena. Research findings indicate that ICT adoption and usage improves SMEs performance (Cuevas-Vargas et al., 2021). It is worthy to note that acceptance of ICT equally contributes to the performance of firms. As such, TAM as proposed by Davis (1989) is synonymous with acceptance of information systems and technology by individual users, however the model focuses mainly on perceived usefulness and perceived ease of use as important factors in ICT adoption. While perceived usefulness emanates from subjective probability of individual user that utilizing specific ICT application or tools will enhance performance, perceive ease of use on the other hand focuses on the extent to which a potential user expects the usage to be effortless.

Theoretically, various models and theories have explained ICT adoption by SMEs from various perspectives. However, a significant number of studies on ICT adoption largely focus on determinant factor thereby portraying ICT adoption as merely predictable and straightforward without considering uncertainties arising from socio, economic and political peculiarities of societies and people (Lawrence, 2010; McAfee, 2006). Similarly, Sunday and Vera (2018) observed that while majority of previous studies on ICT adoption deploy parallel methodology, hypotheses testing and theory confirmation, still they lack the ability to offer in-depth probe to ICT adoption from the perspective of business owners. As a result, Chinedu Eze et al. (2014) stressed the need for research process to move beyond conventional hypotheses testing to include approaches such as document analysis, interviews, field studies, and action research. This is because portraying ICT adoption with a predictable outcome or as static one-off activity with emphasis on factors influencing its adoption ignores the flow of activities in terms of ability and willingness to adopt and use ICT which lies on users' needs (Sunday and Vera, 2018). Subsequently, the desire to advance empirical evidence on adoption and usage of ICT can be enhanced when theories and model of ICT adoption examines the process from a dynamic point of view, taking into consideration interactive and evolving process of ICT from individual abilities and attitude towards adoption (Sunday and Vera, 2018; Chinedu Eze, 2013). Thus, the notion leadership and ownership in SMEs extends to information behaviors and decision making and as such, Eze et al. (2018) noted that while numerous studies have examined information behaviors of groups and people like CEOs and managers. However, research on information behaviors of SMEs is limited (Eze et al., 2018) and thus, this study sought to appraise the impact of incentives on SMEs adoption of ICT and usage from the perspective of Agro SMEs in Selangor Malaysia.

Consequently, critically, behavior of users can be subjectively evaluated as behavioral intention can differ from person to person depending on the nature of usage, attitude, cost and affordability. For instance, a small business owner may be successful in using merely mobile phones even though expanding or adopting more advanced ICT can improve business output and overall performance. Consequently, the notion that attitude toward usage emanates from ease of use or perceived usefulness negates issues such as education, cost of adoption, laws can equally influence adoption, acceptance, and willingness to use ICT. This notion is echoed by Zahid et al. (2013) who suggested that TAM model does not consider factors like age, education as possible influencers of ICT acceptance and adoption as external factors. Likewise, Bashange (2015) noted that a good number of studies on TAM regard the model as an effect (dependent variable) which is to say that most of these studies negate TAM as a means of determining factors that influence behavior to adopt. Based on the TAM model, perceived ease of use and

perceived usefulness impacts attitude and behavioral intention leading to actual adoption and usage of ICT (Ajibade, 2018a). This notion cannot be broadly assumed, and this is rightly so because measuring hidden behavioral traits may be difficult to measure as individuals have various characters and temperance. Similarly, the notion that acceptance and willingness to use emanates from perceived usefulness and ease of use is debatable, however suggestion that external factors could possibly influence acceptance requires further research to uncover specifically those factors (*Figure 1*).

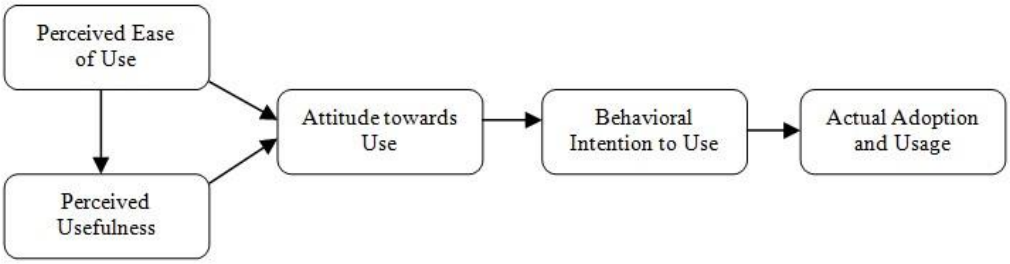

Figure 1. *Conceptual Model for Technology Acceptance Model.*
Source: Davis (1989).

Theoretical contribution

The technology acceptance model asserts that when users recognize the usefulness of technology and the ease of using such technology, they are more likely and willing to adopt and use it. However, the model is significantly limited in that it does not explain individual/human behavior towards technology as enumerated (Lim et al., 2016; Hai and Kazmi, 2015). Although, studies exploring technology acceptance and use examine mainly how users perceive the usefulness of the technology, however reasons behind acceptance and subsequent use of technology for personal use differ from acceptance and use a business environment. This perhaps fuels the argument that TAM is not robust in explaining specific behaviors of users in adopting or rejecting technology (Chandio et al., 2017). Subsequently, a modified version of TAM which is technology acceptance and use model (UTAUT) was introduced to address the inadequacy of TAM. Given that technology use can be determined by factors such as organization management, business policies and needs (Ajibade, 2018b) and as such firms and individuals have come up with rules and perhaps guidelines and on what to use it for and how to adopt and use technology for organizational success. In addition, the lack of general policy guidelines and how to use ICT warrants the need to explore user's attitude towards adoption because adoption and uses of ICT does not necessarily guarantee success. This is because lack of knowledge, level of use and affordability may hamper adoption and usage of ICT for organizational or business performance. The implication is that the nature of use and the level of usage determine the type of ICT to be adopted. Theoretically, TAM asserts that usefulness and ease of use affects behavioral intention to use ICT. However, the model cannot be practically applicable across the board, and this is because elements like risk involved in adoption process are not included in the framework. Nevertheless, TAM is seemingly flexible in the sense that there is room for adjustment and expansion given the various combinations and upgrades of the model to accommodate the various dimensions of technology need.

