CHAPTER- III

THEORETICAL FRAMEWORK

3.1 Introduction

Creswell, (2009) defined theory as *"... interrelated set of constructs (or variables) formed into propositions or hypotheses that specify the relationship among variables (typically in terms of magnitude or direction"*. According to Walsham, (1995a), an important question for researchers is the role of theory in their research. Eisenhardt, (1989) identified three distinct uses of theory in research: to guide a) guide to design and data collection; b) iterative process of data collection and analysis; and c) final outcome. A theory might be used in research as an argument, discussion or rationale to explain the phenomena (Creswell, 2009). This study is exploratory in nature and existing theoretical frameworks are important in order to understand about the existing knowledge and what the outcome will be.

The use of theory in interpretive cases research is important as it creates an initial theoretical framework, basis and approach on which initial empirical work is based (Walsham, 1995a). The choice of theory is essentially subjective and Walsham emphasized the freedom of choosing theories with which the researcher is comfortable (Walsham, 2006).

Walsham, (1995a) warned not to use theory in a rigid way that might stifle new ideas and exploration. Therefore, it is necessary to maintain a considerable degree of openness to the collected data with changes to the initial assumptions and theories. The researcher is confident that choosing an existing theoretical framework will establish a leading edge, viewpoints, and a set of theoretical lenses through which to view the problem.

3.2 Theories and frameworks

Existing theories and frameworks developed by researchers have been used to explain the adoption ICT facilities in Higher Education Institutions. Diffusion of Innovation is an important theory in information system, which explains how and why technology spread through cultures (Rogers, 2003). According to Rogers, DOI is largely a social process, which means that innovations are "gradually worked out through a process of social construction" (Rogers, 2003, p. xxi). One of the most commonly employed models is the Technology Acceptance Model (TAM) developed by Davis, (1989), which explains and

predicts the acceptance of particular technologies across a range of populations (Lippert & Govindarajulu, 2006).

3.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Davis, (1989). This model (Davis 1989; Davis et. al., 1989), shown in Figure 3.1, is the most widely used model of user acceptance and usage. Researchers have used TAM to study the adoption of various technologies and it has become the most influential theory in the information systems field (Benbasat & Barki, 2007; Chen, Li & Li, 2010; Godoe & Johansen, 2012). The model explains that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are beliefs about a new technology that influence an individual's attitude towards the use of that technology (Davis et. al., 1989; Godoe & Johansen, 2012).

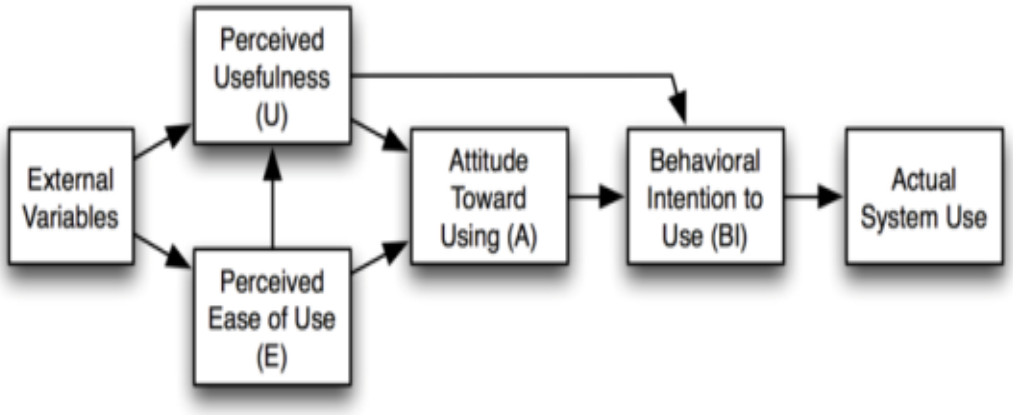

Figure 3.1: Original Technology Acceptance Model (Davis et al. 1989, p.985)

Adoption of an IT artefact depends on two main constructs: PU and PEOU (Chen et. al., 2010; Davis, 1989; Davis, 1993; Iqbal & Qureshi, 2012; Venkatesh & Bala, 2008). PU and PEOU determine the intention to use the system, which in turn has an effect on the actual system use. Perceived Usefulness and Perceived Ease of Use are assumed to be

related to the acceptance of a computer or technology system (Chang, Yan & Tseng, 2012; Godoe & Johansen, 2012).

