

Technology Adoption and Integration: A Multiple Case Study of Rogers' Diffusion of Innovation Theory in Kuwait

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Abstract

The adoption and integration of technology is limited in K-12 contexts worldwide, including in the Middle East. Based on the work of Everett Rogers (1995) and his disciplines, studies in the United States indicate that teachers' perceptions towards the attributes of technology (relative advantage, compatibility, complexity, trialability and observability) reflect the extent by which technology is used. Furthermore, teachers' characteristics and the support environment provided can potentially encourage or inhibit the adoption of technologies. This multiple case study was designed to show the applicability of Rogers' diffusion of innovation theory in Kuwait public school systems. The study was conducted with eight female Kuwaiti teachers in two primary public schools. A qualitative methodology was employed using interviews, participant observations, and physical artifacts for collecting data.

The study reveals that Rogers' three attributes relative advantage, compatibility and observability (result demonstrability) contributed to use, while complexity and observability (visibility) limited use. Prior experience and practice, motivational support provided by the school administration and department head, and teachers' voluntary decisions on the type of technologies to use encouraged use. Anxiety from lack of functionality of devices and extra time and effort in preparing materials, centralized decision-making on technology purchases, budget constraint, and limited access to technology and classrooms in which devices are located were factors that limited teachers' use. The study showed that Kuwaiti teachers' acceptance of technology varied along the continuum, where some teachers were early adopters and some were laggards. Support initiatives are needed from the Ministry of Education and school administration, in order to facilitate technology adoption and use in Kuwaiti schools.

Dedication

To **the people** I love most

My parents; Sedki my husband; Abdelhafiz, Abdelwahab, and Ahmed my brothers; Ibraheem, Yousuf, and Heba my children; and my late beloved grandfather Abdelhafiz.

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CHAPTER ONE - INTRODUCTION

The rapid emergence of technology and its current role in developing and enhancing learning have made educational practitioners and instructors strive to adopt new technological innovations to meet the growing needs within their school systems and higher educational institutions. In the field of instructional technology, research on new innovation has focused on the diffusion and adoption process. Diffusion refers to the spread of technology to general use, and adoption refers to the selection of a technology for use by individuals or organizations. The study of diffusion theory is potentially valuable for instructional technologists for three reasons. First, by being knowledgeable of the problems that face technology adoption, the impeding or facilitating factors are better predicted, explained and taken into consideration. Second, being knowledgeable in innovation processes and theories will make working with clients and possible adopters more effective. Third, acquiring knowledge about diffusion theory, diffusion and adoption models can be generated that would lead to innovations that are valuable and pedagogically appropriate (Surry, 1997).

Studies show that general diffusion theories have been employed to build theories specific to instructional technology. Surry (1997) divides diffusion theories into two broad categories, which are general diffusion theories that are applicable to a wide range of organizations, and instructional technology (IT) related diffusion theories that deal with specific innovations in specific instructional settings (Alias & Zainnudin, 2005). Numerous diffusion theories exist, but for the needs of this research study, the main focus will be on Rogers' Diffusion of Innovation Theory (DOI) developed in 1962 and Adoption Analysis (AA), a micro-level IT diffusion theory developed in 1994 by Farquhar and Surry. Rogers'

DOI theory (2003) describes the process by which an innovation is adopted and gains acceptance by members of a certain community. It postulates that the diffusion process involves four main elements: the innovation, communication channel, time and the social system. The AA model focuses on the adoption of a specific innovation by a specific group of potential adopters (Farquhar & Surry, 1994). It involves both the individual and organizational attributes.

Rogers DOI theory (2003) emphasizes that several variables influence the adoption of an innovation. One of these variables is perceived attributes of an innovation. The principle of perceived attributes is that potential adopters judge an innovation based on their perception in regards to five characteristics of the innovation, which are relative advantage, compatibility, trialability, observability, and complexity. That is, the rate of diffusion will increase if the potential adopter perceives the innovation to have relative advantage to other innovations, is compatible with existing practices and values, can be tried on a limited basis, offers observable results and is not complex in terms of usage (Rogers, 2003). Moore and Benbasat (1991) further separated observability into two dimensions: result demonstrability and visibility. Result demonstrability deals with tangible results that emerge from using the innovation and visibility refers to the physical presence of the innovation in the setting. Studies have shown that it is not only the visibility of the technology that matters, but also making it accessible in terms of location, quantity and availability encourages use (Oncu et al., 2008; Rogers, 1999). Furthermore, personality variables, socioeconomic characteristics and communication behavior impact the decision of potential adopters on whether to adopt or reject an innovation (Rogers, 2003). Potential adopters need to have the knowledge or skill to effectively adopt an innovation. How-to

knowledge, which consists of information needed to use an innovation properly, and principles-knowledge, which consists of functioning principles underlying how an innovation works are important factors for adoption

Similarly, the AA model (Farquhar & Surry, 1994) examines the user characteristics of the adopters, which is the “psychological, physical, affective and cognitive characteristics that make up the adopter population” (p. 21). The user characteristics include the adopter’s traits such as knowledge, prior experience, skill level, anxiety, and motivation. In addition to users characteristics, the model shows that perceived attributes, physical environment and support environment play a role on whether an innovation will be rejected or effectively utilized. Both the physical and support environment are organizational aspects that includes the “hardware, knowledge, attitudes and skills that exist within the organization in which the innovation is to be implemented” (p. 21). The AA is utilized as an additional tool for the development of successful instructional products pertinent to the users. It assists in analyzing the factors and solving problems during the adoption process, thus increasing the adopters’ chances of utilizing the product. This study will embrace the instrumentalist or adopter-based philosophy that highlights that the end users of an innovation are the individuals who bring about the desired change and therefore it is considered essential to understand the social context in which the innovation will be used and the function that it will serve for them (Surry, 1997).

Studies have shown that Rogers’ DOI (2003) has been applied to various educational sectors in the United States, where the perceived attributes of an innovation have shown to predict the rate of adoption of innovations. Rogers (2003) emphasizes “the first research on attributes of innovation and their rate of adoption was conducted with farmers, but

teachers and school administration suggested that similar attributes predict the rate of adoption for educational innovations” (p. 223). However, studies show a substantial variation between countries on the prediction of technology use (Usluel, Aşkar, & Baş, 2008). Furthermore, Moore and Benbasat (1991) emphasize that adopters perceive innovation attributes in different ways. These perceptions determine to what extent the technology is used. Thus it is important to identify the needs and wants of the potential adopters and develop products that meet their needs (Farquhar & Surry, 1994) to facilitate the adoption process. Therefore, it is important to study each culture individually as it would be more valuable (Al Senaidi, 2009).

The state of Kuwait is located in the Middle East bordering the Persian Gulf between Iraq and Saudi Arabia. Education is viewed in Kuwait as a keystone for development and progress for both individuals and society. Like many modern countries, Kuwait has given great attention to education in order to keep its society economically and culturally strong (Al-Sahel, 2005). Oil profits have allowed Kuwait to build a broad-based educational system in which the literacy rate is 93%, according to Kuwait’s 2008 national educational report. Equal access of education is given to all the citizens of Kuwait regardless of gender and socioeconomic status as stated by the 1962 constitution of Kuwait, which asserts that “education is the right for Kuwaitis and that it is compulsory and free at its preliminary stages” (p. 11). Nevertheless, Kuwait’s 2008 national report emphasizes that education in Kuwait faces several challenges, including both cognitive and technological challenges.

Statement of the Problem

Studies on technology adoption and use have shown that teachers’ perceptions of

whether technology should be used in their profession and in student learning, relies on their view of how learning should take place and on their ability to go through a change process. Technology can provide support to teachers to effectively and efficiently manage their school activities and tasks; however most teachers neither use technology in classroom instruction nor integrate it into the curriculum (Bauer & Kenton, 2005; Zhao, Pugh, Sheldon & Byers, 2002). For example, Dashti and Behbhani (2005) established that teachers' use of computers and other technologies in teaching English is limited in Kuwaiti public schools. Individuals when confronted with new innovations would show reactions of anxiety and resistance at first before making their final decision as to whether or not to adopt (2003). However, teachers will adopt and integrate technology more smoothly if they perceive that it is relevant to their pedagogical needs (Yates, 2001).

Studies have also found that "conflicting ideas and advice on the value of technology leads to a confusion on the teachers' behalf regarding its educational value" (Zhao & Frank, 2003, p. 809) and, accordingly, tardiness in acceptance and usage. Thus there is a need for more empirical investigations on the use of technology as a means of bridging the gap that exists regarding its use. Despite the existence of some research studies on technology use in Kuwait, these studies tend to focus more on higher education and institutions than on school systems. In addition, diffusion studies have been implemented in various sectors, but not in the school systems within Kuwait and most studies carried out in the Middle East and Kuwait are quantitative in nature while qualitative research is limited. This study was therefore designed to expand and add to the existing research by exploring teachers' use of technology in K-12 Kuwaiti school systems using qualitative methodology.

Purpose Statement and Research Questions

This multiple-case study will use the perceptions of female Kuwaiti teachers toward technology that may have contributed to or limited their adoption of it in order to show the applicability of Rogers' DOI theory, within two Kuwaiti primary public school contexts. The study seeks to answer the following specific questions and sub questions:

1. To what extent have the Kuwaiti teachers adopted and integrated technology?
 - a. How do teachers' characteristics (prior knowledge and experience, motivation, and anxiety) affect the way they perceive technology use?
 - b. What are the support environments that facilitate or impede their use of technology?
2. In what way do the attributes of technology affect the perceptions of Kuwaiti teachers' towards technology adoption and use?
 - a. How is technology useful and beneficial to teachers in their profession? (relative advantage)
 - b. Is the technology used consistent with the teachers' pedagogical beliefs and needs? (compatibility)
 - c. What are the challenges that teachers face when working with technology? (complexity)
 - d. What opportunities do teachers have to experiment with the technology before becoming potential adopters? (trialability)
 - e. What do teachers experience when using technology? (observability)
 - i. What tangible results do teachers witness?
 - ii. How do visibility and accessibility contribute to use?

Significance of Study

This research study is significant from an *educational and diffusion* research standpoint. From an educational standpoint, this study would serve as a framework for both public school administrators and policy makers in Kuwait and the Arab Gulf Cooperation Countries (GCC) countries to understand and determine how to effectively integrate technology. This study will also contribute to the *adoption and diffusion* research field, as it would present issues and provide results that reflect the Middle Eastern (ME) culture and accordingly bridge the gap in literature in this regard. Ali (2004) indicated “There is very limited IT adoption related research in the context of the Middle East” (p. 2). Furthermore, Farag (2005) emphasized that there is a lack of studies carried out regarding the use of technology in education and in schools in the GCC and the ME.

Organization of the Study

Chapter 1 provides an introduction and the need of the study, statement of the problem, significance of the study and organization of the study. Chapter 2 discusses the contributing and challenging issues pertaining to teachers’ adoption and utilization of technology, an overview of Rogers’ DOI theory, including its application in various education systems, criticisms of the theory and related diffusion theories. In addition background information on Kuwait’s public educational system and primary level will be discussed including problematic issues facing the primary schools.

Chapter 3 present a description of the research design employed, the study population, as well as the data collection procedures and data analysis strategy that was followed. This chapter also includes a description of how the validation of results and

findings was attained. Chapter 4 provides the findings generated from both the interviews and participant observation. Chapter 5 presents a discussion of the findings, the conclusion and the recommendation of the study. Areas for further research will also be highlighted, including the limitations of the study.

CHAPTER TWO: LITERATURE REVIEW

This chapter will discuss the issues pertaining to teachers' adoption and utilization of technology; the adoption process that focuses primarily on Rogers' DOI theory, including the contributions and criticisms of the theory; related diffusion perspectives and commonalties; and an overview of how the theory of perceived attributes was applied in various educational systems. Background information on Kuwait's public educational system and primary level will also be discussed, including issues facing the primary schools.

Teachers' Adoption and Utilization of Technology

The adoption and utilization of technology is a broad topic that involves numerous facets; however, for the needs of this research study, the focus will be on the adoption and utilization of technology within school systems. *Technology*, in this context, refers to all tools used by teachers in their profession. There is an increased interest in and emphasis on how technology should be integrated into teaching (Hofer & Swan, 2008), as seen by the promotion of such initiatives by educational practitioners (Dashti & Behbhani, 2005; Safar, 2001). Oncu et al. (2008) described technology integration as being composed of three aspects: teachers' attitudes, conditions affecting technology adoption, and the process of adoption. Although other factors such as age, experience, gender, suburban vs. urban location, and grade level impact technology use, for this study reference is made to challenges that were discussed numerous times in the literature, were identified by the literature as most influential, and were "findings in empirical researches" (Hew & Brush, 2007, p. 225).

Teachers' Attitudes and Beliefs

Teachers have diverse ways of using technology, and, based on how it is used, the learning outcomes vary. One method of teaching is didactic pedagogy, wherein students passively receive knowledge from teachers (Tiene & Ingram, 2001). This type of passive teaching approach is “unlikely to cultivate in learners analytical, reasoning, and problem-solving skills that are most desired and are useful beyond the classroom setting” (Gwayi, 2009, p. 76). Teachers also tend to rely on individualistic learning processes and use drills or repetition of information (Wenglinsky, 2005) to solve students’ learning problems. In addition, concentration is on students’ memorization and recitation, and the attainment of basic knowledge (Aldhafeeri, Almulla, & Alraqas, 2006). A second method of teaching is the constructivist approach (Taylor & Duran, 2006; Wenglinsky, 2005), wherein teachers allow students to think abstractly by illustrating concepts in real-world contexts and employ various learning techniques (Wenglinsky, 2005). Through this approach, students tend to develop their problem-solving and critical-thinking skills (Niederhauser, Lindstrom, & Strobel, 2006). In addition, constructivism promotes collaborative learning (Grainger & Tolhurst, 2005; Venezky, 2004; Zhao et al., 2002) and increases student concentration on course content (Oncu et al., 2008; Hennessy et al., 2005).