In view of the impact of ICT on business performance of firms, the study offers several recommendations geared at aiding SMEs adoption and usage of ICT for

business performance and growth. While government and other independent bodies have put in place various schemes and incentives to help SMEs adopt and use ICT, it is equally important to understand how the nature of use, ICT type and affordability can impact on attitude of user and subsequent decision to adopt ICT. An appraisal of the impact of incentives, particularly those focusing mainly on ICT, is very limited. In other words, ICT adoption and usage does not grantee success because lack of knowledge on use, ease of use and perceive usefulness impacts user intentions and behaviors to adopt. This is to say that when a firm does not see or perceive ICT as important, it may not adopt or use it. Seemingly, TAM is not applicable across the board because conditions that enable adoption and uses differ in space, time and context. Evidently, literatures on ICT adoption and use by Malaysian agro SMEs points to the fact that most SMEs are not tech savvy, and this affect their ability to compete in international market (Yatim et al., 2022; Ahmad et al., 2020). Hence, based on the reviews of literature the following observations are made: (1) Introduction of free training and courses for small business on ICT usage; (2) Upgrade of infrastructures, network connectivity to power ICT usage; (3) Increasing avenues for awareness creation about the importance of ICT in business activities/purposes; (4) Establishment of incentive packages for ICT adoption such as reduction in price for machines and software; (5) Establishment of formal ICT plan for agro SMEs; and (6) Granting autonomy to corporative societies to fund SMEs as alternative to bank loans.

Future research

Over the years scholars have come up with modifications and extensions to technology acceptance model. One of such is the unified theory of acceptance and use of technology model (UTAUT). The UTAUT model examines possible factors that influence behavioral intentions of users to accept and use technology. Given that TAM was largely limited by its inability to holistically explain the individual/human behavior towards technology and behavior differ from person to person depending on the nature of usage, attitude, cost and affordability. As a result of this, UTAUT model recognizes that ICT acceptance and usage is determined by performance expectancy (belief), effort expectancy (usefulness/advantage), and social influence (popularity/pressure) and facilitating conditions (affordability/compatibility) (Akinnuwesi et al., 2022). Thus, UTAUT includes attitudinal antecedents as moderators/predictors such as experiences, gender, age and voluntariness of use. The introduction of contextual and moderating variables into the model enhances understanding and applications of the model. As a result, the behavioral antecedent's highlights contextual variables like culture, location, ethnicity among other facilitating conditions to accommodate the extension of the model. UTAUT as an extension of TAM was geared at offering a better explanation to user's behavior and intension to use ICT as well as theoretical justified for prediction of technology acceptance among users. However, the UTAUT model is still faced with limitations methodologically and theoretically as it fails to address behavioral intention in adopting and using technology in different settings. Similarly, risk involved in adoption and use of ICT as well as efficacy of use needs further exploration in order to have a better understanding of behavioral intention to adopt and use ICT. This is in line with Dwivedi et al. (2019) argument that UTAUT is equally hampered methodologically even though scales used to measure constructs are supported by literature. However, given that behavior scales are adopted from previous studies, there is a need for development of alternative measurements in order to enhance their

application in future studies. Hence, further research can be conducted to identify additional variables that aid the understanding of ICT usage by Malaysian SMEs.

Conclusion

The importance of SMEs to the economic growth of nations across the globe has prompted the development and implementation of schemes, programs, and policies to aid the continuous development of SMEs. As such, the success of adoption and use of ICT goes beyond perceived usefulness and ease of usage and thus knowhow, affordability and nature of use equally plays a role in the adoption process. Thus, adoption and use must be such meets the needs of users individually or collectively particularly in an organizational setting. It is perhaps important for firms including SMEs to identify specific areas through which ICT is needed to aid business activities and overall output. In today's business environment, ICT is a necessity. Notably, most studies on SMEs adoption and use of ICT focus on challenges of ICT as well as ICT in the realm of communication facilitation and digitization of services (Mohamad et al., 2021). In addition, most of these studies focus on determinant factors thereby portraying ICT adoption as merely without considering factors such as socio, economic and political and cultural peculiarities (Lawrence, 2010; McAfee, 2006). An assessment of existing studies on ICT adoption by agro SMEs in Malaysia besides being limited also deploy similar methodology of hypotheses testing and theory confirmation (Sunday and Vera, 2018). As such, they lack the ability to offer in-depth probe into ICT adoption from the perspective of business owners. In the quest to accommodate the limitation of TAM, the UTAUT model examines factors that influence intentions of users to accept and use technology especially behavioral intension to include risk of adoption as limitation. This paper appraises technology adoption on the performances of agro SMEs in which existing studies support the fact that ICT elevates the performance of SMEs. However, policies intended to encourage ICT usage in SMEs are not readily available or easily accessible. Thus, SMEs are still akin to the usual challenges of funding and low know how and this paper makes a case for extension of TAM and UTAUM model to have a practical framework for ICT adoption and usage by SMEs taking into consideration risk involved and other possible factors that may impair the adoption process.

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Conflict of interest

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