Davis, (1993) explained that PU has a causal effect on PEOU since it has an indirect effect on attitudes towards actual usage behaviour. TAM suggests that PU will be influenced by PEOU because the easier a technology is to use, the more useful it will be (Venkatesh, 2000).

The model is designed to predict information technology acceptance and usage on the job (Ventakesh, Morris, Davis & Davis, 2003). The goal of TAM as explained by Davis, Bagozzi & Warshaw (1989, p.985) is: *" ... to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behaviour across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified".*

The model also has predictive power to enable it to apply to different situations but the model also has key limitations (Venkatesh, 2000). According to Benbasat and Barki (2007, p.212), *"TAM is the most influential theory, but its intense focus has led to a number of dysfunctional outcomes ---*
a) The diversion of researchers' attention away from important phenomena ---
b) TAM-based research has led to the creation of an illusion of progress in knowledge accumulation; and
c) The inability of TAM as a theory to provide a systematic means of expanding and adapting its core model has limited its usefulness in the constantly evolving IT adoption context".

3.3.1 Perceived Ease of Use (PEOU)

Davis (1989, p. 320) defined PEOU as *"the degree to which a person believes that using a particular system would be free of effort"* (see also Chen et. al., 2010, p.125). PEOU is a construct tied to an individual's assessment of the efforts required in using the system (Davis, 1989). Chang et. al., (2012) described PEOU as the belief that a user does not

expect to put much effort into making use of a particular system. If technology is skill demanding, individuals are more willing to use user-friendly systems that can achieve the same performance (Pee & Kankanhalli, 2010).

3.3.2 Perceived Usefulness (PU)

Perceived usefulness is defined here as *"the degree to which a person believes that using a particular system would enhance his or her job performance"* (Davis, 1989, p. 320). PU is the belief that a user anticipates work efficiency can be enhanced by a particular application system (Chang et. al., 2012). Outcome expectations are a vital antecedent to technology use behaviour, since individuals expect to solve problems in a favourable manner (Pee & Kankanhalli, 2010).

Doh & Stough, (2010) argued that there is a belief that personal behaviour and personality are related depending on the PU of that issue in our society. The relative advantages of IT cannot be achieved due to a lack of ICT adoption and usage is unimportant, despite the potential benefits (Doh & Stough, 2010).

3.3.3 Attitude towards using technology

PEOU and PU positively affect the attitudes toward an information system and affect individuals' intentions to use and acceptance (Chen et. al., 2010). Research undertaken by Chang, Yan and Tseng regarding mobile technology showed that PU and attitude toward using had a considerable positive effect on continuance of intention to use (Chang et. al., 2012).

3.3.4 Behavioral intention of use

Behavioral Intention (BI) was defined as the extent to which an individual intends to perform a specific behaviour (Davis et. al., 1989). Both PEOU and PU positively affect attitudes toward an information system and individuals' intentions to use and the acceptance (Chen et. al., 2010).

3.3.5 Justification of TAM

Researchers have used TAM to study the adoption of various ICT technologies. The TAM has become the most influential theory in the information systems field (Benbasat & Barki, 2007; Chen, Li & Li, 2010; Godoe & Johansen, 2012). The model suggests that when users are exposed to new technology, there will be several factors (i.e. PU and PEOU) that influence decisions about how and when they will use it.

As Venkatesh & Bala, (2008) also noted, TAM was developed to predict individual adoption and use of new information technologies. This model suggests that PU and PEOU are beliefs about a new technology that influence an individual's attitude towards the use of that technology (Davis et. al., 1989). The researcher used TAM for this specific research since it is an Information Systems theory that models how users come to accept and use a technology.

3.4 Diffusion of Innovation (DOI)

Noted sociologist Everett Rogers, (1995) is best known for his "diffusion of innovation" theory and for introducing the term "early adopter". Rogers, (2003) defined diffusion as "*the process by which an innovation is communicated through certain channels over time among the members of a social system"* (p. 5). DOI is important because it is hard to develop useful knowledge (Rogers, 2003). Diffusion of Innovation is an important theory in information system, which explains how and why technology spread through cultures (Rogers, 2003). According to Rogers, DOI is largely a social process, which means that innovations are "*gradually worked out through a process of social construction*" (Rogers, 2003, p. xxi).