Agreement does not exist regarding whether these teaching approaches are applicable in all school systems or whether they have the same effect on students’ learning. It stands to reason that instructional technology can serve to support either predominant teaching approach. Technology can be beneficial when utilized in a manner that relates to the need of the teachers and students. For instance, Safar (2001) discusses teachers becoming more creative with preparing lesson plans, finding ways to make learning

effective and efficient to the students, as well as becoming encouraged to use other advanced computer-related applications when they are left to utilize technology in a manner that is appropriate to them. Zhao and Frank (2003) argue that technology directly benefits teachers when they use it for their own profession, but it does not necessarily apply to students unless teachers themselves facilitate student use of technology. This shows that not only is teachers' use an important component of technology use, but also that an assessment of the real outcomes related to students' learning is another key component.

Despite the promotion of using technology in schools and studies that show how technology can assist in teaching and students' learning, a considerable body of literature indicates that schoolteachers have not effectively used technology (Keengwe, Onchwari, & Wachira, 2008; Culp, Honey, & Mandinach, 2005). Zhao and Frank (2003) indicate that "some of the technologies are judged to be more useful, or fit for the task, than others, and they survive while others perish that are judged to be less fit" (p. 812). This judgment arises from teachers' beliefs about how and what technology can achieve for them. Studies have shown that teachers' beliefs and attitudes towards a certain technology influence its integration in schools (Oncu et al., 2008; Wozney, Venkatesh, & Abrami, 2006). The extent to which technology is used depends largely on the teachers' choice and belief on whether technology can be a solution to improving student learning (Hermans, Tondeur, van Braak, & Valcke, 2008; Sugar, 2002). When technology is compatible with teachers' pedagogical orientation or beliefs, they tend to integrate technology more smoothly (Zhao et al., 2002) and vice versa, thus they decide what kind and how much technology is to be used in their classroom settings (Oncu et al., 2008). Furthermore, teachers are reluctant to adopt a

technology that seems incompatible with the norm of a subject culture (Hew & Brush, 2007; Hennessy et al., 2005). *Subject culture* refers to the common joint pedagogical beliefs that teachers of that group hold regarding how a subject area ought to be taught. Hennessy et al. (2005) refer to it as the “community of practice” (p. 160) associated with subject area. John and La Velle (2004) summarize it well by saying that “teaching and learning are influenced by teachers’ beliefs about the subject matter and subject cultural traditions, as well as personal theories and related pedagogical styles” (p. 309). They argue that prior teachers’ roles, values, and beliefs shape their current understanding of how to integrate technology and how they perceive its challenges. As a result, there is a need to understand the main issues that have an impact on teachers’ use or non-use of technology.

Challenges of Technology Adoption and Utilization

Numerous challenges, barriers, and constraints play a role in technology adoption and use. By the same token, authors such as Ely (1999) use a reverse logic, and instead of looking at barriers, he looks at the aspects that facilitate integration. These challenging or facilitating aspects are described in the literature as *internal* or *external components*. Ertmer et al. (2006) divides technology challenges into those related to teachers directly (intrinsic) versus those that externally impact usage (extrinsic). She argues that “intrinsic enablers” are more important than “extrinsic enablers” because teachers are the decision-makers about how to integrate technology in meaningful ways, regardless of the type and amount of technology available (p. 55). This supports the notion that “most factors do not directly influence technology users in a linear fashion; rather their influence is mediated or filtered by teachers’ perception” (Zhao & Frank, 2003, p. 817). Some of these challenges

and/or facilitators are intertwined, and in many situations overlap each other. Ely (1999) states, "The mix of personal and institutional characteristics is sometimes confusing. There is an overlap and interrelationship among the conditions, yet is it very difficult to separate them" (p. 8).

One of the major issues facing teachers is educational change and whether they have the readiness and openness to adopt and integrate technology into their profession and classroom practice (Hennessy et al., 2005; Byrom & Bingham, 2001). Fabry & Higgs (1997) talked about how "teachers would need to change their teaching ideologies and this transition usually is more difficult than using technology itself" (p. 388). Moore (2007) emphasizes that real change involves uncertainty, which leads to anxiety. This anxiety tends to lead to a failure of change to take place. Some authors argue that if individual characteristics such as age, years of teaching experience, and training (Moore, 2007) are put into perspective during the adoption and integration process, change will take place smoothly. Baylor and Ritchie (2002) emphasize that teachers can adjust to change through professional development and a supportive school culture, but more importantly, teachers need to have "an open-to-change attitude and positive perception of the benefits of technology" (p. 3). Other authors discuss that change only occurs when an individual sense of innovativeness emerges and there is an awareness of the need for innovation and a positive attitude towards change (Van Braak, 2001). This supports Ely's (1991) condition of *dissatisfaction with the status quo* when individuals perceive technology and related processes as ineffective and inefficient and thus strive to change.

Another problematic issue is teachers not having sufficient knowledge and skills to work with technology. First, teachers need to have complete awareness of the type of

technologies that would be beneficial for teaching their subject area. Studies have shown that the subject or content area taught by teachers determines whether technologies are used and what technologies are used. For example, studies showed that computer use in English and Social studies is higher than Math, Science and Foreign language (Cuban, Kirkpatrick & Peck, 2001). Furthermore, Alkhezzi and Alqahtani (2007) found that the use of spreadsheets was used by teachers in the science department and not by those in the art department. Second, teachers need to have the expertise and knowledge about the topic being taught (content) and how to design a learning experience (pedagogy) for their students (Hofer & Swan, 2008) through the use of technology. As indicated by Hennessy et al. (2005), there is a need for “teachers to have both ‘technological pedagogical knowledge’, which is utilizing certain strategies to guide students in using a certain technology, and ‘technological content knowledge’, which is being aware of whether the content provided can be taught by technology” (p. 181). Third, teachers need to have knowledge of the enabling conditions for technology, or “technology proficiency” (Zhao et al., 2002), which is “knowing what is necessary to use a specific technology in teaching,” (p. 389). For example, in order to have a computer videoconference for students, teachers would need to know how to install the necessary software and acknowledge the need to have high-speed Internet and digital cameras for successful implementation.

The next major challenge for technology adoption and use is the importance for teachers to have technology-related classroom-management knowledge and skills, which are crucial for proper integration of technology in the class. Teachers need to be equipped with classroom management skills on how to manage technology-based lessons, organize the class effectively so that students have equal opportunities to use technology tools, and

be able to assist them with troubleshooting issues (Hew & Brush, 2007). Exposure to and acquisition of such skills would lead teachers to a comfortable zone, which would enable them to build their confidence in utilizing technology in the best possible manner. This aspect supports the *training and skill development* condition raised by Ely (1999), which is one of the facilitators for technology integration.

Scarcity of technological resources is also considered a challenge for teachers. Hew and Brush (2007) include the lack of technical support and lack of time to learn technology under this category. The literature shows that schools still lack sufficient computers, peripherals, and software (Karagiorgi, 2005; O'Mahony, 2003), despite the National Center for Education Statistics 2006 report, which showed that 97% of schools and 94% of instructional rooms in the United States had computers with Internet access in 2005 (Belland, 2009). Additionally, the growing number of schools has placed pressure on the need for more teaching tools and technologies to be made available, thus leading to this shortage. Ely's (1999) condition *adequate resource* talks about how important it is to have adequate resources such as hardware, software, money, and personnel for any innovation to be successfully implemented. Furthermore, even with the technologies available in schools, teachers still find it difficult to have access at all times because of limited amounts and locations in which they are placed (Hew & Brush, 2007).

The lack of technical support is another challenge for teachers. Teachers often do not receive the technical support needed for them to use technology effectively (Ertmer et al., 1999; Rogers, 1999), due the fact that some schools employ a limited number of technical support personnel who are often overwhelmed by teacher requests and do not respond swiftly or adequately (Hew & Brush, 2007). Other schools depend on outsourced

technical support, and, thus, technicians are not available at all times, which slows down use by teachers when a malfunction occurs. In her study, Nyirongo (2009) found that only 30.1% of faculty members believed that Mzuzu University in Malawi provided sufficient technical support to help them integrate electronic technology in teaching and learning. The rest thought that technical support was nonexistent, or that where it existed, it was mostly insufficient. The study showed that technical support was rated as a key component to the successful use of electronic technologies for teaching and learning.

Time is also another challenging aspect for teachers (Ertmer et al., 1999; Seavers, 2002), since many teachers have no time to learn, embed, and improve their technological skills due to overload of work responsibilities at schools. Zhao and Frank (2003) argue that simple technologies that “require little change and [do] not require reconfiguring teaching practices, [and] cost less in terms of time and energy are used most frequently” (p. 821). Ely’s condition of *availability of time* indicates that individuals need time to learn, adapt, integrate, and reflect on their actions to be able to understand and be capable of adapting the innovation to suit their situation. For instance teachers learn to use an interactive whiteboard in a manner that assists them in conveying the information to the students.

The lack of provision of incentives to teachers who use technology also challenges their use. Ely (1999) emphasized that *rewards or incentives* facilitate technology adoption. When teachers are provided with rewards or any form of incentives, they become encouraged and stimulated to act. A study by Mosley (2005) showed that the use of incentives to promote teacher participation in the technology-mentoring program was deemed important by the participants. Rewards may help implementers to have something to look forward to and, hence, facilitate successful implementation of the innovation

(Nyirongo, 2009). Overall, it is evident that the lack of resources, whether in the form of technologies, technical support, time, or incentives is due to funding issues (Rogers, 1999). Not having sufficient funds or inappropriate allocation of funds by institutions can act as a major obstacle for adopting technology.

Another challenge that teachers face is the issue of assessment, in which teachers measure students' learning progress. Formative assessments measure students' ongoing learning progress, but summative assessments are related to national test scores (Hew & Brush, 2007; Williams & Easingwood, 2007), and, thus, are considered very critical by teachers and school administrators. Studies have shown that teachers often face a conflict between trying to use technology tools and needing to conform to the external requirements of standardized tests and assessment instruments (Hew & Brush, 2007). For example, teachers may face the difficulty of assessing the efforts of students who have drawn graphs by hand versus those who have produced them on a computer, as the official assessment may be on traditional manual skills and not technology skills (Hennessy et al., 2005). Thus, teachers may need to change the way they assess their students when using technology to address the new kind of skills and knowledge developed through the use of technology (Pierson, 2001).

The lack of planning and leadership in schools is also a problem facing technology use. School leaders need to provide the proper support and encouragement, and address concerns of potential adopters, as well as serve as role models for using the innovation (Ensminger & Surry, 2008). This is similar to Ely's (1999) *leadership condition*. Furthermore, administrators and supervisors need to have planning strategies to facilitate the adoption and integration process. A clear vision of the achievable goals and tangible

outcomes expected from integrating technologies must be developed and communicated to the teachers. Studies have shown that when administrations do not cooperate with teachers and provide leadership and planning strategies, the use of technology does not extend beyond that point (Hew & Brush, 2007). This discussion of leadership in technology use brings us to the issue of commitment. *Commitment* (Ely, 1999) is a very important component needed by those who are involved in the technology adoption process. Nyirongo (2009) found that the largest portion of the study respondents identified that the commitment of Mzuzu University's (Malawi) leadership provided an enabling environment for the integration of electronic technologies for teaching and learning.

Another problem is the lack of teachers' collaboration and communication. Oncu et al. (2008) emphasize that having personal and professional relationships with colleagues who use technology provides encouragement and reassurance for teachers. Through collaboration, teachers are able to learn from others about technologies that are unfamiliar or that they have never considered using in their classrooms. This supports Ely's *participation* condition, which calls for involving all concerned parties in planning and decision-making issues. Despite the fact that collaboration is important because it encourages teachers to create technology-integrated lesson plans and materials, authors have argued that collaboration in itself can be difficult to achieve due to teachers' workload at schools.

The structure and facility of a school influence which technologies are installed and used in schools. School attributes such as the size and layout of the classrooms, as well as having the appropriate facilities and utilities that allow for the installation of technologies such as computers and Internet connectivity, encourage teachers' use. Elmasry (2007)

emphasizes, “learning environments is directly correlated with the pedagogical models taking place” (p. 123). Teachers’ perceptions regarding their learning environment impact how they perform in it and determine the teaching–learning activities that take place and their preferences on the type of learning technologies that are used (Elmasry, 2007). In addition, the insufficient number of classrooms in some schools limits the quantity and types of technologies installed and, accordingly, the availability for teachers. Fabry and Higgs (1997) state that the lack of access to the right types of technology in appropriate locations is a key challenge to the integration of technology in the classroom (Keengwe et al., 2008). For instance, studies show that *laptops* are beginning to be used in schools due to limited computer availability at schools, or if available constraints in scheduling for computers in advance and students unequal access to computers at home (Warschauer, 2007)

The Process of Adoption

The literature has identified many models of technology adoption such as Davis’ (1989) Technology Acceptance Model TAM & Rogers’ (2003) Diffusion of Innovation (DOI) theory, but due to its importance to the present study, Rogers’ theory will be independently described in detail. However, the commonalities between Davis’ (1987) and Moore and Benbasat’s (1991) research that added constructs to Rogers’ DOI theory will be discussed, and reference will also be made to IT-related diffusion theories.

Rogers Diffusion of Innovation (DOI) Theory

Rogers’ DOI theory is a general diffusion theory that is well established and has been utilized in both educational and non-educational contexts. It has also been used

extensively with modifications and extensions when investigating various types of innovations. Rogers' seminal work has been one of the most comprehensive treatments of adoption and diffusion, and, published first in 1962, it is currently in its fifth edition (Surry & Ely, 2002). Surry (1997) emphasized that Rogers' theory "is the most synthesized work done of all of the significant findings and compelling theories related to diffusion and the closest any researcher has come to presenting a unified theory of diffusion" (p. 3). Diffusion is "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p.11). The theory is considered a social change model in which "alteration occurs in the structure and function of a social system" (Rogers, 2003, p. 6). This social change occurs due to the processes that take place when new innovations are introduced, diffused, and then either adopted or rejected. The main elements in the diffusion of new ideas are innovation, communication channels, time, and the social system.

