# The Diffusion of Educational Technology as an Instructional Tool: A Case Study Within a Single-Sex, Postsecondary Educational Institution in Saudi Arabia

By

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**ABSTRACT**

This qualitative, exploratory, single-case study examined female facultys reports in an institution in Saudi Arabia regarding the diffusion of educational technology as an innovative instructional tool in a single-sex, postsecondary education institution. The study of educational technology includes "the content to be learned, the format of instructional messages, and the interaction between computers and students" (Winn, 2002, p. 331). For the purpose of this study, educational technology is defined as hardware and software technologies such as computers, information and communications technology (ICT), distance education, e-learning, and other applications that can be used for instructional or learning purposes. Rogers (2003) diffusion of innovation guided this study and served as the theoretical lens. The model consists of five characteristics that influence the rate of adoption include relative advantage, compatibility complexity, trialability, and observability. Interview questions were researcher-developed and based on the survey instrument developed by Moore and Benbasat (1991) and Rogers (2003) theoretical framework. A total of fifteen full-time female faculty members from one education department within a university located in Saudi Arabia were recruited to participate in this study, using the snowball sampling strategy. This analysis yielded 27 findings. Female faculty reported that there were educational benefits gained as well as technology-related problems. The diffusion of innovation was impacted by the discipline in which they teach, inaccessibility, lack of technical and institutional support, and the unavailability of needed technology, university trainings and workshops. Female faculty also noted that personal time constraints, influenced their use of educational technology.

## DEDICATION

*I dedicate this work to my lovely family. I love for them. Thanks to my parents, who were my role models for encouraging me to reach for my dreams. Thanks to my brothers and sisters for their support and encouragement. Thanks to my husband and my son for their support, patience, encouragement, and, above all, for giving meaning to my life. I love you all.*

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# CHAPTER ONE: INTRODUCTION TO THE STUDY

## Introduction to the Chapter

The scholarly examination of educational technology, as defined by the Association for Educational Communication and Technology (AECT), is "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources" (Januszewski & Molenda, 2013, p. 1). The study of educational technology includes "the content to be learned, the format of instructional messages, and the interaction between computers and students" (Winn, 2002, p.331). Winn (2002) contended that the field has shifted to examine "the study of learning in complete, complex and interactive environments" (p. 331). For the purpose of this study, educational technology is defined as hardware and software technologies such as computers, information and communications technology (ICT), distance education, E-learning and other applications that can be used for instructional or learning purposes. Within Arab states, the scholarship of technology interchangeably refers to all of these as educational technology (Addawood, 1991; Al-Oteawi, 2002; Alfahad, 2012; Algahtani, 2017; Aljabre, 2012; Almuqayteeb, 2009; Alruwaili, 2014; Karkouti, 2016; Sahin, 2008).

The higher education and educational technology literature within the Arab states have been increasing in the 21st century (Al Saif, 2005; Alkraiji & Eidaroos, 2016). Educational leaders have called upon those vested with oversight of the curriculum to utilize and integrate educational technology into their methods of learning and teaching (Alajmi, 2010; Alfahad, 2012; Almobarraz, 2007). More specifically, educational technologies have become an integral part of the teaching and learning processes (Al Senaidi, 2009; Almuqayteeb, 2009), particularly within Saudi Arabian institutions of higher education. Entering the information age, Saudi Arabian postsecondary institutions faced the requisite challenges to advance technological tools (Alkraiji & Eidaroos, 2016; Alnujaidi, 2008) to prepare and equip students with the needed knowledge and skills to compete in the global economy (Almobarraz, 2007; Almuqayteeb, 2009; Badry & Willoughby, 2015). Spector (2014) maintained that there were particular challenges regarding the

"effective use of new technologies while preparing students for productive lives in the 21st century" (p. 5), particularly given "the expectations of a technologically advancing society" and the need for "aggressive IT utilization" which is viewed as "an indicator of a progressive institution" (Alfahad, 2012, p. 1268) within the Arab states.

As such, the Saudi government has made efforts to encourage the use of Information Technology (IT) and allied technologies among faculty and students (R. Alebaikan & Troudi, 2010). According to R. Alebaikan and Troudi (2010), "Projects are continuously being developed to provide adequate IT infrastructure as well as content development for higher education students" (p. 49). An example of new technology use at the university level was the formation of the National Centre for E-Learning and Distance Learning (Alenezi, 2012). Saudi universities have e-learning and distance learning departments that are "responsible for promoting and preparing faculty members for technology integration" (Bajabaa, 2017, p. 167). According to Al Saif (2005), the Saudi Ministry of Education recently implemented distance education programs in 36 women's colleges to "support regular classroom instruction or to serve an alternative approach in other cases" (p. 2). This provides new avenues for technology scholarship in single-sex postsecondary institutions.

Technology studies (Al Saif, 2005; Alajmi, 2010; Albalawi, 2007; Almuqayteeb, 2009) within higher education institutions in Saudi Arabia have shown that female faculty members demonstrate positive attitudes towards using educational technology. According to Alnujaidi (2008), "web-based technologies have not yet been successfully adopted and integrated by faculty members in their teaching process in the Saudi higher education institutions" (p. 56). Moreover, research on educational technology in the Kingdom of Saudi Arabia (KSA) has indicated that despite the importance and usefulness of educational technology as an instructional tool, female faculty tend to use it more for personal needs than academic purposes (Al-Asmari, 2005; Almuqayteeb, 2009). Almobarraz (2007) maintained that despite educational technologies becoming a popular learning and instruction tool in the educational environments, "there is still no evidence of the nature and intention of that adoption" (p. 3).

These contradictions may be due to many factors, such as attitudes and perceptions towards such technology, support, training, time, access, and policies, and may be amplified by the gender-specific educational system within Saudi Arabia. According to Al Saif (2005), this might be explained by the level of access to the resources available for female faculty as opposed to the male faculty. Alshahri (2015) stated that the Saudi gender-specific system, where females and males operate in completely separate buildings, "puts considerable strain on available resources" (p. 72). Al Saif (2005) contended that "access to technology is more readily available to males than females in the society in general and within the University in particular" (p. 71). This statement can be applied to the Saudi Arabian context, specifically where "these faculty members are operating in a male dominated society" (p. 71). The purpose of this qualitative, exploratory, single-case study was to examine female faculty's reports regarding the diffusion of educational technology as an innovative instructional tool in a single-sex, postsecondary education institution located within Saudi Arabia.

**Study Context**

Saudi Arabia is a conservative society influenced by "Islamic values and prevailing Saudi societal constraints" (Hakami, 2015, p. 3). As such, the cultural practice of gender segregation has been and is required at all levels of education (Albalawi, 2007; Almuqayteeb, 2009; Hakami, 2015; Smith & Abouammoh, 2013). Alshahri (2015) stated, "It is obvious how the gender-divided system prevents women from having better educational opportunities" (p. 23). Women's education in Saudi Arabia has been undergoing gradual improvements since its inception in 1960, which marked the beginning of formal education for girls. However, the pace of reform for women's higher education has been slow due to social and traditional norms (Alkhazim, 2003; Metz, 1993). Prior to 1960, women's public education was met with opposition from religious scholars as well as non-scholars in some parts of the country (Hamdan, 2005; Metz, 1993). Metz (1993) explained that "nonreligious education was viewed as useless, if not actually dangerous, for girls" (p. 97). Women's education was put under the General Presidency of Girls (GPFE),

which was controlled and supervised by religious authorities from 1960 until 2002 to ensure that women's education did not deviate from its original goal (Hamdan, 2005; House, 2012).

Women's public education lagged nine years behind men's education. This can be seen in the extensive 1951 program for public-funded secondary schools for men, nine years before the women's initiative began in 1960. Due to the KSA's policy of gender segregation, females are allowed to be taught by either female instructors or male instructors on closed-circuit television (CCTV) (Al Saif, 2005; Alajmi, 2010; Almuqayteeb, 2009; Alruwaili, 2014). Saudi researchers suggesed that the shortage of female staff members in various academic majors led to the introduction of the CCTV technology into girls' colleges and universities (Addawood, 1991; Alruwaili, 2014).

The gender-specific educational system has put women at a disadvantage. Under this model of girls' education, schools did not teach computer literacy (Al-Oteawi, 2002). In 1985, boys were introduced to a general computer curriculum in high schools (Al-Oteawi, 2002). For females, the teaching of computer literacy started in some high schools in 1999 (Al-Oteawi, 2002). This indicates a fourteen-year delay in the introduction of educational technology for female students which has contributed to inequities in educational technology for females. In 2002, the General Presidency for Girls' Education was moved under the Ministry of Education, which was and continues to be responsible for male education. This step may have been an effort to provide males and females with quality education, thus explaining why educational technology is considered an innovation for female faculty but not their male counterparts.

Cultural aspects of the KSA, as well as the policy of gender segregation, may have influenced female faculty's perception and acceptance of educational technology.

## Statement of the Problem

Members within the Saudi Ministry of Education have sought to improve instruction via technology by having educational institutions advance technological tools across all levels (R. Alebaikan & Troudi, 2010), including within postsecondary classrooms. Leaders within the Saudi ministry of higher education "encourage the use of information technology (IT) for teaching and learning among its faculties and students" (R. Alebaikan & Troudi, 2010, p. 49). Educational technology usage in the Arab states offers specific opportunities for higher education institutions, including the potential to improve the quality of education, enhance student outcomes, facilitate access to learning opportunities, facilitate learning and teaching and improve productivity (Al Saif, 2005; Alajmi, 2010; Alfahad, 2012; Almobarraz, 2007; Almuqayteeb, 2009; Bajabaa, 2017; Massy & Zemsky, 1995), if it is adopted effectively and efficiently in the classroom.

However, according to Alshahri (2015), "the potential instructional, cultural and institutional benefits of these ICT tools cannot be realized unless faculty use them" (p. 73). Moreover, Alshangeeti, Alsaghier, and Nguyen (2009) suggested that "there is a risk that this opportunity may not be realized if faculty members are not inclined to adopt the relevant information and communication technologies (ICT)" (p.1). Research has shown that faculty perceptions and attitudes regarding technology and the integration of technology in the classroom can play a critical role in its rejection or adoption as a teaching tool, affecting the successful diffusion of educational technology (Al Gamdi & Samarji, 2016; Al Saif, 2005; Albalwi, 2008; Albirini, 2006; Alkhalaf, Drew, AlGhamdi, & Alfarraj, 2012; Sahin, 2006).

Limited research exists regarding faculty members' willingness to adopt technological tools in general, female faculty members' willingness regarding its usage in particular, and even less regarding their reports on the diffusion of technology. In Saudi Arabia, faculty members represent the primary decision makers regarding the use and integration of technology into instruction (Almuqayteeb, 2009). It has been found that female faculty members are not using educational technology as an instructional tool despite its potential to enhance teaching performance (Al-Asmari, 2005; Almuqayteeb, 2009). Early studies regarding educational technology adoption

maintain that Saudi faculty members may be in the early stages of adopting technology for instructional purposes (Albalwi, 2008; Al-Fulih, 2002; Allehaibi, 2001; Alnujaidi, 2008; Kamal, 2013; Omar, 2016). Moukali (2012), using Rogers' (2003) framework, reported that female faculty were less likely to adopt blended learning. This indicates that female faculty may be at an initial implementation stage whereas male faculty were within reach of what he labels the confirmation stage. Al Saif (2005) indicated that female faculty held more positive attitudes toward internet- and web-based instruction, whereas male faculty were more likely to use and integrate such technology for instructional purposes than their female counterparts. J. M. Moore (2007) emphasized that "instructors are the key to the diffusion of any innovation in the classroom, and if their perception level of the attributes of an innovation is defined, questions answered, and their needs met, the innovation will be adopted and used at a faster rate" (p. 21).

Research on faculty perception and attitude toward educational technology in Saudi Arabia and the Middle East has focused on three main areas (Alshangeeti et al., 2009). Studies have been conducted regarding the barriers that affect the adoption of educational technology as perceived by faculty members (Al Gamdi & Samarji, 2016; Alajmi, 2010; Al-Alwani, 2005; Almuqayteeb, 2009). Other research has focused on factors that motivate or inhibit the effective implementation of educational technology (Al Saif, 2005; Al Senaidi, 2009; Albalawi, 2007; Albalwi, 2008; Al-Fulih, 2002; Algahtani, 2017; Al-Kahtani & Al-Haider, 2010; Bajabaa, 2017; Karkouti, 2016) or on faculty's perceptions of and attitudes toward educational technology (Albirini, 2006; Aldossry, 2011; Alenezi, 2012; Al-Harbi, 2016; Alkhalaf et al., 2012; Al-Oteawi, 2002). These studies are quantitative. Existing studies have focused on the K-12 educational system (Abdelmagid, 2011; Al-Alwani, 2005; Al-Ammari, 2004; Aldossry, 2011; Almekhlafi & Almeqdadi, 2010; Al-Mohaissin, 1993; Alsharari, 2016; Alsulaimani, 2012) as opposed to a higher education setting. Limited, qualitative research examines female faculty members' perceptions regarding attributes of educational technology within the Saudi Arabian context, and thus, this qualitative, single-case study seeks to examine what female faculty members report regarding the diffusion of educational technology as an instructional tool in a single-sex,

postsecondary education institution in Saudi Arabia.

## Overview of the Review of Literature

Three themes emerged from the literature regarding this research on female faculty members reports regarding the diffusion of educational technology as an innovative instructional tool in a single-sex, postsecondary education institution in Saudi Arabia. Books, peer-reviewed papers and empirical studies that examined faculty members' use and integration of educational technology at various universities throughout Saudi Arabia were used to develop this section. The first component of the literature review explores female education, including higher education and technology use in Saudi Arabian single-sex, higher education institutions. The motivating and inhibiting factors that influence the adoption and integration of technology in the postsecondary classroom will comprise the second component of the literature review. The third component examines Rogers' (2003) theory of diffusion of innovation, focusing specifically on the perceived attributes of innovation.

### Technology Integration within a Single-Sex Institution

The literature on women's education in Saudi higher education revealed improvements in women's education (El-Sanabary, 1994). The Saudi government expanded access to higher education for all Saudi citizens, including females, and created various initiatives to support women's education. The establishment of Princess Noura Bint Abdul Rahman University (PNU), (Smith & Abouammoh, 2013) was an initial attempt at supporting women's education. Princess Johara Bent Fahad Al Saud is the Director of PNU, making her the first Saudi woman to hold such a high-level educational position in Saudi Arabia (Jamjoom & Kelly, 2013). Such educational advancement for women provided a pathway for female scholars.

The government initiated the King Abdullah Scholarship Program (KASP), which was introduced in 2005 to encourage women to pursue higher education degrees and complete their advanced education outside of Saudi Arabia in countries such the USA, United Kingdom, Canada, Australia, Egypt and Jordan (Smith & Abouammoh, 2013). Today, female students

represent approximately one-fifth of the total number of students studying abroad (Smith & Abouammoh, 2013). This may have been the result of a five-year plan implemented by the Saudi government. This is currently in operation today and came about in stages.

Historically, the fourth educational development plan (1985-1990) brought remarkable change to the Saudi education system with the inception of the General Administration for Educational Technology (GAET) in 1985 (Almuqayteeb, 2009; Alqarni, 2015). GAET'S responsibilities, according to Almuqayteeb (2009), ranged from "the development of educational materials, supplying classrooms with educational technology, and training staff at the Ministry of Education in the use of educational technology" (p. 16). Realizing the potential benefits that technologies could bring to the learning and teaching process, the Saudi government was determined to implement educational technology at the K-12 and university levels (Alqarni, 2015). The Ministry of Education's expenditure on developing instructional media and materials, and also providing equipment, was approximately 281,658,489 SR equivalent to 75,108,930.40 U.S. dollars from 1976 to 1982 (Alqarni, 2015).

Combining women's education with computer technology, the Saudi government continues today their efforts to improve the educational system to ensure that all Saudi citizens are equipped with the needed skills and knowledge to compete and participate in the country's sophisticated economy. Efforts related to technology began in the early 1970s, when Saudi Arabia was entering a new era of development (Almuqayteeb, 2009). Computer literacy courses were introduced in high school as well as at the college level with the foundation of GAET (Almuqayteeb, 2009). For instance, at the college level, some Saudi universities such as King Fahad University and King Saud University required all students to take computer courses as a prerequisite for graduation (Almuqayteeb, 2009). Moreover, in 2000, the government launched a computer program which included teaching computer courses at all schools in Saudi Arabia (Almuqayteeb, 2009).

However, a gap existed between girls' and boys' education, and differences in curriculum can be seen at all levels of schooling for both boys and girls in the area of computer literacy at the secondary school level (Al-Oteawi, 2002). This indicates an initial gap in the technology curriculum for boys and girls in Saudi Arabia. This gap may have contributed to female faculty members' limited technology use. Thus, technology represents a newer innovation for female faculty members in single-sex institutions, making it essential to examine the diffusion of educational technology within single-sex, postsecondary institutions of Saudi higher education.

Scholars have noted that, in general, female faculty members had low levels of use and integration of low-order computer technologies in their instruction (Al-Asmari, 2005; Almuqayteeb, 2009). Researchers also noted that female faculty rarely used educational technology for academic purposes (Al-Asmari, 2005; Almuqayteeb, 2009). Scholars further observed that factors such as a lack of adequate training, equipment, and infrastructure influenced female faculty to refrain from adopting educational technology. A number of educational researchers have noted that examining the attributes of the diffusion of innovation across all institutions may also improve technology use in Saudi Arabia (Alruwaili, 2014; Rogers, 2003). Literature has confirmed the need for examining the diffusion of educational technology as an instructional tool within single-sex institutions in Saudi Arabia.

**Factors Affect the Adoption of Technology**

Faculty members' efforts to integrate technology into their instruction have been limited by external (First Order) and internal (Second Order) barriers (Ertmer, 1999). Barriers can be classified as external, relating to issues in equipment, time, access, training and support, while internal barriers are related to the teachers themselves, such as their beliefs, attitudes, and perceptions about employing technology in teaching and learning (Ertmer, 1999). Research has been conducted to examine these factors at various universities throughout Saudi Arabia (Al Gamdi & Samarji, 2016; Algahtani, 2017; Almuqayteeb, 2009; Alnujaidi, 2008; Bousbahi & Alrazgan, 2015; El Zawaidy, 2014; Hamdan, 2014; Moukali, 2012; Quadri, Muhammed,

Sanober, Qureshi, & Shah, 2017).

Instructors' attitudes, beliefs, and perceptions towards technology have been found to be a critical factor in determining whether or not they will adopt instructional technology (Al Gamdi & Samarji, 2016). Kerr (1996) emphasized that internal barriers related to instructors were more difficult to eliminate than external barriers. Instructors' attitudes towards technology correlated with technology adoption; that is, faculty with positive attitudes toward technology employed it as part of their teaching practices as opposed to faculty who held more negative stances (Al Gamdi & Samarji, 2016; Asiri, Mahmud, Bakar, & Ayub, 2012).

Rogers (2003) noted that "the perceived attributes of innovation are one important explanation of the rate of adoption of innovation" (p. 221). The principle of perceived attributes is that potential adopters judge an innovation based on their perceptions regarding five characteristics of the innovation under consideration. These include: relative advantage, compatibility, complexity, trialability, and observability. Faculty who were more likely to adopt educational technology into their instruction perceived that technology added value to their everyday practice (Almuqayteeb, 2009). They saw technology as consistent with their own and their students' needs (Asiri et al., 2012), and viewed technology as not difficult and easy to use (Alshammari, Ali, & Rosli, 2016) if they had adequate time to try, learn, and work with the new technology before embedding it (Abdelmagid, 2011).

Research on external factors revealed that the main factors that inhibited faculty adoption of instructional technology were: a lack of technical and institutional support regarding adequate training and development (Al-Harbi, 2016; Al-Judi, 2011; Almuqayteeb, 2009; Hamdan, 2014; Moukali, 2012; Quadri et al., 2017); poor availability of equipment and resources (Algahtani, 2017; Al-Harbi, 2016; Moukali, 2012); and lack of robust infrastructure (El Zawaidy, 2014; Hakami, 2015). Scholars noted that identifying and eliminating these factors could encourage faculty to more effectively integrate technology into their higher education classrooms (Almuqayteeb, 2009; Hoerup, 2001). Examining technology according to Rogers' lens has the potential to provide insight into what female faculty report regarding the diffusion of technology

as an innovation.

## Conceptual Framework

Rogers' (2003) diffusion of innovation theory guided the data collection and analysis for this study. Rogers' model was designed to gain a greater understanding of the process of adopting new innovations. This study focused specifically on the perceived attributes of innovation. The model has its roots in the late 1950s in the field of agricultural innovation (Al Senaidi, 2009; Alajmi, 2010; Al-Fulih, 2002). Over the last thirty years, Rogers theory has been applied as a conceptual framework to a wide variety of disciplines such as community culture (Cooper & Wolfe, 2005; Hashem & Tann, 2007; Koz, 2014; Mudalier, 2002); the business arena (Aljabre, 2012; Bhattacharya, 2015; Gerrard & Barton Cunningham, 2003; Hsu, 2016; Lee, Kwon, & Schumann, 2005); and education (Archambault, 2016; Doyle, Garrett, & Currie, 2014; Juergens, 2012; Wlodarczyk Hickey, 2011). Rogers' work is considered to be "the most appropriate for investigating the adoption of technology in higher education and educational environments" (Sahin, 2006, p.14).

A key concept of Rogers' model is diffusion. Diffusion is "a special type of communication," which is defined as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 5). Rogers identified four main elements found in every diffusion: the innovation, communication channels, time, and the social system, all of which played a critical role in influencing the rate of adoption.

An innovation is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 11). Rogers explained that "if an idea seems new to the individual, it is an innovation" (p. 12). For Rogers, technological innovation has two components, namely an aspect of hardware and software. While hardware refers to "the tool that embodies the technology as material or physical objects," software refers to "the information base for the tool" (p. 13).

Communication channels were the second important element in the diffusion of innovations process. Rogers defined the communication channel as "the process by which participants create and share information with one another in order to reach a mutual understanding" (p. 18). Rogers emphasized that the core of the diffusion process lies in the information exchange when members "create and share information with one another in order to reach a mutual understanding" (p. 5). In other words, one individual passed along a new idea to one or several others. This process included: "(1) an innovation, (2) an individual or other unit of adoption that has knowledge of, or experience with using, the innovation, (3) another individual or other unit that does not yet have knowledge of the innovation, and (4) a communication channel connecting the two units" (Rogers, 2003, p. 18).

According to Rogers (2003), two types of communication channels were used to deliver information concerns: mass media and interpersonal channels. Mass media channels occurred through such mediums as the TV, radio, or newspaper. Interpersonal channels occurred through face-to-face exchanges between two or more individuals. Mass medium was an effective way of reaching a large audience but may not be as persuasive as interpersonal channels. Rogers (2003) suggested that more effective communication occurred through interpersonal channels especially if these channels connected individuals who were near-peers (p. 18). Thus, interpersonal channels may be a more powerful way of persuading an individual to adopt and accept a new idea or change strong attitudes. Rogers (2003) explained that "most individuals evaluate an innovation not on the basis of scientific research by experts, but through the subjective evaluations of near peers.... whose innovation behavior tends to be imitated by others in their system" (p. 36).

Time and social system were the last two elements in the diffusion of innovations process (Rogers, 2003). Rogers (2003) emphasized the importance of time in the diffusion process. This involved several factors:

> (a) the innovation-decision process by which an individual passes from first knowledge of an innovation through its adoption or rejection, (b) the innovativeness of an individual or other unit of adoption (that is, the relative earliness/lateness with

> which an innovation is adopted) compared with other members of a system, and (c) an innovation's rate of adoption in a system, usually measured as the number of members of the system who adopt the innovation in a given time period. (p. 20)

These occurred within a social system, which Rogers defined as "a set of interrelated units that are engaged in joint problem solving to accomplish a common goal" (p. 23). For Rogers (1995), this element was considered critical as it directly aided in carrying out the diffusion of the innovation. Thus, the innovation should be designed in such a way that it fits the social structure, especially of the intended users. In other words, when the innovation aligned itself with the social set-up, the diffusion may be easier and faster.

Rogers (2003) suggested that there were five attributes of innovation that influenced the rate of adoption. Individual perceptions of these five attributes or characteristics included: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability predict the rate of adoption. For an adoption process to be successful, the users will judged innovation based on their initial perception (Rogers, 1995). The potential adopter's perception of the innovation depended on these five characteristics, which determined whether the diffusion process would increase or decrease.

Relative advantage was "the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 2003, p. 229). He emphasized that "the greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is going to be" (p. 15). Sahin (2006) maintained that if the innovation helped users, the diffusion would be faster as has been largely the case for adopting educational technology tools in higher education institutions. For example, faculty members were motivated to use Blackboard in teaching online courses because of the perceived effectiveness it brought to teaching performance (Al-Harbi, 2016).

Compatibility referred to "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 240). Thus, when technology was perceived as jointly meeting faculty and student needs, both groups were likely to instructionally embrace it. Asiri et al. (2012) revealed that a faculty

learning management system (Jusur) was consistent with their own and students' needs in "saving time and effort," "enhane[ing] students' learning progress," and represented a "fast and efficient means of getting information" (p. 530).

Complexity referred to "the degree to which an innovation is perceived as difficult to understand and use" (Rogers, 2003, p. 257). Rogers maintained that when innovations were easy to use, as well as easy to integrate into any system, then the diffusion level would be higher in that "new ideas that are simpler to understand will be adopted more rapidly than innovations that require the adopter to develop new skills and understandings" (p. 15). According to Alshammari et al. (2016), individuals with weak computer self-efficacy (CSE) held negative attitudes toward the learning management system and viewed the system as "difficult to use" or "less useful" when compared to individuals who possessed strong CSE (p. 119).

Trialability referred to "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 258). Rogers explained that an innovation that can be tested and provided reliable and sufficient results would be adopted at a faster rate. For faculty to become effective users, they needed the time to learn, and work with the new technology to acquire the teaching and learning experience needed before embedding it as an integral part of instructional practice (Abdelmagid, 2011).

Observability was the last characteristic of innovation, and is defined as "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 258). According to Sahin (2006), individuals were more likely to adopt the innovation if the results were observable and efficient in light of speed of acquisition and functionality.

These characteristics of innovation are essential to understanding and explaining the rate of adoption, because "Innovations that are perceived by receivers as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations" (Rogers, 2003, p. 16). Thus, these characteristics of innovations are important to take into consideration to increase the rate of diffusion of innovation. A summary of the model components and each is explained next in Table 1.