The word innovation is described as *"... an idea, practice or object perceived as new by an individual or other unit of adoption"* (Rogers, 2003, p. 12; Sahin, 2006, p. 14). Without diffusion, an innovation has no economic impact (Arpacı et. al., 2012). The four components of diffusion of innovation ---

a) an innovation,

b) is communicated through certain channels,

c) over time, and,

d) among the members of a social system (Knowlton, 2008; Rogers 1995; Rogers, 2003).

There are four main elements in the diffusion of an idea:

A. the innovation,
B. communication channels,
C. time,
D. the social system,

3.4.1 Innovation

Rogers described an innovation as an idea, practice, or object that is perceived as new by an individual or others (Rogers, 1995, 2003). The innovation does not have to be objectively new but merely perceived as new to the people involved. This could be both technical (i.e. new technologies) and administrative (i.e. new procedures and policies) (Van de Ven, 1986). There are five stages to diffusion of innovation (shown in Figure 3.2):

- Knowledge
- Persuasion
- Decision
- Implementation
- Confirmation

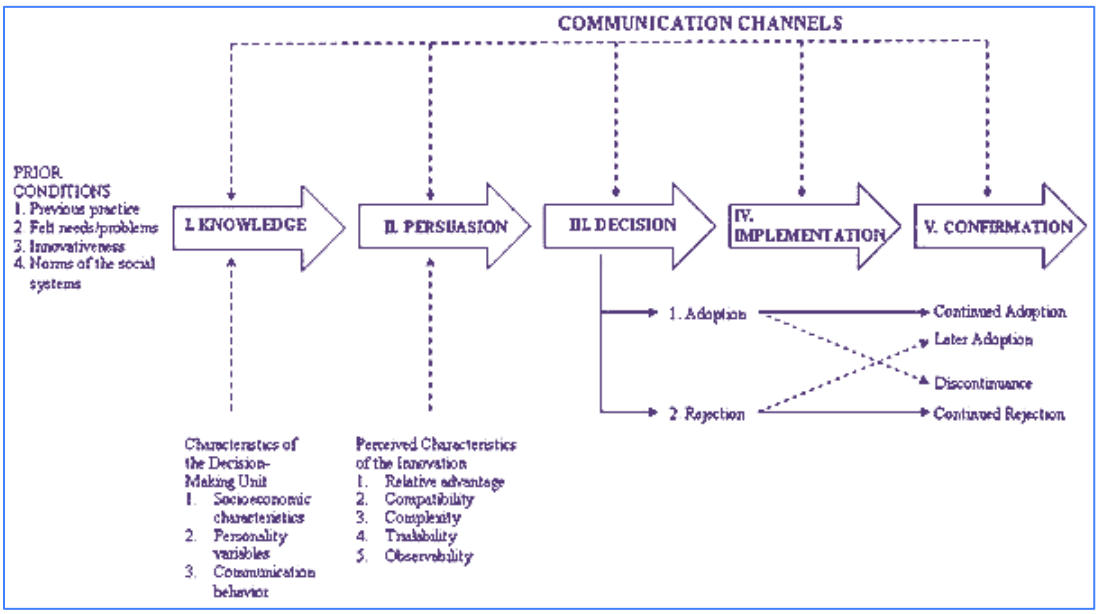

Figure 3.2 : Five stages of Innovations (adapted from: Rogers, 2003, p.281)

On the other hand Van de Ven, (1986) defined innovation as "*the development and implementation of new ideas by people who over time engage in transactions with others within an institutional context*" (p. 604). Innovation is viewed a good thing because the new idea must be useful, profitable and constructive with any new idea that are not useful regarded as mistakes (Van de Ven, 1986). According to Damanpour, (1992), organisational innovation pertains to all parts of the organisation, all aspects of operation and all types of innovations.