Innovation

An *innovation* is "an idea, practice or object that is perceived as new by an individual or another unit of adoption" (Rogers, 2003, p. 12). These individuals or units of adoption make the final decision on whether to use it or not. Many different types of innovations exist that require different levels of commitment. New innovations are not always necessarily viewed as progress or important to all individuals (Rogers, 2003). Furthermore, the characteristics of the innovation influence the speed at which potential users will adopt it. The characteristics or attributes of an innovation, as will be discussed, subsequently play a very crucial role in the adoption process. Innovations in one social

system may not be desirable for others in the same social system, and this also impacts the rate of adoption. The concept of *reinvention* (Rogers, 2003) is an aspect of innovation in which individuals change the innovation in the process of its adoption and implementation. Users tend to use reinvention to ensure the innovation fits their unique situation, leading diffusion to take place more rapidly and adoption likely to be sustained (Rogers, 2003).

Perceived Attributes of Innovations

Rogers' (2003) theory suggests that individuals are inherently more or less predisposed to innovative behavior. Teachers are the key to the diffusion of any innovation in the classroom, and their perception level of the attributes of an innovation defines whether it will be adopted and used (Moore, 2007). The term *perceived attribute* refers to "the opinions of potential adopters who base their feelings about an innovation on how they perceive that innovation" (Surry & Ely, 2002, p. 186). These perceived attributes make them acceptable to some individuals and not to others. Moore and Benbasat (1991) emphasize that adopters perceive innovation attributes in different ways and, accordingly, behaviors differ too. These behaviors determine to what extent technology is used. Five attributes were defined by Rogers (2003):

1. relative advantage,
2. compatibility,
3. complexity,
4. trialability, and
5. observability.

The first characteristic, *relative advantage*, is the degree to which an individual perceives an innovation to be superior to previous methods. Economic advantage, social prestige, convenience, and satisfaction are important factors. However, an individual must perceive the innovation as advantageous, even if it is not the case. Next, *compatibility* is the degree to which an individual perceives an innovation to be consistent with his or her existing values, past experiences, and needs. Third, *complexity* is the degree to which an innovation is perceived as difficult to understand and use. Fourth, *trialability* is the degree to which an innovation will be tried on a limited basis, which helps reduce the adopters' uncertainty toward the use of the innovation and, accordingly, its adoption. Fifth, *observability* is the degree to which the results of an innovation are visible to other individuals. In summary, innovations perceived by individuals to have greater advantage, compatibility, trialability, observability, and less complexity are adopted more quickly than other innovations (Rogers, 2003). Moore and Benbasat (1991) emphasize that the "perceptions of using the innovation is of interest rather than the innovation itself, since its use is predicted by how these individuals perceive the innovation attributes" (p. 194).

Communication Channels

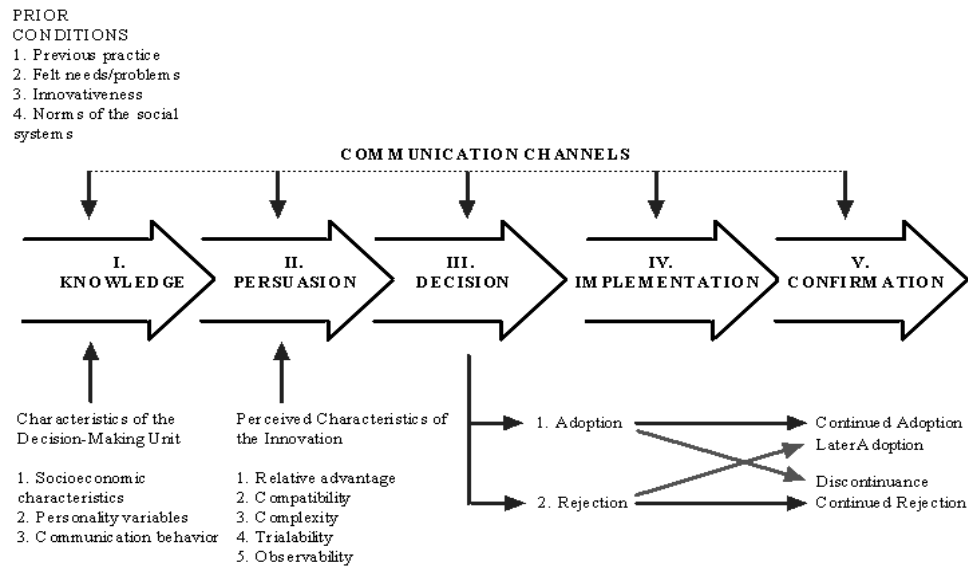
Communication is the "process that individuals use to create and share information to achieve a mutual understanding" (Rogers, 2003, p. 18). This communication allows for a better decision-making process to take place concerning the innovation (Moore, 2007). Two forms of communication, *mass media* and *interpersonal channels*, are used to transmit information (Rogers, 2003). The former is concerned with the transmission of information through mass media formats such as radio, television, journals, newspapers,

telecommunications, etc. Information distributed in this manner usually occurs rapidly but lacks credibility and trustworthiness when transferring information. Interpersonal channels are used when the information is exchanged face-to-face. This method is considered much slower than mass media, but it is more effective because of human interaction and the ability of individuals to exchange and communicate new ideas to each other. Rogers (2003) emphasized that when information is exchanged between individuals who are *homophilous*—who have common attributes whether in regards to education, socioeconomic status, or beliefs—communication tends to be more effective. This effectiveness comes in terms of knowledge gain and attitude formation about the innovation. This effect is reversed when the group is *heterophilous*, as these parties have different attributes that negatively influence the achievement of effective communication. Despite this fact, some degree of difference is needed for new information to be exchanged (Rogers, 2003). This degree of difference is needed as it allows for new ideas to spread to other individuals of socioeconomic status, education and technical expertise connected in a close-knit network.

Time

Time is the factor that refers to how long individuals take to go through the process of either accepting or rejecting an innovation (Moore, 2007). Three related events take place during the diffusion process (Rogers, 2003) as shown below in Figure 1:

1. the innovation-decision process,
2. the innovativeness of the individual, and
3. the innovation's rate of adoption.



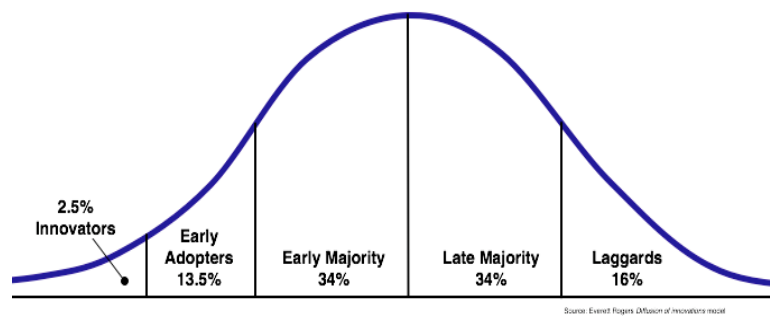
¹Figure 1. The innovation-decision process model (Rogers, 2003).

During the *innovation-decision process*, as shown in Figure 1, the individual first acquires the *knowledge* needed to learn and understand about the innovation. An attitude is then formed about the innovation during the *persuasion* stage, which leads to either favorable or unfavorable opinions concerning it. In the *decision stage*, an individual will seek additional information about the innovation, try the innovation, and decide whether to adopt or reject the innovation. The *implementation* stage occurs when an individual decides to adopt the new innovation and puts it into use. In the last stage, the individual *confirms* the decision and seeks reinforcement of the decision to adopt the innovation. The individual recognizes the benefits of using the innovation, integrates the innovation into a continuous routine, and promotes the innovation to other individuals. However, an individual may reverse his or her decision and discontinue the innovation if “exposed to

¹ Source: *Diffusion of Innovations, 5th Edition* by Everett M. Rogers (5.1, p 170). Copyright © 1962, 1971, 1983 by The Free Press, a Division of Simon & Schuster, Inc. Used with permission of the publisher. All rights reserved.

conflicting messages about the innovation thus effort is exerted to avoid a ‘state of dissonance or reduce it if occurs’ ” (Rogers, 2003, p. 189). Implementation of an innovation in an organization is more complex than for an individual because the individuals who use the innovation are usually a different set of people from the decision-makers. Therefore an organization may decide to adopt an innovation, but implementation may not always follow, since decisions to implement involve other individuals (Gwayi, 2009).

The second issue related to time is *innovativeness*, which is the degree to which an individual is relatively early in adopting new ideas compared to other members of a social system. Rogers (2003) grouped adopters into five categories of a social system in a bell-shaped curve based on their degree of innovativeness, as shown in Figure 2.



²Figure 2. Adopter categorization on the basis of innovativeness (Rogers, 2003).

Innovators are the first people to adopt a new idea in their system. They represent the first 2.5% of the individuals to adopt an innovation. These people can cope with uncertainty at higher levels concerning an innovation, have a high level of media exposure, understand and apply complex technical knowledge, have interpersonal networks, and

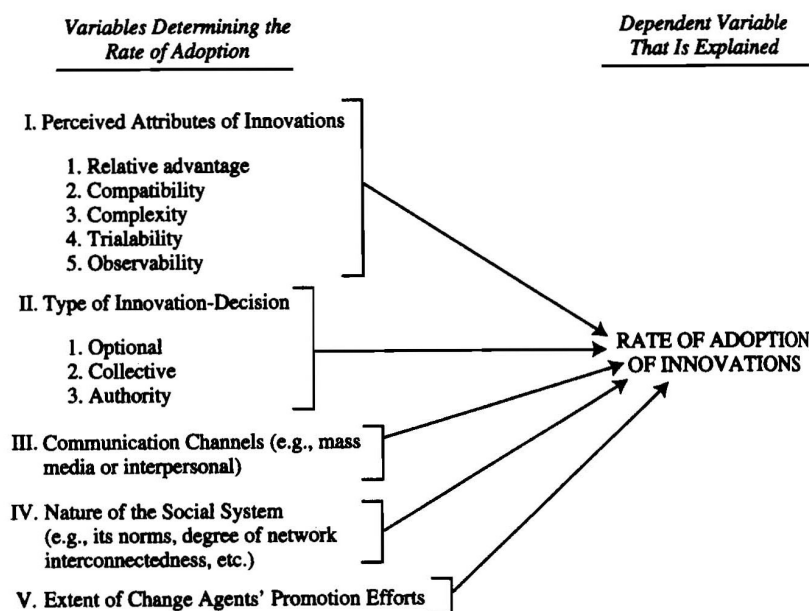
² Source: *Diffusion of Innovations, 5th Edition* by Everett M. Rogers (6.1, p 222). Copyright © 1962, 1971, 1983 by The Free Press, a Division of Simon & Schuster, Inc. Used with permission of the publisher. All rights reserved.

usually control substantial financial resources that help in losses from unprofitable innovation (Rogers, 2003). *Early adopters* are an integrated part of the local social system and represent the next 13.5% to adopt a new idea. They serve as opinion leaders from whom other individuals obtain advice and instruction before adopting a new idea and are respected by their peers (Rogers, 2003). The *early majority* represents the next 34% of the adopters. They adopt innovations before the average member of the social system and interact with their peers but seldom are opinion leaders. They provide an important link in the social process between the very early and the late majority, since they provide interconnectedness in the social system's network (Rogers, 2003).

Late majority adopters make up the next 34% the members of the social system. The late majority are skeptics and do not adopt new ideas until the majority of the members in their social system have done so. However, they usually adopt an innovation due to economic necessity and increasing pressure from their peers in their network. They have scarce resources, and, thus, most of the uncertainty about the innovation must be removed before they feel it is safe to adopt (Rogers, 2003). *Laggards* are the last 16% to adopt a new idea in a social system. They usually are not opinion leaders, have limited resources, and make certain that a new idea will be successful before they will adopt it. Their point of reference is in the past and what has been done previously. They have traditional values and are suspicious of innovations and change agents (Rogers, 2003).

The third aspect related to time is the *rate of adoption*. The rate of adoption is defined as "the relative speed with which an innovation is adopted by members of a social system" (Rogers, 2003, p. 23). When the number of individuals adopting an innovation is plotted on a cumulative frequency over time, an S-shaped curve is formed. Initially, only a

few innovators adopt the new idea. It will then have a period of rapid growth that will taper off and become stable, then eventually decline. Several variables affect the rate of adoption of innovation. The rate of adoption differs for the same innovation in different social systems. This is due to the fact that “rate of adoption is measured for an innovation in a system rather than for an individual as a unit of analysis” (Rogers, 2003, p. 23). In addition, attributes of innovations that are highly perceived by individuals will have a more rapid rate of adoption. Other variables that play a role as seen in Figure 3, are the perceived attributes of innovations, the communication channels, the type of innovation-decision taking place, and the efforts exerted by change agents to promote the innovation.



³Figure 3. Variables determining the rate of adoption of innovations (Rogers, 2003).

³ Source: *Diffusion of Innovations, 5th Edition* by Everett M. Rogers (7.3, p 281). Copyright © 1962, 1971, 1983 by The Free Press, a Division of Simon & Schuster, Inc. Used with permission of the publisher. All rights reserved.

The Social System

A *social system* “is a set of interrelated units that engage in joint problem solving to accomplish a common goal” (Rogers, 2003, p. 23). Members of a social system can be individuals, informal groups, or organizations. The diffusion of an innovation within any social system is dependent upon social structure, norms, opinion leaders, and change agents; types of innovation-decisions; and consequences of innovation (Rogers, 2003). A *social structure* explains how members of a social system interact and live together, predicting how they will behave. Not only does individual behavior count, but also norms of the individuals within that social system. *Norms* are the “established behavior patterns for the members of a social system” (Rogers, 2003, p. 26). System norms affect diffusion in that they provide a guide on the behavioral patterns that are shared and established by members of the same social group. If the innovation aligns well with the norms of the social system, there is a high probability that it will be adopted; otherwise, it will be rejected (Rogers, 2003). Yates (2001) emphasized that teachers interact more frequently and more freely with each other, and, thus, if some teachers adopt an innovation, others will pursue the same goal (Gwayi, 2009).

Within this social system, opinion leaders and change agents also play a role in the diffusion process. The *opinion leader* is an individual who is influential in changing the attitudes of others toward the innovation (Rogers, 2003). Opinion leadership is earned by technical competence, social accessibility, and conformity to the system’s norms. A *change agent* is “an individual who influences clients’ innovation decisions in a direction deemed desirable by a change agency” (Rogers, 2003, p. 27). A change agent usually seeks to promote the adoption of new ideas but may also try to slow down diffusion and prevent

adoption of undesirable innovations. Furthermore, change agents bridge the communication gap between a change agency and the potential clients. Decision-making regarding innovations are either *optional innovation-decision*, in which individuals make their decision to adopt or reject an innovation independent of the members of the groups; *collective innovation-decisions*, which are made based on the consensus of the group; or *authority innovation-decisions*, which are made by people who have power, status, or technical expertise. Changes occur to an individual or to a social system resulting from the adoption or rejection of the innovation (Rogers, 2003).

