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Strategic roles of actors in emerging information communication technology (EICT) adoption in SMEs

Actor network theory analysis

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Abstract

Purpose – The purpose of this paper is to examine how small and medium enterprises (SMEs) are involved in emerging information and communication technology (EICT) adoption by concentrating on the adoption process and the role played by various actors in the process. Information and communication technology (ICT) adoption research, especially in SMEs, has moved from a simple adopters' participation process to involving diverse actors that continually interact and influence the process. SMEs need to constantly interact with various human and non-human actors to keep up with the EICT adoption. However, this has proved difficult.

Design/methodology/approach – This study adopted a qualitative method to examine the dynamic process of EICT adoption in service SMEs in the UK, and deployed both unstructured and semi-structured interviews in two separate rounds with 26 participants drawn from Crunch Online Database and Luton Business Directory. The participants include managers, customers, government agencies, SMEs consultants and information technology (IT) vendors, with the help of purposeful random sampling.

Findings – The study develops a framework informed by actor network theory (ANT) concepts and found that using ANT to examine the process of adoption helps to unveil the recursive nature of the process and the roles of actors which vary from one stage to another. The finding reveals that adoption of EICT is not straightforward; rather, it is evolutionary and dynamic, and small business managers' play an important role in the process amidst other actors influence. The framework supports businesses of all types. Although ICT applications are influenced by diverse actors including IT experts, customers and vendors, the decision of SME managers regularly shape the values and beliefs of other actors if adequate information are conveyed by the numerous actors. Therefore, adoption of EICT is embraced faster by organizations, especially small businesses, if diverse actors are committed in conveying the right information to the key actors, thereby helping them to make adequate decision, and streamline their business processes.

Research limitations/implications – This study is limited by its focus and other factors. Studying the opinions of small service UK SMEs limits the power of generalizing the identified causal relationships; therefore, extended measures are required on accounts of environmental, cultural, geographical and sectorial differences. While some errors seemed unavoidable when measures appear subjective and prone to common error biases, the study advised on recognizing the overriding influence of the roles at each stage of the adoption process to be proactive in committing resources.

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The Bottom Line

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Originality/value – This work is of value to practitioners and academics, as it provides further insight into ICT adoption framework by showing how the diverse actors guarantee EICT adoption in small service(s) businesses. This is relevant given that SMEs have limited knowledge of new ICT and understanding diverse actors and their roles in the adoption process would enhance their knowledge of the analysts in the context of new technology adoption and to cope with EICT continually amidst of the roles of actors in the adoption process. The framework serves as an analytical instrument in explaining ICT adoption process and its outcomes characterized by conflicting views.

Keywords SMEs, Services, Adoption, ACTORS, ANT, EICT

Paper type Research paper

Introduction

UK small and medium service businesses are witnessing a period of rapid transformation occasioned by aggressive quest for improved efficiency through understanding and adoption of complex information and communications technology (ICT) platforms (Nissan *et al.*, 2010). Emerging information and communications technology (EICT) defines originally and/or almost unanticipated new technologies and/or applications. Although EICT applications offer great opportunities, they are besieged with challenges to small business managers and their sustainability is often unclear (Cavusoglu *et al.*, 2010) because small and medium enterprises (SMEs) most times have little or no support from others on new technology adoption and operate in a more difficult and competitive environment (Simpson and Docherty, 2004). Fang *et al.* (2011) noted that deteriorating effects often result when an innovation is launched with inadequate testing in terms of how it aligns with the organization's policies, structures and philosophies. Often, stakeholders inhibit or enable successful adoption processes. Scholars (Fang *et al.*, 2011; Barrett *et al.*, 2006; Child, 1974; Alutto and Hrebiniak, 1975; Carlsson and Karlsson, 1970) argue that some SMEs place more emphasis on conventional ways of how things are done rather than trying something new, and most times, actors' concern over the standard of the ICT applications, safety and privacy issues continually influence their adoption decisions (Fang *et al.*, 2011). AQ: 1

These problems and the contemporary business environment have regularly forced managers to frequently hunt for the roles played by diverse actors to gain new and broader insights that will help them predict and adopt new ICT applications continually. These complexities are becoming more and more challenging for SMEs and need further investigations (Benamati and Lederer, 2008; Eze and Chinedu-Eze, 2018), as most times, the insights and information conveyed by these numerous actors during the negotiation process are not adequate in ensuring that SMEs understand, adopt and implement the right technology. According to Kallinikos (2004) and Barrett *et al.* (2006), majority of the contributions in this area have emphasized on how ICT shapes the social context, whereas the roles played by information and the human actors in the adoption process have been neglected. Monteiro and Hanseth (1996) advised scholars to look at adoption from a broader perspective instead of a deterministic point of view. In addition, extensive literature review also reveals that limited research have been conducted on how various actors exert influences during the negotiation process of ICT adoption (Cavusoglu *et al.*, 2010; Kallinikos, 2004; Barrett *et al.*, 2006). Therefore, this research attempts to create awareness and provide additional insights into ICT adoption framework by illustrating how diverse actors exert influence for successful ICT adoption to be prepared.

This purpose remains pertinent given that SMEs have limited understanding of these new applications and recognizing the strategic roles of various actors in adoption process would not only enhance their understanding but also become more strategic and proactive (Benamati and Lederer, 2008) in decision-making, as the adoption of EICT is becoming more

complex and problematic. This work focuses on UK SMEs, considering the fact that small service businesses in the UK are surviving in times of recession and they contribute over 69 per cent of UK's wealth creation (one-third more productive than other sectors; Glancey *et al.*, 1998; Office of the National Statistics, 2009).