The five characteristics that determine the rate of adoption of innovation are --- relative advantage, compatibility, complexity, trialability and observability (Bates, Manuel & Oppenheim, 2007; Rogers & Scott, 1997).

i. **Relative advantage** - *"the degree to which an innovation is perceived as better than the idea it supersedes"* (Rogers, 2003, p. 229). It does not matter so much if an innovation has a great deal of objective advantage, Rogers & Scott, (1997) explained that what is important is that the individual perceives the innovation as advantageous.

ii. **Compatibility** – *"the degree to which an innovation is perceived as consistent with the existing values, past experience, and needs of potential adopters"* (Rogers, 2003, p. 15).

iii. **Complexity** – "the degree to which an innovation is perceived as difficult to understand and use" (Rogers, 2003, p. 15). Excessive complexity of an innovation is a vital obstacle in its adoption since it negatively correlates with the rate of adoption (Sahin, 2006).

iv. **Trialability** - *"the degree to which an innovation may be experimented on a limited basis"* (Rogers, 2003, p. 16). An innovation that is trialable presents less uncertainty to the individual who is considering adopting its use.

v. **Observability** - *"the degree to which the results of an innovation are visible to others"* (Rogers, 2003, p. 16). The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it.

3.4.2 Communication Channels

Communication is the process whereby participants create and share information with each other to reach shared understanding (Bates et. al., 2007; Roger, 1995; Rogers, 2003). It is the heart of 'diffusion of innovation' theory. A communication channel is the means by which messages are transferred from one individual to another (i.e. through ICT).

The concept of the diffusion process is simple, as Rogers stated: "*the diffusion process is the information exchange through which one individual communicates a new idea to one or several others*" (Rogers, 2005, p. 18). Communication is the process by which students and teachers create and share information with one another in order to reach a mutual understanding, using ICT within higher education.

Rogers identified two categories of communication channels --- mass media and interpersonal communication (Rogers, 2003; Sahin, 2006). The role of mass media and internet are considered the best channels to create awareness among users (Roman, 2003). Mass media include mass medium such as TV, radio or internet. On the other hand, *"diffusion is a very social process that involves interpersonal communication relationships"* (Rogers, 2003, p. 19). Bates et. al., (2007) argued that a combination of mass media (i.e. formal method) and interpersonal methods (i.e. informal methods) is important in this regard.

This element of the diffusion theory is important as one of the main ideas in the use of ICT is to increase the communication among teachers, learners, and the management of higher education authorities. Therefore, mass media channels are effective in creating knowledge about innovations and interpersonal channels are effective in changing attitudes towards a new idea.

3.4.3 Time

The element of time has three phases: a) innovation-decision process; b) innovativeness; and c) innovation rate (Rogers, 1995, 2003). The innovation-decision process includes the five mental stages or steps that the individual passes through which are knowledge, persuasion, decision, implementation and confirmation (Rogers, 2003).

In the second phase, the degree to which a member or members of a social system adopt

an innovation earlier than others within the same social system is defined as innovativeness.

3.4.4 Adopter Categories

Rogers, (1995) identified five adopter categories that reflect relative innovativeness: innovators, early adopters; early majority; late majority and laggards. It is believed that at the initial stage a few individuals adopt an innovation. Later the diffusion curves climbs up as the innovators, early adopters and early majority adopt the innovation. The highest peak is somewhere between the early majority and late majority, and finally it slopes down to the laggards. The resistance to adoption is derived from research by Rogers and represented in Figure 3.3.

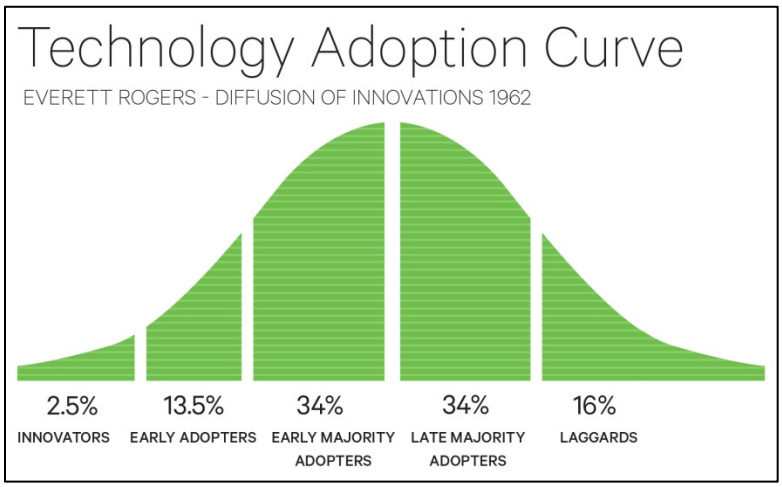

Figure 3.3: Rogers' Innovation adoption Curve (Rogers, 2003, p. 281)