Table 1

*Summary of Rogers' (2003) Diffusion of Innovation Conceptual Model*

| Component | Description |
|---|---|
| Innovation | An idea, practice, or object that is perceived as new by an individual or other unit of adoption. |
| Communication Channels | The means by which messages get from one individual to another. |
| Time | The time dimensions involve: (a) the innovation-decision process, (b) the innovativeness of an individual or other unit of adoption compared with other members of a system, and (c) an innovation's rate of adoption in a system. |
| Social System | A set of interrelated units that are engaged in joint problem solving to accomplish a common goal. |
| Attributes of Innovations | The five characteristics influence the rate of the adoption of innovations (Rogers, 2003): relative advantage, compatibility, complexity, trialability, and observability. |
| Relative Advantage | The degree to which an innovation is perceived as being better than the idea it supersedes. |
| Compatibility | The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. |
| Complexity | The degree to which an innovation is perceived as relatively difficult to understand and use. |
| Trialability | The degree to which an innovation may be experimented with on a limited basis. |

| | |
|---|---|
| Observability | The degree to which the results of an innovation are visible to others. |

## Research Questions

The research questions were derived from Rogers's (2003), diffusion of innovation theory, and specifically address Saudi Arabian female faculty members' reports on the diffusion of educational technology into their instruction. Rogers's theory acts as the conceptual framework that provided the lens through which the data was collected and analyzed. The main research question for this study concerns female faculty members' reports regarding the diffusion of educational technology into their instructions. There were five sub-questions:

1. What do female faculty members report regarding the relative advantage of incorporating educational technology in their instruction?
2. What do female faculty members report regarding the compatibility of incorporating technology in their instruction?
3. What do female faculty members report regarding the complexity of incorporating technology in their instruction?
4. What do female faculty members report regarding the trialability of incorporating technology in their instruction?
5. What do female faculty member report regarding the observability of incorporating technology in their instruction?

## Definitions of Terms

The following table contains definitions of key terms applied in this study.

Table 2

*Definition of Terms*

| Term | Definition |
|---|---|
| Adoption | A decision to make full use of an innovation as the best course of action available (Rogers, 2003, p. 21). |
| Diffusion | The process in which an innovation is communicated through certain channels over time between the members of a social system (Rogers, 2003, p. 5). |
| Innovation | An idea, practice, or object that is perceived as new by an individual or other unit of adoption (Rogers, 2003, p. 11). |
| Educational Technology | Any hardware and software based technologies, such as computers and other applications that can be used for educational purposes. |
| Information and Communication Technology (ICT) | The electronic and non- electronic technologies and infrastructure systems used to create, store, manipulate, retrieve, and communicate or disseminate information (Alshahri, 2015). |
| Ministry of Education | An organization that is responsible for the development and fulfillment of the strategy for K-12 (boys) education (Almobarraz, 2007). |
| Presidency of Girls' Education | An organization that is responsible for the development and fulfillment of the strategy for K-12 (girls) education (Almobarraz, 2007). |

| | |
|---|---|
| Faculty | Instructors teaching undergraduate or graduate level courses at higher education institutions including professor, associate professor, assistant professor, lecturer, and graduate teacher assistant (Bajabaa, 2017). |
| Relative Advantage | The degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 2003, p. 229). |
| Compatibility | The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 2003, p. 240). |
| Complexity | The degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 2003, p. 257). |
| Trialability | The degree to which an innovation may be experimented with on a limited basis (Rogers, 2003, p. 258). |
| Observability | The degree to which the results of an innovation are visible to others (Rogers, 2003, p. 258). |

## Research Design and Methodology

This research was designed as an exploratory, qualitative, single-case study. The case study design is the most appropriate when examining a phenomenon in depth (J. W. Creswell & Creswell, 2017; J. W. Creswell & Inquiry, 2007; Yin, 2009). One of the fundamental aspects of the case study approach was that it allowed the researcher to develop insights,discover and interpret a situation rather than test a hypothesis (Merriam & Tisdell, 2015). Case studies allow the researcher an avenue which "explores in depth a program, an event, an activity, a processor, or one or more individuals" (J. W. Creswell & Creswell, 2017, p. 14). Cases are "bounded by time and activity" in which the researcher collects detailed, in-depth data by interviewing subjects as well as other forms of data collection (J. W. Creswell & Inquiry, 2007; Yin, 1994).

The boundaries in this study were defined by a number of limiting factors: time, individuals, and the context within which the study took place. This study took place in a midsize, single-sex, postsecondary education institution in northern Saudi Arabia in an attempt to better understand female faculty members' perceptions of the diffusion of educational technology as an instructional tool. The site was purposefully selected because it is the only public postsecondary institution that allowed for questions to be collectively answered (J. W. Creswell & Inquiry, 2007).

Female faculty members represented the target population for this study. Cultural constraints limit the interaction between males and females due to gender segregation in schools and universities in Saudi Arabia. The sample for this study was purposefully selected using a snowballing sample approach. The researcher sought help from the department chair, who suggested potential female faculty members who might be willing to participate in the study and be interviewed. The number of participants was fifteen full-time female faculty members from the education department. Given the scarcity of full-time faculty members, part-time faculty members who met the sampling criteria for the study were included.

Data collection for this study involved semi-structured, in-depth, in-person interviews. The interviews were conducted by the researcher with female faculty at a midsize, single-sex, postsecondary education institution in Saudi Arabia, and were expected to last between 45 and 60 minutes. The interview questions were researcher-developed and based on both the survey instrument developed by G. C. Moore and Benbasat (1991) and based on Rogers' (2003) theoretical framework. Interviews were audiotaped, transcribed, and coded to answer the research questions.

## Significance of the Study

Female faculty and their integration of technology into their instruction has thus far been understudied. Existing studies have focused on the K-12 educational system (Abdelmagid, 2011; Al-Alwani, 2005; Al-Ammari, 2004; Almekhlafi & Almeqdadi, 2010; Al-Mohaissin, 1993;

Alsharari, 2016; Alsulaimani, 2012) as opposed to a higher education setting. This study employed Rogers' (2003) theoretical framework as a conceptual framework and used a qualitative methodology.

Many studies have employed quantitative research methods (Al Senaidi, 2009; Alajmi, 2010; Alhawiti, 2011; Almobarraz, 2007; Alnujaidi, 2008; Alshangeeti et al., 2009; Moukali, 2012). While researchers have conducted quantitative studies regarding the barriers to educational technology in the Middle East and Saudi Arabia (Al Senaidi, 2009; Alajmi, 2010; Al-Harbi, 2016; Alhawiti, 2011; Moukali, 2012; Qudais, Al-Adhaileh, & Al-Omari, 2010) there is a lack of qualitative research on what female faculty report regarding the diffusion of educational technology into their instruction. This study is intends to fill the gap in the literature by providing insight on female faculty members in Saudi Arabia. Findings from this research can provide administrative leaders and policymakers in Saudi Arabia with information regarding what female faculty members report on the diffusion of educational technologies as instructional tools. This research might lend insights into the barriers, as well as determine strategies, to encourage female faculty to integrate technology into their classrooms. Finally, this study has the potential to help educational leaders within single-sex institutions in Saudi Arabia determine the level of appropriate resources and support needed for faculty professional development opportunities, spread awareness regarding the importance of educational technology as an instructional tool, and provide an argument for the technological resourcing of single-sex institutions.

## Organization of the Dissertation

This dissertation was organized into five chapters. Chapter 1 provides detail on the context of the study, a statement of the problem, the guiding conceptual framework, the research questions, the definition of terms, and the significance of the study.

Chapter 2 includes a review of the literature related to technology use and integration in higher education within a single-sex institution, research on educational technology in higher education and factors that influence the adoption and integration of technology in the

postsecondary classroom. It also contains a review of Rogers (2003) theory of diffusion of innovation and research; this model has been employed as a framework in a worldwide context.

Chapter 3 presents the study design and the research methodology. It provides a detailed description of the sampled population, the validity and reliability of the research design, the instrumentation, data collection and analysis procedures, the procedures that will be followed for the protection of human subjects, and finally the limitations of the study.

Chapter 4 presents a brief overview of the study design and methodology, a description of the study participants, and the findings of the in-person interviews. It also contains a discussion for each finding.

Chapter 5 presents a summary of the study including the problem statement, conceptual framework, research questions, and a summary of the findings. It also contains the conclusions derived from the findings, followed by recommendations for practice and future research.

# CHAPTER 2: LITERATURE REVIEW

## Introduction to the Chapter

Members of the Saudi Ministry of Education have sought to improve technology-driven instruction by advancing technology across all levels of education (R. Alebaikan & Troudi, 2010), including within higher education classrooms. Within single-sex institutions, faculty members in general, and female faculty members in particular, have been called upon to integrate instructional technology into their curriculum. Although quantitative studies exist regarding technological barriers in male institutions (Alajmi, 2010; Al-Harbi, 2016; Alhawiti, 2011; Alnujaidi, 2008; Alshangeeti et al., 2009; Moukali, 2012), limited qualitative research has been done regarding the reports of female faculty members on the attributes of educational technology . Thus, this study will examine what female faculty members report regarding the diffusion of technology within single-sex, postsecondary educational institutions in Saudi Arabia. Given the innovative nature of technology adoption, this research will employ the conceptual framework of diffusion of innovation advanced by Rogers (2003). This chapter begins with (a) technology use in Saudi Arabian higher education within single-sex institutions, (b) barriers and facilitators that influence the adoption and integration of technology in the postsecondary classroom, and (c) a review of Rogers model of diffusion of innovation.

## Technology Use and Integration in Saudi Arabian Higher Education

### Saudi Arabia: Country Profile

Saudi Arabia is formally known as the Kingdom of Saudi Arabia (KSA), founded by King Abdul-Aziz Bin Saud in 1902. It is the largest Islamic state in the Arabian Peninsula and "custodian of the Two Holy Mosques" (Henderson, 2011, p. 546). the two holiest places in Islam Al-Masjid al-Haram and Al-Masjid an-Nabawi. Arabic is the country's official language; English is widely spoken in urban areas. Saudi Arabia is bordered by eight countries and three bodies of water, which include: Jorden, Iraq, and Kuwait on the north; Oman and Yemen on the south;

Qatar, Bahrain and United Arab Emirates on the east; and the Gulf of Aqaba, the Red Sea and Persian Gulf on the west (Metz, 1993). A unique aspect distinguishes Saudi Arabia from its neighboring countries that is "Saudi Arabia has never been under the direct control of a European power" (p. 4). The country has a total population of approximately 43.2 million, including nearly 31.7 million Saudi citizens and 11.5 million foreign workers from third world countries. Modern-day Saudi Arabia is 118 governorates and within these governorates are 13 regions with a "centralized government, planning, and financial system" (Alkhazim, 2003, p. 480). Riyadh is the capital and considered the largest city and the most densely populated area in Saudi Arabia.

For many years, Saudi Arabia has been the world's proven oil reserves (260 billion barrels) making it the world's largest producer and exporter of oil (Burt, Crawford, & Arcand, 2012). Because of this, Saudi Arabia is a member of the political and economic union Cooperation Council for the Arab States of the Gulf (CCG) that takes place every year in Riyadh with other countries such as Bahrain, Kuwait, Oman, Qatar, and the United Arab Emirates. Oil is the primary source of income in Saudi Arabia, accounting for more than 90% of national income (Alkhazim, 2003), oil revenues have been generated which aid in promoting the country's socioeconomic and political development.

The government strived to transform "a basic agricultural society into a regional and global economic power with a modern infrastructure" (*Country Information-Economy and Global Trade*, 2017). Since the discovery of oil, the country has undergone major transformations in many areas; they have built modern infrastructure and improved education and health care systems. According to Alkhazim (2003), Saudi Arabia has invested approximately 900 billion dollars (US) in its infrastructure. The government realized the importance of education in the country's socioeconomic and political development and established the Ministry of Education in 1954, followed by the Ministry of Higher Education in 1975, with the goal of making education "open to all citizens, and provides students with free education" (*Country Information-Education*, 2017).

**Background on Education System in Saudi Arabia**

Education in Saudi Arabia has witnessed astonishing improvements, particularly for women. In the late eighteenth century, education in Saudi Arabia took the form of Islamic education with the aim to "ensure that the believer would understand God's laws and live his or her life in accordance with them" , "classes for reading and memorizing the Quran along with selections from the hadith were sponsored in towns and villages throughout the peninsula" (Metz, 1993, p. 96). Gender segregation was required at all levels of education (Alhujaylan, 2014) with some exceptions such as kindergarten, nursery schools, a few private elementary schools, and medical schools in universities (Smith & Abouammoh, 2013). According to Metz (1993), education in Saudi Arabia began in the kuttab, with "a class of Quran recitation for children " at the hands of a "professional Quran reader" where boys were taught at the mosque by a male educator known as a shayk and girls received private lessons at home by a female referred to as shaykhah (p. 96). However, during that period, education was available only to very few, most of whom were from wealthy families living in major cities (*Country Information-Education*, 2017). In the nineteenth century, subjects such as arithmetic, foreign language, and Arabic reading were introduced in addition to kuttab schools, based on Quran recitation (Metz, 1993).

Although the government launched an extensive program for public-funded secondary schools in 1951, girls' public schooling did not begin until 1960. and it was met with opposition. According to Metz (1993), "nonreligious education was viewed as useless, if not actually dangerous, for girls" (p. 97). This was reflected in the low ratio of females to males, where girls represented only two percent compared to 22 percent for boys at that time (Metz, 1993).

Broadly, education in Saudi Arabia at all levels is based on Islamic roots with the objectives of "belief in the One God, Islam as the way of life, and Muhammad as God's Messenger" (Metz, 1993, p. 98). Education for women is no exception, where the goal of education as provided in official policy was ideologically associated with religion (Metz, 1993). According to Metz (1993), "The purpose of educating a girl is to bring her up in a proper Islamic way so as to perform her duty in life, be an ideal and successful housewife and a good mother, ready to do

things which suit her nature such as teaching, nursing and medical treatment" (p. 98). To ensure that women's education did not deviate from its original goal (Hamdan, 2005), girls' education was put under the General Presidency of Girls (GPG) which was controlled and supervised by religious authorities from its inception in 1960 until 2002 (House, 2012). In 2002, the General Presidency for Girls Education was dissolved and girls' education was moved under the Ministry of Education which already oversaw boys' education.

Public education is supported by the government and is free from K to 12 through the college level for all Saudi citizens (R. A. Alebaikan, 2010). According to Onsman (2011), "the public education system provides students with free education, books, and health services" (p. 521). Moreover, students at the college level receive monthly stipends to help them pay expenses (Alhujaylan, 2014). The Saudi government invests enormously in the education sector, allocating about 26% of its national budget there (Onsman, 2011).

**Higher Education System in Saudi Arabia**

Higher education in Saudi Arabia has a short history (Onsman, 2011). In its formal sense, it dates back to the 1950s with the inception of the first Ministry of Education in 1953 (Bashshur, 2004). Established in 1957, Riyadh University, which is considered the "mother university" as well as the first higher education institution in the whole Gulf region, was renamed King Saud University (KSU) at a later time (Bashshur, 2004). Researchers maintained that many of the universities in Saudi Arabia, those established after 1975, were amalgamations of pre-existing colleges (R. A. Alebaikan, 2010; Onsman, 2011). For instance, 23 girls' colleges unified under Riyadh Women's University, renamed later as Princess Nora bint Abdulrahman University (PNU) (Jamjoom & Kelly, 2013).

During that period, higher education in Saudi Arabia witnessed growth particularly, in the number of higher education institutions. Six universities founded after King Saud University were, in order, The Islamic University in 1961, King Fahd University for Petroleum and Minerals in 1963, King Abdul-Aziz University in 1967, Um Al-Qura University in 1949, Imam

Muhammad Bin Saud Islamic University in 1974 and King Faisal University in 1975 (Alamri, 2011). This increase created an urgency to establish the Ministry of Higher Education with the responsibility of "planning, coordinating and supervising the higher education system in Saudi Arabia" (Smith & Abouammoh, 2013, p. 3). In 1980, the General Organization for Technical Education and Vocational Training (GOTEVOT) was founded with the primary responsibility to "coordinate and implement the Kingdom's manpower development plans and supervise all related training centers and institutes" (Saudi Arabian Cultural Mission to the USA, 2013).

Since 1960, women's education has undergone improvements. It is noteworthy that the Saudi government has paid special attention to developing women's education (Alhujaylan, 2014). The objective of the first development plan (19691975) as Jamjoom and Kelly (2013) stated was to "expand opportunities for female education at all levels from primary school to university, while taking more care to improve the quality of institutes of education and to upgrade the efficiency of their educational programmes" (p. 120). The pace for girls' higher education was slow mainly because of social and traditional norms; and it was not until the number of female secondary-level graduates exceeded that of males (Metz, 1993) that the first women's college of education was established in 1970 in Riyadh (Alhujaylan, 2014; Bashshur, 2004), "called Kulliyyat Al Banat, or the Girls' College" (Hamdan, 2005, p. 49).

The government's efforts led to the inauguration of various colleges for females seeking admission at higher education institutions. It's goal, as Al-Bassam (1984) stated, was mainly to "train Saudi teachers for intermediate and secondary girls schools" (p. 256). Since then, seven colleges of education were opened across the country; in order, these were the college of education in Jeddah (1974), the college of education in Makkah (1975), the institute of social sciences in Dammam (1979), the college of arts in Riyadh (1979), the college of education in Madinah (1981), the college of education in Boreida (1981) and the college of education in Abha (1981) (Al-Bassam, 1984). All of these institutions of higher education were four-year institutions which lead to bachelors degree and provided universitylevel education in many subjects such as Islamic Studies, Arabic Studies, English Geography, History, Home Economics,

Mathematical Sciences, Physics, and Education (Al-Bassam, 1984).

Many Saudi universities opened their doors to females as part-time students (Jamjoom & Kelly, 2013). King Saud University was the first university to have a campus for women offering subjects such as Arabic, English, Geography, and History. They recently added colleges for public administration, medicine, dentistry, nursing, and education. The University of King Abdulaziz and Imam Mohammad Bin Saud Islamic University (Jamjoom & Kelly, 2013) followed suit.

Princess Noura Bint Abdul Rahman University (PNU) was the most notable initiative that the Saudi government took towards supporting women's education. Today, PNU represents the first female-only university in Saudi Arabia and the largest womens university in the world (Jamjoom & Kelly, 2013). Princess Johara Bent Fahad Al Saud is the Director of PNU, making her the first Saudi woman to hold such a high-level educational position in Saudi Arabia (Jamjoom & Kelly, 2013). PNU was funded under the Ministry's umbrella; in 2010, the university received 238.8 million U.S. dollars (Alhujaylan, 2014) to relocate the campus to a new building in 2011 to accommodate 40,000 students and 12,000 staff (Smith & Abouammoh, 2013). According to Smith and Abouammoh (2013), PNU "has a 700-bed teaching hospital along with specialist research centers in information technology, nanotechnology, and bioscience" (p. 3).

Moreover, the government initiated the King Abdullah Scholarship Program (KASP), which was introduced in 2005 to encourage women to pursue higher education degrees and strive for advanced education outside Saudi Arabia in countries such as the USA, United Kingdom, Canada, Australia, Egypt and Jordan (Smith & Abouammoh, 2013). According to Smith and Abouammoh (2013), the Saudi Ministry of Economy and Planning reports 107,706 Saudi international students studying abroad in January 2011; female students represent approximately one-fifth of this total number (Smith & Abouammoh, 2013).

In reviewing the higher education system in Saudi Arabia, Smith and Abouammoh (2013) wrote:

> Four agencies have responsibility for the implementation of education policy: the Ministry of Education, with primary responsibility for elementary schools (years 1-6), intermediate schools (years 7-9) and male secondary schools (years- 10-12); the General Presidency of Girls Education, with primary responsibility for the segregated education of girls and women; the Ministry of Higher Education, with primary responsibility for universities; and the General Organization for Technical Education and Vocational Training, with primary responsibility for technical colleges and trade training (p. 2).

Realizing the importance of higher education institutions in building the countrys human capital, the Saudi government has expanded access to higher education to all Saudi citizens. Its effort has been reflected in the number of universities and colleges built during the past few years. Since the inception of the first Ministry of Education in 1953, the number of higher education institutions has been increased dramatically. Currently, there are 26 governmental universities (Ministry of Education, 2017), 26 private universities and colleges, 18 teachers colleges for men, 80 teachers colleges for women, 12 technical colleges, and 37 health colleges and institutes (Onsman, 2011). There were 757,770 students enrolled in Saudi universities and colleges, of which females represent 414,420which is more than half of the total number of students (Smith & Abouammoh, 2013). Women received 62% of bachelors' degrees; , only 25% pursue masters' and doctoral degrees in Saudi Arabia (Smith & Abouammoh, 2013).

**Technology Integration in Saudi Higher Education**

The Saudi government gave top priority to developing education, and its efforts have been translated into a series of a five-year plans that continue today. Each development plan comes with a set of goals, the most important of which is to improve as well as develop the quality of education through the use of technology. The fourth educational development plan (19851990)

brought remarkable change to the Saudi education system: The General Administration for Educational Technology (GAET) was established in 1985 (Almuqayteeb, 2009; Alqarni, 2015). Its responsibilities, as Almuqayteeb (2009) stated, were to range from "the development of educational materials, supplying classrooms with educational technology, and training staff at the Ministry of Education in the use of educational technology" (p. 16). Realizing the potential benefits that technologies can bring to the learning and teaching process, the Saudi government decided to implement educational technology at the K-12 and university levels (Alqarni, 2015). According to Alqarni (2015), the Ministry of Educations expenditures on developing instructional media, materials and providing equipment was approximately 281,658,489 SR equivalent to 75,108,930.40 U.S. dollars from 1976 to 1982.

The Saudi government continues its efforts to improve the educational system to ensure that Saudi manpower is equipped with the needed skills and knowledge to compete and participate in the country's sophisticated economy, which was especially important when Saudi Arabia was entering a new era of development in the early 1970s (Almuqayteeb, 2009; R. A. Alebaikan, 2010). Efforts related to technology began with the foundation of GAET when computer literacy courses were introduced in high schools as well as colleges (Almuqayteeb, 2009). In 2000, the government formally launched a program which included teaching computer courses at all schools in Saudi Arabia (Almuqayteeb, 2009). However, according to R. A. Alebaikan (2010), "in 2005 the Ministry of Education formally approved computer literacy to be taught at all public school levels, but this has not yet been implemented" (p. 25).

Under this model of girls' education, schools did not teach computer literacy (Al-Oteawi, 2002). In 1985, boys were introduced to a general computer curriculum in high schools . For females, the teaching of computer literacy started in some high schools in 1999 (Al-Oteawi, 2002). A gap existed between girls and boys education; differences in curriculum could be seen at all levels of schooling for boys and girls in computer literacy at the secondary school level (Al-Oteawi, 2002). Today, however, the curriculum used for girls and boys at all levels of precollege education is almost the same with one exception: boys are required to take physical

education while girls take home economics (Smith & Abouammoh, 2013).

At the college or university level, some Saudi universities such as King Fahad University and King Saud University provide introductory computer courses as a prerequisite for graduation for all students (Almuqayteeb, 2009). Additionally, the "Information and Communication Driving License (ICDL) program" was applied in the preparatory year at some universities such as King Saud University, Princess Nora bint Abdulrahman University, and University of Tabuk to equip students with "basic computer and internet skills to enhance learning" (R. A. Alebaikan, 2010, p. 26).

The Ministry of Education under the Saudi's government umbrella continues to encourage the use of Information Technology (IT) among faculty and students . According to R. Alebaikan and Troudi (2010), "Projects are continuously being developed to provide adequate IT infrastructure as well as content development for higher education students" (p. 49). An example of new technology use at the university level is the formation of the National Centre for E-Learning and Distance Learning (Alenezi, 2012). Saudi universities have e-learning and distance learning departments that are "responsible for promoting and preparing faculty members for technology integration" (Bajabaa, 2017, p. 167). Recently, higher education institution started to adopt Learning Management Systems, such as Blackboard, WebCT, and Tadarus (an Arabic version) to facilitate learning (R. A. Alebaikan, 2010). Al Saif (2005) maintained that the Saudi Ministry of Education recently implemented distance education programs in 36 women's colleges to "support regular classroom instruction or to serve an alternative approach in other cases" (p. 2).

The Saudi Embassy outlined three steps that the government took to improve the educational system. Such steps, they maintained, include: (1) providing high-quality training programs for teachers, (2) improving student assessment standards, and (3) increasing the use of educational technology (*Country Information-Education*, 2017).

Today, educational technologies have become an integral part of the teaching and learning processes in the higher education classroom. Thus, higher education institutions face the challenge of advancing technological tools (Alnujaidi, 2008). Spector (2014) maintained that "the challenge is to make effective use of new technologies while preparing students for productive lives in the 21st century" (p. 5). With this in mind, educators find themselves under pressure to integrate educational technologies into their instruction to equip student with the knowledge and skills necessary for college and career readiness in the 21st century. The body of literature indicated that despite the importance and usefulness of educational technology as an instructional tool, female faculty tend to use it more for personal needs than academic purposes (Al-Asmari, 2005; Almuqayteeb, 2009). Considering the various changes that have been made in Saudi girls' colleges to improve the use of computer technologies, it is essential to examine the diffusion of educational technology within single-sex, postsecondary institutions.

**Research on Educational Technology in single-sex Saudi Higher Education**

Research on educational technology in Saudi Arabia has focused on examining the barriers that affect the adoption of educational technology (Al Gamdi & Samarji, 2016; Alajmi, 2010; Al-Alwani, 2005; Almuqayteeb, 2009), the factors that motivate or inhibit the effective implementation of educational technology (Al Saif, 2005; Al Senaidi, 2009; Albalawi, 2007; Albalwi, 2008; Al-Fulih, 2002; Algahtani, 2017; Al-Kahtani & Al-Haider, 2010; Bajabaa, 2017), and faculty's perceptions and attitudes toward educational technology(Albirini, 2006; Aldossry, 2011; Alenezi, 2012; Al-Harbi, 2016; Alkhalaf et al., 2012; Al-Oteawi, 2002). Limited qualitative research examines female faculty members' perceptions of educational technology within Saudi Arabia (Al-Asmari, 2005; Almuqayteeb, 2009).

Al-Asmari (2005) conducted a study to investigate English as a foreign language in teachers' use of the Internet for instructional purposes at four colleges of technology in Riyadh, Abha, Jeddah, and Dammam. The findings revealed that EFL teachers rarely used the Internet for academic purposes. He also found that EFL teachers had a high level of Internet use and the most

frequently used Internet services were email and the World Wide Web. Al-Asmari concluded that a lack of training, a lack of Internet access and service, and a lack of computer infrastructure were three factors that influenced the low-level use of the Internet for instructional purpose.

In a similar study, Almuqayteeb (2009) examined the extent to which female faculty used computer technologies in their instruction and related professional activities at girls' colleges in Dammam and Jubail. The findings revealed that, in general, female faculty members had low levels of use and integration of computer technologies into their instruction. The most frequently used computer applications were e-mail, word processing, computers in general and the Internet. The results showed that female faculty never used more complicated computer applications such as web page creation programs or 3-D design programs. She also found that the extent of female faculty members professional use of computer technologies was to access information and research on best practices for teaching, to do administrative record keeping, and to communicate with colleagues and other professionals. The least frequent uses were to communicate with students outside of classroom hours, to post/share student work on the web, and to communicate with students parents. She concluded that the lack of technical support, lack of adequate training, and a lack of equipment and infrastructure inhibited the use of computer technologies as an instructional tool.

## Factors and Barriers Affecting the Adoption of Technology

Identifying and eliminating barriers that hinder implementation could encourage faculty to more effectively integrate technology into their higher education classrooms (Hoerup, 2001). Despite the usefulness of classroom technology, faculty members' efforts to integrate technology have been limited by external (First Order) and internal (Second-Order) barriers (Ertmer, 1999). First-order, or external, barriers relate to equipment, time, access, training and support; second-order, or internal, barriers are teachers' beliefs, attitudes and perceptions about employing technology in teaching and learning. Jones (2004) classifies barriers as being individual (teacher-level) and institutional (school-level).