Literature review

Studies (Barrett *et al.*, 2006; Jacobsson and Linderoth, 2010) argue that more than two-thirds of the ICT adoption projects fail because majority of the studies in SMEs have focused on technology itself and placed less emphasis on human actors who influenced and are being influenced by the project. Such deterministic conception (or technology directing change) has been predominant among traditional adoption theories (Rogers, 1995; Thong, 1999; Davis, 1989; Ajzen and Fishbein, 1980; Tornatzky and Fleisher, 1990) that perceive ICT as the only determinant of organizational structure and behavior of organizational members, who shape the social world (see Barrett *et al.*, 2006; Markus and Robey, 1998; Jacobsson and Linderoth, 2010; Callon, 1986). However, ICT adoption and implementation is more of a socio- process involving social technical entities who shape adoption behavior involving much broader situations or multi-layer contexts (Chen and Chang, 2013; Venkatesh *et al.*, 2003; Orlikowski, 1992; Jacobsson and Linderoth, 2010) including structural arrangement, culture, division of labor and specialization, standardization, operating procedure, communication patterns, ideology, government regulations, competitive forces, vendors' strategies, and knowledge about the technology as well as the socio-economic conditions (Orlikowski, 1992).

According to Jacobsson and Linderoth (2010) and Orlikowski (1992), change in the business environment may impact both the adoption and implementation of new ICT application as well as existing power relations in the organizations. As such, diverse actors draw from these experiences to interpret and allocate meanings that will emerge as new technology (Jacobsson and Linderoth, 2010). In addition, Orlikowski (1992) maintained that technology may have objective functions accepted today but may be challenged tomorrow because of several meanings actors attached to it. An understanding of how innovation evolves involves a thorough review of the members of the society that make the technology happen and the knowledge about the ICT and the users in specific settings (Orlikowski and Gash, 1994; Jacobsson and Linderoth, 2010). Scholars (Orlikowski and Lacono, 2001; Barrett *et al.*, 2006; Jacobsson and Linderoth, 2010) are of the view that studying adoption and implementation of ICT is not to be neglected; however, more emphases on careful analysis should be placed on the interaction between the technology and social contexts.

Often, the actors' new acquired information, experiential knowledge, values and norms cause them to consider and reconsider meanings that transforms into new technology (Jacobsson and Linderoth, 2010; Barrett *et al.*, 2006). When diverse actors bring their programs of actions to others in the network, it is emblazoned into a technology. It is important to note that inscription in technology is not straightforward but rather dynamic and requires an understanding about the commitments of actors, and the characteristics of the technology (Callon, 1986; Markus and Robey, 1998), as actors have the onus to accept or reject the inscribed program, leading to an improved or totally new program of action (Orlikowski and Lacono, 2001; Jacobsson and Linderoth, 2010). The structuration model and actor network theory (ANT) are theories that identify the interplay of technology and social contexts in adoption process. The structuration model of technology emphasizes duality. According to Orlikowski (1992, p. 406):

> Technology is constructed physically by diverse actors in a given society and technology is informally made via the meaning actors given to them as well as the features they emphasize and use.

ANT recognizes the fact that both technology and humans play major roles in enhancing social order through heterogeneous networks' social-tech entities (Barrett *et al.*, 2006). On the recognition of this, a number of other studies (Silva, 2007; Benbasat and Barki, 2007; Andrade and Urquhart, 2010) have recognized ANT in ICT adoption research.

Actor network theory

Theoretically, ANT underpins this paper because methods such as survey and other statistical methods have been criticized (Benbasat and Barki, 2007; Silver, 2007), and ANT have underpinned many studies in similar areas and recognize the unpredictable nature of technology itself (Williams *et al.*, 2009; Chen and Hirschheim 2004; Silva, 2007; Benbasat and Barki, 2007; Andrade and Urquhart, 2010). ICT adoption turns unprecedentedly complex, interlinked and linked with the social world (Hanseth *et al.*, 2004; Andrade and Urquhart, 2010) that the traditional theories can vigorously explain and/or predict. The traditional adoption theories (Ajzen and Fishbein, 1980; Davis, 1989; Porter, 1985) scarcely challenge technology implementation (Andrade and Urquhart, 2010; Akrich *et al.*, 2002a), as they contribute little or no insight into the dynamic and ever evolving nature of ICT adoption (Eze, 2013; Eze *et al.*, 2013). Scholars attack such theoretical frameworks for being static and predictable in definite terms (Callon, 1991; Al-Natour and Benbasat, 2009; Ray and Ray, 2006), less adaptable (Ray and Ray, 2006) and unable to study various actors involved in the adoption process (Eze *et al.*, 2013)

Traditional adoption theories place more premium on the technical aspect and have continually neglected the roles played by the social entities (Barrett *et al.*, 2006; Jacobsson and Linderoth, 2010; Vannoy and Palvia, 2010; Lee and Oh, 2006; Tatnll and Lepa, 2003). Hence, the need for new frameworks that will bridge the perpetual parting between the technology and the social worlds as found in traditional theories. Scholars (Cordella and Shaikh, 2006; Andrade and Urquhart, 2010; Ray and Ray, 2006; Akrich *et al.*, 2002a; Wernick *et al.*, 2007) pointed out that the sciences of social and technological artifacts are inseparably interwoven in the contemporary world and, therefore, should be considered simultaneously to give a more clear and accurate representation of the adoption of EICT (Cordella and Shaikh, 2006). In line with these dynamics, it is argued (Mahring *et al.*, 2004; Callon, 1986; Silva, 2007; Benbasat and Barki, 2007) that ANT is more suitable because of its socio-technical features in the management and use of ICT. ANT draws on the insights of ethno methodology:

> ANT is not the empty claim that objects do things, instead of human actors: it simply says that no science of the social can start if the enquiry into who participate in the action is not first discovered (Latour, 2005, p. 72).

ANT emphasizes the dynamic forces of technology and society (Mahring *et al.*, 2004; Bruun and Hukkinen, 2003). The theory does not support that either technological determinism or social constructivism should be studied separately (Faraj *et al.*, 2004; Hanseth *et al.*, 2004); rather, it studies how both human and technology are enrolled in a network means of negotiations involving key actors attempting to impose roles to others. ANT considers ICT, people and other elements as actors, and named them "actants" (Hanseth *et al.*, 2004) and defines an actor "as any element which bends and shapes around itself, makes other elements depend upon itself and translates their wills into the language of its own" (Callon and Latour, 1981, p. 286). Andrade and Urquhart (2010) criticized ANT for treating

social-technological entities symmetrically. This criticism, according to Bruun and Hukkinen (2003), is because of the misunderstanding of what ANT actually is all about, or at least, what it could be all about. ANT recognizes that actors are not associated to only human; instead, it is considered depending on how solid the relationship between the actors is. Callon and Latour (1981) argue that the creation of a network will be neglected if non-human actors are considered more important than human actors.