Innovators (2.5%): a small group of early adopters; they are enthusiasts who are committed to ICT use in higher education (Bates, 2001). This group would be committed to change and do whatever they can, to make the innovation work and are willing to experience new ideas (Rogers, 1995, 2003). Innovators should be prepared to handle with unsuccessful innovations with a certain level of uncertainty about the innovation (Sahin, 2006).

Early Adopters (13.5%): Most important group for targeting innovative practices (Bates,

2001). This group of people would have not yet adopted a new practice, but are open to change (Rogers, 2003). This group is more likely to hold leadership roles in the social system.

Early Majority (34%): This group tends to be slower in the adoption process but have good interaction with other members of the social system (Rogers, 2003).
Late Majority (34%): Members are strongly hostile to change. They may have deep ideological or philosophical objections to change, or may see their status or position challenged by the change (Bates, 2001). They are unlikely ever to embrace the innovation with a high degree of skepticism (Rogers, 1995, 2003). This group includes almost one-third of all members who wait until most of their peers adopt the innovation (Sahin, 2006).

Laggards (16%): The last ones to adopt an innovation with no opinion leadership and are focused on traditions with caring for old ways (Rogers, 1995, 2003). Laggards wait until an innovation is successful due to lack of awareness-knowledge and has no leadership role (Sahin, 2006).

3.4.5 Social System

Roger (2003, p. 23) defined the social system as *"a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal"*. An innovation "diffuses" within the boundary of a social system (Rogers & Scott, 1997). Rogers (1995; 2003) noted that the structure of a social system can facilitate or hinder the diffusion process. The social system is a norm which influences "*the establishment of behaviour patterns of the members*" (Rogers, 2003, p. 37). Therefore, it may take time to learn new ICT technologies due to the social system.

3.4.6 Justification of DOI to this study

Rogers' DOI (Rogers, 1995, 2003) has been chosen because it provides a general explanation for the manner in which new entities and ideas that ICT over time disseminate through social system in higher education (Uys, Nleya & Molelu, 2004). The researcher chooses to use the DOI theory since it is a well-known and proven concept, which is

widely used in information technology research (Mustonen-Ollila & Lyytinen, 2003). The social side is important in order to understand the process of ICT adoption in any HEIs. This aspect will help to explain the social relationships and interactions among individuals (Knowlton, 2008).

3.5 UNESCO's continuum model of ICT development

The UNESCO continuum model of ICT development identified at least four broad stages of development in terms of adoption and use of ICT (UNESCO, 2002). The four broad approaches are --- emerging, applying, infusing and transforming (Olakulehin, 2007; UNESCO, 2002). Figure 3.4 shows the continuum model from the emerging to applying to the infusing and culminates in the transforming process (Olakulehin, 2007).

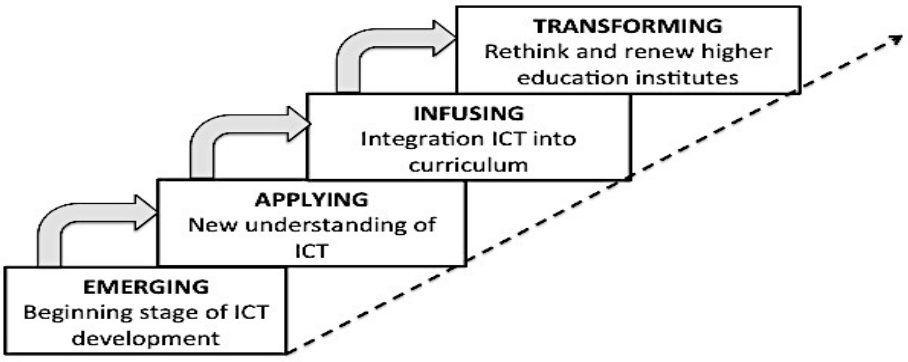

Figure 3.4: UNESCO's Continuum for ICT development (UNESCO, 2002, p.14)

i. Emerging: This stage is the one where HEIs are in the initial phase of ICT development (Shinohara & Nan-Zhao, 2006; UNESCO, 2002). In this phase, teachers and academic management will start to explore the possibilities of general use of ICT and skills development (Olakulehin, 2007; Shinohara & Nan-Zhao, 2006; UNESCO, 2002).