Three dimensions categorize consequences: *direct consequences* that occur in immediate response to an innovation; *indirect consequences*, which occur in response to the effects of direct consequences; and *anticipated* or *unanticipated* consequences, which are changes that are recognized or unrecognized respectively by members of a social system. In summary, a social system consists of various aspects that are all important to take into consideration during the diffusion process.

Summary

Three dimensions that involve technology adoption and integration have been discussed in the literature: teachers' beliefs and attitudes, the challenges and constraints facing teachers, and the adoption process. A slight shift in technology acceptance and use by teachers is seen despite the challenges and constraints. Teachers are becoming more aware of the importance of promoting technology integration in schools, regardless of how they are used, for what purposes, and in what context. "Pedagogical evolution does appear to be taking place. There is a gradual but perceptible shift in subject practice and thinking,

involving both pupils and teachers developing new strategies in response to new experiences and the lifting of existing constraints” (Hennessy et al., 2005, p. 186).

Rogers’ DOI theory (2003) offers a valuable framework for understanding why innovations are accepted or rejected. The four elements of the diffusion process are the innovation, how information about the innovation is communicated, time, and the nature of the social system into which the innovation is being introduced. The rate of adoption of an innovation is influenced by perceived attributes of an innovation, the type of innovation, communication channels, nature of the social system, and the efforts exerted by the change agents in promoting the innovation.

Related Diffusion Perspectives and Commonalities

Studies show that several attempts have been made to use general theories of diffusion to develop theories specific to the field of instructional technology (IT) in order to increase the adoption of instructional technologies. Surry (1997) states that the application of diffusion theories to the field of IT is divided into two major categories: macro and micro theories. Macro theories deal with restructuring and reform of organizations and are referred to as *systematic change theories* since they “involve the adoption of a wide range of innovative technologies and practices” (p. 4). A shift and development in the extent of computer usage is presented in recent articles (Niederhauser, et al., 2006; Sutherland, et al., 2004) which shows that students are using productivity tools like web browsing to access and download information, email, word processing, desktop publishing as well as making websites. Micro theories, also known as *product utilization theories* (Surry, 1997), focus on adoption and utilization of instructional products and tend to focus on specific innovations as

applied in specific environments. Some studies have shown that PDAs (hand-held computers) are used for multimedia activities and context based tutorial system when learning foreign languages like English (Wishart, 2008). A number of macro and micro IT diffusion theories have been developed, such as Burkman's model user-oriented instructional development model (UOID) developed in 1987, Hall and Hord's model concerns based adoption model (CBAM) also developed in 1987, and Farquhar and Surry's adoption analysis model (AA) developed in 1994 (Alias & Zainnudin, 2005).

Two predominant philosophical viewpoints have been discussed regarding how technology is viewed: determinist (developer-based) and instrumentalist (adopter-based) perspectives (Surry, 1997). The determinist philosophy views technology as autonomous, revolutionary, and the primary cause of social change beyond human control. The technical characteristics of an innovation are deemed important, and, therefore, successful adoption and diffusion takes place based on an innovation's technological superiority. Despite the physical limitation on using the PDAs due to "screen sizes, limited audiovisual quality, restrictive keyboard for data entry, the need of SD cards for extra memory and limited battery life" (Wishart, 2008, p. 349), teachers have recognized its usefulness in regards to managing and presenting information efficiently, internet browsing, word processing, sharing information through beaming files, audio recordings and taking photos and videos for learning purposes. The instrumentalist philosophy views the growth of technology as an evolutionary process, in which human control over the innovation is a key issue and the causes of change are based on the social conditions and on human's aspiration for change and improvement (Surry, 1997). Studies have shown that using email over letter writing has proven to be more rapid

and efficient in communicating with others and therefore is being more utilized by teachers when communicating with parents at school.

The debate between whether an instrumentalist or a determinist philosophy (Surry, 1997) should be followed shows a consensus that technological superiority alone is not enough and that an instrumentalist approach is needed to maximize the potential benefit of diffusion theories when used by instructional technologists. At the same time, technologists also need to have a determinist viewpoint on “how to improve society by improving instructional technology” (Surry, 1997, p. 11). Clearly, an understanding is needed by instructional technologists on the issues pertaining to the adopters and the surrounding social system before pursuing either of these philosophies. This will ensure that the adoption and diffusion process is successful and technological improvement is really occurring.

Despite each model being conceptually different from the other, the similarity between Rogers' (2003), Moore and Benbasat's (1991), Davis' (1987), and Farquhar and Surry's (1995) theories is that all four emphasize the importance of individuals' perception towards the attributes of an innovation during the adoption process. Through the adoption analysis approach (Farquhar & Surry, 1994), a broader perspective of both user-perception and organization attributes is taken into consideration, resulting in the adoption of technology that is rooted in an organizational context and addresses issues of concern to the intended user. Adoption analysis is a “process that calls for a thorough examination of both the context in which an instructional product will be used and of the people who will use the product” (Surry & Farquhar, 1995, p. 594). This model focuses on both the individual and the organizational factors that have an impact on whether or not the

product in adopted. Individual factors are the “skills, attitudes, perceptions and knowledge possessed by the people who will use the technology” (Surry & Farquhar, 1995, p. 596), which includes both “user characteristics” and “perceived attributes.” *User characteristics* include the adopter’s traits such as knowledge, prior experience, skill level, anxiety, and motivation, while *perceived attributes* deal with how the innovation is perceived by the adopters, as discussed previously in Rogers’ theory (2003). Organizational factors include “all of the personnel, expertise, attitudes, hardware, software, facilities and services available within or to an organization” (p. 596). They consist of both the physical environment and the support environments. The physical environment includes “how technology is utilized, available classroom facilities and existing hardware and software while the support component include production services, technical support, ongoing monetary support, and storage support” (Surry & Farquhar, 1995, p. 596).

Similarly, Rogers’ DOI theory shares some common features with the Technology Acceptance Model (TAM) proposed by Davis (1989). Davis developed the TAM to explain the behavioral intention and actual behavior of a person’s computer usage. The TAM model defines Perceived Usefulness (PU) as “the degree to which a person believes that using a particular system would enhance his or her performance” and Perceived Ease of Use (PEOU) as “the degree to which a person believes that using a particular system would be free of effort” (p. 320). We see a similarity to Rogers’ (2003) concepts of “relative advantage” and “complexity,” which refer to teachers’ belief that using technology in their classrooms would enhance their teaching performance and to their belief that they will be able to utilize the technology with ease, respectively. TAM proposed that PU and PEOU are affected by various external variables such as user characteristics and organizational

factors (Al-Senaidi, 2009). It is important to identify the perceptions of the potential adopters as well as their needs and wants to develop products that meet these needs (Farquhar & Surry, 1995) in order to facilitate the adoption process. “In a meta-analysis study on TAM with 88 published studies, King and He (2006) concluded the TAM is a valid and robust model” (Al Senaidi, 2009, p. 10).

Rogers’ (2003) five attributes of perceived attributes were further refined by Moore & Benbasat (1991). Relative advantage was decomposed into two constructs: relative advantage and image. *Image* is defined as “the degree to which use of an innovation is perceived to enhance one’s image or status in one’s social system” (Moore & Benbasat, 1991, p. 175). Roger’s viewpoint is that image is part of relative advantage, but Moore and Benbasat’s (1991) research found it to be independent of relative advantage. Moore and Benbasat (1991) also divided observability into two constructs—visibility and result demonstrability. *Visibility* is “the extent to which potential adopters see the innovation as being visible in the adoption context” (Moore & Benbasat, 1991, p. 203). The construct *result demonstrability* is defined as “tangibility of the result of using an innovation” (Moore & Benbasat, 1991, p. 203).

An additional construct was generated through this study, called voluntariness. *Voluntariness* of use is defined as “the degree to which use of innovation is perceived as being voluntary or free will” (Moore & Benbasat, 1991, p. 195). According to the authors, technology acceptance is not only influenced by a person’s perception but also by a mandate from superiors. Agarwal and Prasad (1997) indicated that this construct was not part of the innovation characteristics by Rogers but has shown that potential adopters can perceive varying levels of choice in the adoption of innovations. The constructs image and

voluntariness show the extent to which teachers are affected by these constructs rather than their own self-interest in using the technology. In his study, Gwayi (2009) found that although TALULAR (Teaching and Learning Using Locally Available Resources) is not strictly mandatory, science teachers generally perceived using the innovation to be less voluntary. Their perception that they were required to use the innovation tended to be associated with increased levels of use.

Contributions and Criticisms of Diffusion Research

Diffusion research studies have contributed to other research studies but have also drawn criticism. Rogers (2003) emphasized that diffusion studies are relevant to many disciplines, especially to social sciences. Studying behaviors of individuals and organizations paints an accurate picture of the social change process that takes place over time and leads to results that provide individuals with solutions in similar situations. The growth of diffusion studies leads to empirical evidence from which scholars can generalize results and apply it to specific cases. Diffusion studies also reflect clear research methodologies, where data is not difficult to gather and the methods of data analysis are well laid out. Yates (2001) indicated that through Rogers' seminal work on diffusion of innovation, researchers are able to understand the reasons behind individuals adopting or rejecting a technology, come up with ways to introduce new hardware and software components to the users, and develop several models that can be used in similar studies.

Beginning in 1970, criticism started to take shape among the diffusion scholars (Rogers, 2003). Four issues pertaining to these criticisms will be discussed. The first is the *pro-innovation bias*, which implies that an innovation is adopted by all the members of the

social system and that the innovation should be neither reinvented nor rejected. The issue then becomes that “researchers are unable to look at diffusion of innovations holistically and fail to learn certain important issues such as end-users’ ignorance about new ideas, discontinuance, and other anti-diffusion programs aimed at preventing undesirable innovations” (Gwayi, 2009, p. 26). Successful diffusions have the data, which could be retraced by diffusion researchers, while unsuccessful diffusions do not leave much to trace for reconstruction (Ozaygen, 2005). The second criticism is the *individual-blame bias*, in which there is a tendency to hold an individual responsible rather than the systems of which the individual is a part. “Diffusion studies tend to take side with change agencies that promote innovation rather than with the individuals who are potential adopters” (Rogers, 2003, p. 118).

The third criticism is the *recall problem*, which may lead to inaccuracies in time (period) as to when the individual adopted a new idea. Ozaygen (2005) emphasized that participants fail to give the right answers regarding when they adopted an innovation, and only snapshots are collected. This is due to the fact that most diffusion processes involve aspects that extend in time and events. The final criticism is the *issue of equality*, whereby the spread of new ideas causes a socioeconomic gap between the higher and lower status segments of a system. Studies have shown that if “communication strategies are used effectively in narrowing the socioeconomic benefits gap, then socioeconomic structure will no more become a major barrier to diffusion of innovations for those who are disadvantaged in the population” (Rogers, 2003, p. 134). In understanding these criticisms, researchers can help to provide solutions that improve the field of diffusion studies. However, with all the criticisms, diffusion research has led to the formation of theories

explaining the impact of new innovations on societies (Rogers, 2003).

Application of Rogers' Perceived Attributes in Educational Systems

Despite the variations in findings regarding Rogers' (2003) propositions, studies have shown that some attributes are consistent predictors in the adoption process (Gwayi, 2009). Below is a description of some of the studies that were carried out in higher education and K-12 schools in the Arab Gulf States, the Middle East, Africa, and the United States. The Arab Gulf States are Saudi Arabia, Qatar, Oman, Bahrain, Kuwait, and the United Arab Emirates; these states comprise the Gulf Cooperation Countries (GCC).

Studies in Higher Education

A quantitative study by Al Senaidi (2009) explored the factors influencing Information and Computing Technology (ICT) adoption for Omani faculty members from Sultan Qaboos University. Consistent with Rogers' (2003) model, this study found that the number of faculty members in the five-adopter categories were close to a normal distribution. Approximately 86% of the faculty members classified themselves in the innovator, early adopter, and early majority categories (which included the laggard group). Significant group differences of ICT uses and skills, perception of barriers, and perception of ICT attributes in the adopter category showed that the early adopters used technology more, had a higher level of technological skills, perceived fewer barriers in the adoption process, and recognized higher values of technology attributes than the later adopters. Compatibility between ICT and job duties or personal style, ease of use, and relative advantage regarding job efficiency accounted collectively for 68% of the variance on the

perception scale. In contrast, the study showed that other constructs such as trialability, image, voluntariness, demonstrability, and visibility, which are valid in Western culture, did not hold in Omani culture.

Usluel et al. (2008) investigated the impacts of ICT facilities (i.e., in classroom, lab, and office) and ICT attributes (i.e., relative advantage, compatibility, ease of use, and observability) on ICT instructional and managerial uses by 834 faculty members from 22 universities in Turkey. The study showed that the use of ICT is becoming widespread in higher education and that the faculty members use ICT mostly as a means of communication and for doing research about the course through the Internet. They use ICT less frequently for publishing their lecture notes and announcements concerning the course (e.g., assignments, projects) on the Internet. Furthermore, this study investigated the underlying relationship between ICT facilities, perceived attributes, and ICT usage for higher education, showing that the use of the ICT using Rogers' DOI model (2003) has been tested and validated and all the hypotheses were supported. The study provided further evidence of the appropriateness of DOI to measure the ICT usage in higher education in Turkey.