ANT treats both human and non-human actors at a level playing ground because it tries to recognize the qualities of both human and non-human actors, as they both can adjust to a state of affair (Andrade and Urquhart, 2010; Latour, 2005). According to Vannoy and Palvia (2010), social impact links to technology adoption, and in turn, technology adoption entails actors embracing the technology and how it is embedded in the society. The proponents of ANT claim that both the human and non-human actors are obviously distinct and studied differently, but this paper assumes that they are not independent. Orlikowski (1992) argues that the ongoing actions of human with the non-human help in understanding the merits of adopting new ICT applications. Hence, instead of treating people and technology as separate entities, ANT considers these actors as a single entity (Gomart and Hennion, 1999; Akrich *et al.*, 2002a).

The theory allows the researchers to observe multifaceted group of actors during ICT adoption process and how desperate they are in achieving their goals by tracing their interaction, as the adoption and implementation of ICT cannot be predicted in exact terms (Andrade and Urquhart, 2010). For Akrich *et al.* (2002b), ANT allows understanding of how an invention emerges, extends progressively and is renovated into a success. This perspective explains that technology adoption and its implementation happens during the lifecycle of a firm where new forms of technology may become more acceptable (Schwarz and Chin, 2007). Van de Ven and Poole (1995) inspect the procedure involved in an organization change (such as that induced by ICT adoption) and development process and argue that the activities that lead to such a change is challenging. They advised researchers to draw from theories and concepts to develop new ways of looking at organization change and development processes, and that through the understanding of different views one can gain comprehensive insights into organizational life because not one theory is capable of accounting a complex phenomenon (Van de Ven and Poole, 1995).

ANT, therefore, is not a stable theory; rather, it adopts a radical indeterminacy of the actors (Callon, 1991). Actors influence others to learn what they do, how and why they do it (Latour, 1999). ANT is relevant in this study because it looks at the socio-technical interactions and the negotiation processes (Andrade and Urquhart, 2010; Sarker *et al.*, 2006), and accounts for the socio-technical inhibiting and enabling factors that influence adoption (Sarker *et al.*, 2006), the relations among actors during adoption (Tatnll and Lepa, 2003), development (Faraj *et al.*, 2004) and implementation (Andrade and Urquhart, 2010). ANT is relevant in this study because SMEs are flexible; yet, many small businesses do not understand (or rarely articulate) the needs of EICT.

Research method

Population and sampling

Rich data are essential for any inquiry; they are the key to any study's credibility and strength (Schultze and Avital, 2011). To generate better insights into activities (see Williams *et al.*, 2009; Gilmore and Carson, 2007), we adopt a qualitative research. The participants were small business managers and other actors – information technology (IT) experts (designers, developers and vendors), government agencies (Business Link, Regeneration Department in Luton local council) and customers. Specifically, the small business managers

interviewed ranged from marketing, construction, security, support and advisory services, IT companies, social media companies, sales and distribution up to management. This mixture of respondents was informed by Miles *et al.*'s (1994) categorization of small service businesses, and to interview SME managers alone will not help in developing an in-depth understanding of the complexities associated with the studies. The responses from the interviewee helped in the analysis (Jacobsson and Linderoth, 2010).

Interviews were conducted and participants were deliberately selected through purposeful random sampling and snowball. Our experiential knowledge and judgment were used to pick initial key informants, who then introduced other key participants in the community. Mason (1996) suggests that sampling units of analysis in this form permits discovery and reasonable comparison in relations to the research objectives and not for statistical generalization. Twenty interviews (see Table I) were conducted involving 23 participants with specific categorization of participants' functions and services (see Table II). T1 T2

The interviews

We adopted unstructured and semi-structured interviews based on two obvious reasons; first, to explore in depth the dynamic interplay of various actors that often leads to

No. of companies	Participants and types of interviews: Formal	Informal	Positions	Company size	Services
C1	A1 (MMSL)		Managing Director	30	Security
C2	A2 (MSL) A3 (ITS1) A4 (IT S2)		Manager IT support staff IT support staff	25	Internet marketing and advertising
C3	A5 (MPOG)		Manager	9	Social media/Consultancy
C4	A6 (MSB)		Manager	–	Social networking provider
C5	A7 (MGDL) A8 (AMGDL)		Managing Director Directors	25	IT vendor/Consultancy
C6	A9 (OMEPS)		Operational Manager	45	Sales and distribution
C7		A10 (MMG)	Manager	–	Construction
C8	A11 (DHC)		Managing Director	80	Construction
C9	A12 (CFSB)		Manager	5	IT vendor/Consultancy
C10	A13 (MGS)		Manager	52	Business and management/Consultancy
C11	A14 (OFO)		IT support staff	99	IT
C12	A15 (AIA)		Manager	8	Accounting
C13	A16 (TL)		Developer	1	IT and networking
C14	A17 (BRI)		Designer	1	IT
C15	A18 (EJ)		Test analyst	245	IT quality control
C16	A19 (MT)		IT Designer/ developer	2	IT
C17	A20 (ARD)		IT Developer	1	IT and networking
C18	A21 (TUN)		IT consultant	11	Consultancy
C19	A22 (BL)		Manager	–	Support and advices
C20	A23 (RD)		Manager	–	Support and advice

Table I.
Interviewee profile

Table II.
Interviewees' positions

No. of Companies	Participants	Manager/ Customers	Internal IT staff	Developers	Designers	Consultants	Test analyst	Vendors/Suppliers	Government agencies
1	A1 (MMSL)	X							
2	A2 (MSL)	X							
	A3 (ITS1)		X						
	A4 (IT S2		X						
3	A5 (MPOG)	X				X			
4	A6 (MSB)	X							
5	A7 (MGDL)	X						X	
	A8 (AMGDL)	X							
6	A9 (OMEPS)	X							
7	A10 (MMG)	X							
8	A11 (DHC)	X							
9	A12 (CFSB)	X				X		X	
10	A13 (MGS)	X				X			
11	A14 (OFO)		X						
12	A15 (AIA)	X							
13	A16 (TL)			X	X				
14	A17 (BRI)			X	X				
15	A18 (EJ)						X		
16	A19 (MT)				X				
17	A20 (AFD)			X					
18	A21 (Tun)					X			
19	A22 (BL)	X							X
20	A23 (RD)	X							X

successful adoption and, second, to unveil the key success factors influencing continuous adoption and to describe people's experiential life (Schultze and Avital, 2011). Myers and Newman (2007) argued that studies that consider using interviews should consider a detailed process from the onset to the findings. Unstructured interview questions were developed to get the respondents' opinions and experiences about the current critical issues/situations of EICT in UK small business service sector through open-ended interview protocol. Gilmore and Carson (2007) noted that SMEs also do not usually adopt a formal approach in conducting business, and thus, unstructured interviews get the researcher closer and familiar to the study areas as the research progresses and provide a broader way of looking at events. The unstructured interview questions stimulated participants' narratives on how their companies regularly keep up with EICT.

