

The diffusion of innovations theory and the adoption of cloud computing technologies by small scale enterprises in Kampala, Uganda

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Abstract

This research paper is a review of the Diffusion of Innovations Theory and how it applies to the adoption of cloud computing by SMEs. Empirical data were collected from SMEs in Kampala as the unit of analysis from which 416 respondents were selected using the stratified sampling technique. It was a qualitative undertaking to the extent that data were interpreted in tandem with the postulations of the theory, but with some degree of statistical descriptions.

Keywords: SMEs, innovation, diffusion of innovations

Introduction

Small and medium-sized firms (SMEs) are universally recognized as an important component of any country's economy because they are the primary source of employment. As a result, the importance of SMEs in the adoption and dissemination of ICT innovations cannot be overstated, not only because of their importance to national development but also because of their capability to foster creativity, innovativeness, and adaptation (Ritchie and Brindley, 2005). The success of SMEs is an important component of the development of innovations and their associated socio-economic benefits. Constant technological breakthroughs, as well as the deployment of new innovative applications and tools in ICT, provide SMEs with several options to

use and benefit from ICTs (Wang et al., 2010).

Pavic et al (2007) suggested in a study on ICT adoption and implementation that the use of ICTs has various positive benefits among SMEs, including establishing a competitive advantage in SME marketing through the use of innovative, customer-responsive, and efficient ICT tools.

The adoption of innovations has been a subject of research and academic debate for decades now. However, the Diffusion of Innovations Theory by Rogers has distinguished itself as the dominant model that explains the process of the adoption of innovation (Sherry & Gibson, 2002). The model has served as a framework for much research from a wide range of disciplines,

including political science, public health, communications, history, economics, technology, and education (Dooley, 1999; Stuart, 2000).

Rogers' Diffusion of Innovation Theory

The theory by Rogers (2003) has been touted as the most appropriate for any inquiry into the adoption of technology (Medlin, 2001; Parisot, 1995) or to be succinct, technological innovation.

Rogers (2003, p.177) conceives of "adoption" as a decision to fully utilize an innovation as the most important decision and rejection is a decision to not use the innovation (p. 177). Diffusion according to Rogers (2003, p.5) entails the communication of an innovation using specific channels of communication over a period within a social system. Accordingly, the primary elements that attach to Rogers' diffusion of innovations theory include innovation, communication channels, time, and social systems.

Innovation

"An innovation is an idea, practice, or project that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 12). Implicit in this definition is that for it to stand a chance to be adopted, it does not matter if an innovation was innovated a far or near time ago; what matters is that it is perceived as new by a prospective adopter. The "newness" characteristic of adoption is more related to the three steps (knowledge, persuasion, and decision) of the innovation-decision process that will be discussed later (Sahin, 2006).

According to Rogers (2003), a decision to adopt an innovation may be hampered by uncertainty of its consequences—the changes that occur in an individual or a social system as a result of the adoption or rejection of an innovation" (Rogers, 2003, p. 436). Consequences can be classified variously: as desirable versus undesirable (functional or dysfunctional), direct versus indirect (immediate result or result of the immediate result), and anticipated versus unanticipated (recognized and intended or not). Therefore, it is imperative that uncertainty is eliminated or diminished to build confidence in and create room for the adoption of an innovation, including by informing prospective adopters about all the consequences of choosing or abstaining from choosing an innovation.

Communication channel

The second element of the theory of diffusion of innovations process that informs the adoption of an innovation is communication channels. However, it is important to understand what communication is before a discussion of communication channels may be delved into. According to Rogers (2003, p.5), communication is "a process in which participants create and share information with one another in order to reach a mutual understanding". Communication is originated by a source, which sends or transmits a message to a receiver, and for mutual understanding to happen between the sender or source and the receiver, the receiver transmits it back to the sender in form of feedback. The feedback contains clues as to whether the receiver understood the source's message, and if not, the source

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transmits it back and the receiver gives feedback. In the communication process, it is assumed that the back and forth-continues until there is an identical understanding between the source and the receiver of the information. Yet, in real-life experiences, it is possible for communication to break down before mutual understanding is achieved.

The back and forth between the source and receiver of messages in the communication process is facilitated by a medium called a channel. According to Rogers (2003, p. 204), a channel is the means by which a message gets from the source to the receiver". Channels of communication may be numerous but some are more appropriate than others, depending on the type of message and the target audience. While some messages may require mass media channels, which include TV, radio, and newspaper channels; others need interpersonal communication channels, which consist of two-way communication between two or more individuals (Sahin, 2006). In the regard to adoption of innovations, which may need a full understanding of the consequences of using or refusing to use innovation to influence a decision to adopt an innovation, interpersonal channels may be more powerful to create or changing strong attitudes held by decision-makers in that regard (Sahin, 2006).

Time

According to Rogers (2003), time is a major factor. This is because the stages of diffusing an innovation, including the process of innovation itself, communicating,

decision-making, enactment, approval, adoption, and implementation, all take time.

For instance, decision-making, which is a critical element in adopting an innovation is a process that takes time. Rogers (2003, p.172) described the innovation-decision process as "an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation", and added that the process entails five stages namely, (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation.