## Internal Barriers

### Faculty Attitudes and Beliefs Towards Educational Technology

Faculty members are the major decision-makers regarding teaching practices and technology use. Faculty who believe technology adds value to their everyday practice tend to use it more. Al-Harbi (2016) revealed that faculty members are motivated to use Blackboard in teaching online courses because of the perceived effectiveness it brings to teaching performance. Moreover, when technology is perceived as jointly meeting faculty and student needs, faculty are likely to instructionally embrace it. Asiri et al. (2012) revealed that a faculty learning management system (Jusur) was consistent with their own and students' needs in "saving time and effort," "enhancing students' learning progress," and represented a "fast and efficient means of getting information." Moukali (2012) reported that faculty participation in blended learning was due to their perception that "blended learning improves students' and instructors' technological skills" (p. 99).

Prior studies have examined barriers and factors that affect faculty's adoption and integration of educational technology into higher education (Al Gamdi & Samarji, 2016; Algahtani, 2017; Almuqayteeb, 2009; Alnujaidi, 2008; El Zawaidy, 2014; Hamdan, 2014; Moukali, 2012; Quadri et al., 2017). Instructors' attitudes and beliefs toward technology are a critical factor in determining whether faculty adopt instructional technology or reject it (Al-Harbi, 2016; Almuqayteeb, 2009; Asiri et al., 2012; Moukali, 2012; Qudais et al., 2010). Kerr (1996) emphasized that internal barriers related to instructors are more difficult to eliminate than external barriers. Al Gamdi and Samarji (2016) reported that instructors' attitudes toward technology correlated with technology adoption. Faculty with positive attitudes toward technology adopted it more frequently in their instruction and everyday activity. They were more interested and willing to implement technology, indicating a positive stance toward technology (Al Gamdi & Samarji, 2016). This reconfirms Asiri et al. (2012), who found that faculty who believe technology usage to be consistent with teaching methods employ it.

A lack of confidence with technology can cause some faculty to avoid it. Quadri et al. (2017) found that the lack of technological skill and knowledge directly impacted the confidence level of faculty members. Moukali (2012) examined factors that impacted the attitudes of 303 Jazan university faculty members regarding adopting technology-rich blended learning. He examined faculty experience with technology as well as group differences regarding demographic variables including gender and academic rank. He reported that there were differences in implementing blended learning between male and female faculty; group differences were in favor of male faculty. Female faculty were less likely to adopt blended learning because of their lack of experience and knowledge in comparison to their counterparts who had advanced technical skills implementing blended learning. Alshammari et al. (2016) reported that individuals with weak computer self-efficacy (CSE) held negative attitudes toward learning management systems and viewed them as "difficult to use" or "less useful" when compared to individuals who possessed strong CSE. Al-Harbi (2016) also identified that faculty motivation and attitudes toward implementing Blackboard was negatively affected by students reluctant to participate in online activities. Algahtani (2017) found students' engagement and cooperation to be a key element in successful Blackboard use.

**External Barriers**

A number of researchers refer to technical and institutional support regarding adequate training and development (Al-Harbi, 2016; Al-Judi, 2011; Almuqayteeb, 2009; Hamdan, 2014; Moukali, 2012; Quadri et al., 2017), the availability of equipment and resources (Algahtani, 2017; Al-Harbi, 2016; Moukali, 2012), and robust infrastructure (El Zawaidy, 2014; Hakami, 2015). A lack of training and technical and institutional support has been reported as the main external barriers that inhibit the adoption of instructional technology (Algahtani, 2017; Al-Harbi, 2016; Almuqayteeb, 2009; Hamdan, 2014; Moukali, 2012).

Without adequate and efficient training, faculty are not able to build knowledge and skills crucial to the successful adoption and integration of technology for academic purposes. This lack of training was identified by Rogers (2003) as key to what hinders faculty adoption of technology. Moukali (2012) revealed that the lack of training and adequate technical support were major barriers to implementing blended learning in Jazan University. A similar result was found by Quadri et al. (2017) who reported the lack of appropriate training as being the most significant barrier that inhibited faculty participation in E-Learning. Hamdan (2014) suggests that one of the major challenges facing faculty members in online teaching was a lack of training in instructional design. She suggested universities design professional development programs in the form of workshops and trainings to ensure faculty effectiveness in delivering an online course.

Moukali (2012) reported that faculty face challenges when designing material for blended learning. Faculty members expressed concern regarding the need to receive training on how to use Blackboard (Al-Harbi, 2016). He suggested such training might be obtained via faculty exposure to best practice. Moreover, researchers emphasized the importance of providing training to faculty in areas such as the designing of interactive materials to promote faculty and student interaction (Al-Judi, 2011; Almuqayteeb, 2009). The lack of IT and resources blocked faculty implementation efforts (Algahtani, 2017; Al-Harbi, 2016; Alhawiti, 2011; Almuqayteeb, 2009; El Zawaidy, 2014; Moukali, 2012; Qudais et al., 2010). Such barriers included a lack of IT and resources in terms of the actual technology, access to available hardware and software, and technical support. Al-Harbi (2016) reported that faculty were not motivated to use Blackboard because students either didn't have adequate access to technology and other equipment or had limited access while working off campus.

Algahtani (2017) supported this finding; she reported that a lack of equipment and resources further discourages female faculty to engage in eLearning, because they are often required to share scarce resources with their male counterparts. Faculty reported that the lack of adequate support was a key hurdle in implementing blended learning in Jazan University (Moukali, 2012). Moukali (2012) suggested that universities should provide sufficient technical

support prior and during the implementation of blended learning. Almuqayteeb (2009) identified the lack of technical support as a factor that hindered faculty use of technology. Similarly, Alhawiti (2011) revealed that the lack of support as related to technical expertise represented a significant barrier that prevented faculty from participating in web-based distance education at Taif University and Tabuk University in Saudi Arabia.

Time is another common barrier that hinders technology integration efforts (Algahtani, 2017; Almuqayteeb, 2009; Quadri et al., 2017). This lack of time prevents faculty from becoming effective users because they need time to learn and work with the new technology before embedding it in their instructional practice (Abdelmagid, 2011). Algahtani (2017) revealed that female faculty did not have sufficient time to prepare course materials for Blackboard. Quadri et al. (2017) suggested that there was a lack of necessary time for the implementation of E-learning in Saudi Arabian universities. Work by Qudais et al. (2010) had previously maintained that time was a significant barrier. Moukali (2012) expressed the need for providing adequate time to faculty, especially when developing materials for blended learning environments.

Similarly, female faculty needed time to develop their skills in using computer technologies, which was noted by Almuqayteeb (2009). Moreover, studies reported that faculty have expressed concerns regarding how technology such as Blackboard could actually increase workloads as a result of the time and effort needed to embrace the technology into their instruction (Al Gamdi & Samarji, 2016; Almuqayteeb, 2009; Bousbahi & Alrazgan, 2015). Similarly Alhawiti (2011) reported that faculty viewed “concerns about time” as a moderate barrier to the adoption of web-based distance education at Taif University and Tabuk University.

The lack of a solid infrastructure is another barrier to the implementation of technology in Saudi Arabian higher education institutions (Algahtani, 2017; Almuqayteeb, 2009; El Zawaidy, 2014; Hakami, 2015). Providing fast, reliable internet connection services could encourage faculty to adopt educational technology. For example, Hakami (2015) revealed that a slow Internet speed which interrupted the continuous connection cut significantly into the lecture time, inhibiting the use of Blackboard in an e-learning setting at Najran University. Algahtani (2017)

maintained that inadequate internet infrastructure on campus was a major barrier to the implementation of Blackboard in teaching online; a similar result was found by El Zawaidy (2014). Alhawiti (2011) stated that the lack of infrastructure in terms of "adequate technology-enhanced classroom/labs/infrastructure", "appropriate student and faculty access to computers and Internet", and "library access or delivery of materials and services" was a strong obstacle that discouraged web-based distance education at Taif University and Tabuk University in Saudi Arabia. However, "good internet speed" was one of the most significant factors promoting the efficient integration of E-Learning in three Saudi Arabian universities (Quadri et al., 2017).

Studies have reported incentives and rewards that promoted faculty adoption of technology (Al-Harbi, 2016; Qudais et al., 2010). Incentives in the form of financial reimbursement and credit awards might encourage faculty members to integrate technology (Al-Harbi, 2016; Qudais et al., 2010). For example, Al-Harbi (2016) reported that faculty participated in teaching online courses as a result of a "financial and credit rewards given by deanship of e-learning" (p. 108). Qudais et al. (2010) revealed that senior faculty members expressed an interest and willingness to devote training time and to develop course materials when incentives were provided.

The above literature discusses the barriers and facilitators that influence the adoption and integration of technology in the postsecondary classroom. Rogers (1995) suggested that five characteristics can explain the rate of adoption, that innovations viewed "as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations" (p. 16). Therefore, institutions of higher education should develop strategies to overcome the internal and external barriers that hinder faculty technology integration. Research maintains that minimizing as well as overcoming such obstacles could be acquired by (1) changing and enhancing faculty members attitudes and beliefs toward educational technology, (2) equipping faculty with the needed professional development, (3) strengthening and promoting the campus infrastructure, and (4) increasing technical and institutional supports (Al Gamdi & Samarji, 2016; Algahtani, 2017; Asiri et al., 2012; Hakami, 2015).

## Rogers' Theory of Diffusion of Innovation

Rogers (2003) diffusion of innovation theory is relevant to this study, which seeks to examine the diffusion of educational technology as an instructional tool within single-sex, postsecondary institutions in Saudi Arabia as reported by female faculty members. Rogers (2003) describes diffusion as "the process in which an innovation is communicated through certain channels over time among the members of a social system" (p. 10) and refers to diffusion as the spread and the adoption of the innovation (Rogers, 1995). He stated that diffusion takes place after the innovation has been exposed to adopters. This is greatly influenced by the innovation-decision process. He emphasized that the diffusion process is influenced by four main variables which include: the innovation, communication channels, time, and the social system. Rogers (2003) believed an "individuals' perceptions of these characteristics predict the rate of adoption of innovations" (p. 219).

### Elements in the Diffusion of Innovations

There are four main elements in the diffusion of new idea or innovation include: the innovation, communication channels, time, and the social system. The first element, innovation, is defined as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 11). A practice or object could have been in existence prior to the adoption; however, it becomes known to individuals as an innovation in that it is the first time they are experiencing it.

Rogers defined the second element as "the process by which participants create and share information with one another in order to reach a mutual understanding" (p. 17). For Rogers, the core of the diffusion process lies in the information exchange when one individual passes along "a new idea to one or several others" (p. 18). This process includes: "(1) an innovation, (2) an individual or other unit of adoption that has knowledge of, or experience with using, the innovation, (3) another individual or other unit that does not yet have knowledge of the innovation, and (4) a communication channel connecting the two units" (Rogers, 2003, p. 18). He

further explains that upon the introduction of the innovation to the users, communication channels used to deliver information should be effective. The communication channels should work to spread the information efficiently. Those communicating should advertise the positives of the innovation. Effective communication channels influence people to be aware of the innovation and thus work to encourage more adoption.

Rogers emphasized the importance of time in the diffusion process. Time in the diffusion process can be viewed "(1) in the innovation-decision process by which an individual passes from first knowledge of an innovation through its adoption or rejection, (2) in the innovativeness of an individual or other unit of adoptionthat is, the relative earliness/lateness with which an innovation is adoptedcompared with other members of a system, and (3) in an innovation's rate of adoption in a system, usually measured as the number of members of the system that adopt the innovation in a given time period" (Rogers, 2003, p. 20).

The last element in the diffusion process is the social system. Rogers defined a social system as "a set of interrelated units that are engaged in joint problem solving to accomplish a common goal" (p. 23). For Rogers (1995), this element was considered critical as it directly aided in carrying out the diffusion of the innovation. As a result, the innovation should be designed in such a way that it fits the social structure of the intended users. When the innovation aligns itself with the social set-up, diffusion will be easier and faster, thus becoming more successful.

**The innovation-decision process**

Rogers described the innovation decision process as "the process through which an individual (or other decision-making unit) passes from gaining the first knowledge of an innovation, to forming an attitude about the innovation, to the ultimate decision to adopt or reject, to the implementation of the new idea, and eventual confirmation of the decision" (Rogers, 2003, p. 168). Rogers stated that adoption of any given innovation falls entirely on the decision made by a given individual. It is the individual (adopter) who decides whether to adopt an innovation or reject it. Rogers (2003) outlined the five essential steps in the innovation-decision process as

being related to: (1) knowledge; (2) persuasion; (3) decision; (4) implementation; and (5) confirmation (p. 20). Thus, for parties seeking to encourage the adoption of innovations, Rogers recommended that these parties target the decision-making stages. Such targeting will influence the diffusion and adoption of innovations. Rogers further explained that individuals take different approaches in the decision-making process, of which there are five stages. These stages influence the level of acquired knowledge relating to the innovation.

Adopters are classified into five categories based on their acceptance of new innovations: innovators, early adopters, early majority, late majority, and laggards (Rogers, 2003). Rogers (2003) defined innovativeness as "the degree to which an individual (or other unit of adoption) is relatively earlier in adopting new ideas than other members of a system" (p. 267). Innovators as a category refer to those who are willing to try out new ideas (Sahin, 2006); they quickly adopt an innovation despite uncertainty. Innovators, according to Rogers (2003), play an important role in introducing new ideas to a system and represent the first 2.5% to adopt a new idea.

Early adopters are role models from whom individuals seek advice and information about an innovation; they are more integrated into the social system compared to innovators. Rogers (2003) described early adaptors as usually holding leadership roles; they are respected by other members and represent the next 13.5% to adopt a new idea.

Rogers (2003) referred to the early majority as deliberate, adopting "new ideas just before the average member of a system. The early majority interact frequently with their peers but seldom hold positions of opinion leadership in a system" (p. 283). They serve as links between the very early and the late majority in the diffusion process, and they make up the next 34% of the individuals in a system.

The late majority, according to Rogers (2003), are skeptical; they adopt a new idea as a result of peer pressures or economic necessity. They adopt new ideas just after the average member of a system and represent the next 34%.

The laggards are the last within a social system to adopt an innovation and they represent 16% of the individuals in a system. Their point of reference is the past and their decisions are often made based on what has been done previously. According to Rogers (2003), "these individuals interact primarily with others who also have relatively traditional values. Laggards tend to be suspicious of innovations and of change agents." (p.284) meaning that they are isolated in their social networks.

**Attributes of Innovations**

Rogers (2003) stated that in the process of adopting any given innovation, a variety of attributes impacts the level and the rate of adoption. He stated that the five characteristics of innovations, as perceived by individuals, help to explain their rate of adoption. Rogers (2003) defined rate of adoption as "the relative speed with which an innovation is adopted by members of a social system" (p. 221). According to Rogers (2003), for an adoption process to be successful, the users will judge the innovation based on their initial perception. The perception the adopter holds determines whether the diffusion process will increase or decrease and depends on five essential characteristics:

1. Relative advantage
2. Compatibility
3. Complexity
4. Trialability
5. Observability

When all these traits are satisfied and meet the expectations of any given adopter, then the likelihood of the adoption will be high. According to Surry (1997), a faster adoption means that issues such as compatibility, as well as trialability, satisfy the need and preference of the adopter.

Sahin (2006) explains that a complex innovation that does not seem advantageous to users (adopters) will negatively affect the adoption rate. Innovations that appear advantageous as compared to previous options will be diffused or spread (Sahin, 2006).

**Relative advantage**

Rogers (2003) described relative advantage as "the degree to which an innovation is perceived as better than the idea it supersedes" ( p. 229). Surry (1997) explained that those innovations with higher rates of spread and use are the ones that enable users more ease in their day-to-day operations. In other words, innovations better suited receive a better response (Rogers, 1995). Rogers emphasized that "the greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is going to be" (Rogers, 2003, p. 15). Sahin (2006) maintained that if the innovation helps users, then the diffusion will be faster.

**Compatibility**

Compatibility refers to "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 240). Rogers (2003) emphasizes innovation that is "incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible" (p. 15). In other words, innovations that are compatible with the current system are absorbed and spread quickly. Rogers (1995) stated that individuals will adopt an innovation because it is easy to use and does not cause massive changes which interfere with the functionality and reliability of given systems.

**Complexity**

Complexity refers to "the degree to which an innovation is perceived as difficult to understand and use" (Rogers, 2003, p. 257). When an innovation appears to be complex in application or use, then the level of diffusion is most likely to be low (Sahin, 2006). However, if the innovation is simple and easy to use, as well as easy to integrate into any system, then the level of diffusion will be higher. Rogers (2003) emphasized that "new ideas that are simpler to

understand will be adopted more rapidly than innovations that require the adopter to develop new skills and understandings" (p. 15).

### Trialability

Rogers (2003) referred to trialability as "the degree to which an innovation may be experimented with on a limited basis" (p. 258). If an innovation can be tested and gives reliable and sufficient results, it will be adopted at a faster rate. Rogers emphasized that "new ideas that can be tried on the installment plan will generally be adopted more quickly than innovations that are not divisible" (Rogers, 2003, p. 16). As a result, the innovation is more likely to receive a high rate of adoption (Surry, 1997).

### Observability

Observability is the last characteristic of innovation, which Rogers defined as "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 258). Adopters are more likely to accept the innovation if the results are observable and efficient in light of speed of acquisition and functionality (Sahin, 2006). Rogers (2003) emphasized that "the easier it is for individuals to see the results of an innovation, the more likely they are to adopt" (p. 16).

Characteristics of innovation are essential to understanding and explaining the rate of adoption. Rogers (2003) stated that "innovations that are perceived by receivers as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations" (p. 16). Thus, to increase the rate of diffusion of innovation, these five characteristics have to be taken into consideration.

## The Diffusion of innovation Model in Research

Rogers (2003) diffusion of innovation has been used to examine research areas within community culture (Cooper & Wolfe, 2005; Hashem & Tann, 2007; Koz, 2014; Mudalier, 2002), the business arena (Aljabre, 2012; Bhattacharya, 2015; Gerrard & Barton Cunningham, 2003;

Hsu, 2016; Lee et al., 2005) and education (Doyle et al., 2014; Juergens, 2012; Wlodarczyk Hickey, 2011).

Within education, the following innovations exist: instructional rounds (Wlodarczyk Hickey, 2011), secondary school models designed for honors (Juergens, 2012) and universal design (Archambault, 2016). Studies on the diffusion of technology have focused on predicting the rate of adoption and classifying faculty in their adoption of technology (Al Senaidi, 2009; Alajmi, 2010; Tshabalala, Ndeya-Ndereya, & van der Merwe, 2014; Less, 2003), identify stages in their adoption processes (Moukali, 2012), and examining the attributes of innovations and rate of adoption (Alnujaidi, 2008; Alshangeeti et al., 2009). The following section reviews the literature that used Rogers' theory as a framework in order to model technology diffusion and adoption. A rich body of empirical research has specifically focused on classifying faculty in their adoption of technology (Less, 2003; Moukali, 2012).

Analyzing the data quantitatively, Less (2003) studied the demographic characteristics (age, gender, race/ethnicity, years of teaching experience, and highest degree attained) of 579 full-time faculty members at North Carolina Community College to classify and compare their adoption of computer technologies for instructional purposes. Based on Rogers (1995) five adoption categories, more than 14.5% of faculty were self-identified innovators while more than 25.4% considered themselves to be early adopters. The study showed that there was no difference between faculty when classified in Rogers' five categories of innovation adoption based on age, gender, race, and ethnicity. However, faculty differed in their adoption of computer technologies based on their years of teaching experience and highest degree attained.

Using Rogers (2003) diffusion theory, Sahin and Thompson (2006) employed a qualitative research methodology studying 117 full-time faculty members' use of instructional computers in a College of Education at Anatolian University in Turkey. In their study, the variables used to predict computer use were computer expertise, computer access, barriers to computer access, attitude toward computer use, and support for computer use. While faculty reported high levels of computer use and expertise in Internet use, word processing, and email, their computer use and expertise within these applications in teaching was very low. The study also showed that there was a relationship between faculty levels of computer use and computer expertise, computer access, barriers to computer access, attitudes toward computer use, support for computer use, and Rogers adopter categories. One of the major findings of the study was that these variables were statistically significant predictors of faculty computer use as instructional tool. To increase the level of faculty computer use, Sahin and Thompson suggested that educational leaders in the College of Education should increase adminstrative and collegial support.

A study by Alnujaidi (2008) focused on the relationship between perceptions of oneself and technology adoption. Alnujaidi employed Rogers (2003) perceived attributes of innovation (relative advantage, compatibility, complexity, trialability, and observability) to explore the adoption of Web-Based Instruction (WBI) as perceived by English language faculty members from 20 Saudi higher education institutions. He further explored the relationship between group demographic variables such as gender, age, academic rank, nationality, major, country of graduation, and years of teaching experience and adoption of WBI. The results found that (a) English language faculty members' adoption of WBI is in its early stage where 68% were WBI adopters compared to 32% non-adopters; (b) the relationship between WBI adoption and Rogers' five attributes of the Diffusion of Innovations Model was statistically significant where relative advantage and trialability were the most significant predictor to WBI adoption; and (c) the relationship between WBI adoption and participants' demographic variables such as academic rank, major, and country of graduation were statistically significant.

Alshangeeti et al. (2009) used the five attributes from Rogers (2003) (relative advantage, compatibility, complexity, trialability, and observability) to examine the perceptions and attitudes of 20 faculty members toward key attributes of online teaching at King Saud University. He further examined the correlation between faculty members' demographic characteristics and their perceptions of online teaching as well as their perceptions and attitudes toward online learning. The results showed that faculty members held a positive stance toward online teaching. "Relative advantage" and "observability" were critical attributes for predicting the successful adoption of online teaching. The study also showed that there was a significant relationship between faculty members demographic variables, professional area, gender, and prior experience of teaching online and the rate of key online teaching attributes. Furthermore, faculty attitudes toward online teaching significantly correlated with their rating of the five attributes. The strongest correlation was found between faculty attitudes and ratings of "relative advantage" and "compatibility" whereas the weakest correlation was found between faculty attitude and ratings of "trialability" and "complexity" followed by "observability."

Using Rogers (2003) diffusion of innovation theory, Al Senaidi (2009) conducted a quantitative research study to predict the level of use and skills as well as the factors that influenced 300 Omani faculty members' adoption of ICT at Sultan Qaboos University. The variables used to predict Omani faculty ICT use and skills in the classroom were Rogers' adopter categories, perception of barriers to adopting ICT, and demographic and job-related variables. The results showed that the level of Omani faculty ICT use was "sometimes" while skills were at the "intermediate" level. Also, Al Senaidi found that website browsing, Internet search engine, and word processing were the most frequently used ICT applications. Based on Rogers' five categories adaptor, approximately 86% of Omani faculty members self-identified as innovators, early adopters, and those in the early majority. This finding was in line with Rogers' model that in the five adopter categories, the majority of individuals tend to fall in the middle categories.

The group differences on ICT use and skills, adopter categories, perception of barriers to adopting ICT and demographic and job-related were significant between early adopters and later adopters. According to Al Senaidi, "Early adopters used ICT more, had higher ICT skills, perceived fewer barriers in the adopting process, and recognized higher values of ICT attributes than later adopters did" (p. 91). Finally, Al Senaidi suggested that leaders at Sultan Qaboos University develop strategies to increase faculty members' ICT uses.

Alajmi (2010) carried out a quantitative study based on the responses of 51 Kuwait faculty members at the College of Basic Education to examine (a) faculty members' readiness to adopt e-learning into their teaching practices based on Rogers' distribution of adopter categories; (b) their attitudes and levels of skills toward e-learning integration; and (c) obstacles that influenced their adoption of e-learning. Results showed that faculty members at the College of Basic Education classified themselves as early adopters of e-learning, which indicated an inconsistency with Rogers (2003) model that the majority of individuals would fall into the middle categories. The study also showed that there were no differences between faculty attitudes or skills based on the demographic variable age which suggested that younger and older faculty were similar in their perceived barriers of e-learning. Faculty members from technology departments perceived fewer barriers toward e-learning than other departments.

Moukali (2012) used demographic variables (i.e., gender, academic rank, level of experience in computer usage) and Rogers (2003) five stages in the adoption process (knowledge, persuasion, decision, implementation, and confirmation) to examine the barriers that influenced 303 faculty members at Jazan University in Saudi Arabia. The results indicated that female faculty perceived more barriers to blended learning than their male counterparts given their lack of experience using educational technologies; male faculty experienced less barriers because of their advanced technological skills. This result suggests that female faculty seem to be at the initial implementation stage whereas male faculty are closer to reaching the confirmation stage. Furthermore, the study showed that experience using educational technologies was a strong predictor of attitudes towards adopting blended learning.

A study conducted by Tshabalala et al. (2014) investigated the attitudes of 25 academic staff toward blended learning and also identified the barriers affecting its adoption at a developing university in South Africa. Using qualitative research methods and Rogers (1983) five adopter categories, three academic staff were identified as innovators which suggested that the other academic staff were slow adopters to blended learning. The study also showed that the absence of policy on blended learning, the lack of adequate training, and restricted access to computers for students and faculty were barriers influencing blended learning.

## Chapter Summary

This chapter presented a review of the selected literature pertinent to women education in Saudi Arabia including technology use and integration in higher education within a single-sex postsecondary institutions. Then presented review of the literature focused on barriers and facilitators that influence the adoption and integration of technology in the postsecondary classroom. This chapter end with a review of Rogers theory regarding the diffusion of innovation and examined studies related to educational technology adoption in higher education institutions. This research study is guided by Rogers' theory, in particular, the perceived attributes of innovation which served as a lens to understanding the diffusion of educational technology as an instructional tool. Rogers (2003) suggested that five characteristics can explain the rate of adoption, that innovations viewed "as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations" (p. 16).

It's evident from the literature reviewed here that there was an urgent need to examine the phenomenon of diffusion of educational technology. Educational researchers have noted that examining attributes of educational technology in single-sex postsecondary institutions would add to the existing knowledge base and may also improve technology use in Saudi Arabia (Alruwaili, 2014; Rogers, 2003). As such, qualitative, single-case study that examines the reports of female faculty members on the diffusion of educational technology would provide insights into the diffusion of educational technology within single-sex postsecondary institution as well as

determine strategies to encourage female faculty to integrate technology into their classrooms. Finally, this study has the potential to help educational leaders within single-sex institutions in Saudi Arabia to determine the level of appropriate resources and support needed for faculty professional development opportunities, spread awareness regarding the importance of educational technology as instructional tool and provide an argument for the technological resourcing of single-sex institutions.