Based on the preliminary analysis, the concepts of inscription, translation, framing and stabilization were identified and used on the account that ANT also serves as a methodological tool for data collection and analysis (Sarker *et al.*, 2006; Andrade and Urquhart, 2010). Inscription involves a process whereby actors form values and beliefs about the technology (Sarker *et al.*, 2006) which is dependent on an organization's beliefs and expectations of what the technology is about and can do (Faraj *et al.*, 2004; Kim, 2009; Allan *et al.*, 2002). Translation brings into line the beliefs of diverse actors with that of key actors in a network (Sarker *et al.*, 2006; Callon, 1986). It is the process wherein actors pursue the interest of others during the process of new technologies adoption (Callon, 1986; Faraj *et al.*, 2004; Gao, 2005; Sarker *et al.*, 2006; Tatnall and Jerzy, 2003). Framing is the process actors inscribe their beliefs, over technology, which may be different from one another (Faraj *et al.*, 2004); and stabilization happens when actors in a network see the problem as resolved (Bijker *et al.*, 1989). Stabilization of technology is not static in nature; rather, it creates room for the amendment of the technology because of changes in business processes, leading to redefinition of problems.

Semi-structured interviews were carried out and the questions asked were associated with the theoretical categories to further elicit actors' experiences about the technology adoption. Semi-structured interview approach allowed the researchers to take hold of comprehensive views of the participants articulated in their own words (Oates, 2006) and the data collected were respondents' stories about the situation (Schultze and Avital, 2011). On account of Oates' (2006) recommendation that the questions should be sent in advance so the respondents can have leeway to think through and help establish the investigators' trustworthiness, semi-structured interview questions were sent few days before the interview to allow the participants to be more relaxed and contribute freely during the interview. Also, a formal letter stating the purpose and length of the interview as well as privacy issues accompanied the questions. Beforehand, the bases and objective of the interviews were explained to help participants understand the purpose for the study, and participants (managers) were asked to identify any EICT that they are currently using and why they considered it as emerging.

Observations during these interviews showed that EICT may have been present but not fully recognized; as such, we considered it as any new hardware, software and computer-mediated networks which are not originally anticipated by management. To get in-depth information, probing questions were also asked where the participant's narratives are not clear. The interview was scheduled to last between 40 minutes and 1 hour, but some lasted for about 2 hours. With the consent of the participants, audio tape recorder was used to provide a supportive document and complete record of the conversation. Oates (2006) regarded this as an essential part of the interview procedure, as relying on memory is not recommended and may be prone to bias and error. Information such as electronic reports

and PowerPoint presentation materials from subjects were also sought to develop a deeper understanding of the points raised during the interviews.

Data analysis

The data were analyzed and interpreted in line with the theoretical concepts of ANT using the thematic analysis on a latent level (Braun and Clarke, 2006). In addressing the first questions, the latent-level theoretical coding was adopted, while latent-level inductive coding was adopted in the second questions. During this exercise, efforts were made to identify and examine the underlying ideas, assumptions and conceptualization (Braun and Clarke, 2006) instead of focusing at the semantic level which only emphasizes on the surface meaning of the data. NVivo software facilitated the coding of data into appropriate categories. Consistencies were addressed between the categories identified and the extracted quotes from the interview transcript using inter-coder reliability analysis (Bryman, 2008) involving four judges. These judges related the extracted quotes against the themes, and the final outcome was further validated through a cross-case analysis of supporting evidence (Eisnhardt, 1998; Macredie and Mijinyawa, 2011) which has been proved to be effective (Allen *et al.*, 2002). Interpretive approach was used which allowed both the small service businesses and the researchers to see the society from another standpoint (Jacobsson and Linderoth, 2010).

This approach is particularly suitable in the context of small businesses (Hine and Carson, 2007); it proves both convincing and transferable (Orlikowski and Baroudi, 1991; Orlikowski, 1992; Jacobsson and Linderoth, 2010) and appropriate when the researchers seek to understand the emerging process of organizational change (Jacobsson and Linderoth, 2010). The results were organized based on the researchers' interpretation as reflected in the short narratives. Following actors from inscription stage to stabilization stage, we were able to trace the activities at these stages and revealed the outcomes. However, because of the complex nature of the process, to understand how actors actually challenge and are been challenged in EICT adoption and implementation process and what it takes to make such implementation successful, efforts were made to understand the unique situations that shaped the entire network of actors (Andrade and Urquhart 2010); otherwise, rich understanding about the conflicting actions of diverse actors at each stages will not be gained. The interpretations were observed in different contexts (micro, small and medium) because of their nature and social formation (Parker and Castleman, 2009) and provided implications for managers. These interpretations both explain the sequence of activities that regularly lead to EICT adoption and helped recognized entities and their associated roles as a system of relations (Ng-Kruelle *et al.*, 2005) involving different associations in each stage.

Findings

Identification of actors in emerging adoption process

A number of actors were involved in the adoption of EICT because of the complex and unpredictable nature of EICT. Small business managers as the EICT's adopter and decision-maker are the competing actors that ensure that other actors support their claim in technology development and deployment (Eze *et al.*, 2014). Therefore, they are regarded as the key actor in this context who took up the role of the most visible actor. The key actor made it possible for the enrollment of other actors in the research. Interviews conducted with SME's mangers made it possible to identify other internal actors such as employees and external actors such as IT experts, IT vendors and consultants, government agencies, EICT and standards. These set of actors constitute an integral part of the players for this study.