At the knowledge stage, a prospective adopter learns about the existence of innovation and seeks information about the innovation regarding the "What?," "how?," and "why?". During this stage, the person tries to figure out "what the innovation is and how and why it works" (Rogers, 2003, p. 21).

Sometimes it is important to persuade a prospective adopter of an innovation, especially when he or she has a negative or positive attitude toward the innovation, but "the formation of a favorable or unfavorable attitude toward an innovation does not always lead directly or indirectly to an adoption or rejection" (Rogers, 2003, p. 176). (Rogers, 2003, p. 176).

As a result, the individual is more sensitively involved with an innovation during the persuasion stage. The degree of uncertainty about the functioning of the innovation, as well as social reinforcement from others including colleagues, peers, etc., influence the individual's opinions and beliefs about the innovation.

The individual decides whether to accept or reject the innovation at the decision stage of the innovation-decision process, according to Rogers (2003, p.177), rejection means "not to adopt an innovation," whereas adoption refers to "full use of an innovation as the best course of action available". Since most people want to try an innovation in their own situation before making an adoption decision, innovations that have a partial trial basis are typically adopted more quickly (Sahin, 2006). However, at any point in the innovation-decision process, rejection is conceivable. Active rejection and passive rejection are two different types of rejection that Rogers described. In a situation of active rejection, a person tries a new innovation and considers adopting it, but ultimately decides against doing so (Sahin, 2006). An active form of rejection could be the choice to reject an innovation after initially adopting it, but a person does not even consider adopting the innovation when they are in a passive rejection (or non-adoption) position (ibid).

An innovation is applied during the implementation stage. However, an innovation introduces novelty, and "some degree of uncertainty is involved in diffusion" (Rogers, 2003, p. 6). At this stage, uncertainty about the outcomes of the innovation can be a problem. As a result, the implementer may require technical assistance from change agents and others to reduce uncertainty about the consequences (Sahin, 2006). Furthermore, the innovation-decision process will come to an end because "the innovation loses its distinctive quality as the distinct identity of the new idea fades" (Rogers, 2003, p. 180).

The decision to innovate has already been made, but at the confirmation stage, the individual seeks support for his or her decision. This decision, according to Rogers (2003, p.189), can be reversed if the individual is "exposed to conflicting messages about the innovation". However, the person tends to avoid these messages and look for affirming messages that support their choice. As a result, at the confirmation stage, attitudes become more significant. This stage is when later adoption or discontinuance occurs, depending on the degree of support for the innovation's adoption and the person's attitude (Sahin, 2006).

Social system

This is the last element that constitutes the processing of diffusion of Innovations, according to Rogers (2003), which he defined as "a set of interrelated units engaged in joint problem solving to accomplish a common goal" (p. 23). Since diffusion of innovations takes place in the social system, it is influenced by the social structure, which according to Rogers (2003, p.24) is "the patterned arrangements of the units in a system" (p. 24). These also help or hinder a decision to adopt an innovation in many ways.

A social system has social norms that are categorized by the behavioral patterns of the members. An innovation that is incompatible with the social norms of a target society is less likely to be adopted within the society (Rogers, 2003). In contrast, innovations that are compatible with the norms of a society are easily diffused within the society. Opinion leaders

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in a social system are viewed highly as their decisions tend to influence other members. They influence and persuade their fellow members to adopt the suggested innovation. Change agents are either entities or individuals who influence other members to sway in a certain direction (Rogers, 2003). Change agents sometimes support the diffusion of an innovation and at other times they don't.

In consequence, innovation dictates that individuals target short-term benefits, which if they don't get, they are less likely to implement the innovation. Products that are planned to have stretched time consequences are less slow than the consistent products.

At the firm level, decision-making comprises various groups, including supporters and opponents of an innovation-decision (Oredo & Njihia, 2014). The internal characteristics of organizations that their organizational behavior follows, and the external characteristics that affect the organization show how firms are involved in organizational innovation (Rogers, 1995). Rogers (1995) proffers that innovation is about the degree to which an individual or a unit incorporates and adopts new ideas in a group or firm earlier by new members than by older ones. Without catering to this, therefore, innovations in an organization would still be useless and so this research was undertaken to investigate such a dimension.

Leaders, according to Rogers (1995), are defined by their attitude toward change. Individuals' attitudes about change have an impact on their level of innovativeness. Individuals' attitudes about innovation

change as they learn about a new product or service (Sahin, 2006). Internal organizational characteristics such as centralization, complexity, formalization, interconnectedness, organizational slackness, and corporate size determine the degree of organizational innovativeness.

According to Rogers (1995), "centralization is the degree to which power and control in a structure are centralized in the hands of a relatively small number of individuals; complexity is the degree to which members of an organization have a relatively high level of information and expertise; formalization is the degree to which an organization emphasizes the specific rules and procedures of its members."

Rogers (1995) also defines system openness as the external qualities of the organization that influence organizational openness. However, there is a gap in Roger's definition, which is that external characteristics alone are not sufficient when it comes to an organization's openness, especially when the focus is on adoption decisions for innovations pertaining to cloud computing in an organization. There are other factors such as environmental factors, human factors among others that this study sought to address.