# CHAPTER THREE: RESEARCH METHODOLOGY AND DESIGN

## Introduction to the Chapter

This qualitative, exploratory single-case study examined female faculty members' reports regarding the diffusion of educational technology as an innovative instructional tool in a single-sex, postsecondary education institution located within Saudi Arabia. Rogers' (2003) diffusion of innovations framework guided the data collection and analysis for this study as it was considered suitable for "investigating the adoption of technology in higher education and educational environments" (Sahin, 2006, p. 14). Rogers' model was designed to explain and predict the rate of adoption of innovation. Rogers (2003) suggested that there were "five characteristics by which an innovation may be described" (p. 210). Individual perceptions of these five attributes or characteristics include: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability, all of which predict the rate of adoption. The potential adopter's perception of the innovation depended on these five characteristics, which determined whether the diffusion process would increase or decrease.

This chapter contains a description of the following aspects related to the research design and methodology of this study connecting the five attributes of innovations of Rogers (2003) framework to the research questions. Chapter 3 includes: (a) a restatement of the problem; (b) the research questions; (c) definitions of terms; (d) the research design; (e) population sampling strategies, and the procedures; (f) data collection procedures; (g) data analysis strategies; (h) protection of human subjects; and (i) the limitations of this study.

## Restatement of the Problem

Members within the Saudi Ministry of Education have sought to improve instruction via technology by having educational institutions advance technological tools across all levels (R. Alebaikan & Troudi, 2010), including within postsecondary classrooms. Leaders within the Saudi ministry of higher education "encourage the use of information technology (IT) for teaching and learning among its faculties and students" (R. Alebaikan & Troudi, 2010, p. 49). Educational

technology usage in the Arab states offers specific opportunities for higher education institutions, including the potential to improve the quality of education, enhance student outcomes, facilitate access to learning opportunities, facilitate learning and teaching and improve productivity (Al Saif, 2005; Alajmi, 2010; Alfahad, 2012; Almobarraz, 2007; Almuqayteeb, 2009; Bajabaa, 2017; Massy & Zemsky, 1995), if it adopted effectively and efficiently in the classroom.

However, according to Alshahri (2015), "the potential instructional, cultural and institutional benefits of these ICT tools cannot be realized unless faculty use them" (p. 73). Moreover, Alshangeeti et al. (2009) suggested that "there is a risk that this opportunity may not be realized if faculty members are not inclined to adopt the relevant information and communication technologies (ICT)" (p. 1). Research has shown that faculty perceptions and attitudes regarding technology and the integration of technology in the classroom can play a critical role in its rejection or adoption as a teaching tool, affecting the successful diffusion of educational technology (Al Gamdi & Samarji, 2016; Al Saif, 2005; Albalwi, 2008; Albirini, 2006; Alkhalaf et al., 2012; Sahin, 2006).

Limited research exists regarding faculty members' willingness to adopt technological tools in general, female faculty members' willingness regarding its usage in particular, and even less regarding their reports on the diffusion of technology. In Saudi Arabia, faculty members represent the primary decision makers regarding the use and integration of technology into instruction (Almuqayteeb, 2009). It has been found that female faculty members are not using educational technology as an instructional tool despite its potential to enhance teaching performance (Al-Asmari, 2005; Almuqayteeb, 2009). Early studies regarding educational technology adoption maintain that Saudi faculty members may be in the early stages of adopting technology for instructional purposes (Albalwi, 2008; Al-Fulih, 2002; Allehaibi, 2001; Alnujaidi, 2008; Kamal, 2013; Omar, 2016). Moukali (2012), using Rogers' (2003) framework reported that female faculty were less likely to adopt blended learning. This indicates that female faculty may be at an initial implementation stage whereas male faculty were within reach of what he labels the confirmation stage. Al Saif (2005) indicated that female faculty held more positive attitudes

toward Internet- and web-based instruction, whereas male faculty were more likely to use and integrate such technology for instructional purposes than their female counterparts. J. M. Moore (2007) emphasized that "instructors are the key to the diffusion of any innovation in the classroom, and if their perception level of the attributes of an innovation is defined, questions answered, and their needs met, the innovation will be adopted and used at a faster rate" (p. 21).

Research on faculty perception and attitude toward educational technology in Saudi Arabia and the Middle East has focused on three main areas (Alshangeeti et al., 2009). Studies have been conducted regarding the barriers that affect the adoption of educational technology as perceived by faculty members (Al Gamdi & Samarji, 2016; Alajmi, 2010; Al-Alwani, 2005; Almuqayteeb, 2009). Other research has focused on factors that motivate or inhibit the effective implementation of educational technology (Al Saif, 2005; Al Senaidi, 2009; Albalawi, 2007; Albalwi, 2008; Al-Fulih, 2002; Algahtani, 2017; Al-Kahtani & Al-Haider, 2010; Bajabaa, 2017; Karkouti, 2016) or on faculty's perceptions of and attitudes toward educational technology (Albirini, 2006; Aldossry, 2011; Alenezi, 2012; Al-Harbi, 2016; Alkhalaf et al., 2012; Al-Oteawi, 2002). These studies are quantitative. Existing studies have focused on the K-12 educational system (Abdelmagid, 2011; Al-Alwani, 2005; Al-Ammari, 2004; Aldossry, 2011; Almekhlafi & Almeqdadi, 2010; Al-Mohaissin, 1993; Alsharari, 2016; Alsulaimani, 2012) as opposed to a higher education setting. Limited, qualitative research examines female faculty members' perceptions regarding attributes of educational technology within the Saudi Arabian context, and thus, this qualitative, single-case study seeks to examine what female faculty members report regarding the diffusion of educational technology as an instructional tool in a single-sex, postsecondary education institution in Saudi Arabia.

## Research Questions

The research questions were derived from Rogers's (2003), diffusion of innovation theory, and specifically address Saudi Arabian female faculty members' reports on the diffusion of educational technology into their instruction. Rogers's theory acts as the conceptual framework that provided the lens through which the data was collected and analyzed. The main research question for this study concerns female faculty members reports regarding the diffusion of educational technology into their instructions. There were five sub-questions:

1. What do female faculty members report regarding the relative advantage of incorporating educational technology in their instruction?

2. What do female faculty members report regarding the compatibility of incorporating technology in their instruction?

3. What do female faculty members report regarding the complexity of incorporating technology in their instruction?

4. What do female faculty members report regarding the trialability of incorporating technology in their instruction?

5. What do female faculty member report regarding the observability of incorporating technology in their instruction?

## Definitions of Terms

The following table contains definitions of key terms, as applied in this study.

Adoption: A decision to make full use of an innovation as the best course of action available (Rogers, 2003, p. 21).

Diffusion: The process in which an innovation is communicated through certain channels over time between the members of a social system (Rogers, 2003, p. 5).

Innovation & An idea, practice, or object that is perceived as new by an individual or other unit of adoption (Rogers, 2003, p. 11).

Educational Technology: Any hardware and software based technologies, such as computers and other applications that can be used for educational purposes

Information and Communication Technology (ICT): The electronic and non- electronic technologies and infrastructure systems used to create, store, manipulate, retrieve, and communicate or disseminate information (Alshahri, 2015).

Ministry of Education: An organization that is responsible for the development and fulfillment of the strategy for K-12 (boys) education (Almobarraz, 2007).

Presidency of Girls' Education: An organization that is responsible for the development and fulfillment of the strategy for K-12 (girls) education (Almobarraz, 2007).

Faculty: Instructors teaching undergraduate or graduate level courses at higher education institutions including professor, associate professor, assistant professor, lecturer, and graduate teacher assistant (Bajabaa, 2017).

Relative Advantage: The degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 2003, p. 229).

Compatibility: The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 2003, p. 240).

Complexity: The degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 2003, p. 257).

Trialability: The degree to which an innovation may be experimented with on a limited basis (Rogers, 2003, p. 258).

Observability: The degree to which the results of an innovation are visible to others (Rogers, 2003, p. 258).

## Design of the Study

This research was designed as an exploratory, qualitative, single-case study. According to J. W. Creswell and Creswell (2017), the chief reasons for choosing a qualitative research approach are for exploring and understanding the meaning individuals or groups ascribe to a social or human problem (p. 4). The case study design was the most appropriate when examining a phenomenon in depth (J. W. Creswell & Creswell, 2017; J. W. Creswell & Inquiry, 2007; Yin, 2009). Case study research, as defined by Yin (2009), involves the study of a "contemporary phenomenon within its real-life context" (p. 13). According to Merriam and Tisdell (2015), a fundamental aspect of the case study approach was that it allowed the researcher to develop insights and also discover and interpret a situation rather than test a hypothesis. Case studies, as explained by J. W. Creswell and Creswell (2017), allow the researcher an avenue which "explores in depth a program, an event, an activity, a processor, or one or more individuals. The case(s) are bounded by time and activity" (p. 14) in which the researcher collects detailed, in-depth data by interviewing subjects or performing other data collection (J. W. Creswell & Creswell, 2017; J. W. Creswell & Inquiry, 2007; Yin, 1994).

The boundaries in this study were defined by a number of limiting factors: time, individuals, and the context within which the study occurred. This study took place in a midsize, single-sex, postsecondary education institution in northern Saudi Arabia in an attempt to better understand female faculty members perceptions of educational technology as an instructional tool. Accordingly, all aspects of conducting a single-case study are represented. The site was purposefully selected because it is the only public, postsecondary institution that allowed for questions to be collectively answered (J. W. Creswell & Inquiry, 2007).

This study was exploratory in nature as no empirical research studies have examined the diffusion of educational technology as an instructional tool in a single-sex, postsecondary education institution in northern Saudi Arabia. According to J. W. Creswell and Creswell (2017), the qualitative case study design was more appropriate when the aim of the research is exploratory; that is, when "not much has been written about the topic or the population being

studied, and the researcher seeks to listen to participants and build an understanding based on what is heard" (p. 27). Educational technology offers many opportunities to higher education institutions, including the potential to improve the quality of education, enhance students outcomes, facilitate access to learning opportunities and improve productivity. Examining technology according to Rogers lens has the potential to provide insight into what female faculty report regarding the diffusion of educational technology as an innovative instructional tool.

## Validity and Reliability of the Design

Research studies are concerned with providing knowledge that can be trusted and validated. As defined by J. W. Creswell and Creswell (2017), validity means "that the researcher checks for the accuracy of the findings by employing certain procedures" (p. 199). Reliability in qualitative research indicates that "the researcher's approach is consistent across different researchers and among different projects" (p. 199).

The interview questions guide utilized in this study were based upon the survey instrument developed by G. C. Moore and Benbasat (1991). In order to examine the innovation of educational technology, G. C. Moore and Benbasat (1991) recommended that researchers modify their original survey questions and develop interview questions to measure the five characteristics of Educational Technology that influence the diffusion of ET (relative advantage, compatibility, complexity, trialability, and observability). According to J. W. Creswell (2014), when a researcher modifies the instrument, "the original validity and reliability may not hold for the new instrument, and it becomes important to reestablish validity and reliability during data analysis" (p.160).

Yin (2009) suggested four measures to increase the quality of a case study: (a) construct validity, (b) internal validity, (c) external validity, and (d) reliability. He explained that applying these measures in case study designs was different than in other research study designs. The researcher employed Yin's (2009) construct validity tactics to reestablish the validity of the research findings. Yin (2009) defined construct validity as "establishing correct operational

measure for the concepts being studied" (p. 33), and suggested three ways to establish construct validity during data collection and later: (a) collecting data from multiple sources, (b) showing a chain of evidence during data collection, and (c) allowing key informants to review a draft report during the composition phase. In this study, the researcher enhanced construct validity by allowing female faculty members the opportunity to review a draft report of the findings.

## Research Site and Participants

### Population

This study examined Saudi female faculty members' reports regarding the diffusion of educational technology as an innovative instructional tool as viewed through the lens of Rogers' (2003) attributes of innovation (which included relative advantage, compatibility, complexity, trialability, and observability). Therefore, female faculty members were the target population of interest for this study. Cultural and social constraints limited the interaction between males and females due to gender segregation in schools and universities in Saudi Arabia. The sample for this study was purposefully selected using a snowballing sample strategy. This strategy, as explained by J. W. Creswell and Poth (2017), can be useful to access "hard-to-reach groups" (p 160). Patton (2002) explained that purposeful sampling is widely used in case study designs (people, organizations, events, etc.) which "offer useful manifestations of the phenomenon of interest" (p. 46). J. W. Creswell and Creswell (2017) explained that this kind of sampling allowed the researcher to "purposefully select participants or sites that will best help the researcher understand the problem and the research question" (p. 185).

Snowballing strategies are an example of purposeful sampling, which Vogt and Johnson (2011) referred to as "a technique for finding research subjects. One subject gives the researcher the name of another subject, who in turn provides the name of a third, and so on" (p. 368). As such, the researcher sought help from the department chair, who suggested female faculty members potentially willing to participate in the study. Patton (2002) explained that there were no

specific rules or formulas for sample size in a qualitative inquiry; rather, it depends on what the researcher wants to know, the purpose of the research, and what would be useful in terms of credibility (p. 244). According to J. W. Creswell (2015), "it is typical in qualitative research to study a few individuals or a few cases. This is because the overall ability of a researcher to provide an in-depth picture diminishes with the addition of each new individual or site" (p. 209). Accordingly, the number of participants was fifteen full-time female faculty members from the education department.

**Description of the site**

This site is an all-female public, postsecondary institution in northern Saudi Arabia. The institution chosen started as a community college and was under the umbrella of King Fahd University of Petroleum and Minerals (KFUPM) in September 1998. During that period, the institution provided four programs that led to a three-year associate degree in Business Administration, Computer Systems, and Electronic Engineering and Instrumentation. Later on, the institution provided bachelors degree programs in Applied Electrical Engineering, Computer Science, and Management Information Systems to expand opportunities for high school graduates. On June 2006, the institution was officially established by Royal Decree; it was, and continues to be, under the supervision of the Ministry of Education.

In its current form, the institution has fifteen colleges: the College of Preparatory Year, College of Applied Medical Sciences, College of Pharmacy, College of Dentistry, College of Nursing, College of Public Health, College of Medicine, College of Arts and Sciences, College of Education, College of Community, College of Sciences, College of Engineering, College of Computer Science and Engineering, College of Business Administration, and College of Shariah-Low. Within one year, two existing colleges, the men's teachers' College, currently known as the College of Education and Girls' College of Education have also joined the university.

## Data Collection and Analysis Procedures

Semi-structured, in-depth, in-person interviews with female faculty members comprised the data collection method. The data collection procedures were further detailed below, including descriptions of the interview guide, data source chart, and the procedures used to collect as well as analyze the data.

### Data Collection Instruments

According to J. W. Creswell and Creswell (2017), interviews are a form of data collection in qualitative research where the researcher develops "open-ended questions that are few in number and intended to elicit views and opinions from the participants" (p. 187) about the phenomenon under study. As such, data collection for this study involved semi-structured, in-depth, in-person interviews to answer the research questions. The interviews were conducted by the researcher with female faculty at a midsize, single-sex, postsecondary education institution in northern Saudi Arabia, and were expected to last between 45 to 60 minutes. According to Bernard (2012), semi-structured interviewing is the recommended method to use when the researcher "won't get more than one chance to interview someone" (p. 181). Semi-structured interviews were based on the utilization of an interview guide containing a "written list of questions and topics that need to be covered in a particular order" (Bernard, 2012, p. 181).

The interview questions guide were researcher-developed and based on the survey instrument developed by G. C. Moore and Benbasat (1991) as well as on Rogers' (2003) theoretical framework. This instrument has previously been adopted by Wlodarczyk Hickey (2011) to examine the diffusion of instructional rounds and by Archambault (2016) to examine the diffusion of universal design for instruction in post-secondary institutions. This instrument was originally designed to measure individual perceptions about adopting an information technology (IT) innovation; however, according to the authors, it can be applied to other innovation studies such as educational technology. The original survey tool has eight scales: voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability,

visibility, and trialability. For the purpose of this study, only five scales were used: relative advantage, compatibility, ease of use, visibility and trialability, as they directly pertain to Rogers' (2003) theoretical framework. The attributes described by voluntariness, image, and result demonstrability were excluded for the following reasons: voluntariness is not a factor as female faculty members were the major decision makers regarding teaching practices and technology use, the scale of image was part of Rogers' relative Advantage concept, and result demonstrability was similar to Rogers' concept of observability.

The interview questions were divided into six categories, related to Rogers' perceived attributes of innovation (see Appendix A). The first category (background questions) addressed demographic information such as the faculty member's highest academic degree obtained, subject area taught, and years of teaching experience. The second category (relative advantage) addressed the female faculty member's perceptions on the benefits of using technology in teaching. The third category (compatibility) addressed whether this technology was consistent with female faculty's pedagogical beliefs and needs. The fourth category (complexity) addressed the level of ease and difficulty female faculty faced when using technology in the classroom. The fifth category (trialability) addressed female faculty's opportunities to use technology on a trial basis. The last category (observability) addressed the opportunity that female faculty have had in watching the innovation in action.

The process of translating the interview protocol took place after the approval of the University of Hartford Human Subjects Committee. Some of the participants were non-native speakers of English who required the interview questions in their native language (Arabic) so they could understand and answer the research questions. The technique used was pretested to "ensure that future users of the target language version can comprehend all questions and procedures" (Maneesriwongul & Dixon, 2004, p. 176). The interview questions were administered first through pilot testing, done with two female faculty members, prior to the conduction of the final interviews. Pilot data was not included in the study.

Again, interview questions as well as a brief description of Rogers' (2003) conceptual framework was sent to the female faculty members to get their reflections and to ensure a common understanding of the conceptual framework. Interviews were audiotaped, transcribed, and coded to answer the research questions. To assure the accuracy of the transcribed interviews, a peer review of the interview transcript was conducted by the researchers advisor and a doctoral student with the knowledge of Arabic.

**Data Source Chart**

Table 3 the data sources as they are related to the research questions:

Table 3

*Data Source Chart*

| Rogers (2003) Conceptual Model | Research Questions | Interview Question | Data Source | Analysis |
|---|---|---|---|---|
| | What do female faculty members report regarding the diffusion of educational technology into their instruction? | | Semi-Structured Interview | Open coding |
| Relative Advantage | What do female faculty members report regarding the relative advantage of incorporating educational technology into their instruction? | See Appendix A | Semi-Structured Interview | Open Coding |

| | | | | |
|---|---|---|---|---|
| Compatibility | What do female faculty members report regarding the compatibility of incorporating educational technology in their instruction? | See Appendix A | Semi-Structured Interview | Open Coding |
| Complexity | What do female faculty members report regarding the complexity of incorporating educational technology in their instruction? | See Appendix A | Semi-Structured Interview | Open Coding |
| Trialability | What do female faculty members reports regarding the trialability of incorporating technology into their instruction? | See Appendix A | Semi-Structured Interview | Open Coding |
| Observability | What do female faculty members reports regarding the observability of incorporating technology in their instruction? | See Appendix A | Semi-Structured Interview | Open Coding |

**Description of Recruitment Procedures**

In order to gather information from the appropriate participants, the researcher recruited participants using the snowball sampling strategy. Again, the researcher sought help from the department chair, who suggested potential female faculty members who were willing to participate in the study (see Appendix B). Participants were contacted using WhatsApp, as it the

most commonly used means of communication among university administration, staff, faculty, and students. Potential participants were contacted twice to request their participation in in-person interviews. The first contact was a WhatsApp message to female faculty members in the education department (both full-time and part-time), informing them of the purpose of the research study as well as requesting them to voluntarily participate in interviews (see Appendix C). To ensure participants' engagement, follow up phone calls were used to schedule interviews with those who had expressed interest. The second contact WhatsApp message was sent to those who agreed to participate; it contained the research questions to reflect upon (see Appendix A), a brief description of Rogers' (2003) conceptual framework to ensure understanding (see Appendix D), and the informed consent form to sign and send back (see Appendix E). Participants were informed that they were welcome to keep a copy for their reference.

A total of fifteen faculty members, who were full-time members of the education department, agreed to be interviewed (audio-recorded) and comprised the sample. Prior to the interviews, the researcher contacted the interested female faculty to set a mutually agreed upon date and time to conduct the interview and also thanked them for volunteering. Prior to each interview, the researcher informed participants of their rights to withdraw at any time during the interview. In addition, because demographic information such as names, was not collected, the researcher listed faculty without any identifiable characteristics (e.g. Female faculty 1, Female faculty 2, and Female faculty 3). Participants were informed that the interviews were expected to last between 45 and 60 minutes.

Table 4 contains a summary of the recruitment timeline and strategy.

Table 4

*Summary of Recruitment Timeline and Strategies*

| Contact | Timeframes | Strategy |
|---|---|---|
| First | Upon approval by the Human Subjects Committee, the first WhatsApp message sent | A WhatsApp message sent to the department chair seeking potential participants |
| Second | Within a few days of receiving female faculty contact information, a WhatsApp message sent to potential participants | An invitation addressing the purpose of research study sent to female faculty |
| Third | Within two days of receiving a WhatsApp message from female faculty willing to participate, a final recruitment WhatsApp message will be sent | A WhatsApp message sent to thank those who agreed to participate. It also contained the research questions, a brief description of Rogers' (2003) conceptual framework, and the informed consent form to sign |

## Data Analysis Procedures

According to Yin (2014), data analysis procedures entailed "examining, categorizing, tabulating, testing, or otherwise recombining evidence, to produce empirically based findings" (p. 36). He further identified four strategies for analyzing case study data; they were "rely on theoretical propositions, work your data from the ground up, develop a case description, and examine rival explanations" (p. 36). In this study, the main strategy to analyze the data was a reliance on theoretical propositions (Yin, 2014). Yin (2014) emphasized the importance of this strategy during the analysis phase of any case study. Baxter and Jack (2008) also explained that reliance on theoretical propositions helps to ensure that the analysis is focused, and that it avoids analyzing data "outside the scope of the research questions" (p. 555). The theoretical proposition that this study relies on is Rogers' (2003) perceived attributes of innovation through which the

data was collected and analyzed. Utilizing this theoretical proposition helped the researcher to decide how to organize the data collected and how to focus on the data generating the most relevant and useful information for the study.

J. Creswell (2003) highlighted that "case study and ethnographic research involve a detailed description of the setting or individuals followed by an analysis of the data for themes or issues" (p. 191). After the completion of the transcription phase, the researcher analyzed the interview responses. The full responses underwent a "data reduction and sense-making effort that takes a volume of qualitative materials and attempts to identify core consistencies and meanings" (Patton, 2002, p. 453). The researcher read the interviews to become familiar with the information provided and then moved on to the coding phase.

According to J. W. Creswell and Creswell (2017), coding involves "taking text data or pictures gathered during data collection, segmenting sentences or images into categories, and labeling those categories with a term, often based in the actual language of the participant" (pp. 193-194). The first set of codes was generated based on the conceptual framework to address the core issues regarding female faculty members' perceptions about the benefits of using educational technology as instructional tool, whether this technology was consistent with female faculty pedagogical beliefs and needs, the level of ease and difficulty they faced when using technology in the classroom, opportunities to use technology on a trial basis, and the opportunities that they have, or have not, had to watch an innovation in action.

From the first set of codes, common patterns in female faculty members' responses were established, and unrelated data were eliminated. These shared patterns were grouped together into meaningful clusters (Patton, 2002; Rossman & Rallis, 2003), allowing the researcher to identify themes. The researcher created a subtheme for those that seemed to be close in nature. This technique ensured the accurate interpretation of data and helped construct a more fine-grained analysis of the findings. The themes generated were supported by the female faculties' statements to represent their perceptions regarding the explored phenomenon.

## Protection of Human Subjects

This study adhered to the guidelines outlined by the University of Hartford Human Subjects Committee. J. W. Creswell and Poth (2017) emphasized the importance of protecting the confidentiality of study participants. As such, confidentiality was maintained through the assignment of pseudonyms. Qualitative data, both digital and hard-copy, was stored securely in a computer or locked file cabinet that will be only accessible to the researcher and her research advisor. For accuracy and verification purposes, data and results collected from this study will be maintained for a period of five years after publication according to the American Psychological Associations (2009) recommendations. Upon completion of this study, all information will be deleted from the researcher's computer and paper copies will be shredded. There were no known physical risks or discomfort associated with participating in this study.

## Limitations of the Study

J. W. Creswell (2015) described limitations as "potential weaknesses or problems with the study identified by the researcher" (p. 199). As such, the researcher identified several limitations in this exploratory, qualitative, single-case study which can be described as follows.

Researcher bias is a limitation. The researcher, who is an educational/instructional technology specialist, believes that educational technology tools should be implemented in female higher education institutions. This could influence her interpretation of participants responses. Accordingly, in an attempt to minimize this bias, participants interview transcripts were shared with peers to enhance validation and confirmation of the data.

The second limitation is inherent in a single-case study design. This study focused on female faculty in a single-sex college in northern Saudi Arabia; therefore, the results were limited only to the population described. Generalizations from this study may not apply to other groups, other departments, or other universities. Future research will need to expand and include female faculty across different departments, which may yield a different result.

Relying on interviews as the primary data collection tool limits the validity of these findings, which constitutes a possible third limitation.

Finally, although all necessary precautions were taken during the translation process to ensure the validity and reliability of the Arabic interview guide, translation may have affected the meaning of the questions or provided a different understanding or interpretation of the original interview guide. The translation of the interview questions and transcripts from English to Arabic and from Arabic to English represents a limitation of this research.

## Chapter Summary

In summary, this research examined female faculty members' reports regarding the diffusion of educational technology as an innovative instructional tool as viewed through the lens of Roger's (2003) attributes of innovation (relative advantage, compatibility, complexity, trialability, and observability). This chapter described the methodology and research design of an exploratory, qualitative, single-case study. In addition, it provided a detailed description of every step of the research process, including the instrumentation, data collection, participant recruitment, data source, analysis procedures, and, finally, the limitations of the study.

# CHAPTER FOUR: FINDINGS

## Introduction to the Chapter

This chapter reports the findings of this exploratory, qualitative, single-case study that examined Saudi female faculty members' perceptions of the diffusion of educational technology as an innovative instructional tool. Rogers (2003) is the conceptual framework that guided the data collection and analysis for this study. Its five attributes include: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. These five characteristics determine whether the diffusion process will increase or decrease. This chapter begins with a brief overview of the study design and methodology, a description of the study participants, and the results of in-person interviews. The findings of the study were presented in narrative form and participant quotes are representative of the themes that emerged through analysis.

## Overview of Study Design and Methodology

An exploratory, qualitative, single-case study design was selected to examine female faculty's reports regarding the diffusion of educational technology as an innovative instructional tool in a single-sex, postsecondary educational institution located within Saudi Arabia. Contact information was gathered by the department chair, who suggested female faculty members who were potentially willing to participate in the study. Participants were contacted using WhatsApp, as it the most commonly used means of communication among university administration, staff, faculty, and students. The first contact was a WhatsApp message to female faculty members in the education department contained the purpose of the study as well as requesting them to voluntarily participate in interviews (see Appendix C). To ensure participants' engagement, follow-up phone calls were used to schedule interviews with those who had expressed interest. The second contact was a WhatsApp message sent to those who had agreed to participate; it contained the research questions for them to reflect upon (see Appendix A), a brief description of Rogers' (2003) conceptual framework to ensure an understanding (see Appendix D), and the informed consent form to sign and send back (see Appendix E). Participants were informed that

they were welcome to keep a copy for their reference. Demographic information about the participants is presented in a later section of this chapter.