Inscription stage

The decision for EICT in small businesses was something widely perceived as a role played by key actors, who have the responsible to define the need for the EICT with the assistance of external parties. The key actors are the competing actors – Managers, Directors, Managing Directors or Chief Executive Officers (CEOs) – depending the nature and structure of the business. These actors are regarded as the innovators that drive ideas into the organization, though evidence from the interviewees suggests that not all small business managers encourage new ideas. However, these set of actors define the interests and the roles of the others, and ensure that they support their claims on what has been initiated. It was evident in the analysis that key actors' interests, values and expectations in this stage are not only defined based on their previous experiences, organization beliefs, norms and prejudice about what the technology is about and can do for the organizations (Faraj *et al.*, 2004; Kim 2009; Allan *et al.*, 2002) but also depends on external actors. Internally, depending on the nature of the organization, employees may contribute to decision-making, and externally, customers and government agencies greatly shape and reshape the values and interests of the competing actors.

Evidence suggests that in most micro- and small businesses, the decision to adopt EICT is mostly in the hands of few actors, especially the managers, while in fairly large (medium) small businesses, the key actors bring in *potentially other expertise that may have not been included (CFSB)*. These actors are regarded by key actors as having right knowledge and skills to make informed evaluation. For most businesses that have IT staff in house, these set of actors play crucial roles in evaluating what can suit the business taking into consideration the decision of key actors and all the functional aspects of the organization. Drawing from the interviewees, actors that influence and/or challenge the decisions of key actors' interests, values, and prejudice are government agencies such as Business Link, Regeneration Departments in local councils and the key actors' customers.

Government and legislation

Government was strongly perceived as substantially shaping and reshaping values, interest of the key actors at the inscription stage via the enactment of laws while other agencies of government (especially Business Link) shaped the activates of the key actors through support activities, advice to UK SMEs in the last 20 years (Simpson and Docherty, 2004). However, these activities as noted by most key actors are not always adhered to since there is no follow up encouragement or support thereafter. One of the managers maintained that these activities were not serving the overall needs of its business. One major challenge the UK government faces is how to induce small business managers for the need to take advice and support these agencies. On the other hand, government through legislation was also widely perceived by most key actors interviewed as exerting influence on ICT adoption. A manager during one of the interviews in a small accounting firm echoed that UK government in April 2011 introduced and persuaded them to adopt an ICT application that will help their clients fill their tax returns online. It was understood that the company did not expect such change but they had to adhere to the legislation to ensure that what has been adopted are in line with what is specified by the government.

As noted by one of the managers:

> "[–] Legislation can trigger technology to emerge [–] that is what will drive organization to make changes which will impact the way they do business" [Such legislation] can be changing the VAT from 171/2 to 20 per cent and how does the organization deal with the fact that it is going to affects its invoicing [–] and other things (MGS).

Simple change in government legislation was perceived as greatly shaping key actors 'values and interests regarding decisions for EICT and subsequently triggers them to make changes that directly or indirectly impact on their business. Such legislations according to respondents may cut across the globe since globalization is becoming much more common and changes in laws in one organization or country may have an impact in another.

Customers

Akrich *et al.* (2002a) noted that the users evaluate merits and demerits of a new technology based on their expectation. One of the unique situations identified in the inscription stage is the opposing interests between the SME managers and their principal clients over what the potential technology should be. One manager noted that customers were much more informed and empowered; taking control, resisting the intended interest and altering beliefs and values so: *"[–] whatever we do, the customers remain number one [–]" (DHC)*. This assertion points to the fact that values, interests and ideas small business managers enact and their decisions toward adopting any EICT are greatly challenged. Where the opinions and interests of the key actors and that of the lead customers are constantly at opposing ends, the outcome is unfavorable and the resulting conflicts often take time to resolve (Faraj *et al.*, 2004). The conflicts that arise between small business managers and their customers always result to reconsideration that tends to benefit both parties in the long term, especially when the key actors incorporate users' ideas and interests.

This statement was supported by managers across cases:

> "The contributions of the users were vital because they considered it from the perspective of what they envisaged the system will do for them. They contributed immensely in terms of what we wanted and what we do not want from the system" (OFO). Similarly another manager noted: "[–] many organizations would have some many customers so what they [–] they use these customers to seek for some unmatched competencies" (GSM).

The finding revealed most SME managers are careful about ideas they take into account. Most often they focus on those from lead customers.

Translation stage

While key actors identify what the intended technology should be and recognize the opinion of other potential actors, mapping out strategies to ensure that these actors adapt to their beliefs and interests at the first and third stages was regarded critical since the key actors and IT experts come together to deliberate on the successful adoption of the potential innovations. Faraj *et al.* (2004) note that actors come with their ideas, motives, and intensions which they try to inscribe in the technology. Similarly, Akrich *et al.* (2002b, p. 217) emphasized that "innovation moves, via the reactions which it provokes, from negotiation to negotiation and from redefinition to redefinition, everything depends on the identity of the protagonists who are mobilized".

Most participants during the interview admit that there is always a conflicting view between what the key actors' intentions are and what the views of other actors (IT experts and consultant, vendors) are. While at this stage key actors may try as much as possible to win over other actors to accept their interests and what they believed will help meet their needs, transcription was difficult to attain because of the conflicts arising from diverse actors. For example a manager in one of the security firms noted as follow:

> The stage was pretty demanding. For instance, the new smart patrol was very new and people who did it were very much IT specialist, they find it very easy to work out but their perception of

> what we wanted and what they are putting together was different. We wanted to get something easy but they continue making it complicated. They put different model together thinking that is what we wanted (MMSL).

Connecting different actors in this stage was a process full of "uncertainty, brittleness, and disagreement and ever-shifting ties" (Latour, 2005, p. 28). The outcomes of this was in two fold. First, key actors have no choice but to persuade other actors to accept their views. For example one manager noted as follows:

> As a small business we do not have so many web developers [. . .] [–] we outsource the projects to outsource developers when the need arises in connection with the lay down rules on how the company do business (MPOG).