A study by Almobarraz (2007) examined factors leading to the decision to adopt the Internet in the academic environment as perceived by faculty members of Imam Mohammed Bin Saud University, in Saudi Arabia. It found that attributes of Rogers's theory (2003) and those in Moore and Benbasat's study (1999) influenced faculty members' adoption of the Internet. Almobarraz showed that using the Internet for academic purposes was compatible with all aspects of faculty members in regards to their profession as well as for their personal needs. Relative advantage was the second strongest predictor, followed

by image, ease of use, result demonstrability, trialability, visibility, and voluntariness, respectively. In regards to relative advantage, faculty members used the Internet because it enabled them to accomplish academic tasks faster and it enhanced their efficiency in completing the academic tasks. Complexity (ease of use) also was a factor in that faculty members found that learning to operate the Internet was easy for them. This study showed that trialability is a weak predictor of faculty members' Internet adoption. The reason for this result is due to the lack of training available for using Internet applications and services. Lastly, observability (result demonstrability and visibility) showed that the results of using the Internet are apparent to the faculty members and that an increased number of Internet Services Providers (ISPs) and the spread of Internet cafes through the major cities made more people aware of the Internet's uses.

Al-Asmari (2005) carried out a study to investigate the use of Internet by teachers of English as a Foreign Language (EFL) in Saudi Arabian Colleges of Technology using Rogers' DOI theory (2003). The study showed that the teachers had positive perceptions about the Internet as a tool for EFL instruction since it "[saved] time and effort in obtaining information and materials needed for class, [lessened] the using of traditional delivery methods and added an element of interest and joy to the teaching/learning process" (p. 142). However, several issues hindered teachers' Internet use. The main issue was the need for financial support to enable the purchase of more computers and better Internet connections. Limited access to computers in classroom and limited opportunities to train on the use of the Internet reduced teachers' interest in implementing the Internet in teaching EFL. In regards to attitudes and appropriateness, teachers had two concerns. The first was that the Saudi teachers did not want to change their traditional ways of delivering

instruction and resisted using the Internet. The second was that they had apprehension about the negative values and moralities that the Internet might have on the students. Furthermore, the study showed that external factors were a stronger predictor in comparison to personal factors when it came to the use of the Internet in teaching EFL.

Studies in K-12 School Systems

A study by Gwayi (2009) was carried out with secondary school science teachers in Malawi, investigating the relationship between perceptions of using TALULAR (Teaching and Learning Using Locally Available Resources) and the level of its implementation. The study used perceived attributes characteristics derived from Rogers (2003), Moore and Benbasat (1991), and Compeau, Meister, and Higgins (2007). The study revealed that relative advantage, ease of use, compatibility with prior experience, others' use, communicability, measurability (observability), and trialability were significantly and positively related to the implementation of TALULAR, while voluntariness was negatively related. The study showed that level of education, school type, and training attendance were significantly related to implementation, while no significant association was made with gender, teaching experience, or length of innovation training. Teachers were also concerned about certain issues that included "time limitation to use the innovation, ineffectiveness of the innovation in some cases, need for training, and scarcity of some local resources to facilitate the use of the innovation for teaching" (Gwayi, 2009, p. 181).

Moore (2007) carried out a study with Virginia secondary technology education teachers to determine to what extent are they implementing STL (Standards for Technological Literacy), to what extent each standard was being implemented, and the

relationship between the individual standards implemented and respondents' perceptions according to Rogers' (2003) innovation attributes. The study showed that 20% of respondents, having adopted STL, perceive them to be an advantage to their teaching, compatible with their life experiences, easy to try on a limited basis, easy to observe, and not too difficult to understand and apply. The study showed that the teachers understood how the individual standards were compatible with what they were currently teaching in their classroom and were willing to try implementing individual standards separately. For some of the individual standards, teachers had a difficult time trying only portions of the standards or being able to observe someone else using them, and many of the individual standards were viewed as being too complex to use and implement. The study showed that there were variations of perceived attributes of the individual standards due to the extreme range of topics covered; nevertheless, it was evident from the study that stronger relationships with Rogers' (2003) perceived attributes and the individual standards are needed as these could increase the rate of adoption.

A study was carried out by Martins, Steil, and Todesco (2004), investigating the factors that influenced the use of the Internet in language schools in Brazil using Rogers' (2003) perceived attributes. The study showed that observability and trialability were the two variables that appeared as the two most significant ones, while relative advantage and complexity exerted little influence in the study. Trialability was an important indicator because the teachers who attended training programs applied the Internet skills they acquired in the classroom. Internet availability and adoption in this study was intrinsically related to training. Observability was also a strong variable since the results and the benefits of its use were visible to the teachers. When an innovation is perceived to be

explicit and visible, favorable attitudes concerning the innovation are more likely to occur (Martins et al., 2004).

A study was conducted in Trinidad and Tobago in elementary schools, examining the relationship between teachers' attitudes towards computers and Rogers' (2003) perceived innovation characteristics and their satisfaction and use of computers (Sooknanan, Melkote, & Skinner, 2002). The study showed that the individuals' attitudes and perceptions on the innovations were determining factors in its implementation, and satisfaction constructs were related to reliability and accuracy, learning tools, networking tools, and utilization construct of education and networking. By applying Rogers' (2003) theory, the study showed that relative advantage, compatibility, and observability influenced teachers' adoption and use of computers. Relative advantage was applicable since teachers perceived that computers enabled quicker access to information, helped overcome administrative delays, and improved the storage and retrieval of students' records. Compatibility in this study was divided into two types: compatibility with classroom instruction and compatibility with classroom needs. Teachers had a positive perception toward the compatibility of computers to their curriculum goals because they perceived that computers were reliable and accurate, met their information needs, and made up for limited classroom time. No relationship was found between the perceived complexity in using computers and the degree of implementation.

Summary

The application of Rogers' DOI theory (2003) as well as other adoption theories in worldwide higher education and school systems to determine the factors that influence

technology adoption and integration has shown a common perspective between various cultures. This common perspective is the need to start at the level of the potential adopters by addressing their characteristics in the environment in which they will be using the technology. Studying teacher's philosophies and personal interpretations of whether it is valuable to use technology leads to an understanding of how technology is diffused easily and rapidly and what kind of adaptation takes place and is needed in the educational context in which the technology will be utilized.

Background on Kuwait's Public Educational System and Primary Level

The state of Kuwait is located in the Middle East, bordering the Persian Gulf between Iraq and Saudi Arabia. Kuwait is a constitutional, hereditary emirate, ruled by princes (Amirs) who have been drawn from the Al Sabah family since the mid-18th century. The capital is Kuwait City, and the state has 178 kilometers (120 miles) of coastline on the Arabian Gulf. One of the smallest countries in the world, Kuwait occupies only 17,818 square kilometers (6,880 square miles). The total population of Kuwait in 2005 was 2,991,189, out of which only 992,217 (45%) were native Kuwaitis (The National Mid-Decade Report on Education for All in the State of Kuwait, 2002–2006).

Islam is the official religion, and the Shari'ah, which includes the Holy Quran and the teachings of Prophet Muhammad, is the foundation for the Kuwait society and government (Al-Enezi, 2002). Most Kuwaitis are Sunni Muslims, and about 30% are Shi'a Muslims. Non-Muslims who live in Kuwait are free to practice their own religions within the country's law (Alqahtani, 2006). The official language is Arabic, but English is widely spoken and is taught in schools. Before the discovery of oil in 1936, Kuwait depended on sea trade and

pearl exports; petroleum became the main and the sole economic product beginning in the 20th century, which made Kuwait a classic welfare country with one of the highest per capita incomes in the world. Kuwait is considered the fifth-largest oil reserve in the world after Saudi Arabia, Canada, Iran, and Iraq. Kuwait is also a tax-free country in which health, housing, and public services, such as building roads, are free (Alqahtani, 2006).

Despite its oil, Kuwait is not considered a developed country, according to the International Monetary Fund (IMF) World Economic Report in 2010; rather, it is considered an emerging, developing country. The IMF classification system is based on per capita income level, export diversification (oil exporters that have high per capita GDP would not make the advanced classification because around 70% of its exports are oil), and degree of integration into the global financial system (IMF World Economic Outlook, 2010). Developing countries are, in general, countries, that have not achieved a significant degree of industrialization relative to their populations, whereas developed countries have self-sustaining economic growth in both the service industry and knowledge (intellectual) sector of the economy and have high material standards of living. The World Bank's main criterion for classifying economies is Gross National Income (GNI) per capita, and high-income countries have (GNI) above \$12,196, putting Kuwait and the rest of the GCC as developing high-income countries. Criticisms about using the Western model of economic development as an indication of certain countries being developed while others are not have been raised by many. Perkins (2003) emphasized "Eastmond (2000) uses the term low technology countries to identify countries in North and West Europe, the Middle East and North America that lack or are lacking educational or technological resources" (p. 7).

The philosophical framework for the national vision of education in Kuwait is

“visualizing the future and envisaging what the citizen's character should be like, in order to cope with this future image, with its spiritual, mental, cultural, psychological, social, and technological dimensions, while preserving the national identity” (The National Report: Development of Education in the State of Kuwait, 2004–2008, p. 23). The Kuwaiti government worked productively to enhance the educational stages, starting from kindergarten through university, and have spent more than 12% of its annual income on education (Ebrahim, 2004). Kuwait has employed the “financial resources that were produced from the enormous rise in state revenues to carry out ambitious plans to promote public education” (Alqahtani, 2006, p. 15).

There are three formal educational systems in Kuwait: public (government), qualitative (religious), and private education (The National Report: Development of Education in the State of Kuwait, 2004–2008). The educational structure is two years of kindergarten (ages four to six), five years in the primary stage (ages six to 10), four years in the intermediate stage (ages 11 to 14), and three years in the secondary stage (ages 15 to 17). Subject areas taught in public schools are based on the national curriculum guide of Kuwait. Due to Islamic beliefs, public education is segregated, except for kindergarten, which is coeducational; in addition, faculty and staff members are of the same gender “except for a few male elementary schools that have female faculty and staff due to the abundance of female educators in Kuwait” (Al-Enezi, 2002, p. 15).

Historically, most schools in Kuwait were based on religious education, in which the mosques and Quranic schools, called Al-Katatib, played the largest role in educating youngsters. The main curriculum was the Holy Quran, mathematics, reading, and writing. Between 1911 and 1921, two formal public schools were established. In 1936 oil was

discovered, which led to comprehensive revitalization in the Kuwaiti society economically, socially, and educationally, and a Board of Education (Da'erat Almaarif) was founded and the education system was taken over and financed by the government (Ebrahim, 2004; Al Ahmad, 2000). Da'erat Almaarif had an important role in developing and organizing education. Initially, the new schools were for primary level, but between the 1940s and 1950s, different grade levels were added. Formal education for women started in 1937.

With the increase in schools being established, Da'erat Almaarif approached other Arab countries to provide teachers for Kuwait, which resulted in an influx of teachers who were mainly from Egypt. Over time, education became influenced by the Egyptian model in regards to teachers, curriculum, and textbooks (Al Ahmad, 2000). This issue was a concern for many Kuwaitis, and after Kuwait's independence, the work of Da'erat Almaarif was transferred to the Ministry of Education (MOE) of Kuwait in 1962, through which all public educational institutions became centralized and operated by the MOE, including the operation of private schools to ensure that quality education is provided (Al-Enezi, 2002).

In 1965, education was made compulsory for every Kuwaiti child up the age of 18; since then, education has been free to every Kuwaiti from kindergarten until university level, including vocational and professional education. With the expansion of education, the MOE adopted five educational areas (Al-Jahra, Al Ahmadi, Al Farwania, Hawally, and Al Aseema) in the 1980s. By forming these five educational areas, the MOE appointed decentralized administrators to work on their behalf and implement their goals by overseeing the technical and administrative aspects of each school in the district as well as supervise, evaluate, and follow-up on educational services within the designated area (Al Ahmad, 2000). Recently, another governate, Mubarak Al Kabeer, was added.

The MOE is responsible for determining the curriculum and its implementation. It provides the schools with annual budgets, which are subsidized by the government of Kuwait, to finance school equipment, teaching materials, and resources. Therefore salaries are relatively uniform from school to school, and the recruiting of teachers is done through the ministry itself. "The ultimate staffing decisions and funding is carried out by the MOE, which equally provides both human and technological resources without any differentiation" (Alkhezzi & Alqahtani, 2007). The disadvantage is that decision-making regarding budgetary support and the needs of each school are taken for granted without awareness of each school's conditions. This situation causes lack of consistency in the provision of what each school really needs.

Funds provided by the MOE are divided into capital (more than one year) and operational (only one year) funds. The former deals with expenditures such as furniture and equipment, audiovisual equipment, overhead projectors, and library books and materials, while the latter deals with aspects such as textbooks, workbooks, and other student materials (Al-Enezi, 2002). The MOE provides schools with a budget, which is distributed between the content area departments and administrative needs. The departments use the budget for stationeries such as ink, photocopy paper, etc. The school administration uses the allocated budget on stationeries, maintenance of devices, workshops, etc. (N. Aleteki, personal communication, April 6, 2010). The MOE is also responsible for renovation, remodeling, and major maintenance of the school premises. Furthermore, the MOE receives other sources of funding from charitable organizations and private foundations in Kuwait to support and develop educational services (Al-Enezi, 2002). Similarly, schools generate extra funds through their cafeterias and funding from

charitable organizations (N. Aleteki, personal communication, April 6, 2010).

The primary stage in Kuwait lasts for five years, when students are ages six to 10. The curriculum consists of 10 content areas (subject areas), which are Arabic, Islamic Studies, Mathematics, Social Studies, Science, Arts, Music, Physical Education, English, and Computer Studies. The curriculum is unified in all primary stages throughout the schools in Kuwait. The MOE unifies the content of the textbooks and the student assessments, and determines the allocation of lessons for each subject per week. Allocated lesson time is 45 minutes, with a total of 32 lessons per week (Al Ahmad, 2000). The educational areas are responsible for execution, supervision, and evaluation of the curricula. The system of education and teaching in Kuwait is based on traditional teaching approaches. Ebrahim (2004) emphasizes that despite the current changes taking place in the use of contemporary teaching methods, teacher-centered instruction has solid and empirical roots in Kuwaiti schools. Students move from one grade to another according to their performance in class, mid-term tests, and progression during the school year, as there are no final exams as there are in middle and secondary levels (Al Ahmad, 2000). Grades four and five, on the other hand, take final exams to move from one level to another in public schools (N. Aleteki, personal communication, April 6, 2010).