**In-person Interview Data Collection and Analysis**

Data were collected using semi-structured interviews conducted with fifteen full-time female faculty members. The purpose of the interview was to examine female faculty's reports regarding the diffusion of educational technology as an innovative instructional tool. The interview guide (Appendix A) was researcher-developed and based on the survey instrument developed by G. C. Moore and Benbasat (1991) and based on Rogers (2003) theoretical framework. Utilizing this instrument, female faculty were asked to identify the attributes of educational innovation that affected the adoption of educational technology for instructional purposes.

The interviews were conducted at a mutually agreed upon date and time. All participants requested that the interview questions be asked in their native language (Arabic) so they could understand and answer the research questions more fully. Using a conversational tone, the researcher followed the interview guide with each interviewee. To ensure clear understanding, the researcher asked probing questions and rephrased and paraphrased interview questions (J. Creswell, n.d.; Bryman, 2016). Each interview was digitally recorded, and lasted between 45 and 60 minutes. A verbatim transcript of each individual interview was created from the digital recordings. To ensure the accuracy of the transcribed interviews, a peer review of the interview transcript was conducted by a doctoral colleague with the knowledge of Arabic.

The process of analyzing the interview data began after translating the 15 interview transcripts into English. Coding was guided by the research questions and Rogers (2003) theoretical framework. The researcher used a hand-coded process, reading each transcript and marking segments of text with colored highlighters. Similar themes were marked with the same color. Once this process was completed for all transcripts, the researcher utilized a similar approach to identify themes across participants. Only themes that related to the research

questions were reported; unnecessary themes were eliminated. To maintain confidentiality when using direct quotations, each of the interviewees was identified using the letter F and a number.

**Sample Description**

Fifteen full-time female faculty members from the College of Education were recruited as described in Chapter 3. More specifically, the sample for this study was drawn from the College of Education department *(n=15)* including Curricula Teaching, Special Education, Islamic Culture, Arts, Educational Technology, and Kindergarten Female. Table 5 below provides an overview of the participants demographic information, such as the faculty members highest academic degree obtained, subject area taught, and years of teaching experience.

Table 5

*Participants Characteristics (N = 15)*

| Participants | Title | Subject Area | Teaching Experience |
|---|---|---|---|
| F1 | Assistance Professor | Curriculum and Methods of Teaching Mathematics | 11 years |
| F2 | Lecturer | Kindergarten | 3 years |
| F3 | Lecturer | Curricula Teaching | 6 years |
| F4 | Associate Professor | Educational Administration and School Management | 2 years |
| F5 | Lecturer | Kindergarten | 7 months |
| F6 | Lecturer | Kindergarten | 7 months |
| F7 | Lecturer | Educational Technology | 4 years |
| F8 | Lecturer | Special Education | 5 years |
| F9 | Lecturer | Educational Technology | 8 years |
| F10 | Lecturer | Special Education | 5 years |
| F11 | Lecturer | Educational Technology | 5 years |
| F12 | Assistant Professor | Islamic Culture | 23 years |
| F13 | Assistant Professor | Arts | 9 years |

| | | | |
|---|---|---|---|
| F14 | Assistant Professor | Islamic Culture | 16 years |
| F15 | Lecturer | Kindergarten | 18 months |

## Study Findings

This section contained findings from the data analysis, organized by research question. An explanation of the primary research question and how it related to the applied conceptual framework presented first, followed by a discussion of the five research sub-questions. For each research sub-question, a table of major themes by participants presented along with participant quotes that were representative of the themes that emerged through analysis. A summary of the salient findings concludes each analysis.

**Primary Research Question: What do female faculty members report regarding the diffusion of educational technology into their instructions?**

Rogers (2003) suggested that "the perceived attributes of innovation are one important explanation of the rate of adoption of innovation" (p. 221). The principle of perceived attributes is that potential adopters judge an innovation based on their perceptions regarding five characteristics including relative advantage, compatibility, complexity, trialability, and observability. Research on technology integration suggested that faculty member were more likely to adopt educational technology into their instruction if they perceived technology to add value to their everyday practice, consistent with their own and their students' needs, not difficult to use if they had adequate time to try, learn, and work with the new technology before embedding it (Almuqayteeb, 2009; Alshammari et al., 2016; Abdelmagid, 2011; Asiri et al., 2012). Level of the attributes can be understood as the level by which participants questions were answered and their needs met. If this is existing according to respondents perceptions, then the "innovation will be adopted and used at a faster rate" (J. M. Moore, 2007, p. 21).Therefore, to explore the diffusion of educational technology, female faculty were asked to respond to a series of questions which encompassed Rogers (2003) conceptual framework.

**Research Sub-question 1: What do female faculty members report regarding the relative advantage of incorporating educational technology in their instruction?**

Relative advantage is the first attributes of Rogers' (2003) framework. Prior to conducting the interviews, the researcher explained to participants that relative advantage is "the degree to which an innovation is perceived as better than the idea it supersedes" (p. 229). Table 6 highlights the major themes reported by female regarding the relative advantage of incorporating educational technology into their instruction.

Table 6

*Female Faculty Reports on the Relative Advantage of Incorporating Educational Technology in Their Instruction (N = 15)*

| Code | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 | F11 | F12 | F13 | F14 | F15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teaching Performance | x | x | x | - | - | x | x | - | - | x | - | - | x | - | x |
| Knowledge | x | - | - | x | x | x | x | x | - | x | x | x | - | x | - |
| Communication | | | | | | | | | | | | | | | |
| Student Engagement | x | x | x | x | x | x | - | - | x | x | x | x | - | x | x |
| Accommodate Learning | - | - | - | x | - | x | x | - | x | x | - | x | x | - | - |
| Style | | | | | | | | | | | | | | | |
| Teaching Concept | - | - | - | x | - | - | x | - | - | x | - | x | x | - | - |
| Confident | x | x | x | - | x | - | - | x | - | - | - | - | x | x | x |
| Feedback | - | - | - | - | x | x | x | x | - | - | x | - | - | x | x |
| Job Expectations | x | x | x | x | x | - | x | x | - | - | x | x | | x | |

**Findings for Research Sub-question 1**

Female faculty members' reports regarding the relative advantage of incorporating educational technology in their instruction.

**Finding 1.1.** Eight of the participants *(N = 15)* reported that the relative advantage of educational technology was that it effectively improves teaching performance more so than the

traditional method of lecturing.

They defined teaching performance as including setting the tone of the classroom, saving time and effort, classroom management, and content access. Eight female faculty pointed out that incorporating ET in the classroom improved their teaching performance from the start to the completion of a class, which also includes preparing, organizing, engaging, and evaluating students. In support of this argument F10 shared, "ET effectively serves the educational process right from beginning to the end, from the time a faculty member starts to present the content, getting students' attention, to the point of evaluating students' progress." Similarly, F3 shared that "ET saved time and effort specially when it comes to the repeated part of my duties such as writing the course objectives on the board at the beginning of every class having the objectives already written on slides allows more time for going through the content and according to a logical sequence." F2 explained that designing PPT presentations carefully and attentively saved time and effort in course material preparation: "Instead of wasting time memorizing the content when preparing it, and having to waste more time writing what I prepared on the traditional blackboard and, in the meantime, having to explain it to students, using PPT will be effective." Equally important, F1 shared, "ET are time-saving and help me to cover quite a number of topics in a relatively short time." Likewise, F6 reported, "It helps me to be more organized with almost no chance of skipping a main point or overlooking a critical angle of the topic more than when the class is managed by the traditional teaching methods." Speaking about the importance of access to course content, F13 shared:

> ET facilitates the constant availability of the course material and the speed with which I can get it whenever and wherever. Putting the presentation together and storing it in Google Slides for instance and running it when offline definitely made my work in the classroom efficient and much easier. Additionally, having my Google slides backed up in the cloud and share it with the students by posting the link on the Blackboard saves me time and effort.

F7 continued, stating, "Students can refer to Blackboard and download PPT presentations and learn about the main points covered in the class and hence make up for the missed parts or the missed class." Similarly, F15 shared, "Being able to upload the presentation as a permanent source to go to is definitely an advantage."

All the above quotes demonstrate female faculty reports of the relative advantage of incorporating ET as an instructional tool to improves teaching performance.

**Finding 1.2.** Ten female faculty *(N = 15)* explained that the relative advantage of ET was that it facilitated knowledge communication. More specifically, all ten participants explained that passing on knowledge with the employment of ET organizes the teaching and learning process in the classroom better than a lecturing method. In support of this argument, F4 shared, "It helps me to control the display of the slides in an efficient manner as I can easily focus on main points and elaborate on some selected slides, unlike the lecturing method which does not provide the opportunity to be effectively selective." Similarly, F1 asserted, "When the content is presented in the form of a PowerPoint presentation, it makes it easier for the instructor to cover the displayed points in an organized and comprehensive manner. With the addition of worksheets for students to work on...the presentation slides really set the tone for students' involvement." Speaking about how ET keep the pace of the class and the lesson on task, F7 stated, "When I use PPT presentations the class agenda provides both me and my students with a logical sequence of the points to be covered during the class." Additionally, F8 stated that the use of ET in the classroom helps her during the preparation and teaching of course material:

> ET assists me in logically organizing knowledge and selecting a proper sequence to communicate it. I could start with simple parts and move on to the more complicated parts. I could start with the general concept of learning disabilities, for instance, and then move on to the reasons behind these disabilities and so on.

In the same context, F12 commented that when it came to teaching a well-organized and concise plan of the topic(s) to be covered, "I do it smoothly and more confidently because I know when to give details of a point and when to invite students to interact in a discussion and so on."

In summary, ten female faculty reported that the relative advantage of incorporating ET as an instructional tool to facilitated knowledge communication.

**Finding 1.3.** Twelve of the participants *(N = 15)* reported that the relative advantage of incorporating ET in the classroom was the creation of an engaging environment for students.

It allows room for student interactions that would not happen if they followed the traditional methods of instruction. In support of this argument, F3 shared, "ET is student-oriented, which gives students the space to participate and positively interact with the displayed content through reading and commenting." Equally important, F12 stated, "Using a PPT presentation in an attractive and inviting manner can stimulate students' interest in learning and help them to be involved in the displayed content." Moreover, F4 shared, "Whenever I used ET in my classes, students were always interactive and responsive." Likewise, F15 stated, "ET helped me to create an enjoyable educational environment for students to get more involved and willing to take part." Similarly, F2 commented, "I can easily notice the students' enthusiasm and willingness to grasp and internalize knowledge more effectively and quickly with a well-prepared presentation." To explain this point further, F1 stated:

> The use of educational technologies in classrooms creates quite an enthusiastic and involving learning environment. I happened to teach two classes last year in two different classrooms, one equipped with an overhead projector while the other was not. I could easily notice the difference between the two educational environments. While the former was an interactive environment with interested and highly responsive students, the latter was rather slow, and I could even say boring.

The representative quotes reflect female faculty reports of the relative advantage of incorporating ET as an instructional tool to create an engaging environment for students.

**Finding 1.4.** Seven of the participants *(N = 15)* reported the relative advantage of the use of ET as instructional tool was how it aided facultys ability to accommodate students' learning style. All seven mentioned how ET allowed them to reach all types of student including visual, auditory, reading/writing, and kinesthetic learners. F12 shared, "PPT presentations facilitate the

learning process more smoothly and quickly to the majority of studentssome students access knowledge successfully through visual aids like photos and videos, while others do so through audios and so on." Recognizing the importance of employing ET in conjunction with diversifying teaching methods, F9 stated, "I believe that learning will be more successful when the teaching method in which the course being taught is consistent with the students learning styles." Equally important, F7 explained:

> ET is an essential tool to accommodate students' different learning styles. Diversifying my teaching methods through the employment of PPT presentations, multimedia, and questionnaires assists the majority of students to smoothly grasp the course material and to recall it more quickly.

F10 provided examples of effectively employed ET especially with students with special needs. She stated, "It made it easier to recall knowledge as it was demonstrated by diagrams and mental maps and those sorts of aids. It made the learning process more interesting and enriching through the use of diversified media, particularly visual aids like photos and videos."

All the above quotes demonstrate female faculty reports of the relative advantage of incorporating ET as an instructional tool to accommodate students' learning style.

**Finding 1.5.** Five female faculty *(N = 15)* reported that using ET as alternative method to teach concept helped them to better communicate the intended knowledge and made it easier for students to relate to the topic. F10 asserted, "When I teach a course like Hearing Impairment for instance, I need to provide photos of the ear parts, which can help students better relate to the topic and see for themselves how hearing issues occur; the same applies to eye anatomy." Similarly, F7 stated, "Inserting models demonstrating the concepts of communication and technology in a PPT presentation makes it easier for students to quickly and effectively understand and identify with the topic." Likewise, F12 commented, "To show students a presentation with visual aids of Hajj (pilgrimage) and how it is performed is much better than just lecturing about it in abstract." Speaking about how ET made it possible to teach concepts to students, F13 explained:

> Using videos helps to facilitate the delivery of information to students. For example, in the teaching of "Childrens Drawings & Its Development," I asked students to do artwork using origami paper. The students have no idea about the paper material, so I played a video clip showing the paper and how to use it to do artwork. After watching the video, students were able to grasp the concept and were creative in their artwork. It was even better than what I showed them.

According to F4, covering topics like that of school management through lectures does not open up new windows for students or help them to relate to the topic. She commented that "showing them an educational video with scholars talking about school management in different countries, students were very responsive, able to distinguish differences and similarities as well as able to follow the thread of the discussion."

In summary, five female faculty reported that the relative advantage of incorporating ET as alternative method to teach concept helped them to better communicate the intended knowledge.

**Finding 1.6.** Eight of the participants *(N = 15)* reported that the relative advantage of incorporating ET into the classroom was the boost it provided in their self-confidence. They explained that ET made them feel more confident in communicating the intended knowledge to students. F8 stated, "I feel more confident when presenting the content through PPT presentations because the main points to be covered are well organized in the slides which helps me to be effectively comprehensive. I do not skip any parts and I do not have to memorize the content to be able to present it." Similarly, F2 commented, "I feel confident communicating the course material using a PPT presentation with all the liveliness created by the varied inserted media and the comprehensiveness of the way the content is displayed." Likewise, F1 stressed the importance of ET specifically for new faculty who dont possess adequate teaching experience. She stated that it "Can actually help to boost their abilities and skills as well as their self-confidence." In the same context, F13 commented, "I feel more confident in front of the student when I use PPT presentations than holding the book which give students negative impressions like that of being unable to teach (having insufficient teaching experience)." Equally important, F3 stated:

> Teaching was a brand-new experience for me. Holding the book to give the content through the traditional method of lecturing with me being the sole focus of students' attention, I used to get even more tense. When I started to use PPT presentations, students' attention diverted to the displayed slides and I started to feel more and more confident until I was eventually able to manage the classes and the students efficiently feeling that it was very familiar to be in this spot and confidently facing students.

All the above quotes demonstrate female faculty reports of the relative advantage of incorporating ET as an instructional tool to boost their self-confidence.

**Finding 1.7.** Seven of the participants *(N = 15)* reported that the relative advantage of incorporating ET was that it helped them evaluate students' comprehension of the content presented. F15 commented, "ET helps me to evaluate students' comprehension of the content presented. I employ PPT presentations, upload assignments to Blackboard, and assign students to create PPT presentations to present in class on which I comment and give my feedback." Speaking about how employing ET provides a prompt feedback in terms of students' interaction with the female faculty and with the course material, F14 commented, "Using ET provides instant feedback and helps me to evaluate how far students managed to comprehend course material on the spot instead of being surprised by a disappointing performance in the exams." Likewise, F5 stated, "Utilizing PPT presentation help me test student's comprehension through discussion and posing questions."

Moreover, feedback is a useful tool as F7 explained: "I personally prefer modern teaching methods to communicate content as these involve the useful feedback technique. Feedback provided through educational games, which are available on websites, and clearly show the responsiveness of students to the presented material."

In summary, seven female faculty reported that the relative advantage of incorporating ET was it helped them evaluate students' comprehension of the content presented.

**Finding 1.8.** Ten of the participants (N = 15) reported that the relative advantage of incorporating ET in the classroom was meeting job expectations.

According to the study participants *(n = 10)*, job expectations represent the fulfilling of all of the requirements of academic accreditations according to certain standards to improve the quality of education, such as: (1) encouraging e-learning through the use of the course management system, Blackboard, in their courses, (2) incorporating various teaching and learning strategies, (3) integrating and infusing technology into their pedagogy and teaching practices, and (4) distributing students' evaluation forms to assess the quality of the course and the efficiency of the faculty members. Recognizing how important it is to integrate electronic tools such as the Blackboard into university education, F2 shared that, "The university has been trying to effectively make e-learning functional, requiring, for instance, final examinations to be held through Blackboard as is the case with preparatory year examinations." She continued, "The same interest was expressed in activating e-learning at the College of Education, but it will take time to provide for a proper environment in terms the technological infrastructure."

All of the female faculty explained that they were required to integrate educational tools, specifically the course management system Blackboard, into their courses as an obligation imposed by the university administration. To support this argument, F12 shared, "We are officially required to activate Blackboard and post course descriptions and PPT presentations." Similarly, F8 stated, "Faculty members are required to provide documented material to confirm this use, such as screenshots of uploaded course description, the content to be covered in classes, students' assignments and quizzes, and students' performance evaluation methods and so on." Equally important, F11 stated, "Periodic reports are sent to the faculty coordinators with the names of faculty members who have/not activated Blackboard and there can be some disciplinary measures for those who have not." Likewise, F3 shared, "I use Blackboard in order not to get blamed for such shortcomings and experience an embarrassing situation and to keep up with other active colleagues." Similar to F3, F5 explained that, "Not complying to the requirement of activating and using e-learning negatively affects the performance evaluation of faculty members which, in

turn, affects the performance of the department and the college as a whole." Moreover, F1 shared, "It is not optional anymore as some disciplinary procedures might take place in case instructions of the essentiality of using educational technologies are not followed by female faculty members." Likewise, F7 shared, "Visits by officials from the Deanship of Quality and Development are promptly paid to faculty members in classrooms with no prior notice to monitor the quality of the content provided for students and the use of ET." To explain these points further, F4 stated:

> Female faculty are obliged to use ET for several reasons; the Deanship of Quality and Development closely monitor faculty members' use of ET, it directly influences faculty members performance evaluation, and the fact that students have become more aware of the faculty members' teaching practices in classrooms. Most female faculty members have started to use ET in response to an initiative entitled "Bab project" through which we (as members of the Quality and Development Committee) pay unexpected visits to faculty members in classrooms to check whether they employ ET during their classes.

All the above quotes demonstrate the relative advantage for female faculty who incorporate ET as an instructional tool to meet their job expectations.

**Summary of Data Analyses for Research Sub-question 1.** Female faculty reported the relative advantage of incorporating educational technology in their instruction:

**Finding 1.1.** Eight of the participants *(N = 15)* reported that ET effectively improves teaching performance.

**Finding 1.2.** Ten of the participants *(N = 15)* explained that ET facilitated knowledge communication when employed in the classroom.

**Finding 1.3.** Twelve of the participants *(N = 15)* reported that incorporating ET created an engaging environment for students.

**Finding 1.4.** Seven of the participants *(N = 15)* reported that ET aided faculty's ability to accommodate students learning styles.

**Finding 1.5.** Five of the participants *(N = 15)* reported that ET, as an alternative method to teach concepts, helped them to better communicate the intended knowledge.

**Finding 1.6.** Eight of the participants *(N = 15)*) reported that ET boosted their self-confidence.

**Finding 1.7.** Seven of the participants *(N = 15)* reported that ET helped them evaluate students' comprehension of the content presented.

**Finding 1.8.** Ten of the participants *(N = 15)* reported that ET in the classroom helped them meet their job expectations.

**Research Sub-question 2: What do female faculty members report regarding the compatibility of using technology in their instruction?**

The second attribute of Rogers' (2003) framework is compatibility. According to Roger (2003), compatibility is "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (p. 223). For example, when technology is perceived as jointly meeting faculty and student needs, both groups are likely to instructionally embrace it. Table 7 highlights the major themes female faculty reported regarding the compatibility educational technology with their instruction.

Table 7

*Female Faculty Reports on the compatibility of Educational Technology with Their Instruction (N = 15)*

| Code | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 | F11 | F12 | F13 | F14 | F15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| School Culture | x | x | x | x | - | - | - | - | x | x | x | - | - | - | - |
| Philosophy of Teaching and Learning | x | - | x | - | - | - | - | x | x | x | - | x | x | x | - |
| Subject Areas | x | x | x | x | - | - | x | - | x | x | x | x | x | - | - |
| Existing Experience & practice | x | x | x | x | - | - | - | x | - | x | - | - | x | - | - |
| Work Style | x | x | x | x | - | - | x | - | - | - | x | - | - | - | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Students & Faculty Needs | x | - | x | - | - | - | x | x | x | x | x | x | x | x | x |

**Findings for Research Sub-question 2**

Female faculty members' reports regarding the compatibility of incorporating educational technology in their instruction

**Finding 2.1.** Seven of the participants *(N = 15)* reported that the compatibility of incorporating ET fits into the culture of their institution.

Of note is that all faculty members concluded that ET was in alignment with the culture that prevails within their university community, which revolves around achieving institutional efficiency through instructional improvement. Specifically, improving the quality of instruction through technology integration leads to better teaching practices and better students' outcomes. With regard to increasing the institution's efficiency, F11 explained, "The University started to motivate faculty members to carry out both administration and academic tasks electronically." Similarly, F2 shared, "There was effort exerted by the university administration to motivate faculty members to use the Blackboard into their courses. I have recently attended a couple of sessions about e-learning where it was explicitly expressed how important it is to integrate it into university education." Equally important, F1 stated:

> The use of Blackboard as one of the modern educational technologies is ambitiously supported by the university administration. The percentage of the use of the program is attentively evaluated within all the university departments by the administration on a monthly basis. This has lead deans and vice-deans, in turn, to motivate female faculty members to use the Blackboard.

Moreover, F10 reported that "The university administration has stressed the importance of integrating Blackboard into their course like uploading classes content, students' assignments, and quizzes." She continued, "Training courses have been conducted to train faculty members to use Blackboard and to upgrade their academic efficiency." In support of F10's argument, F9

asserted, “Every year, university officials direct their efforts to employ ET as last year we start to activate Blackboard and providing faculty members with training courses.” Recognizing the importance of having devices available in classrooms, F3 shared that “Faculty members would report to the officials if certain classrooms are not equipped with an overhead projector so that they would work on providing them for the new academic year most faculty members have started to utilize PPT presentations in the educational process.” To explain these point further F4 stated:

> The university administration motivates faculty members to use ET to meet the Kingdom’s vision of 2030 and to develop skills essential requirement of employability in the 21st century. The efforts of the Deanship of Quality and Development include: (1) conducting training courses to familiarize faculty members with ET, (2) providing 50% of the needed devices in classrooms, (3) activating e-learning through the use of Blackboard to post assignments, quizzes, and discussion boards. These are some of the activities we are involved in to catch up with the development pace of other countries.

All of the above quotes demonstrate the compatibility of ET in this institution’s culture.

**Finding 2.2.** Eight of the participants *(N = 15)* reported that ET was consistent with their philosophies of teaching and learning.

Of note is that all female faculty indicated that ET was compatible with their philosophies of teaching and learning, and that it was effective in supporting their current instructional practices. In support of this argument, F10 shared, “The use of ET complements my teaching philosophy as I have a firsthand experience about learning and teaching through the use of ET. It assists in the effective presentation of [special education courses] as they can be supported with relevant diversified educational aids and websites links which are aimed to the education of students with special needs.” Similarly, F14 stated, “ET does not only complement my teaching style, but it is essential to the learning process as well because the topics of ’Aqedah’ or the study of creed and theology requires visual aids to help students better understand the passed-on knowledge. lecturing is never as effective as using ET with such specialization.” Equally

important, F8 stated, "ET effectively represent the teaching style I am very much advocating which focus on positively involving students in the educational process. The use of ET gives students the opportunity to be active participants and engaged in constructive dialogues and debates where they could express themselves and work within groups." Likewise, F1 shared, "ET supports the diversified teaching strategies I apply in the class. For some parts of the content, it is more useful to integrate a PPT presentation with photos, while some other parts might require the debate strategy." Moreover, F9 shared, "ET support the teaching method and strategies that we adopt at the ET department. Employing ET such as PPT presentation, or a video clip presenting a problem, an issue or even written statement would be of a considerable help in communicating the content to the students."

Speaking about the importance of employing ET in the classroom, F3 shared, "We live in the age of technology and we need to employ it in education as best as we can. The PowerPoint program is a modern technology which attracts students' attention and facilitates the way content is communicated." Similarly, F13 explained, "The use of ET is compatible with my personal teaching philosophy to keep up with current technological advancements. I personally prefer modern educational methods and technology to communicate the content as it involves teaching students how to create portfolio website." Equally important, F12 acknowledged:

> I used to spend quite a long time preparing the course material, searching for examples of phenomena or practices which still exist to make the topics I teach more approachable to students. With ET, I am saved much of this effort as employing a video or a photo about a religious sect for instance is very sufficient to convey the messagewhen such topics are presented with visual aids (i.e. practices of some sects), students get involved and better digest intended knowledge.

In summary, eight female faculty reported that ET was in line with their philosophies of teaching and learning.

**Finding 2.3.** Ten of the participants *(N = 15)* reported that ET's compatibility depends on the discipline in which they teach. Consistent with other studies that examined technology integration (Almuqayteeb, 2009; Alshahri, 2015; Abdelmagid, 2011), all ten participants indicated that educational technology was compatible with the subject area they teach. For example, F2 stated, "Using Technology translation software can be of good use to teach the course 'English Reading in Early Childhood' as it involves English vocabulary pronunciation for which audios are required." Similarly, F3 shared, "ET perfectly accommodates the courses I teach which mainly depend on the use of computer labs to train students in applying programs such as Microsoft Office applications including its key features such as inserting texts and managing tool bars." Moreover, F11 shared that "students usually are assigned to practice and apply computer skills inside and/or outside class such as designing an educational video and interacting and responding to the Blackboard properties." ET department curricula heavily depend on the use of ET, as F9 explained:

> I need to use and integrate ET as the students are frequently assigned to work on projects based on the use of ET such as designing and producing educational aids.teaching the course "production and use of teaching aids" require me to make connection between the content delivered in the class and my use of ET.the materials that is partially delivered to students in the class represents the theoretical part and my use of ET represents the application aspect.

Speaking about how employing ET matches the nature of the courses taught in the art department, F13 shared, "It is essential for students as artists or fashion designers to create their own portfolio website that exemplify their skills, qualifications, collection of their best work and contact form." Moreover, employing ET with students with hearing impairment was very effective in communicating intended knowledge. F10 explained:

> Students with hearing impairment heavily depend on their sight sense to learnthey need visual aids in their learning process, so I used to employ short educational

> videos to be able to translate them into sign language and PPT presentation which were an effective means to facilitate students' access to and comprehension of knowledge.

In the same context, F4 shared that "The usage of ET depends on the course material and the set sub-objectives derived from this material. it is necessary to use ET in the courses I teach." She continued, "As for some other non-scientific courses which are studied in the College of Education, like psychology for instance, they require more of application activities with students being the main focus than the use of ET which can be used as secondary aids with some simple slides to introduce the topics discussed."