Second, in a situation where the initial experts refuse the request of the key actors, the key actors look for new experts who are ready to adhere to beliefs and values. In line with Akrich *et al.* (2002a; 2002b) and Faraj *et al.*(2004) it was obvious that key actors are not always certain on how they plan to convince other actors .

Business/IT consultants

Most of the key actors maintained that business/IT consultants are in their first point of contact and for these consultants to help plan for and implement EICT. This challenges key actors' decisions since the key actors themselves may have pre- conceived ideas that need fleshing out by the consultants. The consultants suggest and tailor what has been agreed in writing (business case) because key actors believe they are active and autonomous to make decisions that will reveal the benefit of the new technology. Writing a business case according to consultants was shaped and reshaped by the extent the key actors were equipped in terms of available resources and sometime it can be written in-house, especially where the resources are available. What appear surprising is that consultants who are expected to help these small businesses were not untrustworthy despite key actors' heavy reliance on them. One of the participants' strongly emphasize that a lot of these consultants tell their clients what they would want to hear and not what will move the business forward because they don't want to lose their client*: It is a very simple approach to follow but this is reality (CFSB)*. This statement was an indication that the business case or what has been proposed may not be viable.

Information and communication technology designers/developers

Among others, IT designers and developers assess and reassess all available EICT options in line with their suitability to the clients' needs. The IT designers and developers echoed that small businesses are not interested in who the IT consultants/developers are; rather, their interest is to get an application that satisfies their immediate needs. For instance, one of the developers noted that EICT can be developed and implemented from the scratch. On the other hand, off-the-shelve application can also be bought which may not be as expensive as developing the application from the scratch. There are two issues that result to opposing interests among actors here; first, it was highly perceived that consultants are not always proficient to understand the needs of these businesses and thus suggest what may not be feasible. Second, it was widely perceived by interviewees that key actors have limited knowledge and agree with propositions initiated by the consultants.

According to one of the web designers interviewed:

> Majority of times the problem we have with customers (key actors) is that they have a specific idea of what they need. You see, I don't just sell solution [–] I have to take into consideration, what

> is invoke trendy [. . .]. As well as my mark [. . .]. So most times we have misunderstanding that can make the project to stop (MT).

Most of the actors in this category noted that agreement at this time may or may not be reached. This is a function of understanding the appropriate requirements of the key actors and methodologies for development; otherwise, the project will stop or further conflicts will arise and previous decisions or original design interests will be called in question. Benamati and Lederer (2008) argued that the regular change in ICT applications requires that the approach be revisited in line with the changes in the trend. The role of the developers at this point was to look for the best approach that may suit the intended ICT. As one of the developers noted:

> There are some that re adoptable one system but may be difficult in another. [. . .] the appropriate requirements have to be identified to us clients by us [–]. We have the responsibility to make it clear [. . .]. (TL)

This action was fundamental to key actors because if designers/developers fail to reassess the requirements of their clients regarding the intended ICT, the EICT may not be in line with the formal and new organization's plan and may lead to renegotiation. One of the issues pointed out by most of the key actors is that the substantial amount of ICT is perceived as a means through which they achieve business objectives, and controlling this action is most important; otherwise, our objectives will not be achieved. Translation stage is crucial because if the views of actors are not in agreement, compromise may not be reached. Hence, the key actors learn from such situation and, to a great extent, ensure that what has been initiated meets their needs. As claimed by one of the key actors:

> From the MD's point of view [. . .] I was controlling. [. . .] the cost and value each of the applications was considered in terms of the business (GSM).

Framing stage

Framing was regarded as one of the most critical stages considered by key actors, as a huge commitment is often made in terms of finance. Observation shows that it was at this stage the ideas are being translated into a prototype technology. Most key actors noted that they would be happy if the ideas and values are incorporated which was in line with the work of Faraj *et al.* (2004). One of the developers observed most times that the standards of the EICT are difficult to achieve at the beginning, and this triggers key actors to make regular evaluations. For example, a key actor of a security firm interviewed was skeptical toward the new ICT as a result of his past experiences of bad functions/results in previous applications. Bringing into line the key actors' views is one of the most difficult things because values are different across actors.

A manager noted: *"when it was first developed, it was difficult to understand the original package (MMSL)."*

To ensure that the interests of these diverse actors align at the transcription stage, *these actors enter into another negotiation to* further shape the interest of the key actors.

Developers, designers and emerging information and communication technology standards

These actors play fundamental roles of testing the EICT in an environment similar to the client's environment. Participants across cases highlighted:

> Software or new applications are not perfect. As a [. . .] developer I will test it within my organization as well as inviting my client to come and test it [–] by following all the requirements (TL).

> I get many customers; if there are problems I go back [. . .] again for testing (MT).

Test analyst and emerging information and communication technology standards

Test analyst: a quality control specialist may be invited by the developer from the client organizations where necessary for further verification to ensure that the product is what the users exactly want. As noted by a test analyst, there is a reason for this:

> [–] Sometimes consultants may misinterpret the users' needs and requirement. Therefore, what we do is to check ICT application and ensures it is in line with the required requirements. [–] we test against requirements to ensure that it is good and user friendly (EJ).

Key actors and emerging information and communication technology standards

Despite the roles played by most designers and developers to ensure the right functions are incorporated in the technology, assessments of the EICT as maintained by some respondents were not always up to the standard envisaged by the key actors. Often, this leads to the technology being rejected. One of the managers noted that the technology was rejected because "*it is complex and does not save us time. So part of it was taken off (MMSL)*".

This points out that considerations are given to EICT that are faster and time saver (Jacobsson and Linderoth, 2010). For example, one of the key actors maintained that his phones were specifically designed to send emails and messages when a quick reply to any communication is needed. Regardless of benefits the application offers, it was evident that the same application may be perceived differently by other actors' and customers' values and interests which, in turn, leads to fresh negotiation. This is one way technology shapes the social context.

Customers, information technology vendor and emerging information and communication technology standards

Evidence from the analysis suggested that core SMEs' customers perform essential roles to ensure that their needs are satisfied.