Methods and Materials

The study used a descriptive research design and adopted both qualitative and quantitative approaches to data analysis. The study used a sample size of 416 and used the stratified sampling technique to sample SMEs in Kampala as a unit of analysis. Data were collected through the

survey questionnaire method and a self-administered questionnaire as the data collection instrument. Pretesting was also used to demonstrate the instrument's clarity. Before the instruments were administered to the real sample, unclear instructions, incorrect numberings, and similar questions were rectified and adjusted.

The content, criteria, and construct validity of the instruments were tested to see how well they were representative, how they captured relationships between variables, and measured ideas. For all of the items in the questionnaire, the Content Validity Index was found to be 0.95. As a result, the questionnaire was deemed valid, as a CVI of at least 0.8 is regarded highly in terms of assessing validity. Descriptive statistics were used as well as interpretive analysis.

Results and Discussion

As noted already, Rogers (2003) opined that a decision to adopt an innovation may be hampered by the uncertainty of its consequences; whether such consequences are desirable or undesirable, direct or indirect, and anticipated or unanticipated. This, as observed also already behaves that uncertainty is eliminated or diminished and that confidence in an innovation is built if it is to be adopted. It has also been noted that the Theory takes time as a factor in determining the adoption of innovations, as well as the communication channel and the system.

Meanwhile, the study found that SMEs in Kampala moderately (51%) appreciated cloud computing, which could explain why not all or several SMEs in Kampala had not

adopted cloud computing technologies and services.

The decision to either adopt cloud computing or not has been in part informed by whether or not SMEs appreciated the benefits that accrue from adopting cloud computing technologies and services, which could mean that there was some level of aversion to the adoption of cloud computing technologies by SMEs in Kampala. This goes on to vindicate Rogers' (2003) Diffusion of Innovations Theory, which postulates that uncertainty prevents the adoption of innovations.

The study also revealed that cloud computing was perceived to be complex (Mean = 4.01, St. Dev = 1.180), which could imply that the adoption by SMEs in Kampala of cloud computing technology was being encumbered by uncertainty.

The findings also revealed that most potential adopters feared that the cloud could not be easily integrated into existing IT infrastructure (Mean = 2.62, St. Dev = 1.032). This could imply that several SMEs in Kampala failed to adopt cloud computing, in part because they were apprehensive of the consequences of adopting it, including poor integration that could result in the failure to use the technology. This finding vindicated Rogers' (2003) Diffusion of Innovations Theory to the extent that it showed that the aversion by SMEs to the failure of integration of cloud computing into their existing IT infrastructure was in tandem with the theory's postulation that uncertainty hinders the adoption of an innovation.

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Yet, the expressed fear was neither isolated nor unfounded. According to a survey on the major difficulties faced by Software as a Service (SaaS) vendors, many executives (90%) were worried about getting past the integration barrier (Mulesoft, n.d.). SaaS is a platform that allows users to use cloud-based applications over the Internet. In the same survey, it was found that (Mulesoft, n.d.):

1. Integration with other systems was considered "important" or "extremely important" by 94 percent of respondents in winning new customers.
2. More than 20% of survey respondents consider integration or data importing to be "extremely time consuming," while more than 60% consider it to be "somewhat time consuming."
3. Integration of cloud applications has become a common issue, one that is becoming increasingly important in customer acquisition and retention.

The study also found from the respondents that training in the use of cloud computing took a long time, which could be a hindrance to the adoption by SMEs in Kampala. This is in line with Rogers' (2003) theory which considers time as a key element in the adoption of an innovation. If an innovation will take very long to work or to be learned by the users, it may fail or slow the progress of the organization, firm, or company; hence the benefits from it will be far-flung. This is a demotivating factor for the adoption of an innovation; hence Rogers' (2003) Diffusion of Innovations Theory is veracious to that extent.

Finally, the study also found that respondents representing SMEs in Kampala were generally ignorant about the various types of cloud computing as well as the various models. This could be because they lacked the requisite knowledge about cloud computing, which would have been the foundation for making a decision to adopt cloud computing technologies. It could imply that communication by cloud computing vendors was not appropriate or sufficient, or that the channels of communication between the developers or vendors of cloud computing technologies to the SME market, were not appropriate.

As Sahin (2006) argued, the adoption of an innovation, which may need full understanding requires interpersonal channels more than mass media channels. Hence, although there was no direct evidence as to whether SMEs obtained their information about cloud computing by interpersonal means or mass media, the finding is significant to the extent that the respondents generally confessed to ignorance of the most basic information about cloud computing, and hence the not so good rate of adoption of cloud computing technology by SMEs in Kampala.

Conclusion

In conclusion, Rogers' (2003) Diffusion of Innovations theory is a good theory to explain the factors that could result in the adoption or rejection of innovation, and although it has served as a framework for research from a wide range of disciplines, including political science, public health, communications, history, economics,

technology, and education; it is also useful in the field of business in general and SMEs in particular. The results have largely vindicated the applicability and veracity of the Theory within the context of SMEs in Kampala.

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