School personnel consist of a school administrator (principal), one or two assistant principals, and one department head for each subject area, teachers, technicians, and office personnel. The school administrator is responsible for the administrative and technical performance of the school, financial issues, connecting with the district, and the overall school management. The assistant principal monitors office personnel tasks, oversees teachers' attendance and absenteeism, organizes time allocations for teachers' class hours,

arranges teachers' shift hours, supervises school activities, and acts as a liaison between the teachers and department heads with the principal (Al Ahmad, 2000). The department head supervises and provides guidance to the teachers in her department, controls the department budget, and acts as a liaison between the school administration and the teachers.

The department head, principal, and superintendent evaluate teachers' performance, in which the principal's assessment carries the most weight of 50%, while the department head and the superintendent carry 25% each. Superintendents and department heads evaluate teachers based on their teaching techniques, interaction with students, teaching tools used, etc. The school administration evaluates teachers based on their attendance, cooperation with colleagues, and school administration (N. Aleteki, personal communication, April 6, 2010). The principal and superintendent also assess department heads. Teachers are assessed once at the beginning and once at the end of the academic year. Reports are designed by the MOE and contain elements of assessment, which are graded from most to least (Al Ahmad, 2000). The evaluation forms consists of criteria ranging from following lesson plans as portrayed by the MOE, classroom management, ability to teach the topic, relationship with students, accepting the superintendent's advice, use of tools and different teaching methods, evaluation of students, allowing participation of students, preparation of lesson, and completion and stamping of lesson exercises (B. Alayoub, personal communication, March 17, 2010).

Teachers are promoted to department head after five years of teaching and go through a written exam, oral interviews, and a short-term training program. Nominated candidates for department head positions are distributed to other schools or can choose to

remain in the same school and work as teachers. Furthermore, after five years of service, department heads can be promoted to work as superintendents or assistant principals (M. Aladwani, personal communication, March 31, 2010). Assistant principals get promoted to principals and superintendents get promoted to head superintendents. All these promotions depend on whether excellent evaluations and good conduct are achieved (A. A. Alsaleh, personal communication, February 1, 2011).

Teachers in the primary stage face several problems; for the needs of this study, only a number of issues will be tackled that are in alignment with this research. Kuwait's constitution mandates secure jobs for all Kuwaiti citizens, which lead to an overabundance of teachers in the school systems (Al Ahmad, 2000). Although having a surplus of teachers is good in regards to teacher/student ratio, this issue has a drawback, which is the inconsistency on the allocation of lessons. Department heads are given the authority to distribute lessons as they see fit, and, thus, having an abundance of teachers causes some department heads to give experienced teachers more classes to teach than less experienced ones due to their concern about students achievements. In other cases, some teachers get to carry out school activities while others take over classes for absent teachers (Al Ahmad, 2000).

Kuwaiti teachers also do not have sufficient time in using new teaching methods for several reasons. First, the continuous change of the curriculum by the MOE enforces teachers to exert more effort in implementing it (Al Ahmad, 2000). In addition, it does not give the teachers ample time to exchange ideas with others or prepare the materials needed (N. Aleteki, personal communication, April 6, 2010) nor to implement new teaching ideas (Al Ahmad, 2000). Teachers also receive teaching guidance from various

superintendents, and this causes confusion on the best teaching methods to be employed, which also affects teachers' assessments (Al Ahmad, 2000). Recently, the MOE changed their policies and instead one superintendent is assigned to each content area and is responsible for the schools under each of the five educational areas (A. Alsaleh, personal communication, February 1, 2011).

Al Ahmad (2000) found that the strict school policies regarding absenteeism including sick leave or leave of absence affected teachers' evaluation. Primary school teachers also have limited participation in the decision-making process concerning their jobs, leading to a sense of demotivation (Al Ahmad, 2000). Other problems include dealing with non-cooperative parents who are not willing to cooperate with the teachers in class and difficult student relationships (Al-Lemeh, 2004). The lack of educational tools, the curriculum, technical supervision, and allocated lesson time and class schedules are also a problem for teachers. In his study, Al-Lemeh (2004) found that Kuwaiti female teachers thought class time was more of a problem than the curriculum, since it hinders their use of various educational tools and teaching approaches in conveying the information and instead promotes the traditional teaching approach. During the end of each semester, allocated class time is shortened to 40 minutes instead of 45 minutes, allowing for an extra lesson to be created. This lesson enables students to receive assistance in specific curricular areas. The disadvantage is that concentration is made on doing activities related to the exams and, thus, teachers are unable to use any form of technology (L. Alghoneim, personal communication, April 4, 2011).

Despite the provision of some technologies in the public schools, there is still lack of technological resources in the primary schools. Teachers have constant access to audio-

recorders and overhead projectors due to their availability in classrooms as they are provided by the MOE. On the other hand, there are an insufficient number of other devices such as the *Data Show*, which is a terminology teachers use to refer to a document projector. Internet access is provided for the administration but not to the teachers. Teachers use their personal USB Internet modem for access. The lack of equipment and educational resources forces teachers to pay often from their own personal funds (A. Alasaker, personal communication, April 4, 2011). This means that those who cannot afford it lack the same level of expertise and exposure to technology and those who can afford it feel the burden of self-sustaining educational materials, which is supposed to be granted by the school administration and the MOE.

Summary

The MOE in Kuwait is a centralized institution, which oversees all educational matters for K-12 school systems. The organizational structure of the MOE consists of different work sectors, each headed by assistant undersecretaries. Decisions regarding school budgets, equipment purchase, personnel employment, the curriculum, training programs, and school facilities are under the umbrella of the public education sector. Despite the challenges, the citizens of Kuwait are provided with learning opportunities that foster enhanced educational environments.

CHAPTER THREE: METHODOLOGY

This chapter will present a description of the research design employed, an illustration of the participating schools and study population, and the data collection procedures and data analysis strategy that was followed. The chapter also includes a description of how the validation of results and findings was attained.

Purpose Statement and Research Questions

This multiple-case study will use the perceptions of female Kuwaiti teachers toward technology that may have contributed to or limited their adoption of it in order to show the applicability of Rogers' DOI theory within two Kuwaiti primary public school contexts. The study seeks to answer the following specific questions and sub questions:

1. To what extent have the Kuwaiti teachers adopted and integrated technology?
 - a. How do teachers' characteristics (prior knowledge and experience, motivation, and anxiety) affect the way they perceive technology adoption and use?
 - b. What are the support environments that facilitate or impede their use of technology?
2. In what way do the attributes of technology affect the perceptions of Kuwaiti teachers' towards technology adoption and use?
 - a. How is technology useful and beneficial to teachers in their profession? (relative advantage)
 - b. Is the technology used consistent with the teachers' pedagogical beliefs and needs? (compatibility)

- c. What are the challenges that teachers face when working with technology?
(complexity)
- d. What opportunities do teachers have to experiment with the technology before becoming potential adopters? (trialability)
- e. What do teachers experience when using technology? (observability)
 - iii. What tangible results do teachers witness?
 - iv. How do visibility and accessibility contribute to use?

Research Design

This research study utilized a qualitative methodology for both data collection and data analysis. In qualitative approach studies, the researcher gains knowledge based on the meaning of individual experiences and develops patterns based on the social and historical construct of the group (Creswell, 2003). Conducting the study in a natural setting allowed me to obtain a detailed and holistic picture of the school environment, teachers' roles, their perceptions and viewpoints on the use of technology, as well as their interactions with it. Thus, I was able to obtain a comprehensive understanding of the aspects involved in teachers' decision-making about whether to adopt or minimally adopt the use of technology. Accordingly, I was able to show whether Rogers' (2003) theory is applicable in these two school settings.

Case studies are a qualitative approach in which the "researcher explores in depth a program, an event, an activity, a process or one or more individuals. The case(s) are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures" (Creswell, 2003, p. 15). Qualitative case studies allow the

“researcher to have an insight, [and] discover and interpret situations rather than [test a] hypothesis” (Merriam, 2009, p. 42). The three characteristics of a case study include particularistic, descriptive, and heuristic, which lead to a better understanding of the issue under study (Perkins, 2003). Additionally, the nature of case studies is that they’re bounded, which means that there is a limit to who and what gets investigated. Mertens (2005) emphasizes that the more the “object of study is a specific, unique, bounded system, the greater rationale for calling it a case study” (p. 237). Furthermore, case studies are particularly appealing in educational fields and useful for studying school and educational innovations (Merriam 2009; Yin, 2009), which is also applicable to this research study.

For this study the boundaries were quite clearly defined by a number of factors: time, individuals, and the context within which the events of the study took place, as it was carried out specifically in two Kuwaiti primary public schools (A. E. and I. S.), focusing on teachers, from March 5 to April 10. Therefore, all criteria for carrying out a case study were represented. Each school was regarded as an individual case. Within each individual case, there were embedded cases (each of the eight teachers), making the research design a two-case embedded study. The rationale behind using multiple case designs is twofold: first, the possibility of replication, and second, arriving at common conclusions from both cases, which will expand the external generalizability of the findings (Yin, 2003, 2009). In addition, analyzing the findings within each setting and across settings enables the understanding of the similarities and differences between cases (Baxter & Jack, 2008). In fact, variations across the cases make interpretations more compelling (Merriam, 2009) and the findings more robust.

Pilot Study

Prior to carrying out the main study, I travelled to Kuwait in December 2008 for a week to carry out a pilot study within two public schools (A. M. and A. E.). Prior permission was obtained from the Kuwaiti Ministry of Education (MOE) with the help of a professor from the University of Kuwait. I conducted six interviews with teachers from different disciplines, with differing years of teaching experience, and of differing ages. A short survey was also distributed to 30 teachers to inquire about the types of technologies they use. The pilot study generated information that gave me insight into the various issues affecting the use of technologies in these sectors. From the data collected, I was able to identify the target population for this study as well as decide on the appropriate research design. It should be noted that teachers from the A. E. school participated in the current research study, while teachers from the A. M. school declined to participate, either due to the type of data collection procedures or the lack of time in the school schedule. The second group of teachers who agreed to participate in this study came from I. S., another primary public school in my second visit to Kuwait.

The Study Population

This research study focused on female teachers because Kuwait has cultural constraints regarding interaction between genders, as illustrated by the segregation in public schools and universities. For a comfort level to be reached between the researcher and the participants, it was pertinent to focus on females and not males. This comfort level is important because there is a need for “increased cultural sensitivity, collaboration,

respect and the tailoring of the research procedures to the population being studied” (Mertens, 2005, p. 38) in order to obtain comprehensive and detailed information.

Purposeful sampling was used in this study; Patton (2002) emphasizes that this technique involves choosing information-rich cases, from which one can learn issues of central importance to the study (Merriam, 2009). One of the strategies of purposefully selecting the sample is maximum variation sampling. The benefit of this type of sampling is that it “documents uniqueness of each case and shows the significance of shared patterns that emerged from their heterogeneity, thus capturing the core experiences and central, shared aspects or impacts of a program” (Patton, 1990, p. 172). For multiple-case or comparative studies, maximum variation sampling can be used in the selection of cases “to ensure that the best cases are chosen for the study” (Merriam, 2009, p. 81). The literature shows that sites or individuals can be chosen for maximizing variation within the sample (Merriam, 2009; Mertens, 2005), allowing for the transferability of the findings, which will be discussed later on.

The key variations for constructing the sample population in this study were the differences in sites and the characteristics of the participants. Regarding the sites, two primary public schools were sought to take part in the study. In regards to teachers’ characteristics, although all teachers are Kuwaiti, the variation sample initially included teachers between 25 to 40 years of age, who had five to ten years of teaching experience, and who taught different subject areas and grade levels. Teachers who were willing to be interviewed and audio recorded (as will be seen in the subsequent paragraph) did not match the intended variation sampling, so the final sample included teachers aged 25 to 32, with five to seven years of teaching experience who did not represent all of the content

areas. Furthermore, teachers who agreed to participate came from only two schools. For confidentiality reasons, the real names of the participants and schools are concealed with pseudonyms.

Procedure for Establishing the Sample

In cooperation with Kuwaiti employee Ms. Almajed from the University of Kuwait, the administrator of each school was contacted in advance to request administrative records that showed the names of the Kuwaiti teachers who taught the appropriate central subject areas (excluding sports education, music, and art). Once the records were obtained, I constructed an invitation letter addressing what the research is about (Appendix A) and a small questionnaire. I provided both of these to Ms. Almajed to be distributed to the Kuwaiti teachers. The questionnaire inquired about information related to the above-mentioned criteria (age, experience, subject area taught, grade level, and types of technologies used) and whether they would be willing to be interviewed and observed (Appendix B). Although there were several teachers who met the criteria, some refused due to social traditions against being interviewed using audio, while others who had initially agreed to participate later found that personal circumstances arose which caused them to drop out of the study.

In the end, a total of eight teachers (four from each school) participated in the study and were willing to be interviewed (audio recorded) and observed. From the A.S. school, the interviews were carried out with the English, Islamic, science, and social studies teachers. From the I. S. School, two teachers were from science and two were from the social studies department. It is worthwhile to mention that two of the participants were

willing to be observed but not interviewed. Meeting the teachers in person and describing to them what would take place eased their concerns, and throughout the fieldwork they were responsive to my inquiries, showing that personal communication and contact is an important factor in research studies involving other cultures. The validity of the sample was confirmed through school records and information gathered from the department head. Prior to the interviews, the researcher contacted the interested teachers to schedule times for interviews and observation.

Descriptions of the Schools and Participants

Both the A. E. and I. S. schools are public primary school for girls located in Kuwait and are under the educational area district of Al-Aseema. Both schools consist of grades one to five. Each grade level has three to five classes. A. E. and I. S. are under the supervision of the MOE and follow the national curriculum of Kuwait, which consists of 10 content areas. Each of the content areas has their own department heads. Operating hours of the school are from 7:30 a.m. to 1:20 p.m., Sunday through Thursday. The following is a description of each of the schools.

Description of the A. E. School

The A. E. School was first founded in 1975 as a high school; it later became a middle school, and in 2004–2005 it became the A. E. primary school. Table 1 shows the numbers of students enrolled during my visit. Recently renovated by the MOE, the school has updated furniture, two fully equipped computer labs, and a language lab. The language lab has not been utilized by any of the teachers, as they have not yet received training on how to use it.