A test analyst interviewed reported that this often involves "*user acceptance testing where customers are required to come and test how suitable the new ICT applications are during the initial stage of the development process" (EJ).*

This assertion was supported across cases: "*[. . .] internally three persons are involved in testing" (MPOG).*

Similarly, *"because we don't want to have difficulties during the process[. . .], we test regularly" (OMEBS).*

Depending on the contractual terms, a manger notes that some IT vendors may be called upon to look at how the product can be modified based on the agreement, especially when the EICT is not accepted. From the findings, when such modification is required, there may be competition among vendors, adaptation problem and delay. Voting at this point may be conducted for this to be resolved. It is important to note that activities at this stage may be temporary because the new application may not be accepted. This, in turn, leads to re-evaluation. The nature of agreement among actors at this point determines whether the first stage may be revisited or not.

Stabilization stage

Stabilization occurs where the technology is not only adaptable to previous arrangement but also recent arrangements of the organization. Most times, key actors may expect that the new applications would be stable, but evidence suggests that stabilization of any new technology application is not a one-off activity, and this it is amendable. Although all key actors recognize the importance of training so that all and sundry understand the new ICT application at the same level and *"relate with one another" (MMSL)*. However, this is one of the ways the new applications align with the organizations procedures and arrangements, and the findings suggest that employees and IT vendors at this point shape the whole value of the actors.

Employees

It was discovered that older employees find it difficult to adapt to new trends *"or may not use the new product properly"* (MMSL). It was perceived that most SME managers do not support and encourage employees' ideas and their initiatives most times, as noted by one of the operational manager:

> [–] [. . .] as the manager has the right to take or make decisions, because I know what the organisation wants [. . .]. So I meet with the company, and get it executed" (OMEBS).

It was discovered that when this happens, the company staff and the customers may not be happy with the new technology, especially when the needs are not met. Hence, this calls for criticisms from these actors. Therefore, aligning these actors' views in the new ICT is vital.

Manager across interviews highlighted: *"[. . .].businesses should always recognise employees view because they are the ones that will use the system" (CFSB)*.

In addition, *"they do play a* role *because they give me feedback on whether the system is adaptable to the organisations arrangement or not[. . .]" (AIA)*.

While employee's dissatisfaction in EICT is evidence that leads to reinventing, managers across interviews also highlighted: *"when you are a business person you need to adapt to [. . .] changes in business trend quickly* [and] *evolve. You must always have that at the back of your mind (MSL)*.

Also, *we are at the verge of introducing another new technology because we feel there are other better things" (MMSL)*. These statements were supported by Walden and Browne (2009).

Emerging information and communication technology adoption framework

ICT applications are not just regarded as artifacts, but are entrenched in organization and human behavior (Bygstad *et al*., 2005). Organizations constitute actors who are an integral part of the organization and use the technology. Decisions to adopt new ICT is likely to be interwoven when decisions to adopt are holistic including diverse human and non-human actors in the framework. The framework in Figure 1 illustrates the relationships and the interaction associated with actors, be it human or non-human, that shape the adoption process and lead to new ICT adoption. Therefore, rather than considering ICT adoption from either the social or technological perspectives, the formwork looks at it from a holistic view of social-technical network involving several actors that shape EICT adoption.

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Although these actors might not be exhaustive, arguably, it represents a wide range of actors to deal with when the need for ICT adoption arises. These have enabled an in-depth understanding of the challenges associated with the dynamic process of EICT adoption. The framework demonstrates that adoption of EICT is limited when it is considered as a one-off activity. Rather, it is continuous and iterative in nature (Kim, 2009; Hanseth *et al*., 2004;

Bruun and Hukkinen, 2003) involving diverse actors who shape and reshape the process. This process may be hindered by misunderstanding of actors in the network, especially when information among them are misunderstood. The implication is that the activities in the network may cease to continue at the time when such disagreements occur, leading to reassessment of some or all the stages. The finding from the analysis reveals that technology readiness, degree of commitment and collaboration, performance and values expected of the new ICT are key factors that lead to adoption of EICT.

The analysis shows that especially SMEs are slow in embracing new ideas because they are not ready; most times support initiatives from others are lacking; and there is limited time when considering adopting EICT. This may be as a result of limited resources, leading to little collaboration with other actors in seeking for new applications that can befit them. Most times this is shocking, especially where adoption of a new application is beyond the time frame (Jacobsson and Linderoth, 2010). Therefore, the time needed in the acquisition of the new ICT greatly is linked to the value attached to it. Further, the features of the technology also enable adoption as long as it permits SMEs to realize its benefit. For instance, one of the respondents is of the opinion that if off-the-shelve ICTs are always available and good with little or no effort to understand them, it will be introduced. The finding suggests that new ICT that are readily available and has the capability to improve the organizations business processes, return on investment has the tendency to be acquired regularly and greater chance of being adopted continually.

Discussion

This study focuses on the roles of numerous actors in EICT adoption success. The study revealed that irrespective of the disagreement of numerous actors in the network, new technology applications are mostly adopted by SMEs, although this decision is influenced by several factors which, in turn, shape actors' beliefs and values. Adoption of EICT is dynamic in nature throughout the lifespan of small businesses with each stage providing relevant values and implications to small business managers. According to Akrich *et al.* (2002a), the process is linked to a rapid movement of repeated backward and forward in all the stages of the adoption process that are integrated.

Business Link was one of the government agencies established by the UK Government to help SMEs with the issues related to acquiring EICT. These agencies were visible at the initial stage (inscription stage) but exercise little influence on SME managers. In line with the finding, Simpson and Docherty (2004) noted that support activities given by these agencies have not met the need and aspirations of SME mangers. Beaver (2002) noted that

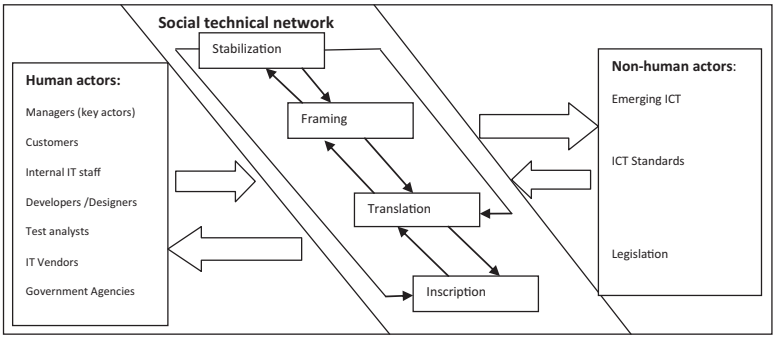

Figure 1.
The interactions of the human and non-human actors in the network

one of the problems with these agencies is that they find it difficult to take into account the variances in business sectors in terms of business settings and contexts which may not be similar. Hence, the roles of government agencies are not adequate enough for SMEs' managers to cope with the complexities of new ICT applications, although their influence shapes majority of SMEs through legislations.