The fact that educational technology fits only scientific disciplines prevented many female faculty from adopting it for instructional purposes outside of the science. In support of this argument, F7 shared, "Many faculty members do not have the interest to use technology particularly those in education and non-scientific departments (i.e. College of Arts, Social Studies majors such as Geography and History) where it is thought that ET is not essential." Similarly, F1 shared, "Some others think that the course of 'Islamic Culture' does not give much space for ET to be used as it is a non-scientific course." To explain this point further, F12 shared:

> The College of Education comes at the end of the list of Colleges in terms of employing ET because it was not merely an essential need. The prevailing misconception that ET only suits scientific majors hindered its use with non-scientific majors which proved to be in bad need for its utilization.

All the above quotes demonstrate that ET, as an instructional tool, can complement the courses taught by these female faculty.

**Finding 2.4.** Seven of the participants *(N = 15)* reported that ET was consistent with their prior experiences.

Of note is that all female faculty mentioned that educational technology is consistent with their past experiences. Prior experience with technology can include working in IT or a certified trainee or a university student who has paved the way for female faculty to adopt ET for instructional purpose later on. In support of this statement, F3 shared, "When I started teaching, I did not adopt the lecturing method because of being used to the employment of technology to accomplish administrative duties at the department of Curricula and Teaching Methods, such as preparing files for Quality and Development purposes and printing statistics of students' examinations." Similarly, F1 shared, "Based on firsthand experience I gained by studying a course in e-learning while working on my master's and doctoral degrees and by using educational technologies in my classes later on, I came to realize the benefits of such technologies for both me and my students." Recognizing how effective it was to use PPT presentations in the training courses she conducted at the Deanship of Community Service, F4 stated that "The positive response I received when I used PPT presentations for the training courses encouraged me to use it in my classes and students were very interactive and responsive." Likewise, F8 shared, "Being a university student and later a masters researcher, it was very common to use technology by both students and faculty members. I have the motivation to adopt the same method with my students." Equally important, F13 stated that, "The advantages of such technology (Google programs) which I enjoyed as a student have motivated me to employ it as a faculty member to pass on such a positive experience to students." Moreover, F10 shared, "As a student it was essential to use ET (i.e. PPT presentations) in every single class. This experience has helped me to develop my skills and motivated me to use ET with my students as a faculty member because I believe in its effectiveness."

Speaking about how it difficult it can be to resort to the traditional method of teaching, which heavily depends on lecturing and old-fashioned tools, F2 stated:

> The use of PPT presentations has become part and parcel of my performance. It is hard for me to imagine teaching the course material without the PPT presentation. The source of this difficulty emerges from the fact that I have got used to employing technology in terms of PPT presentations since I was working on my master thesis. During one of my classes, the overhead projector broke down and I had to face students with the laptop to see the slides. It was not the best solution, but I had to do something to use the presentation.

All the above quotes demonstrate that ET is consistent with these female faculty members past experiences.

**Finding 2.5.** Six of the participants *(N = 15)* reported that the ET fit well with the mode in which they liked to work in the classroom.

All six mentioned how ET was in line with the teaching approaches and practices they followed in teaching course materials. F1 shared, "With the aid of PPT presentations, the educational process is facilitated, the material intended to be covered is easily organized and enjoyably explained and learned, and time and effort are definitely saved." Similarly F2 shared, "Blackboard definitely facilitates the learning experience for students when teaching [English Reading in Early Childhood], uploading the articles to Blackboard one week prior give students enough time to read the specified article on their smartphones or have it printed and start digging the vocabulary and meanings." Likewise, F3 shared, "Teaching the course 'Computer Sciences' is taught in the computer labs to train female students Microsoft Office Programs to practice and apply the steps I explain and monitor their progress while answering their questions." Speaking about how Blackboard played a major role in supplementing instructional practices, F7 shared, "Blackboard is closely related to the class time. When I am done with presenting the course material, I upload the PPT presentation to Blackboard and keep students informed." Similarly, F11 shared, "Blackboard system is mostly used in conjunction with traditional classroom to post

assignments and discussion board to encourage female students engage in discussion about various topics." To explain this point further, F4 stated:

> ET is an assisting addition that complements the effectiveness through which course material is explained to students. For example, communicating topics like [duties and responsibilities of a school principal, classic theories and the emergence and development of school management in different countries] through an attractive PPT presentation would facilitate the students' grasp of the intended knowledge as they could easily relate it to the slides they watch. This responsiveness to presentations shows itself clearly when I ask questions about previously covered content. Students instantly remember a diagram demonstrating first-ranked countries in education, for instance.

In summary, six female faculty reported that ET fit well with the mode in which they like to work in the classroom.

**Finding 2.6.** Eleven of the participants *(N = 15)* reported that ET met both female faculty members and student's needs.

According to the participants *(n =11)*, educational technology such as learning management systems and multiple pathways of communication platforms greatly served their own and students' needs. Specifically, technology has extended learning beyond the walls of the institution in terms of communicating, collaborating, and sharing information. With regard to enhanced communication and sharing of information, F12 stated that "Communication between faculty member and students became way easier than ever because of the various way of communication such as WhatsApp, e-mail and Blackboard students don't have to wait for the next class to ask or inquire about homework, readings and course content." Similarly, F14 shared, "Using Blackboard makes communication between the faculty member and students easier and establish a strong bond between them which is essential for students success." Likewise, F1 stated, "When technology is not available in the class WhatsApp helps to keep me in touch with my students and to be able to send them the material prior to the class in order to have an idea about it." Moreover,

F7 shared, "When students for instance have issues dealing with Blackboard properties such as uploading their assignment in doc or PDF format, I contact the group admin and she forwards the materials I send her to the rest of the members." Equally important, F10 explained, "I can easily communicate with the leader of each class through a WhatsApp group to provide her with links and data and she, in turn, forwards the sent material to other students." She continued:

> Assigning students to search for relevant academic studies using E-Library, summarize a given study to share and present to their fellow classmates, help them broaden their perspectives. Using ET in such a way motivates students to adopt a self-learning attitude through which they seek to access more knowledge sources than the ones available at the class. Students have become more aware of learning through ET.

Recognizing the educational benefits of technology, F13 shared, "Using Blackboard allows students to interact with their classmate outside of the formal classroom by having them post their work to a discussion board, comment and evaluate their performance helps them build skills such as giving and receiving constructive feedback." Equally important, F8 acknowledged that "When planning to teach a somewhat complicated concept or topic, I send a relevant video via emails to students to watch before class time to be prepared for discussion instead of having to start from scratch during the class time."

Speaking about how integrating ET meet students' technology education needs, F15 shared, "Students get the chance to exchange their educational experiences when they are assigned to create PPT presentations to present their projects in the classroom and get prompt feedback." Similar to F15, F3 explained, "ET assists students in gaining digital literacy skills such as the ability to create PPT presentation when assigned to work in groups or individually." Equally important, F11 shared, "Digital literacy is one of the 21st century skills that students need to acquire. In teaching ET courses, for instance I try to give students space to learn Microsoft Office Programs such as Word, PPT main features and simple video editing programs. I walk students through the steps and encourage them to apply it." F9 explained that "Using discussion board or

virtual classrooms environment gives shy students space to speak up which make them learn to articulate their ideas and participateit has encouraged them to overcome their shyness."

All the above quotes demonstrate that ET meets both female faculty members' and student's needs.

**Summary of Data Analyses for Research Sub-question 2.** Female faculty reported the compatibility of incorporating educational technology in their instruction:

**Finding 2.1.** Seven of the participants *(N = 15)* reported that ET fit into the culture of their institution.

**Finding 2.2.** Eight of the participants *(N = 15)* explained that ET was consistent with their philosophies of teaching and learning.

**Finding 2.3.** Ten of the participants *(N = 15)* reported that the compatibility ET depended on the discipline in which they teach.

**Finding 2.4.** Seven of the participants *(N = 15)* reported that ET was consistent with their prior experiences.

**Finding 2.5.** Six of the participants *(N = 15)* reported that t ET fit well with the mode in which they liked to work in the classroom.

**Finding 2.6.** Eleven of the participants *(N = 15)* reported that ET meets both female faculty members' and student's needs.

**Research Sub-question 3: What do female faculty members' reports regarding the complexity of incorporating educational technology in their instruction?**

Complexity is the third attribute of Rogers' (2003) framework. Research indicates that innovations that are not complex, easy to use and integrate into a system will be adopted at a faster rate than innovations that require an individual to develop new skills and understandings (Alshammari et al., 2016; Rogers, 2003). According to Rogers (2003), complexity refers to "the degree to which an innovation is perceived as difficult to understand and use" (p. 230). Table 8 highlights the major themes that female faculty reported regarding the complexity of incorporating educational technology in their instruction.

Table 8

*Female Faculty Reports on the Complexity of Incorporating Educational Technology in Their Instruction (N = 15)*

| Code | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 | F11 | F12 | F13 | F14 | F15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Troubleshooting Tech Problems | - | - | - | x | x | x | - | x | - | - | - | x | - | x | x |
| Poor Availability of Equipment and Resources | - | x | - | - | - | - | - | - | - | x | - | - | x | x | x |
| Inadequate Technology Resources | - | - | x | - | - | - | - | - | - | - | - | - | - | - | - |
| Readiness / Educational Background | - | - | x | - | - | - | x | x | x | x | x | x | - | - | - |
| Require Technology Skills | - | - | - | x | - | - | - | - | - | - | - | - | - | - | - |
| Inconvenient | - | - | - | - | - | - | - | - | - | - | - | x | x | - | - |

**Findings for Research Sub-question 3**

Female faculty members' reports regarding the complexity of incorporating educational technology in their instruction.

**Finding 3.1** Seven of the participants *(N = 15)* stated that the complexity of incorporating educational technology into classroom instruction was related to troubleshooting and technological malfunctions.

The fact that female faculty were unable to troubleshoot technology made it difficult for them to deliver course content. In support of this argument F8 stated, "Staff members are not able to handle technical issues which they encounter during classes. Most of them would simply shut off laptops and immediately resort to lecturing." F12 added, "The technical problems related to

the LCD projector wastes faculty time, trying to resolve it, in addition to the faculty members' inability to handle these problems." Similarly, F14 shared, "If something goes wrong with my laptop, time gets wasted and I manage the class with difficulty." Likewise, F4 stated, "I had a hard time trying to open a YouTube video in one of the PPT presentation slides. It was a waste of time and I eventually had to ask for the help of the technical support." Equally important, F15 added, "Technical breakdowns during the class made my instructional work harder, like when my laptop unexpectedly stops functioning." Specifically, F6 explained:

> It was quite difficult to use ET especially when I encounter a technical problem with the LCD projector as I have no idea how to deal with it or solve the problem. During one of my lectures, I had a technical problem with LCD projector (broken down) which ruined the class plan that was based on a PPT presentation.

Similar to F6, F5 shared, "I feel embarrassed when I encounter a technical issue because I do not know how to fix it and the technical support does not provide an immediate response. So, I had to turn my laptop toward the students to see the PPT slides."

In summary, seven female faculty reported that the complexity of incorporating ET was dealing with troubleshooting due to technological malfunction.

**Finding 3.2.** Five of the participants *(N = 15)* reported that the complexity of incorporating ET stemmed from lack of availability of equipment and resources, which impacted course content delivery.

According to study participants *(n=5)*, technology integration became difficult because the appropriate technology was either unavailable or broken. In support of this argument, F2 stated,

> I frequently encounter the problem of the unavailability of LCD projector in classrooms. If I happened to forget to bring my own portable projector, I would make my laptop face students which is not even a workable solution as students complain about the small screen. I asked students who were not able to see the presentation to refer to the Blackboard.

Similarly, F12 shared, “Some classrooms are not equipped with LCD projectors, and none of the classrooms have desktop computer devices, so I have to bring along my personal laptop to use PPT presentations.” Likewise, F15 pointed out, “I barely use PPT because of the unavailability of LCD projectors due to technical issues and lack of regular maintenance such as the cable provided is not compatible to connect my laptop with the projector.” Similar to F15, F14 explained, “LCD projector devices at the College of Education are almost out of service because of lack of regular maintenance.” Equally important, F10 shared, “I used to bring along my own portable projector because the current educational environment is discouraging as it is not prepared for the use of ET.”

In summary, five female faculty reported that the complexity of incorporating ET stemmed from the poor availability of equipment and resources.

**Finding 3.3.** One of the participants *(N = 15)* reported that the complexity of incorporating educational technology was that the available resources were inadequate for educational tasks.

According to one participant, incorporating technology into instruction was difficult because software applications installed on the available devices were outdated. Specifically, F3 explained:

> The problem I encounter in computer labs is that the version of Microsoft Office installed is outdated, 2007, and I am required to teach students the latest version. technology resources are not aligned with the set objectives. So, I have to ask students to bring along their laptops so that we can work on the latest version of MS Office.

She also added, a “Lack of updating and maintenance negatively impacts any practical examination at the labs. A given computer device would just freeze while a student is finishing her task, and she would have to start all over again.”

In summary, one female faculty reported that the complexity of incorporating ET was inadequate available technology.

**Finding 3.4.** Seven of the participants *(N = 15)* reported that the complexity of incorporating educational technology inside the classroom was dependent on the faculty members' readiness to employ basic technology skills.

All seven participants explained that ET was easy or difficult dependent on faculty members' readiness and educational background. In support of this argument, F7

> It is quite easy to use ET, but it could be rather difficult for faculty members who are used to following the traditional method and who are, at the same time, officially required to currently use ET. The difficulty is related to the challenge of change, and of not being totally for the concept or the technology.

Similarly, F8 shared, "My educational background makes it easy for me to use ET. I have been well-informed about the use of PPT presentations and Microsoft software since I was still a university student." Likewise, F10 commented:

> Faculty members' educational background and skills affect their employment of ET. When I was studying for my bachelor and my masters degrees, it was essential to use ET (i.e. PPT presentations) in every single class. This experience has helped me to develop my skills and motivated me to use ET with my students as a faculty member.

F3 added, "I am already a tech fan and I am interested in developing myself and my skills. Even if it is challenging to use a specific device or program, I get curious to learn it in order to make a good use of it in my classes." Likewise, F9 pointed out, "I do believe that using ET in the educational process is very easy to use if the person has the desire and the personal determination but if there is an internal rejection or negative attitude towards employing ET it will be definitely very difficult." Similar to F9, F12 explained, "I have no difficulty whatsoever in using PPT presentations; they are very easy to use, and I am experienced at using them as I am a certified trainer in four different official bodies." More specifically, F11 stated:

> The educational background I have acquired during my master's and a doctorate degree in educational technology made using ET very easy such as selecting the

> appropriate ET tool that complements the nature of the course.faculty members readiness and educational background whether through training courses or educating themselves play a critical role in employ technology in teaching the course content.

In summary, seven female faculty reported that the complexity of incorporating ET depends on faculty members' readiness and basic technology skills.

**Finding 3.5.** One of the participants *(N = 15)* reported that the complexity of incorporating educational technology was that ET requires her to develop specific technology skills.

One participant incorporating technology into instruction such as virtual classrooms was a difficult because it required specific technology skills that she needed to acquire. Specifically, F4 explained:

> I tried to help students learn the feature of virtual classrooms, but I did not have the sufficient knowledge or experience to make it work. I needed the continuous help of a staff member in the department of Education Technology as neither me nor students had the knowledge to use the feature.

In summary, one female faculty reported that the complexity of incorporating ET was that ET requires her to develop specific technology skills.

**Finding 3.6.** Two of the participants *(N = 15)* reported that the complexity of incorporating educational technology was that students find ET inconvenient to interact with and respond to.

According to the study participants *(N= 2)*, incorporating Blackboard to enhance and support classroom instruction becomes difficult when students were not familiar with it. In support of this argument, F13 stated:

> I end up grading students assignment twice, on paper and electronically. The problem I encounter with students is that not all of them submit their assignment to Blackboard because they are not familiar with Blackboard and they find it difficult to interact with and respond to its properties.

More specifically F12 stated:

> Students at non-scientific college including college of Arts, Education, Applied Arts are not familiar with Blackboard and hence they find it difficult to interact with and respond to its properties. Students need to be trained to use it through organized training courses. I obligate students to use Blackboard by not handing out any content-related material in the class. I instruct them to refer to Blackboard to get it. Sometimes I stress the importance of a PPT presentation I employed in a class in terms of exams preparation to force students to use Blackboard and upload it.

In summary, two female faculty reported that the complexity of incorporating ET was that students find ET inconvenient to interact with and respond to.

**Summary of Data Analyses for Research Sub-question 3.** Female faculty reported the complexity of incorporating educational technology in their instruction:

**Finding 3.1.** Seven of the participants *(N = 15)* stated that the complexity of incorporating educational technology into classroom instruction was related to troubleshooting and technological malfunctions.

**Finding 3.2.** Five of the participants *(N = 15)* reported that the complexity of incorporating ET stemmed from lack of availability of equipment and resources, which impacted course content delivery.

**Finding 3.3.** One of the participants *(N = 15)* reported that the complexity of incorporating educational technology was that the available resources were inadequate for educational tasks.

**Finding 3.4.** Seven of the participants *(N = 15)* reported that the complexity of incorporating educational technology inside the classroom was dependent on the faculty members readiness to employ basic technology skills.

**Finding 3.5.** One participants *(N = 15)* reported that the complexity of incorporating ET was that ET requires them to develop specific technology skills.

**Finding 3.6.** Two of the participants *(N = 15)* reported that the complexity of incorporating educational technology was that students find ET inconvenient to interact with and respond to.

**Research Sub-question 4: What do female faculty members report regarding the trialability of incorporating technology in their instruction?**

The fourth attribute of Rogers' (2003) framework is trialability. Research indicates innovations that can be tested and with individuals being provided time to learn, and work with the innovation prior to embedding it in their practice will be adopted at a faster rate (Rogers, 2003; Abdelmagid, 2011). According to Roger (2003), trialability is "the degree to which an innovation may be experimented with on a limited basis" (p. 231). Table 9 highlights the major themes that female faculty reported regarding the trialability of educational technology with their instruction.

Table 9

*Female Faculty Reports on the Trialability of Educational Technology with Their Instruction (N = 15)*

| Code | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 | F11 | F12 | F13 | F14 | F15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Personal & Academic Interest | x | x | - | x | x | x | x | x | - | x | - | x | x | x | - |
| Personal Effort / Peer Support | - | - | - | - | x | x | - | x | - | x | - | x | x | - | - |
| Professional Development & Training Programs | - | x | x | - | - | - | - | x | - | x | - | x | x | - | x |
| Institutional Support | x | x | x | - | x | - | x | - | x | x | - | - | - | - | - |
| Workload / Time | x | - | - | - | - | - | - | x | - | x | - | x | - | - | - |

**Findings for Research Sub-question 4**

Female faculty members' reports regarding the trialability of incorporating educational technology in their instruction.

**Finding 4.1.** Eleven of the participants *(N = 15)* reported that the trialability of incorporating ET stemmed from their personal and academic interests, which assisted in

developing their technology skills.

According to participants *(n = 11)*, previous experience with technology provided them with the skills needed to employ ET. In support of this argument, F7 shared, "As a student in the department of computers, it was basic to use computer devices, PPT software, and projector devices. As students, we were frequently assigned to create PPT presentations." Similarly, F8 stated, "I had the opportunity to experiment with ET when I was still studying for my bachelor's degree. We were assigned to create PPT presentations in groups and individually." Likewise, F10 commented,

> PPT presentations and Microsoft Word were the most common software I used as a student. I could realize then how effective and interesting the employment of ET was, and I used to be totally engaged by the interesting way with which some faculty members employed ET, and that is why I adopted the same method in my classes.

Moreover, F2 shared, "When I first started my career at the university, I used to create PPT presentations to help students better understand and identify with the course material...it was a sort of personal choice and preference." Equally important, F1 shared, "During my doctoral study I had the time to learn how to employ electronic templates to write my resume, the Robot program as well as other specific programs to help me write my dissertation." F12 added, "When I was studying for my masters and doctoral degrees, I would spend a whole day doing research on my laptop and browsing academic websites and e-libraries to find useful resources to help me with writing my dissertation." Similar to F12, F14 explained "While I was writing my doctoral dissertation, I learned the features of Microsoft Word software to process the texts. I also used the external hard disk to save my dissertation and academic papers." Likewise, F13 pointed out "During my doctoral study I had the time to learn how to employ Google programs including: Google calendar, Google slides and Google Docs. Such programs assist me to keep my life organized and efficient." More specifically, F4 stated:

> When I was a student in the USA, I started using technology to accomplish assignments such as projects and bulletin boards using Blackboard. I also

> encountered the Safeer Program, a program created to help Saudi students abroad, as one of the first experiences which required the use of technology in terms of electronically registering for courses, uploading semester reports, etc. I was forced by this early encounter to learn how to use technology.

Moreover, F5 shared "At earlier stages of my life, I used technology for personal use, such as amusement and shopping purposes." Similar to F5, F6 pointed out, "I was assigned to accomplish administrative duties at the department of Kindergarten or for my personal use, such as surfing the internet, watching movies or shopping online."

In summary, eleven female faculty reported that the trialability of incorporating ET stemmed from personal and academic interests, which assisted in developing their technology skills.

**Finding 4.2.** Six of the participants *(N = 15)* reported that the trialability of incorporating ET was that they learned and experimented with technology as a result of personal effort or peer support.

Six female faculty explained that the university training/ workshops did not assist them in learning how to use Blackboard, maintaining that they were self-taught or more often helped by a colleague when they first started at the university. In support of this argument, F5 shared, "Using Blackboard is a personal effort as I have learned through watching tutorial videos.I have no experience or training on how to use it as I started to follow tutorial videos on YouTube, such as upload PowerPoint presentation and create test and assignment or ask for help from my colleagues." Similarly, F13 stated, "Shortly after receiving my doctoral degree and returning to my teaching practice I was officially required to activate Blackboard. However, the university did not provide any training on how to use Blackboard until the mid of the semester." Likewise, F6 shared, "I normally obtained such training by myself using the online video tutorials and most of the time I request my colleagues' assistance. I did not receive any training on how to activate short quizzes and correct them through the Blackboard until five months after starting my work at the university." Speaking about the important of providing adequate and appropriate training to

female faculty F12 commented, "Faculty members are not trained to use Blackboard, so they just copy and paste the information. If a faculty member is experienced enough or is helped by other experienced members, she can handle it easily." More specifically, F10 commented:

> Since we started to use Blackboard, I have not been required to attend a single training course. I have no previous experience at using it and I ask for my colleagues' assistance. It does not make sense to be obliged to activate it while the training course designed to inform me about how to activate it is to be held a month from now.

F8 added, "I am currently required to use it to upload assignments and short quizzes I still do not know how to upload an exam. Even for the uploading of assignments and quizzes, no training courses were available last year. I asked for my colleagues' assistance."

In summary, six female faculty reported that the trialability of incorporating ET was that they learned and experimented with technology as a result of personal effort or peer support.

**Finding 4.3.** Seven of the participants *(N = 15)* reported that the trialability of incorporating ET was that the professional development/training programs were not designed to suit their needs.

All female faculty explained how aspects of the training courses—such as scheduling, topics covered, and the types of training meant to improve faculty technology proficiency and increase technology integration—were not designed according to their preference.

This can be seen in the comments of F8, who stated, "The current plan of training courses is set according to the perspective of the Deanship of Quality and Development which mainly aims to accomplish administrative tasks of quality and development. Some other training courses lean towards personal preferences (i.e. crisis management, understanding personality types)." She continued "Most training courses lack application and are confined to the theoretical parts of the covered topics." Similarly, F13 commented "The problem is that the training courses usually have conflicting timetable with the classes, so I simply do not attend them in order not to miss my classes." Likewise, F12 shared "In general, training courses are held according to timetables which are usually conflicting with faculty members' classes." Similar to F12, F15 stated, "There is also the point of training courses not being available for all faculty members because a limited

number of trainees are often allowed to register." Equally important, F10 shared:

> Faculty members should be provided with a list of training courses to select the ones they most need. The university organizes a number of training courses but with very limited number of attendees. For instance, the training course in academic publishing is of extreme importance to almost all faculty members, but it is only available for a very limited number.

Moreover, F2 pointed out that "The training courses are usually scheduled at the same times of lectures and faculty members are forced to choose whether to attend the training session and skip the lecture or the other way around. Training courses should be scheduled in a way that does not contradict lecture timetables." More specifically F3 shared:

> The problem is that they usually have conflicting timetable with the classes, so I simply do not attend any of them. Some training courses are not available to all staff members. The number of staff members permitted to attend these courses is very limited as one staff member from each department is permitted to attend and expected to pass on the training experience to the other colleagues. Such an expectation is not often met as it is not easy for all staff members to meet together due to their different timetables. It is very important that these training courses be available for all staff members as the sole attendee might not be able to effectively pass on the training course content with other colleagues.

In summary, seven female faculty reported that the trialability of incorporating ET was that the training courses were not designed to suit their needs.

**Finding 4.4.** Seven of the participants *(N = 15)* reported that the trialability of incorporating ET stemmed from inadequate institutional support, which limited their ability to employ it.

They defined institutional support as including the provision of training, technical support, equipment and resources and robust infrastructure that are all essential to facilitate female

faculty's use of technology. With respect to the importance of providing institutional support to use technology effectively in their classrooms, F9 shared:

> It is of major importance to provide infrastructure in terms of high-speed Internet access, properly equipped classrooms with LCD projectors and desktop computers, and regular maintenance as it is non-existent for the College of Education in order for faculty members to utilize ET more efficiently than it is. Some LCD projector devices for instance remain broken-down for a long time even if the concerned bodies are notified

More specifically, F7 explained, "The internet connection at the university is very slow if available at all; it is very difficult to play a YouTube video, for instance. The University server is constantly overloaded, which makes it challenging to open Blackboard and consequently to access the course material (i.e. PPT presentations)." Likewise, F1 commented, "We frequently encounter electricity power cuts, devices breakdown as a result of irregular maintenance, and, of course, the unavailability of devices in many classrooms in the first place." Similarly, F5 stated, "There are only two available desktop computers for six faculty members in Early Childhood Education Department to fulfill their administrative and academic duties." Equally important, F10 shared, "The persistent problem is the unavailability of LCD projector devices and the lack of regular maintenance to available ones. Classrooms are not provided with any contact numbers to ask for technical support." Similar to F10, F2 stated, "The unavailability of ET equipment in classrooms and, even if available, the lack of technical support and regular maintenance remain the major issues that female faculty encounter." F3 added, "Available desktop computer devices at departments' offices are very limited. For instance, four faculty members in the Curricula Department have to use a single desktop computer."

In summary, seven female faculty reported that the trialability of incorporating ET stemmed from the inadequate institutional support which limited their ability to employ it.

**Finding 4.5.** Four of the participants *(N = 15)* reported that the trialability of incorporating ET stemmed from a lack of time and the increased workloads, which prevent them from becoming effective users of ET.