The school consists of the administration department, which is comprised of one principal, two assistant managers, and six administrative personnel. There are also two social services personnel, one psychiatric worker, two library personnel, one technician, and one facility and storage keeper.

Table 1

Number of students enrolled in the A. E. School, March 2010

Grade Level	Classes	Students	Total
Grade 1	1	17	47
	2	15	
	3	15	
Grade 2	1	18	57
	2	19	
	3	20	
Grade 3	1	23	67
	2	22	
	3	22	
Grade 4	1	17	69
	2	16	
	3	17	
	4	19	
Grade 5	1	18	87
	2	18	
	3	18	
	4	17	
	5	16	
Total Number of Students in the School			327

Department descriptions at the A. E. School

The following is a description of the subject area departments from which the participants were chosen.

The Social Studies department has one department head and six teachers. They have one computer in the office, but five of the teachers have personal laptops. Teachers share the office computer, which is used to enter grades. They have one printer, which the department head provided for her teachers. There is also a photocopy machine, which was donated to them. Sometimes the teachers purchase the ink cartridges, and sometimes the administration provides them. The department head holds weekly meetings with the teachers, in which they discuss various issues, including topics related to technology.

Similar to the Social Studies Department, the Islamic Studies Department has one department head and six teachers. They have one computer, but it is located in the Islamic Club because there is no space for it in the department office. Three of the teachers have personal laptops. The department's computer is used to enter grades, type tests, create worksheets, etc. They have one printer in the office that is non-functional and one that is attached to the computer in the club. Like the Social Studies Department, they have weekly meetings in which they discuss a lesson and what teaching methods could be used. They also inform each other of other technologies they have been exposed to when visiting other school workshops and activities.

The Science Department consists of one department head and eight teachers. They have two computers, and all eight of the teachers have their own personal laptops. They also have three department printers, two of which were provided by the school, while the teachers purchased the third as a group. The computers are used for submitting grades, preparation, worksheets, etc. Some of the teachers in this department have an Internet USB modem to connect to the Internet while they are at school. The department has multiple weekly meetings; one is to discuss curriculum, while others are to discuss administrative

issues. During these meetings, they discuss how to obtain access from the Internet and how to present their work using technologies. Examples include downloading from youtube.com and using the Data Show (which is the term used for the document projector).

The English Department is made up of one department head and nine teachers. They have one computer and eight personal laptops. The laptops are used to make flash cards and exams, while the teachers use the computer for submitting grades, typing materials like worksheets and tests, and printing them out. The MOE has provided one printer. As with the other departments, weekly meetings are held to discuss topics that include new technologies that come to the market. Examples include the iphone and Windows 7.

Description of the participants

The following is a description of the four participants at the A. E. School, in which the subject area and grade level, years of teaching experience, age, education, and experience with technology will be discussed.

Amira is a social studies teacher for grade five. She has been teaching for five years, of which three were spent in this school. She is 29 years old and has a bachelor's degree in sociology. She attended the International Computer Driving License (ICDL), for which she took four of the seven exams necessary for completion, but she did not complete the other three exams. She indicated that she loves technology, so she doesn't feel it is complicated. In her opinion the most difficult application is Moviemaker, since she did not receive any training on how to use it, while the Internet is the least difficult application to use. She mostly uses the laptop and the Data Show, while the audio-recorder is the least used

technology. Her experience with technology is at the university where she took a course called “Computers in Education” as part of her degree program. She then took a training course from a school called the Institute for Integrated Studies, where she learned Word, PowerPoint, and Excel. Her latest training was for the ICDL, during which she studied Word, PowerPoint, Excel, and the Internet.

Abeer is a science teacher for grades one and five. She has five years of teaching experience with seven months teaching at this school. She is 30 years old and she has a bachelor’s degree in education, majoring in biology and chemistry. She also has a master’s degree in educational administration. She completed all seven courses required by the ICDL but did not take the exam for certification. She uses mostly the overhead projector for teaching, as well as PowerPoint. Least used are the audio-recorder and Excel, as they don’t relate to her work. The most difficult machine for her is the Data Show, while the overhead projector is the least difficult. Her education in technology was taking a course in educational technology as part of her coursework at the College of Teacher Education in Kuwait. During this course, she learned Microsoft Office applications (Word, PowerPoint, and Excel).

Leila is an Islamic teacher for grades two and five, and she has been teaching for six years, of which one year was at A. E. She is 28 years old and has a degree in Islamic studies. Leila took the ICDL but did not complete it; however, she did take the Computer Literacy Program (CLP) offered by the MOE at her school. She doesn’t use any complicated technology in her teaching. In her opinion, complicated technology is any device or application that she feels is difficult to use. The easiest technology for her to use is the audio-recorder. In Islamic Studies, the audio-recorder and the TV are the most used

technology, and the overhead projector is the least used. Her experience with technology is through the ICDL (Word and Internet), the CLP (PowerPoint), and at the University (Word).

Nodah is an English teacher for grades one and three. She has five years of teaching experience in which one year was in this school. She is 28 years old and has a bachelor's degree in English. She did not take the ICDL, but she did take the CLP offered at her school, in which she learned how to use PowerPoint and Word. For her, the Data Show is the most difficult technology, while real objects, flash cards, and the audio-recorder are the least difficult. She mostly uses audiotapes and the audio-recorder with her students, while the Data Show is used least. She took several training programs offered by the Public Authority for Education and Practice, in which she learned how to use the computer applications, Internet, PowerPoint, and Word.

Description of the I. S. School

The I. S. School was founded in 1961. Table 2 shows the number of students enrolled during my visit. The I. S. School was transferred to the building in which it is now located in 2006. The school is in the process of renovation, but most classrooms are still inadequately furnished. In addition, some of the equipment is out of date and is stored. But the school has two computer labs and a language lab. Similar to A. E., the language lab is still not used by the teachers. The school consists of the administration department, which is comprised of one principal, two assistant managers, and five administrative personnel. Also on staff are two social services personnel, one psychiatric worker, one librarian, two technicians, one facility and storage keeper, one implementing service person, and three science preparatory persons.

Table 2

Number of students enrolled in the I. S. School, March 2010

Grade Level	Classes	Students	Total
Grade 1	1	19	79
	2	20	
	3	21	
	4	19	
Grade 2	1	23	88
	2	22	
	3	21	
	4	22	
Grade 3	1	19	94
	2	18	
	3	19	
	4	19	
	5	19	
Grade 4	1	23	85
	2	20	
	3	21	
	4	21	
Grade 5	1	17	72
	2	17	
	3	18	
	4	20	
Total Number of Students in the School			418

Department descriptions at the I. S. School

The following is a description of the subject area departments from which the participants were chosen.

The Social Studies Department has one department head and six teachers. They have two computers in the office, which are shared between the teachers for grade entry, but each teacher and the department head has a personal laptop. Their laptops are used for

writing tests and teacher preparation for the classroom. Some of the teachers have USB for Internet connection. They also have one printer, one lamination machine, and one Data Show, which the principal provided to them as a reward to the social science department for hard work. They have weekly meetings and a monthly workshop given by the department head, in which she facilitates discussion with the teachers about teaching tools and new teaching methods, and provides administrative guidance.

The Science Department consists of one department head and eight teachers. They have two computers; one is used for grade entry and the other is used for test construction, developing worksheets, and printing Word documents. One of these computers was donated to the department from an outside source. Some of the teachers have their own personal laptop and some have an Internet USB modem to connect to the Internet. They also have one Data Show that was given to them by an outside source. The department has weekly meetings, in which teachers exchange information about new applications, such as Flash and Photoshop, that they have learned, as well as discuss what technologies are needed for specific lessons.

Description of the participants

The following is a description of the four participants at the I. S. School, in which the subject area and grade level, years of teaching experience, age, education, and experience with technology will be discussed.

Asmaa is a science teacher for grades one and three; she is 29 years old and has a bachelor's degree in basic education with a specialization in science and applied mathematics. She has been teaching for seven years, of which five years were at this school.

She completed her ICDL and received her certificate. She mostly uses PowerPoint for presentations, and she uses TV the least. For her, the most difficult application is using features within PowerPoint, such as making indexes, while the least difficult is the Internet. Her experience with technology is through the ICDL and one week during which she taught herself the use of Moviemaker while she developed an educational movie for the school.

Lojain is a science teacher for grades three and five; she is 32 years old and has a bachelor's degree in education with a major in applied sciences. She has been teaching for seven years and has been teaching at this school for four years. She completed the ICDL and received the certification. She taught herself Flash and Moviemaker initially, but then she took a Moviemaker training program for a week at the Teachers Association in Kuwait. For her, Flash is the most difficult because she didn't take professional training about it. The easiest technology for her is PowerPoint. She mostly uses the Data Show for her work, while the audio-recorder is the least used.

Mai is a social studies teacher for the fourth and fifth grades; she is 29 years old and has a degree in history. She has been teaching for five years, all of which have been at this school. She completed her ICDL training and received her certificate. The most difficult technology for her is the Data Show, and the overhead projector is the least difficult. She mostly uses the Internet in her work, while videotapes are the least used. Her experience with technology, other than the ICDL, occurred during her university studies in which she attended a computer training program that taught Word, PowerPoint, Access, and Excel.

Mariam is a social studies teacher for second and fifth grades; she is 30 years old and has a degree in geography. She has been teaching for six years, all of which have been in this school. She did not take the ICDL, as she believes she knows enough computer skills

and has not had time to take it. Mariam has recently been promoted to department head but has not taken over the post. She mostly uses the Data Show, and she uses the audio-recorder least. The most difficult technology for Mariam is PowerPoint in regards to extracting pictures and organizing them on the slides. The least difficult are the audio-recorder and overhead projector. Her experience with technology is self-taught on the common applications (Word, PowerPoint, Excel, and Internet), from the Computer Literacy program (Word and PowerPoint), at school, and through a one-hour session offered by another school on how to use the Interactive Whiteboard.

Summary of the Study Population

A total of eight teachers participated in this study. Four were from the A. E. School from the English, Islamic Studies, Science, and Social Studies Department. The other four teachers were from the I. S. School, two from the Science and two from the Social studies Department. Table 3 describes the participants of the study:

Table 3

Description of study participants

Teacher's Name	Age	School	Department	Teaching Years
Amira	29	A.E.	Science	5
Abeer	30	A.E.	Social Studies	5
Leila	28	A.E.	Islamic Studies	6
Nodah	28	A.E.	English	5
Lojain	32	I.S.	Science	7
Asmaa	29	I.S.	Science	7
Mai	29	I.S.	Social Studies	5
Mariam	30	I.S.	Social Studies	6

Data Collection

This study was first approved by the Virginia Tech's Institutional Review Board (IRB) to ensure that the research protocols involving human subjects are ethical and that the rights of participants are protected (Appendix C). Furthermore, permission was also obtained from the MOE in Kuwait, which was translated into English for the purpose of this study (Appendix D). Written consent from each participant was obtained before data collection. It should be noted that the consent form provided by the IRB was in English, so it was translated by a third party into Arabic so that the participants understood the contents of the consent form before signing. This was important because "cross-cultural ethical principles indicates that the researcher should communicate the intended research agenda, design and activities with members of the host community" (Mertens, 2005, p. 38). For each school, data was collected via interviews, participation observation, physical artifacts, and records.

Interviews allow researchers to gain insight into educational and social issues by understanding the experience of the individuals whose lives reflect those issues (Seidman, 2006). Both standardized open-ended and dialogic interviews were utilized with the teachers. Through standardized open-ended interviews, the questions for all eight participants are fixed, but they were allowed to respond freely (Rossman & Rallis, 2003). The interview questions I formulated ascertained information about the teachers' perceptions towards the attributes of technology, as well as teachers' characteristics, in order to be aware of how these aspects contribute to the adoption or rejection of technology. The interview questions were divided into ten categories. Five of the categories focused on asking questions related to Rogers' perceived attributes (relative advantage,

compatibility, complexity, observability, and trialability). The other five categories inquired about the individual factors (anxiety due to change, teachers' prior knowledge and experience, administrative support, and types of technology used by the teachers), as well as involvement in decision-making (Appendix E). Teachers were also provided with a table that inquired about where they learned to use technology, what technologies they learned, and whether they completed the training/courses, etc. (Appendix F). The teachers were asked to submit the form before the end of the study.

Dialogic interviews were also used when needed, which are conversations that are carried out "between the researcher and participants, to develop a more complex understanding of the topic" (Rossman & Rallis, 2003, p. 182). This type of conversation encouraged the participants to reach to a comfort level and be more at ease with answering and discussing culturally sensitive issues with me. I noted the questions asked and the points discussed with the participants, department heads, and school principals.

Qualitative observation occurs when the researcher is interested in observing individual behaviors in a naturalistic setting (Mertens, 2005). Participant observation "is a special mode of observation where the researcher assumes a variety of roles and may participate in the events being studied" (Yin, 2009, p. 111). Moderate participant observation is when the researcher participates in some but not all of the activities (Mertens, 2005). For this study, I followed the moderate participant observation approach with the eight participants, which provided me with an opportunity to inquire about certain aspects and get feedback from the teachers. Observation included examining the settings in which the technology is used (classroom, lab, office, etc.), how teachers use and interact with the technology, and for what purposes is technology used. This provided an

understanding of the existing technologies and the patterns of use by the teachers. I attended two class sessions (40–45 minutes) for each teacher, for a total of 70–90 minutes of observation for each teacher and a total of 16 sessions for all eight teachers. In addition, I attended two workshops and a department meeting (invitation-based) in which technology was used. Furthermore, I observed the layout and the technologies present in the department office in which the participants worked (Appendix G). Based on its focus, this study concentrates on the 16 sessions, but reference will also be made to other sessions since they involved the use of technology.

Physical artifacts (Yin, 2009) are also an essential data collection procedure, from which “investigators are able to develop a more precise understanding of classroom applications” (p. 113). This study utilized photos, teaching materials, and archival records in addition to interviews and observation. Verbal permission was granted from both school administrations to take pictures of the classroom settings, including labs and playground areas, without the presence of the teachers. From this investigation, I was able to develop a precise understanding of how the teachers use technology with their students as well as observe the constraints and/or facilitative aspects that teachers face when using technology. In addition, individual teachers provided me with CDs, sample of curriculum textbooks, and worksheets to have a more comprehensive picture of the type of technologies used in student’s learning and in teaching at that school, and grade level. Archival records (Yin, 2009) were also provided by the school administration after being requested by the researcher. These records included information on school establishment, school structure, school population, and inventory.