Translation stage is one of the most difficult and time-consuming stage because of the nature and complexities of these actors leading to misinterpretation or misrepresentation that requires control. At the framing stage, ICT strengthens human actors' beliefs, values and interests. This happens when it fails to adapt to both previous and recent organizational arrangement. This results to redefinition of the phenomena, leading to a new meaning. The activities that lead to a new meaning as pointed out by Jacobsson and Linderoth (2010) often results in long-term benefits since consensus is reached.

At the stabilization stage, organizations' routines and procedures affected by new technology applications should be adaptable to facilitate its continuous use, especially where it helps SMEs meet with their daily business challenges. This requires the know-how of the diverse actors, be it the consultants, designers, developers and vendors, concerning the context-specific condition (Jacobsson and Linderoth, 2010) in SMEs as well as how adoption of the technology application will affect SMEs.

Research implication

Using ANT to examine the process of EICT adoption has helped to unveil the dynamic nature of ICT process and the roles of diverse actors involved in the social-technical network of technology adoption. SME managers are likely to adopt and implement new ICT if the new technology offers immediate values because the disagreements during the negotiation process is one that often takes time coupled with SMEs' pre-conceived ideas based on previous experiences, imposed by IT consultants which may or may not align based on what has been inscribed at the initial stage.

To ensure such challenges are minimized, the key actor should not avoid having a preconceived idea on how new ICT applications should be implemented. Although this research reveals that SME managers play a very important role in the formulation of the new ICT applications and ensure that other actors align with their ideas, these managers would engage with EICT adoption continually if they are technically ready and engage with other actors to understand and adopt the right technology, thereby the expected performance is achieved, and finally, the values anticipated by the ICT can be realized.

It is believed that most key actors have the feeling that they are isolated, especially where they cannot secure some of the free support offered by the government. Most small businesses also do not understand how IT can be used to improve business performance; rather, what most do is to get recommendations from friends and families. More so, a lot of infrastructure companies are going into developing web applications without a thorough understanding of their business processes. Key actors should establish a relationship with some specific actors and mentors, and trust them in such a way that they can support their online trading platforms. This can serve a useful step in gaining an external support that is proficient and avoid common business mistakes through this way. Key actors should rely solely on their informal networks and focus on actors that are knowledgeable about a particular ICT in that sector. They should develop a strategic partnership and not rely on actors that have an interest in a particular product. Also, small business managers should identify their capabilities and where they are deficient, and use the framework to be able to identify where these actors can effectively help (Simpson and Docherty, 2004). It is also important for key actors to encourage employees to contribute their quota in ICT adoption

decision-making, as it is evident that employees can play a substantial role in the adoption process.

In attempt to determine the forces exerting influence on EICT, this study contributes to knowledge by revealing the several actors and their roles in challenging adoption and implementation, specifically in small service business context, and provides a basis for future research.

The adoption of EICT is no longer a decision that rests solely on the developers. This has moved from a decision made by a single organization actor to involving various actors who must be involved in one role or the other to influence the process. The study unveils how the nature of the roles played by these actors may inform the successful adoption of these applications by small businesses.

Finally, most often in qualitative research, the size and the sample used are limited. This study examines the roles of actors in EICT adoption with 26 interviewees. The size and the sample used are limited. These limitations require caution for the generation of the findings. This study requires further validation across a wider population using mix method – a combination of qualitative and quantitative methods. Therefore, further studies should collect and collate a large number of data to allow more generalization.

Conclusion

In summary, a number of important findings emerged from our analysis using ANT as a theoretical lens. First, actors' roles are not static, but dynamic. They play different roles at the different adoption stages. Second, both human and non-human actors influence and are influenced by each other. Third, SMEs' managers are the key actors and play a dominant role in influencing and being influenced by non-human actors, i.e. EICT in this context. In addition, the findings revealed that key actors and the government are visible at all stages of adoption, while IT experts are linked to translation, framing and stabilization. This suggests that key actors, government and IT experts play significant roles at the stages of the adoption process.

One of the functions of an organization is to gather and distribute adequate information via communication that will assist in making the operations of the business more effective and efficient. The study reveals that information plays its role too. The finding suggest that if more accurate and adequate information is conveyed to the key actors by numerous actors during and after the negotiation process of ICT adoption, the decisions to adopt new ICTs become easier for the key actors (SME managers), compared to when inadequate information is disseminated. The implications are that SMEs are more convinced, committed and willing to seeing that EICTs are implemented with less resistance. Second, it makes the operations of the business smoother because more accurate and complete information is conveyed. Therefore, the information or insights given by actors in the overall network make SMEs to streamline their operations quickly. This is in line with one of the opinions of a manager interviewed who argued that one of the major reasons SMEs are not willing to adopt new applications regularly is that the IT consultants always convey information that SMEs want to hear, and not what will help them to improve their business processes in a long run, leading to high resistant rate.

Using ANT to examine the roles of actors in the adoption process has illustrated the dynamic nature, adoption and use of ICTs by SMEs. The findings revealed that the process is one that is difficult to predict as a result of the learning, negotiation, disagreement and acquisition of new knowledge that emerge during the process of adoption and utilization. SMEs' managers are more likely to engage with the new technology if such application demonstrates that it can offer instant values, as the conflicts and negotiations between

actors are difficult tasks that take time to settle because of different values and interests inscribed in the technology and the fact that SME managers come with preconceived ideas of what they feel the technology offers based on the advice of the IT consultants which may not be the case based on what has been inscribed at the initial stage.

To ensure such challenges are minimized, SME managers should be flexible in their decision-making and avoid preconceived ideas on how new ICT should be developed, adopted and realized from the onset. While observations revealed that SME mangers play central roles in the adoption process, key actors are willing and open to adopt new ICTs repeatedly if they are technology ready.

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