HEIS at this phase would still be firmly grounded in traditional methods (Shinohara & Nan-Zhao, 2006; UNESCO, 2002) of teaching and learning. The emerging approach

involves students and teachers developing their literacy skills in the use of ICT, such as word processing, use of the internet and e-mailing (Shinohara & Nan-Zhao, 2006).

ii. Applying: This is new know-how about the contribution of ICT to learning (Shinohara & Nan-Zhao, 2006; UNESCO, 2002). The academic management and teachers will use ICT for tasks already carried out at their institute (Shinohara & Nan-Zhao, 2006; UNESCO, 2002). In this phase, teachers would use ICT for focusing on improving their teaching delivery and enrich teaching and professional development (Olakulehin, 2007; Shinohara & Nan-Zhao, 2006). The opportunity to apply ICT in all their teaching will be limited due to lack of know-how and ICT competency and will not be fully integrated into all classroom settings (Shinohara & Nan-Zhao, 2006).

iii. Infusing: This phase involves integrating ICT across the curriculum (Olakulehin, 2007; Shinohara & Nan-Zhao, 2006; UNESCO, 2002). Teachers and students can explore new ways in which ICT can change professional practice (Olakulehin, 2007; UNESCO, 2002). This phase of ICT infuses all aspects of teachers' and students' environments to improve teaching and learning (Shinohara & Nan-Zhao, 2006). Here, teachers and students will integrate ICT into all aspects of their life in teaching and learning (Shinohara & Nan-Zhao, 2006).

iv. Transforming: There is a shift from the teacher-centred approach to a student-centred one. The focus of the curriculum will now be learner-centred, which integrates subject context with real-world applications (UNESCO, 2002). In this transforming approach, teachers and students will regard ICT as part of the everyday life (Olakulehin, 2007).

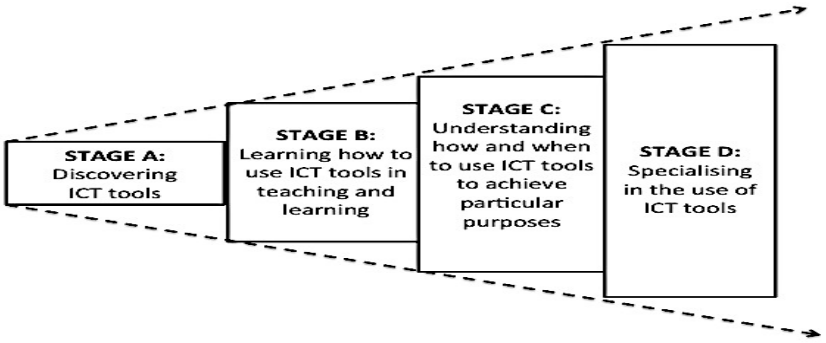

Figure 3.5: Stages of ICT development (UNESCO, 2002, p.17)

UNESCO has formulated a four-stage continuum of learning ICT tools which is represented in Figure 3.5.

Stage A: Discovering ICT tools: Students and teachers discover ICT tools in general use. This is the first stage where students and teachers will start using the ICT tools in their academic life.

Stage B: This is the stage of teaching and learning how to use ICT tools. This is the second stage where students and teachers will explore how to use the ICT tools in their TLP.

Stage C: This is the stage of understanding how and when to use ICT tools to achieve particular purposes and includes the ability to recognise and apply ICT to tasks to solve real problems.

Stage D: This is the last stage where students and teachers specialize in the use of ICT tools and eventually become ICT specialists.

3.6 Chapter Summary

This chapter highlighted the theoretical frameworks, which are appropriate to this research. The theories and model selected for this study are Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI). TAM is used in the acceptance and usage of information technology. DOI is a theory that seeks to explain how new ideas and technology spread through various environments. UNESCO's continuum model of ICT development is selected as a practical model for adopting ICT in the higher education context.

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