All of the female faculty explained that they do not have sufficient time either to learn and work with the new technology or to prepare course materials for Blackboard. In support of this argument, F8 shared, "I used to create PPT presentations when I was a university student and I have the motivation to adopt the same method with my students. I know we can be creative if spared some of the overloading administrative duties we are required to fulfill by the university." Similarly, F10 stated, "We are overloaded with administrative tasks, handling academic advising, attending training courses about administrative work ... All such requirements preoccupy faculty members, waste their time and effort, and hinder their academic ability to prepare course material." Likewise, F12 commented, "University officials need to reduce some of overloading administrative duties we are required to fulfill. They should allow needed time for female faculty to develop their skills and abilities in preparing course material and in using ET." More specifically F1 shared:

> I have to admit that lack of time is a challenge we sometimes fail to resolve. As an assistant professor and an assistant to the vice-dean of the College of Education, I am overloaded with academic and administrative duties and responsibilities. The opportunities to learn more about modern technologies like, for instance, the cellphone application of the "Augmented Reality," or to attend specialized courses, have become very slim because I do not have enough time to do so or to experiment with new technologies with my students.

In summary, four female faculty reported that the trialability of incorporating ET stemmed from a lack of time and increased workloads, which prevent them from becoming effective users of ET.

**Summary of Data Analyses for Research Sub-question 4.** Female faculty reported the trialability of incorporating educational technology in their instruction:

**Finding 4.1.** Elven of the participants *(N = 15)* reported that the trialability of incorporating ET stemmed from their personal and academic interests, which assisted in developing their technology skills.

**Finding 4.2.** Six of the participants *(N = 15)*reported that the trialability of incorporating ET was that they learned and experimented with technology as a result of personal effort or peer support.

**Finding 4.3.** Seven of the participants *(N = 15)* reported that the trialability of incorporating ET was that the professional development/training programs were not designed to suit their needs.

**Finding 4.4.** Seven of the participants *(N = 15)* reported that the trialability of incorporating ET stemmed from inadequate institutional support, which limited their ability to employ it.

**Finding 4.5.** Four of the participants *(N = 15)* reported that the trialability of incorporating ET stemmed from the lack of time and increased workloads, which prevent them from becoming effective users of ET.

**Research Sub-question 5: What do female faculty members report regarding the observability of incorporating educational technology in their instruction?**

Observability is the last attribute of Rogers' (2003) framework. Research indicates that when the results of the innovation are visible to others, then it will be adopted and implemented at a faster rate (Abdelmagid, 2011; Archambault, 2016; Blackburn, 2011). According to Rogers (2003), observability refers to "the degree to which the results of an innovation are visible to others" (p. 232). Table 10 highlights the major themes that female faculty reported regarding the observability of incorporating educational technology in their instruction.

Table 10

*Female Faculty Reports on the Observability of Incorporating Educational Technology in Their Instruction (N = 15)*

| Code | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 | F11 | F12 | F13 | F14 | F15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| University Faculty Rank | x | x | - | x | x | x | x | x | - | x | - | x | x | x | - |
| Perception of the Professionalism | x | - | - | x | x | - | x | x | - | x | - | - | x | x | - |

**Findings for Research Sub-question 5**

Female faculty members' reports regarding the observability of incorporating educational technology in their instruction.

**Finding 5.1.** Twelve of the participants *(N = 15)* reported that the observability of incorporating technology into their instruction was based on their faculty rank.

All participants explained that observing other faculty's teaching practices was limited to those with authority. In support of this argument F2 shared, "I do not have the option to attend lectures by other faculty members or to observe them in their classrooms." Similarly, F12 stated, "We are not entitled to attend classes by other faculty members; however, the Deanship for Quality and Development representatives paid a visit to a colleague who was using a PPT presentation." Likewise, F7 shared, "I was a member of the Quality and Development Committee and we used to pay unexpected visits to faculty members in classrooms to check their activation of ET. I attended a class where the faculty member was using PPT presentation. She did it efficiently and effectively."

More specifically F1 commented:

> When I was a member of Bab Project, I was an eyewitness to two different attitudes towards the use of educational technologies by two female faculty members. The first encountered the problem of a broken LCD deviceshe immediately came up with an

> alternative plan which is the use of a small portable projector. It worked amazingly and an interactive educational environment was created where both the female faculty members and the students' performance was very successful. The second female faculty member's attitude towards almost the same situation ended with complete surrender to the deficiency of the classroom and the resort to the traditional methods.

Similar to F1, F10 commented:

> As a sign language interpreter, I used to interpret faculty member's classes to students with hearing impairments. One of the teaching faculty at Educational technology would face students, who were quite few, with her laptop. She would bring the LCD or the slide projector to present the content. Students still have good memories of her because of the positive impact she has had on them.

Equally important, F4 shared:

> As the department chair of Education and a member of Bab project, I watched the head of the department of ET using a presentation software through which she would amazingly go back and forth from a text to a photo to a video and then automatically to the slides without having to exit the slide. I remember the students' enthusiastic interactions with her, and we were amazed by such a great experience. I met with the head of the department after the class and asked her to take part in the university contest about the best teaching strategy to pass on her expertise to other staff members. A group was selected from each department and the evaluation was performed by heads of departments and branches supervisors and she came first. Her presentation was sent to them so that this technology could be passed on to other staff members.

Moreover, F14 stated that, as the supervisor of Islamic Culture Department,

> I attended a class once where the faculty member was not successful at effectively employing technology. The PPT was cramped with data copied from the textbook

> without being organized to involve students and motivate them to take part. On the other hand, I attended a very successful workshop for students conducted by another faculty member whose presentation was very effective and was personally useful to me. She employed ET very efficiently and variedly and students were enthusiastic to participate.

F8 added, "I came across a colleague in Special Education who used to bring along her own portable projector because there were no available LCD devices in the classroom. She was an inspiration to other members, and we got very interested in using PPT presentations."

In summary, twelve female faculty reported that the observability of incorporating technology into their instruction was based on their faculty rank.

**Finding 5.2.** Eight of the participants *(N = 15)* reported the observability of incorporating technology into their instruction was based on their perception that the most professional faculty members used technology in class.

Meeting job expectations at the university requires that faculty members employ technology. This is related to observability in that when a supervisor observes or perceives a faculty member employing technology, she perceives those faculty members as professional. In support of this argument, F1 stated, "When I encounter faculty members who deliberately choose to use ET, I immediately get the impression that they are hard-working and professional individuals who keep up with modern educational trends." Similarly, F5 stated, "I immediately get the impression that they are hard-working, open-minded, knowledgeable, and professional individuals who spare no effort to be creative and to involve students in the educational process." Likewise, F7 commented, "I think of a faculty member as successful and knowledgeable in terms of technology because they have effectively employed technology to provide for the quality of education making sure to keep updated about modern education which is technology-based." Similar to F7, F10 shared, "Creative individuals are enthusiastically willing to face the challenges of the technologically unprepared educational environment to activate their philosophy of teaching in a way that benefits themselves as well as their students."

Speaking of how these faculty are considered role models as well as positive examples, F8 stated, "They are a positive example to follow and from whom I get inspired to regain enthusiasm to use ET. They are aware of the advantages of using ET in terms of facilitating the communication of course material through the employment of activities and exercises which help improve students' skills and enhance their academic achievement." Equally important, F13 commented, "Trying to find alternatives to employ when technology is not available in the classroom has positive impacts not only on students but upon the teaching process as a whole. I believe such individuals set good examples to students when the latter come to experience the work field." Moreover, F4 stated, "Skillful professionals who possess the vision to provide graduates armored with the skills and experience required to keep up with the fast strides of the 21st century at all levels." More specifically F14 shared:

> I admire faculty members who use ET because they believe in its effectiveness in improving the educational process and not because they are obliged to use it. I think of such faculty members as knowledgeable individuals who would take wide strides to upskill themselves in terms of modern technology and IT knowledge.

In summary, eight female faculty reported that the observability of incorporating technology into their instruction was based on their perception that the most professional faculty members used technology in class.

**Summary of Data Analyses for Research Sub-question 5.** Female faculty reported the observability of incorporating educational technology in their instruction:

**Finding 5.1.** Twelve of the participants *(N = 15)* reported that the observability of incorporating technology into their instruction was based on their faculty rank.

**Finding 5.2.** Eight of the participants *(N = 15)* reported the observability of incorporating technology into their instruction was based on their perception that the most professional faculty members used technology in class.

## Chapter Summary

This chapter presented the findings that emerged from this qualitative, exploratory, single-case study. Interviewees words were analyzed and categorized using open coding. This study was complied with the research methodology presented in Chapter 3. Five research sub-questions offered insight on the primary research question concerning female facultys reports regarding the diffusion of educational technology as an innovative instructional tool in a single-sex, postsecondary education institution. Chapter 5 presents conclusions and implications based on the derived findings as well as recommendations for practice and future research.

# CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

## Introduction to the Chapter

The purpose of this chapter is to present the conclusions and recommendations derived from the findings presented in Chapter Four. This qualitative, exploratory, single-case study examined what female faculty members reported regarding the diffusion of educational technology as an instructional tool as viewed through the lens of Rogers (2003) diffusion of innovations framework. This chapter is organized into three parts. The first is a summary of the study including the problem statement, conceptual framework, research questions, and a summary of findings. The second is a presentation of the conclusions derived from the findings, followed by recommendations for practice and future research. Finally, the chapter ends with the implications of the study.

## Problem Statement

Members within the Saudi Ministry of Education have sought to improve instruction via technology by having educational institutions advance technological tools across all levels (R. Alebaikan & Troudi, 2010), including within postsecondary classrooms. Leaders within the Saudi ministry of higher education "encourage the use of information technology (IT) for teaching and learning among its faculties and students" (R. Alebaikan & Troudi, 2010, p. 49). Educational technology usage in the Arab states offers specific opportunities for higher education institutions, including the potential to improve the quality of education, enhance student outcomes, facilitate access to learning opportunities, facilitate learning and teaching and improve productivity (Al Saif, 2005; Alajmi, 2010; Alfahad, 2012; Almobarraz, 2007; Almuqayteeb, 2009; Bajabaa, 2017; Massy & Zemsky, 1995), if it is adopted effectively and efficiently in the classroom.

However, according to Alshahri (2015), "the potential instructional, cultural and institutional benefits of these ICT tools cannot be realized unless faculty use them" (p. 73). Moreover, Alshangeeti et al. (2009) suggested that "there is a risk that this opportunity may not be realized if faculty members are not inclined to adopt the relevant information and

communication technologies (ICT)" (p.1). Research has shown that faculty perceptions and attitudes regarding technology and the integration of technology in the classroom can play a critical role in its rejection or adoption as a teaching tool, affecting the successful diffusion of educational technology (Al Gamdi & Samarji, 2016; Al Saif, 2005; Albalwi, 2008; Albirini, 2006; Alkhalaf et al., 2012; Sahin, 2006).

Limited research exists regarding faculty members' willingness to adopt technological tools in general, female faculty members' willingness regarding its usage in particular, and even less regarding their reports on the diffusion of technology. In Saudi Arabia, faculty members represent the primary decision makers regarding the use and integration of technology in instruction (Almuqayteeb, 2009). It has been found that female faculty members are not using educational technology as an instructional tool despite its potential to enhance teaching performance (Al-Asmari, 2005; Almuqayteeb, 2009). Early studies regarding educational technology adoption maintain that Saudi faculty members may be in the early stages of adopting technology for instructional purposes (Albalwi, 2008; Al-Fulih, 2002; Allehaibi, 2001; Alnujaidi, 2008; Kamal, 2013; Omar, 2016). Moukali (2012), using Rogers' (2003) framework, reported that female faculty were less likely to adopt blended learning. This indicates that female faculty may be at an initial implementation stage whereas male faculty were within reach of what he labels the confirmation stage. Al Saif (2005) indicated that female faculty held more positive attitudes toward internet- and web-based instruction, whereas male faculty were more likely to use and integrate such technology for instructional purposes than their female counterparts. J. M. Moore (2007) emphasized that "instructors are the key to the diffusion of any innovation in the classroom, and if their perception level of the attributes of an innovation is defined, questions answered, and their needs met, the innovation will be adopted and used at a faster rate" (p. 21).

Research on faculty perception and attitude toward educational technology in Saudi Arabia and the Middle East has focused on three main areas (Alshangeeti et al., 2009). Studies have been conducted regarding the barriers that affect the adoption of educational technology as perceived by faculty members (Al Gamdi & Samarji, 2016; Alajmi, 2010; Al-Alwani, 2005; Almuqayteeb,

2009). Other research has focused on factors that motivate or inhibit the effective implementation of educational technology (Al Saif, 2005; Al Senaidi, 2009; Albalawi, 2007; Albalwi, 2008; Al-Fulih, 2002; Algahtani, 2017; Al-Kahtani & Al-Haider, 2010; Bajabaa, 2017; Karkouti, 2016) or on faculty's perceptions of and attitudes toward educational technology (Albirini, 2006; Aldossry, 2011; Alenezi, 2012; Al-Harbi, 2016; Alkhalaf et al., 2012; Al-Oteawi, 2002). These studies are quantitative. Existing studies have focused on the K-12 educational system (Abdelmagid, 2011; Al-Alwani, 2005; Al-Ammari, 2004; Aldossry, 2011; Almekhlafi & Almeqdadi, 2010; Al-Mohaissin, 1993; Alsharari, 2016; Alsulaimani, 2012) as opposed to a higher education setting. Limited, qualitative research examines female faculty members' perceptions regarding attributes of educational technology within the Saudi Arabian context, and thus, this qualitative, single-case study seeks to examine what female faculty members report regarding the diffusion of educational technology as an instructional tool in a single-sex, postsecondary education institution in Saudi Arabia.

## Research Questions

The primary research question guiding this study was: What are female faculty members' reports regarding the diffusion of educational technology in their instructions? There were five sub-questions derived from Rogers's (2003):

1. What do female faculty members report regarding the relative advantage of incorporating educational technology in their instruction?
2. What do female faculty members report regarding the compatibility of incorporating technology in their instruction?
3. What do female faculty members report regarding the complexity of incorporating technology in their instruction?
4. What do female faculty members report regarding the trialability of incorporating technology in their instruction?

5. What do female faculty member report regarding the observability of incorporating technology in their instruction?

## Conceptual Framework

As discussed in earlier chapters, Rogers's (2003) was the conceptual framework that guided the data collection and analysis for this study. Rogers' model provided a way to explain and predict the rate of adoption of innovation. The model holds that individual perceptions of these five attributes or characteristics included: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability determined whether the diffusion process would increase or decrease.

Relative advantage is "the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 2003, p. 229). He emphasized that "the greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is going to be" (p. 15). Sahin (2006) maintained that if the innovation advantages users, the diffusion would be faster as has been largely the case for adopting educational technology tools in higher education institutions. For example, faculty members were motivated to use Blackboard in teaching online courses because of the perceived effectiveness it brought to teaching performance (Al-Harbi, 2016). Compatibility refers to "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 240). Thus, when technology is perceived as jointly meeting faculty and student needs, both groups are likely to instructionally embrace it. Asiri et al. (2012) revealed that a faculty learning management system (Jusur) was consistent with their own and students' needs in "saving time and effort," "enhanc[ing] students' learning progress," and represented a "fast and efficient means of getting information" (p. 530).

Complexity refers to "the degree to which an innovation is perceived as difficult to understand and use" (Rogers, 2003, p. 257). Rogers maintained that when innovations were easy to use, as well as easy to integrate into any system, then the diffusion level would be higher in that

"New ideas that are simpler to understand will be adopted more rapidly than innovations that require the adopter to develop new skills and understandings" (p. 15). According to Alshammari et al. (2016), individuals with weak computer self-efficacy (CSE) held negative attitudes toward the learning management system and viewed the system as "difficult to use" or "less useful" when compared to individuals who possessed strong CSE (p. 119).

Trialability refers to "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 258). Rogers explained an innovation that can be tested and provided reliable and sufficient results would be adopted at a faster rate. For faculty to become effective users, they needed the time to learn, and work with the new technology to acquire the teaching and learning experience needed before embedding it as an integral part of instructional practice (Abdelmagid, 2011).

Observability is the last characteristic of innovation, and defined as "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 258). According to Sahin (2006), individuals were more likely to adopt the innovation if the results were observable and efficient in light of speed of acquisition and functionality.

These characteristics of innovation are essential to understanding and explaining the rate of adoption. "Innovations that are perceived by receivers as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations" (Rogers, 2003, p. 16). Thus, these characteristics of innovations are important to take into consideration to increase the rate of diffusion of innovation.

## Research Design and Methodology

This research was designed as an exploratory, qualitative, single-case study. The case study design was the most appropriate when examining a phenomenon in depth (J. W. Creswell & Creswell, 2017; J. W. Creswell & Inquiry, 2007; Yin, 2009). One of the fundamental aspects of the case study approach was that it allowed the researcher to develop insights, discover, and interpret a situation rather than test a hypothesis (Merriam & Tisdell, 2015). Case studies allow

the researcher an avenue which "explores in depth a program, an event, an activity, a processor, or one or more individuals" (J. W. Creswell & Creswell, 2017, p. 14). Cases are "bounded by time and activity" in which the researcher collects detailed, in-depth data by interviewing subjects as well as other forms of data collection (J. W. Creswell & Inquiry, 2007; Yin, 1994). The boundaries in this study were defined by a number of limiting factors: time, individuals, and the context within which the study took place. This study took place in a midsize, single-sex, postsecondary education institution in northern Saudi Arabia in an attempt to better understand female faculty members' perceptions of the diffusion of educational technology as an instructional tool. The site was purposefully selected because it is the only public postsecondary institution that allowed for questions to be collectively answered (J. W. Creswell & Inquiry, 2007).

Female faculty members represented the target population for this study. Cultural constraints limit the interaction between males and females due to gender segregation in schools and universities in Saudi Arabia. The sample for this study was purposefully selected using a snowballing sample approach. The researcher sought help from the department chair, who suggested potential female faculty members who might be willing to participate in the study. The number of participants was fifteen full-time female faculty members from the education department.

Data collection for this study involved semi-structured, in-depth, in-person interviews. The interviews were conducted by the researcher with female faculty at a midsize, single-sex, postsecondary education institution in Saudi Arabia, and was expected to last between 45 and 60 minutes. The interview questions were researcher-developed and based on both the survey instrument developed by G. C. Moore and Benbasat (1991) and based on Rogers' (2003) theoretical framework. Interviews were audiotaped, transcribed, and coded to answer the research questions.

## Summary of Study Findings

**Findings for Research Sub-question 1: What do female faculty members report regarding the relative advantage of incorporating educational technology in their instruction?**

**Finding 1.1.** Eight of the participants *(N = 15)* reported that ET effectively improves teaching performance.

**Finding 1.2.** Ten of the participants *(N = 15)* explained that ET facilitated knowledge communication when employed in the classroom.

**Finding 1.3.** Twelve of the participants *(N = 15)* reported that incorporating ET created an engaging environment for students.

**Finding 1.4.** Seven of the participants *(N = 15)* reported that ET aided faculty's ability to accommodate students learning styles.

**Finding 1.5.** Five of the participants *(N = 15)* reported that ET, as an alternative method to teach concepts, helped them to better communicate the intended knowledge.

**Finding 1.6.** Eight of the participants *(N = 15)*) reported that ET boosted their self-confidence.

**Finding 1.7.** Seven of the participants *(N = 15)* reported that ET helped them evaluate students' comprehension of the content presented.

**Finding 1.8.** Eleven of the participants *(N = 15)* reported that ET in the classroom helped them meet their job expectations.

**Findings for Research Sub-question 2: What do female faculty members reports regarding the compatibility of incorporating technology in their instruction?**

**Finding 2.1.** Seven of the participants *(N = 15)* reported that ET fit in the culture of their institution.

**Finding 2.2.** Eight of the participants *(N = 15)* explained that ET was consistent with their philosophies of teaching and learning.

**Finding 2.3.** Ten of the participants *(N = 15)* reported that the compatibility ET depended

on the discipline in which they teach.

**Finding 2.4.** Seven of the participants *(N = 15)* reported that ET was consistent with their prior experiences.

**Finding 2.5.** Six of the participants *(N = 15)* reported that t ET fit well with the mode in which they liked to work in the classroom.

**Finding 2.6.** Eleven of the participants *(N = 15)* reported that ET meets both female faculty members' and student's needs.

**Findings for Research Sub-question 3: What do female faculty members reports regarding the Complexity of incorporating technology in their instruction?**

**Finding 3.1.** Seven of the participants *(N = 15)* stated that the complexity of incorporating educational technology in classroom instruction was related to troubleshooting and technological malfunctions.

**Finding 3.2.** Five of the participants *(N = 15)* reported that the complexity of incorporating ET stemmed from lack of availability of equipment and resources, which impacted course content delivery.

**Finding 3.3.** One of the participants *(N = 15)* reported that the complexity of incorporating educational technology was that the available resources were inadequate for educational tasks.

**Finding 3.4.** Seven of the participants *(N = 15)* reported that the complexity of incorporating educational technology inside the classroom was dependent on the faculty members readiness to employ basic technology skills.

**Finding 3.5.** One participants *(N = 15)* reported that the complexity of incorporating ET was that ET requires them to develop specific technology skills.

**Finding 3.6.** Two of the participants *(N = 15)* reported that the complexity of incorporating educational technology was that students find ET inconvenient to interact with and respond to.

**Findings for Research Sub-question 4: What do female faculty members reports regarding the trialability of incorporating technology in their instruction?**

**Finding 4.1.** Elven of the participants *(N = 15)* reported that the trialability of incorporating ET stemmed from their personal and academic interests, which assisted in developing their technology skills.

**Finding 4.2.** Six of the participants *(N = 15)* reported that the trialability of incorporating ET was that they learned and experimented with technology as a result of personal effort or peer support.

**Finding 4.3.** Seven of the participants *(N = 15)* reported that the trialability of incorporating ET was that the professional development/training programs were not designed to suit their needs.

**Finding 4.4.** Seven of the participants *(N = 15)* reported that the trialability of incorporating ET stemmed from inadequate institutional support, which limited their ability to employ it.

**Finding 4.5.** Four of the participants *(N = 15)* reported that the trialability of incorporating ET stemmed from the lack of time and increased workloads, which prevent them from becoming effective users of ET.

**Findings for Research Sub-question 5: What do female faculty members reports regarding the observability of incorporating technology in their instruction?**

**Finding 5.1.** Twelve of the participants *(N = 15)* reported that the observability of incorporating technology in their instruction was based on their faculty rank.

**Finding 5.2.** Eight of the participants *(N = 15)* reported the observability of incorporating technology in their instruction was based on their perception that the most professional faculty members used technology in class.

## Conclusions and Recommendations

This section presents the conclusions drawn from the findings of this study, organized by research sub-question. Presented next are recommendations for practice and future research.

### Conclusion 1

*Female faculty reported that the educational benefits gained positively influenced their use of educational technology.*

Conclusion 1 is derived from study findings 1.1, 1.2, 1.3, 1.4, and 1.5.

These findings align with Rogers' (2003) first attribute, which is relative advantage. According to Rogers (2003), relative advantage is "the degree to which an innovation is perceived as better than the idea it supersedes" (p. 213). Therefore, innovation that is perceived to have a greater relative advantage—such as "economic profitability, low initial cost, a decrease in discomfort, a savings in time and effort, and an immediate reward" will be adopted and implemented at a faster rate (p.217-218).

Female faculty perceived educational technology to be useful and advantageous as an instructional tool. Specifically, the respondents indicate that employing ET for instructional purposes improved their teaching performance more so than the traditional lecturing method. More importantly, all respondents explained that the use of technology in classroom instruction entails a number of benefits, which include saving time and effort, organizing the teaching and learning process, creating an engaging environment in the classroom, accommodating students learning styles, and helping faculty to better communicate the intended knowledge.

The findings from this investigation support the work of Al-Harbi (2016), Abdelmagid (2011), Al-Asmari (2005), and Almobarraz (2007). In an effort to explore faculty members' attitudes toward using Blackboard in teaching online courses, Al-Harbi (2016) found that faculty members were motivated to use Blackboard because of the perceived effectiveness it brought to teaching performance. Similarly, Abdelmagid (2011) revealed that Kuwaiti teachers used technology because it facilitated the learning process in terms of saving preparation time and reducing faculty members' effort. In the same context, Al-Asmari (2005) found that faculty

members perceived the internet as an instructional tool to add value to their everyday practices, allowing them to "Save time and effort in obtaining information and materials needed for class, improve quality of instruction, added an element of interest and joy to teaching/learning process, resembles and attractive alternative way of presenting information, and offers a mean of student-centered learning" (p. 142). In a related vein, Almobarraz (2007) provided evidence that the perceived relative advantage of using the internet (accomplishment and efficiency in performing an academic task) were among the aspects that encouraged faculty members to use the internet. More importantly, the results of two additional studies provided evidence that both faculty and students perceived ET as advantageous because it was consistent with their own and students' needs in saving time and effort (Asiri et al., 2012; Alfelaij, 2015).

**Recommendations for Practice.** As identified by this study, female faculty were encouraged to use and adopt ET as an instructional tool because of the educational benefits it entails. Therefore, it is recommended that educational leaders maintain female facultys positive perceptions of ET by providing data that shows both the professional and educational benefits of technology when utilized efficiently in the classroom.

**Recommendation for Future Research.** Future studies could examine in-depth how instructors attitudes affect their use of technology and adoption. Such a study could also examine the relationship between faculty attitudes and technology adoption. Faculty members are the major decision-makers regarding teaching practices and technology use.

**Conclusion 2.**

*Female faculty reported that dealing with technology-related problems negatively influenced their use of educational technology.*

This conclusion is derived from findings 3.1, 3.5, and 3.6. With regard to the difficulty female faculty encounter when using educational technology, seven of the participants reported that they were unable to manage troubleshooting and technological malfunctions. More specifically, one participant reported that using virtual classrooms required her to develop specific technology skills. Moreover, two participants reported that using Blackboard to enhance and

support classroom instruction became difficult due to the fact that students found it inconvenient to interact with and respond to. These findings support the work of Alshammari et al. (2016); Abdelmagid (2011); Quadri et al. (2017); Al-Harbi (2016); Alfelaij (2015); and Algahtani (2017).

In a study that examined the factors that influence the integration of learning management systems, Alshammari et al. (2016) found that individuals with weak computer self-efficacy (CSE) viewed the system as "difficult to use" or "less useful" when compared to individuals who possessed strong CSE (p.119). Similarly, Abdelmagid (2011) found the attribute that limited Kuwaiti teachers use of ET was "difficulty in using some devices and dealing with malfunctions" due to their "lack of expertise" (p. 145-151). Moreover, Quadri et al. (2017) found that the lack of technological skills and knowledge directly impacted faculty members' confidence in effectively integrating technology into their higher education classrooms. On the contrary, Moukali (2012) reported that faculty participation in blended learning was due to their perception that "blended learning improves students and instructors' technological skills" (p. 99). More importantly, the results of three studies provided evidence that faculty motivation and attitudes toward implementing Blackboard was negatively affected by students' difficulty in enrolling and using LMS (Alfelaij, 2015) and reluctance to participate in online activities (Al-Harbi, 2016); students' engagement and cooperation is a key element in successful Blackboard use (Algahtani, 2017).

These findings were consistent with Rogers' (2003) third attribute, complexity, or "the degree to which an innovation is perceived as difficult to understand and use" (p. 230). According to Sahin and Thompson (2006), when an innovation appears to be complex in application or use, the level of diffusion is most likely to be low. However, innovations that are not complex, easy to use, and integrate into a system will be adopted at a faster rate than innovations that require an individual to develop new skills and understandings (Rogers, 2003). Therefore, faculty members who perceived technology to be difficult were less likely to integrate technology in their instruction (Sahin, 2006; Alshammari et al., 2016; Abdelmagid, 2011).

**Recommendation for Practice.** Educational leaders should support and encourage faculty members, as well as students, to employ educational technology by equipping them with the suitable skills. It is recommended that these leaders provide training programs on specific areas in which faculty and students need training to improve their technology skills. Additional professional development efforts could look at providing individual training upon faculty a members request. More specifically, professional development opportunities should be tailored to address faculty members unique needs.

**Recommendation for Future Research.** An in-depth study could examine how faculty computer skills influence the choice to integrate technology in classroom instruction. It could also examine the relationship between faculty computer skills and instructor characteristics.

**Conclusion 3.**

*Female faculty reported that the discipline in which they teach influenced their use of educational technology.*

This conclusion is derived from finding 2.3.

Consistent with other studies that examined technology integration (Almuqayteeb, 2009; Alshahri, 2015; Abdelmagid, 2011), ten participants indicated that the discipline in which they teach influences their use of educational technology. Specifically, female faculty perceived that educational technology was more compatible with some disciplines more than others. For example, the misconception that educational technology fit only scientific disciplines prevented female faculty in the education department from adopting it for instructional purposes outside of the sciences. Explicitly, one participant stated:

> The College of Education comes at the end of the list of Colleges in terms of employing ET because it was not merely an essential need. The prevailing misconception that ET only suits scientific majors hindered its use with non-scientific majors, which proved to be in bad need for its utilization.

This finding was in agreement with Abdelmagid (2011), who found that the subject area affected technology use and the type of technology applications used. For example, an Islamic studies teacher did not see the benefit of employing technology in in-class instruction; however, she would use an audio-recorder and textbook to teach the Quran. Similarly, Almuqayteeb (2009) found that there were differences in female faculty members' use of computer technologies based on the subjects they taught. For example, female faculty members who teach computer courses tend to use computer technology more than those who teach courses on subjects such as the Arabic language, Islamic studies, and mathematics. More importantly, Alshahri (2015) reported that the use of the Internet for instructional purposes was based on individual attitudes influenced by the discipline they teach. Moreover, Alfelaij (2015) reported that a colleague felt that the curricula in the context of Public Authority for Applied Education and Training (PAAET) "were not designed to work with technology, but rather with printed material" (p. 245). In support of these arguments and the findings from this present investigation, Karkouti (2016) explained that faculty members reported that "Teaching faculty how to align specific technological resources with course content and methods of instruction and emphasizing the importance of staying consistent with what they teach considered one of the factor that facilitate technology integration in their instruction." (p. 147). This confirms Asiri et al. (2012), who found that faculty who believe technology usage to be consistent with teaching methods employ it.

These findings align with Rogers' (2003) second attribute, compatibility, defined as "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (p. 240). An innovation that is "incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible" (Rogers, 2003, p. 15). Rogers (1995) emphasized that individuals will adopt an innovation because it is easy to use and does not cause massive changes that interfere with either the functionality or reliability of given systems.

**Recommendation for Practice.** Based on the finding from this study, it is recommended that the faculty professional development team should design programs in the form of workshops and trainings. Such training might be obtained via faculty exposure to best practices from other colleges/universities on how to employ ET in teaching and learning effectively. It is also recommended that the university offer the opportunity for faculty to observe, in action, how other faculty members integrate effectively teaching strategies/ technology to increase the rate of adoption in higher education.

**Recommendation for Future Research.** A positive correlation exists between instructors' attitudes and technology adoption (Al-Harbi, 2016; Almuqayteeb, 2009; Qudais et al., 2010; Moukali, 2012; Asiri et al., 2012). A study that examines the relationship between instructors' attitudes and technology adoption seems both timely and vital. Such a study could also explore the relationship between group demographic variables such as gender, age, academic rank, nationality, major, country of graduation, and years of teaching experience with adoption of ET.

**Conclusion 4.**

*Female faculty reported that inaccessibility, a lack of technical and institutional support, and the unavailability of needed technology negatively influenced their use of educational technology. These factors increased the complexity and limit ET's trialability.*

This conclusion is derived from Findings: 3.2, 3.3, and 4.4.

Five of the participants reported that technology integration became difficult because the appropriate technology was either unavailable or broken. More importantly, one female faculty reported that incorporating technology into instruction was difficult because the available resources were inadequate for educational tasks. Moreover, seven of the participants reported that the inadequate institutional support limited their ability to employ technology. Institutional support—including the provision of training, technical support, equipment and resources and robust infrastructure—were all essential to facilitate female faculty's use of technology.

Previous research on the factors that influence technology integration into instruction had similar findings to this present investigation. For example, Algahtani (2017) reported that a lack of equipment and resources further discourages female faculty to engage in e-learning, because they were often required to share scarce resources with their male counterparts. Similarly, Al-Harbi (2016) reported that faculty were not motivated to use Blackboard because students either didn't have adequate access to technology and other equipment or had limited access while working off campus. In a similar study Moukali (2012) found that the lack of adequate support was a key hurdle in implementing blended learning at Jazan University. More importantly, the findings of two studies provided evidence that the lack of support and technical expertise was associated with preventing faculty from effectively using technology (Alhawiti, 2011; Almuqayteeb, 2009). In terms of reliable internet connection services, Hakami (2015) revealed that a slow Internet speed, or interruptions to the connection, cut significantly into lecture time, inhibiting the use of Blackboard in an e-learning setting at Najran University. Alhawiti (2011) stated that the lack of infrastructure in terms of "adequate technology-enhanced classroom/labs/infrastructure", "appropriate student and faculty access to computers and Internet", and "library access or delivery of materials and services" was a strong obstacle that discouraged web-based distance education at Taif University and Tabuk University in Saudi Arabia (p. 127).

These findings align with Rogers' (2003) third and fourth attributes, complexity and trialability, and were consistent with the literature. The absence of the aforementioned institutional support increases the complexity and limits the trialability of ET as instructional tool. Innovations that were simple, easy to use, can be tested, and provided reliable and sufficient results would be adopted at a faster rate (Rogers, 2003). Therefore, providing opportunities for female faculty to try out technology may increase the ease and of using technology in the classroom.

**Recommendation for Practice.** Providing proper institutional support would increase the likelihood that female faculty incorporate technology in their instruction. It is recommended that educational leaders provide the proper technological infrastructure in terms of high-speed Internet access and properly equipped classrooms with LCD projector and desktop computers. More specifically, these leaders need to ensure that sufficient and appropriate technological resources are available and accessible for female faculty at any time. More importantly, female faculty should be provided with computers and reliable Internet to increase their use of technology. The provision of technical support on the spot, as well as regular maintenance, is also recommended.

**Recommendation for Future Research.** Quantitative research could examine the specific obstacles perceived as inhibiting the diffusion and adoption of educational technology. Identifying and eliminating barriers that hinder implementation could encourage faculty to more effectively integrate technology in their higher education classrooms. Such a study could also examine whether there is a relationship between complexity and trialability.

**Conclusion 5.**

*Female faculty reported that university trainings and workshops, as well as personal time constraints, negatively influenced their use of educational technology.*

This conclusion is derived from findings 4.2, 4.3, and 4.5.

Seven of the participants in this study reported that the training or workshops didn't assist them in learning how to use Blackboard, maintaining that they were self-taught or more often helped by a colleague. More importantly, six female faculty reported that the aspects of the training courses—such as scheduling, topics covered, and the types of training—were not designed to suit their needs. Moreover, four female faculty reported that they did not have sufficient time either to learn and work with the new technology or to prepare course materials. This lack of time prevents faculty from becoming effective users, because they need time to learn and work with the new technology before embedding it in their instructional practices (Abdelmagid, 2011). In other words, university training sessions did not provide an opportunity for female faculty to try ET in order to gain the skills needed to use technology in their teaching.

Without adequate and efficient training, faculty are unable to build the knowledge and skills crucial to the successful adoption and integration of technology for academic purposes. This lack of training was identified by Rogers (2003) as key to hindering faculty adoption of technology.

These findings support the work of Moukali (2012), Quadri et al. (2017), Abdelmagid (2011), Hamdan (2014), and Algahtani (2017). In a study examining factors impacting faculty members' attitudes on adopting technology, Moukali (2012) found a lack of training to be the major barrier to implementing blended learning at Jazan University. Moreover, faculty members reported facing challenges when designing material for blended learning; they expressed concern regarding their need for training on how to use Blackboard. A similar result was found by Quadri et al. (2017), who reported the lack of appropriate training as being the most significant barrier inhibiting faculty participation in e-learning. Similarly, Hamdan (2014) suggested that one of the major challenges facing faculty members in online teaching was a lack of training in instructional design. More importantly, Abdelmagid (2011) reported that Kuwaiti teachers perceived the ICDL and CLP training programs as follows: "Time allocated for the ICDL was not convenient for some teachers. [It did] Not align with teachers schedules and school hours;" as for the CLP trainings, they felt that it did "Not offer or cover diverse topic or [come with] a certificate of completion as with the ICDL" (p.146-147). In a related vein, Algahtani (2017) found that female faculty did not have sufficient time to prepare course materials for Blackboard. Work by Moukali (2012) expressed the need for providing adequate time to faculty, especially when developing materials for blended learning environments.

These findings align with Rogers' (2003) fourth attribute, trialability, which entails learning by doing, defined as "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 258). An innovation that can be tested, and provided reliable and sufficient results, would be adopted at a faster rate. For faculty to become effective users, they needed the time to learn and work with the new technology to acquire the teaching and learning experience needed before embedding it as an integral part of their instructional practices (Rogers, 2003; Abdelmagid, 2011).

**Recommendation for Practice.** Providing a professional development program where female faculty are able to experiment with ET may increase the rate of adoption in higher education. Training sessions prior to and during technology adoption and use are required to ensure faculty effectiveness in delivering an online course. It is also recommended that the university offer female faculty more periodic training sessions tailored to their needs. These sessions should be planned in conjunction with female faculty members, so as to anticipate any training problems.

**Recommendation for Future Research.** A mixed-methods study could examine the trialability of ET and investigate the impact of faculty professional development on technology integration. It could also examine what facilitates and hinders trialability, which would assist in identifying factors to encourage faculty to more effectively integrate technology.

## Chapter Summary

The purpose of this qualitative, exploratory, single-case study was to examine female faculty's reports regarding the diffusion of educational technology as an innovative instructional tool in a single-sex, postsecondary education institution. This chapter presented a summary of the conclusions and recommendations based on the derived findings. Suggestions for future research were also presented to encourage other researchers to examine the diffusion of educational technology as an innovative instructional tool.

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**Appendices**

# Appendix A

## Interview Protocol

| Introduction |
|---|

Explanation of the study, procedures for maintaining confidentiality, and securing of the statement of consent prior to recording

| Background Questions |
|---|

1. What is your highest academic degree?
2. What subject area do you teach at the university?
3. How many years of teaching experience do you have?

| Opening Questions |
|---|

1. Tell me about your educational technology use in the classroom
2. In what ways, if any, do you use educational technology in your instruction?

| Relative Advantages |
|---|

1. In what way, if any, does using educational technology improve your instruction?
2. In what way, if any, has educational technology helped you with your instruction?
3. In what way, if any, has educational technology helped you be more efficient with your instruction?
4. In what way, if any, has educational technology made your work in the classroom easier?

If it hasnt made your work easier, why do you think that is?

5. What do you think are the advantages/disadvantages of using educational technology in the classroom compared to prior methods?

| Compatibility |
|---|

1. Tell me how you think educational technology fits in the culture of your school.
2. In what ways, if any, is educational technology compatible with your instructional style? (philosophy of teaching and learning).
3. Tell me in what ways, if any, educational technology compliments your instruction.
4. How does or does not educational technology match how you like to work?

| Complexity |
|---|

1. Tell me the ways educational technology improves your instruction.

2. Describes ways in which ET is easy to use. Is it more difficult to use?

3. Give me an example of when ET made your instructional work easier. When has educational technology made it harder?

| Trialability |
|---|

1. In what ways, if any, have you been able to experiment with ET?

2. Tell me about a time you used ET before you tired it in the classroom.

3. Describe any instances in which you used ET on a trial basis.

4. Before ET was adopted as instructional tool, tell me about the time (s) you were able to experiment or practice with it.

| Observability |
|---|

1. Tell me about how youve seen other(s) changing their instructional practice because of educational technology.

2. Describe an instance where youve seen other(s) use ET that went well, that didnt go well.

3. Finish this statement: When I see someone using ET as instructional tool I think .

| Concluding Questions |
|---|

1. What other issues that was not covered here that you believe is relevant to this study and you would like to discuss?

2. Is there anything else you would like to add?

Appendix B

Recruiting E-Mail # 1

Dear Department Chair of Education

I am currently a doctoral candidate in the Department of Educational Leadership at the University of Hartford. I am writing you this email seeking your help to refer me to potential full-time and part-time female faculty members from the education department who can contribute to this study. This qualitative, exploratory case study is designed to examine female faculty reports regarding the diffusion of educational technology as an innovative instructional tool in a single-sex postsecondary education institution in Saudi Arabia as viewed through the lens of Rogers (2003) framework of attributes of innovation.

Fifteen full-time and part-time female faculty members from the education department will be interviewed for the purpose of this study. The interview will be set a mutually agreed upon date and time and are expected to last one hour. All data and information associated with participants or your institution will not be identified in the written paper, or in any report resulting from this study.

Thank you in advance. I look forward to hearing from you soon and appreciate your time and consideration of my request.

Please contact me at any time for further information. I can be reached at dalshamma@hartford.edu. You may also contact my research advisor, Dr, Karen Case, at Kcase@hartford.edu or by phone at 860.768.4369.

Sincerely,

Dalal Alshammari

Appendix C

Recruitment E-Mail #2 Invitation to Participate in the Study

Dear Faculty,

With the permission of Department Chair of Education, I am contacting you to participate in a qualitative, exploratory case study to examine female faculty reports regarding the diffusion of educational technology as an innovative instructional tool in a single-sex, postsecondary education institution in Saudi Arabia as viewed through the lens of Rogers (2003) attributes of innovation.

You are invited to voluntarily participate in an in-person interview. The interview will be set a mutually agreed upon date and time and are expected to last one hour. You will not be identified by name in the written paper, or in any report resulting from this study, but you will be assigned pseudonym. If you volunteer, you will receive an email containing a copy of the interview questions to reflect upon, brief description of Rogerss (2003) conceptual framework, and informed consent forms. For verification of some of your answers, I might need to get in contact with you again.

Please do not hesitate to contact me for any questions or would like further information. Looking forward to hearing from you soon. Thank you very much.

Sincerely,

Researcher

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**دعوة للمشاركة في دراسة بحثية**

مدي انتشار تقنيات التعليم كأداة تعليمية من وجهة نظر عضوات هيئة التدريس الاناث في أحد مؤسسات التعليم العالي في السعودية

عزيزتي عضوه هيئة التدريس المحترمة

السلام عليكم ورحمه الله وبركاته..... وبعد

بعد الحصول على إذن رئيسة قسم التربية، أنتي مدعوة للمشاركة في دراسة بحثيه بعنوان " مدي انتشار تقنيات التعليم كأداة تعليمية من وجهة نظر عضوات هيئة التدريس الاناث في أحد مؤسسات التعليم العالي في السعودية. سوف تجرى المقابلة الشفهية الشخصية في الوقت والمكان الذي يلائمك وقد تستغرق بين ستون دقيقة الي ساعة. لن يتم الكشف عن أي بيانات او معلومات شخصية مرتبطة بالمشاركات في الدراسة بل سيتم تعيين اسم مستعار. ذا كنتي ترغبين بالمشاركة، سوف تتلقين رسالة بريد إلكتروني تحتوي على نسخة من أسئلة المقابلة للاطلاع عليها ومعرفة رأيك بالأسئلة، وصف موجز للإطار المفاهيمي لروجرز (2003) الخصائص المدركة للابتكار واستمارة الموافقة. بعد فترة وجيزة من اجراء المقابلة، سوف اتواصل معكي من أجل التحقق من إجاباتك والاطلاع عليها.

أشكرك جزيل الشكر لمشاركتك في هذه الدراسة. إذا كان لديك أي تساؤلات تتعلق بالدراسة أو المشاركة فيها، يمكنك الاتصال بي أو الدكتورة المشرفة كما موضح أدناه.

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## Appendix D

### Description of Rogerss (2003) Framework

Rogers (2003) diffusion of innovations framework guided this research study. Rogers model was designed to explain and predict the rate of adoption of innovation. Rogers (2003) suggested that there were five characteristics by which an innovation may be described (p. 210). Individual perceptions of these five attributes or characteristics include: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability predict the rate of adoption. The potential adopters perception of the innovation depends on these five characteristics, which determine the rate of the diffusion process.

1. Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes (Rogers, 2003, p. 213). He emphasizes that the greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is going to be (p. 15).

2. Compatibility refers to the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 2003, p. 223). Thus, when technology is perceived as jointly meeting faculty and student needs, both groups are likely to instructionally embrace it.

3. Complexity refers to the degree to which an innovation is perceived as difficult to understand and use (Rogers, 2003, p. 230). Rogers maintains that when innovations are not complex, easy to use, as well as easy to integrate into any system, then the diffusion level will be higher in that new ideas that are simpler to understand will be adopted more rapidly than innovations that require the adopter to develop new skills and understandings (p.15).

4. Trialability is “the degree to which an innovation may be experimented with on a limited basis” (Rogers, 2003 p. 231). Rogers explains an innovation that can be tested and provides reliable and sufficient results will be adopted at a faster rate.

5. Observability is the last characteristic of innovation is defined as the degree to which the results of an innovation are visible to others (Rogers, 2003, p. 232). According to Sahin (2006), individuals are more likely to adopt the innovation if the results are observable and efficient in light of speed of acquisition and functionality.

These characteristics of innovation are essential to understanding and explaining the rate of adoption. Innovations that are perceived by receivers as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations (Rogers, 2003, p. 16). Thus, these characteristics of innovations are important to take into consideration to increase the rate of diffusion of innovation.

**وصف الإطار المفاهيمي/ النظري لروجر**

أن الإطار المفاهيمي أو النظري المستخدم في هذه الدراسة هو روجرز (2003) انتشار المستحدثات او الابتكارات. صمم روجرز هذا النموذج أو النظريه ليفسر ويتنبأ بمعدل اعتماد الفرد للابتكار. حيث ان نموذج الخصائص المدركة للابتكار بحسب النظرية يتحكم في سرعة انتشار المستحدث. وقد اقترح روجرز (2003) خمس خصائص يمكن من خلالها وصف الابتكار وهذه الخصائص تشمل ما يلي: (1) الميزة النسبية (2) التوافق (3) التعقيد (4) القدرة على التجريب و (5) الملاحظة. تصورات الفرد لهذه السمات أو الخصائص المدركة للابتكار تنبأ بمعدل اعتماد الفرد للابتكار. حيث أن تصور المتبني المحتمل للابتكار يعتمد بدرجة كبيرة على هذه **السمات أو** الخصائص الخمس، والتي بالتالي تحدد معدل عملية الانتشار أو تبني الابتكار.

**الميزة النسبية:**

عرف روجرز الميزة النسبية بالدرجة التي يدرك بها الفرد أن الابتكار أفضل من البديل الحالي، وأكد روجرز أنه كلما زادت الميزة النسبية المتصورة للابتكار بمعني أن الابتكار أفضل مما لدية حاليا، كلما كان معدل التبني أسرع.

**التوافق:**

عرف روجرز التوافق بأنه الدرجة التي يدرك بها الابتكار على أنه متوافق مع الاحتياجات الحالية والقيم والممارسات السائدة، التجارب السابقة. فكلما اتسم الابتكار بدرجه أكبر من التوافق مع القيم الاجتماعية، كلما زاد معدل تبنيه.

**صعوبة الفهم أو التعقيد:**

ويقصد بها الدرجة التي يدرك بها متخذ القرار مدى درجة صعوبة فهم واستخدام الابتكار بحيث يؤثر ذلك على قبول هذا الابتكار. ويؤكد روجرز أنه عندما تكون الابتكارات غير معقدة وسهلة الاستخدام، فضلاً عن كونها سهلة الاندماج في أي نظام، فإن مستوى الانتشار سيكون أعلى بمعني أخر الأفكار الجديدة التي يسهل فهمها سيتم تبنيها بشكل أسرع من الابتكارات التي تتطلب من المتبني تطوير مهارات ومفاهيم جديدة.

**القدرة على التجريب:**

ويعرف روجرز **القدرة على التجريب** بأنها القدرة على تجربة الابتكار على أساس محدود. فان الابتكارات التي يمكن تجربتها يتم تبنيها أسرع من تلك التي لا تتيح امكانية تجربتها.

**قابلية الاتصال أو الملاحظة:**

ويعرف روجرز قابلية الملاحظة بأنها الدرجة التي يمكن بها رصد وملاحظة المزايا والسمات المميزة للابتكار وذلك بواسطة الآخرين في النظام الاجتماعي، فكلما أمكن عرض مزايا الابتكار أو توضيحه للمتبنين كلما أدى إلى زيادة قبوله وتبنيه من جانب متخذي القرار. بمعني أخر، يتبني الفرد الابتكار الذي يمكن مشاهدة نتائجه بسرعه وتأني.

تعتبر الخصائص أو السمات المدركة للابتكار أساسية لفهم والتنبؤ بمعدل تبني الافراد للابتكار. "إن الابتكارات التي يدركها الافراد بأنها تتمتع بميزة نسبية أكبر، توافق، وقابلية للتجربة، قابلية الملاحظة، وأقل تعقيداً، سوف يتم تبنيها بسرعة أكبر من الابتكارات الأخرى. وبالتالي، من المهم أن تأخذ الخصائص المدركة لابتكار في الاعتبار لزيادة معدل انتشار الابتكار بين الافراد.

Appendix E

Informed Consent Form

In-Person Interview

The purpose of this qualitative, exploratory, single-case study is to examine female facultys reports regarding the diffusion of educational technology as an innovative instructional tool in a single-sex, postsecondary education institution located within Saudi Arabia. For the purpose of this study, educational technology is defined as hardware and software technologies such as computers, information and communications technology (ICT), distance education, E-learning and other applications that can be used for instructional or learning purposes. The researcher will use one-on-one interviews to collect data from female faculty members to discuss their perceptions of attributes of innovations that influence the rate of adopting educational technology for instructional or learning purposes. Knowing such information could be a valuable resource for single-sex, postsecondary institutions in Saudi Arabia and other Arab state countries. Prior to agreeing on the terms and conditions of this document, you must know that:

- Your participation in this study is voluntary.
- If you decided to participate, you have the right to withdraw at any time and no risks or harm would entail to you or your institution.
- Risks of participation in the interview are not greater, considering probability and magnitude, than those ordinarily encountered in daily life.
- You may also benefit by knowing you will help fill a gap in the research about the diffusion of educational technology as perceived by female faculty.
- The interview will last approximately one hour.
- All interview responses, in the form of digital or paper, will be stored securely in a computer or locked file cabinet and will be destroyed upon completion of the study.

- The interview will be audiotaped and transcribed. You may choose to review the interview transcript to make any corrections and to ensure its accuracy.
- All information obtained from the interview will be confidential, and the findings from this study will be shared in the dissertation but your name will not be revealed and you will be assigned a pseudonym.
- If you have any concerns or questions about your rights as a research subject, please contact University of Hartford Human Subjects Committee (HSC) at 860-768-5371 or hsc@hartford.edu. The Human Subjects Committee is a group of people that review research studies at the university and protect the rights of people participating in that research.

I agree to participate in the outlined above study.

Subjects Signature Date

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Thank you for participating. Should you have additional questions about the research project you can contact me or my advisor

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**Informed Consent Form Arabic**

الموافقة على الاشتراك في الدراسة

مدي انتشار تقنيات التعليم كأداة تعليمية من وجهة نظر عضوات هيئة التدريس الاناث في أحد مؤسسات التعليم العالي في السعودية

عزيزتي عضوه هيئة التدريس المحترمة

السلام عليكم ورحمه الله وبركاته..... وبعد

أنتي مدعوة للمشاركة في دراسة بحثيه بعنوان " مدي انتشار تقنيات التعليم كأداة تعليمية من وجهة نظر عضوات هيئة التدريس الاناث في أحد مؤسسات التعليم العالي في السعودية. حيث تعرف تقنيات التعليم بأنها الأجهزة والبرامج كأجهزة الكمبيوتر، تكنولوجيا المعلومات والاتصالات، التعليم عن بعد، التعلم الإلكتروني والتطبيقات الأخرى التي يمكن استخدامها لأغراض تعليمية أو تعليمية. حيث أن تقنيات التعليم تتيح فرصًا لمؤسسات التعليم العالي، بما في ذلك إمكانية تحسين جودة التعليم، تعزيز نتائج الطلاب، تسهيل الوصول إلى فرص التعليم، وتحسين الإنتاجية.

قبل أن تقرر ما إذا كنت ستشارك في هذه الدراسة، يجب أن تعرف:

- مشاركتك في هذا البحث طوعي واختياري.
- إذا قررت المشاركة، فلديك الحق في الانسحاب في أي وقت، ولن يترتب أي مخاطر أو ضرر عليك أو على مؤسستك.
- لا يترتب أي مخاطر للمشاركة في الدراسة وان وجد فهي لا تتعدي المخاطر التي يواجها الأنسان في حياته اليومية.
- المشاركة في هذه الدراسة تسهم في اكتشاف وفهم مدي انتشار تقنيات التعليم كأداة تعليمية.
- المقابلات الشفعية قد تستغرق ستين دقيقة الي ساعة.
- سيتم تخزين كل المعلومات الورقية والرقمية المستقاة من المشاركين في مكان أمن وسوف تعامل بسرية تامة وسيتم التخلص منها عند الانتهاء من الدراسة.
- سيتم تسجيل ونسخ أجوبة المقابلة وسوف يتسنى لك الاطلاع على نسخة المقابلة للتأكد من دقتها واجراء أي تعديل إذا استدعي\لزم الامر..
- جميع المعلومات المستقاة من المقابلة سرية، وسيتم مشاركة نتائج هذه الدراسة في الرسالة، ولن يتم الكشف عن اسمك وسيتم تعيين اسم مستعار.
- إذا كانت لديك أسئلة أو استسفار حول حقوقك كمشارك بالبحث يرجى الاتصال بلجنة حقوق المشاركين في البحوث العلمية في جامعة هارتفورد على الرقم: 860-768-5371 أو hsc@hartford.edu لجنة حقوق المشاركين في البحوث العلمية في جامعة هارتفورد هي مجموعة مختصين في حماية حقوق المشاركين في البحوث العلمي.

أوافق على المشاركة في الدراسة المذكورة أعلاه.

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توقيع المشاركة: التاريخ:

أشكرك جزيل الشكر لمشاركتك في هذه الدراسة. إذا كان لديك أي تساولات تتعلق بالدراسة أو المشاركة فيها، يمكنك الاتصال بالباحثة أو الدكتورة المشرفة كما موضح أدناه.

**الرجاء الاحتفاظ بنسخة موقعة من هذه الوثيقة**

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