Data Strategy and Analysis

The following section will discuss the analytical strategies and techniques that were used for each of the data collection methods utilized in this research study. The main strategy used was reliance on theoretical propositions (Yin, 2009). Yin (2003) notes that one important practice during the analysis phase of any case study is to return to the propositions. This ensures that the analysis is focused to “avoid analyzing data that is outside the scope of the research questions” (Baxter & Jack, 2008, p. 555). The theoretical proposition was Rogers’ *perceived attributes* and Farquhar and Surry’s (1994) *user characteristics and support environment*. Using these theoretical propositions, I was able to decide on how to best organize the data collected and to focus on those data generating the most relevant and useful information to the study.

Strategy for Analyzing and Organizing Data for Interviews

Creswell emphasize “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). Researchers need to collect information using the participant’s dominant language (Mertens, 2005). Since Arabic is the native language of both the researcher and the participants, the interviews were carried out in Arabic except for the English teacher, who decided to answer the questions in English. Conducting the interviews in Arabic allowed the participants to be comfortable and elaborate with ease. It was evident the English teacher had difficulty in elaborating as much as she could have if she had spoken in Arabic. Coming from a different cultural background, I had to be cautious not to cause any

discomfort by insisting that the interviews take place in Arabic. Doing so could have hampered the interview process.

The interviews were transcribed into Arabic and then translated into English. During the translation, I experienced two main issues: the first was the issue of the translation itself and the second was the essence of the interview generated by the translation. The process of translation to some extent altered the original meanings of the statements and also disempowered the voices of the participants (Al Kandari, 2004), which resulted in what Delgado-Gaitan (1994) calls “the problematic of representation due the language translation” (p. 301). Despite the fact that my native language is Arabic, I struggled to translate some of the words and terminology used by the participants because of fear they might hold several interpretations. I translated the teachers’ statements literally to ensure that the voices of teachers were not in any way affected, but edits were made to the direct translations for the sake of clarity. These edits are shown in brackets as will be illustrated in Chapter Four (Results and Findings).

Patton (2002) emphasized that even when using common language, words can have a different meaning in other cultures. Therefore, it was pertinent to get assistance from someone of the same national origin in order to ensure accuracy of the translation. A Kuwaiti teacher whom I met during my fieldwork (who received a scholarship to pursue her doctoral degree in the United States) offered her assistance by providing me with the correct translations of some ambiguous terminology and statements used by the teacher.

From my own perspective, reading the Arabic transcription and then reading the English translation, I noticed that I did not get the same effect in the translation as I did in the transcription. This could be because I speak the same language and have a similar

culture as the participants, thereby allowing the teachers' viewpoints and descriptions of the issues to make sense to me in Arabic more than the translated material. It became evident that the issue of culture and language play a very important role in intercultural research studies such as this one.

After the completion of the transcription and translation, content analysis of the interviews took place, which refers to "the data reduction and sense-making effort of qualitative materials to identify core consistencies and meanings" (Patton, 2002, p. 453). I read the interviews to become familiar with the information provided and then proceeded with coding. *Coding* is the process of organizing the material into a segment of text that leads to meaningful information (Creswell, 2009). A first set of codes was generated to highlight critical statements, which addressed the core issues regarding teachers' perceptions on the benefits and usefulness of technology, its applicability, the constraints faced, difficulty of use, the types of technologies used and the context in which they are used, the support initiatives provided, prior experience, and training-related issues.

From the first set of codes, common patterns in the teachers' responses were established and irrelevant data was eliminated. These common patterns were grouped together into meaningful clusters (Rossman & Rallis, 2003; Patton, 2002), allowing me to identify themes. Some of the themes were close in nature and intertwined with each other, so I decided to create a subtheme. This technique ensured accurate interpretation of the data and produced a more fine-grained analysis for the findings. The themes generated are supported by the teachers' quotations and will be presented in Chapter Four (Results and Findings). During all phases of coding and analysis, field notes were maintained that addressed the data and personal reactions to the participants' responses to increase

reflexivity. The same analytical strategy was followed for both schools, and the themes generated will be presented jointly.

Strategy for Analyzing and Organizing Data for Observations and Physical Artifacts

Field notes were collected throughout the process to maintain a written account of the observations in as much detail as possible. These notes included descriptions of the participants, settings, interactions, activities, and conversations related to technology. From the compiled field notes, a descriptive narrative was formulated, including photos of the technologies present in the classrooms and labs. Using this narrative, I identified common issues that described elements of technology as adopted by the teachers. These issues were linked to the themes generated from the interviews and acted as illustrations of how technology was used by teachers (supported by photos when needed).

Validating the Results and Findings

Research studies are concerned with producing knowledge that can be trusted and validated. Validating the accuracy of the findings of this study requires that the researcher deal with issues of validity, credibility, and trustworthiness (Creswell, 2003). “Lincoln and Guba (1989) parallel credibility with internal validity, transferability with external validity, dependability with reliability and confirmability with objectivity” (Mertens, 2005, p. 253). Generalizability (external validity) and reliability are not applicable and play a minor role in qualitative research design, but in this study we will discuss how external validity is somewhat relevant.

Trustworthiness (Internal Validity)

In this study, a number of methods were used to increase the credibility of the study results. First, triangulation was used because it allows for the examination of evidence from different sources or methods, thus building a coherent justification for themes (Creswell, 2003) and ensuring consistency of evidence across sources of data (Mertens, 2005). A combination of interviews, observation, and physical artifacts was used in this study. Second, to ensure integrity of the researcher, the researcher's position (reflexivity) toward the study will be discussed to ensure that biases are reduced and ethics are maintained. Reducing biases can be achieved by ensuring reflective reporting through self-reflexivity (Nyirongo, 2009) and reflexivity of those studied (Patton, 2002).

Researcher's reflexivity.

The role of the researcher in a qualitative research study involves sustained and intensive experience with participants, and, thus, ethical and personal issues might arise that could lead to biases and prejudices (Creswell, 2003). Merriam (2009) states that investigators need to explain their "biases, dispositions and assumptions regarding the research" (p. 219) so that the reader gets a better understanding of how interpretations of the data were made. It is important to understand the researcher's background and history to determine how this reflected on the study under investigation. The researcher's reflexivity or position (Lincoln & Guba, 2000) "is the process of reflecting critically on the self as a researcher" (Merriam, 2009, p. 221).

My perceptions of how teachers should teach and how children learn have been shaped by my personal experiences. All through my formal education, up to the university

level, I was in a segregated environment. I was taught in a private British school system for girls and served as a teacher assistant for two years in the same school. I then completed my bachelor's degree at Ahfad University for Women, which was the first university established in Sudan to promote women's education and enhance their role in society. It was also a private university and followed a British educational system. The surrounding educational context framed my belief and interest in the empowerment of women and their right to develop and educate themselves regardless of the surrounding social and/or cultural constraints. This belief is also reflected in my decision to pursue my education at a graduate level and gave me the encouragement to make the decision to travel to a European country, alone, for my master's degree. I then furthered my education with a doctoral degree.

I believe that my understanding of the role of Middle Eastern women in a society that is bounded by cultural and traditional restrictions makes me aware and sensitive to many of the challenges and issues that Kuwaiti teachers face, whether in their professional teaching or in a general social context. Furthermore, being from the same religion and a similar culture, I was able to relate to their belief systems and understand their reactions and viewpoints. By the same token, as a researcher, I brought knowledge gained from my education in the field of Instructional Design and Technology (IDT) and acted as a link, minimizing the misconceptions about the use of technology in education.

Creswell (2003) emphasizes that researchers should identify biases and sensitive ethical issues that might arise during the study and how these situations will be addressed. My biases, I believe, would emerge from being a supporter of students learning at their own pace rather than being passive learners. Knowing my biases, I had to ensure that this

did not reflect on my field notes and on my observations. My other bias is regarding teachers' ideas and whether they will illustrate their viewpoints regarding the use of technology. This issue is critical since I believe using technology is beneficial in many aspects; during my interviews I needed to make sure that I did not ask leading questions that might influence their responses. In regards to sensitive ethical issues, my expectations are that school administrators, including teachers, might have reservations about the research study itself. I needed to make sure that they were fully aware that I would respect their decisions when they were unable to speak about sensitive issues. In addition, I ensured their understanding that all information provided was confidential and that I would use pseudonyms for all names and school names when writing the final dissertation.

Generalization (external validity) or transferability.

One of the criticisms of case studies is that the findings cannot be generalized. According to Creswell (2003), reliability and generalizability do play a minor role in qualitative studies. There are two perspectives on generalizability that are compatible with qualitative research (Mertens, 2005). The first perspective is "analytical generalization" (Firestone, 1993), whereby the researcher can generalize from a particular set of results to a broader theory" (Mertens, 2005, p. 427). One method to enhance analytical generalization is through the use of multisite cases. Yin (2003) emphasizes that the analytical conclusion arising from multiple case studies are substantial, since focusing on different contexts but arriving at common conclusion expands external generalizability (p. 53). Patton (1990) argues that the "term 'extrapolations' are better than 'generalizations' as they are problem oriented rather than statistical and probabilistic" (p. 489).

Extrapolations are speculations on how certain issues are applicable in similar but not identical conditions (Merriam, 2009).

The second type of generalizability is “transferability (Lincoln & Guba, 1985), which can be produced through the provision of thick descriptions that allows the reader to make judgment about the applicability of the research to another setting” (Mertens, 2005, p. 427). Merriam (2009) addresses how to enhance transferability in qualitative studies, through thick descriptions, which refers to a “description of the setting and participants of the study, as well as a detailed description of the finding with adequate evidence presented in the form of quotes from participant interviews, field notes and documents” (p. 227). In this study, a description of the school, teachers’ viewpoints and their statements, observing their practical use of technology, and snapshots of the technologies in the classroom was maintained in this study. Another method is carefully choosing the study sample. A sampling strategy such as maximum variations sampling whether for sites or participants, allows for a “greater range of application by readers or consumers of the research” (Merriam, 2009, p. 227). Maximum variation sampling was also carried out in this study.

Summary of Data Collection

The study is qualitative in nature and utilized interviews, participation, observation, and physical artifacts as data collection methods. Through the use of interviews, teachers’ perceptions on the attributes of technology, teachers’ characteristics, and the support environment were recorded to show the applicability of Rogers’ DOI (2003) theory and to what extent technology is adopted by the Kuwaiti teachers. The observations and physical artifacts described the suitability for technology use, and the records provided information

regarding the school structure, year of establishment, etc. The study was conducted in two primary public schools with eight Kuwaiti teachers of different subject areas. The reporting of the study findings involves a link between the themes that emerged from the interviews and narrative descriptions from the observations, including snapshots of the technologies used. Validating the results and findings, this study can provide information related to technology adoption that can be transferred to similar school contexts within Kuwait.

Delimitation of the Study

To make this study manageable and to achieve a detailed description of the use of technology within these two primary schools, the scope of the study was reduced to four main aspects. First, the focus was on Kuwaiti teachers and not on non-Kuwaiti teachers to ensure that perceptions toward technology adoption or rejection reflect the Kuwaiti teachers' beliefs and were not influenced by another culture. Second, teachers of the subject areas sports education, music, and arts were excluded, due to the nature of their content, which have slight or no use of technology, thus not matching the criteria of the sample under investigation. Finally, due to limited time constraints and financial resources, only two public school settings within the city of Kuwait were part of the study. The focus was on public schools due to the fact that private schools have more adequate capital and resources and, thus, are equipped with various technologies. The school structure, classroom context, curriculum, etc. of a private school could lead to aspects that do not reflect the situation within the public educational sector, and the results may represent a specific context and group of people not particularly relevant to the public sector.

CHAPTER FOUR: RESULTS AND FINDINGS

This chapter will present the findings of the research study. It will make an integrated presentation of the themes generated from the interviews and supported by teachers' statements, excerpts from the teachers' observations, and snapshots of the classroom and lab settings. This chapter will be divided into two sections. The first section focuses on themes relevant to teachers' characteristics, and to the support environments provided by the schools. The second section will focus on themes relevant to the attributes of technology. As mentioned earlier, edits were made to the direct translations for the sake of clarity, which will be shown in brackets.

Change Process

One set of research questions addressed teachers' viewpoints regarding incorporating technology and whether they experienced any form of anxiety during this process. This allowed me to get a clear picture of what the teachers went through as they moved from their accustomed teaching practices to using new teaching methods and, accordingly, to discover the important aspects that made the transition and adjustment process feasible.

Transition and Adjustment

During the transition stage from non-use to use of technology, the teachers in the study faced various issues. While transition was not a problem for some teachers, others were concerned about the extra time needed in lesson preparation, the lack of training in using certain devices or applications, and the lack of functionality of the devices.

Amira, the social studies teacher from the A. E. School, discussed how the change affected her constructively. Before the plasma TV was installed in the Social Studies Club, Amira faced the problem of not having a variety of teaching tools, as illustrated by her statement:

The club provides [a] TV [and] DVD, so it made it easier for me to use my laptop. Before, they did not provide us with these, so I used to face a problem. I did not like the lesson when I used only explanation and pictures. I wanted to use the laptop, but in the lesson if I used the laptop, the screen is [so] small [that] it was difficult to explain to all the girls. I faced problems before I started to use technology. On the contrary, technology facilitates things for me significantly. . . . Change affected me positively.

Time and Effort in Lesson Preparation

Time and effort made in lesson preparation was a concern for some teachers, despite knowing its benefits. Due to their obligations inside and outside of school, in some cases teachers avoided using technology and instead used traditional means such as writing on the blackboard and reading from the textbook. They noticed that during the class, less effort was exerted using traditional teaching methods. Nodah, the English teacher from the A. E. School, talked about how it was easier for her to write on the blackboard than to make a PowerPoint. Leila, the Islamic studies teacher, iterated a similar experience:

The computer at school takes some time. For example, if I prepare a lesson and put pictures [in it], it takes more time . . . if you want to use a picture, you enter a site,

you download the picture, and you organize and prepare the lesson. The textbook is a bit easier in preparation. If I want a picture, I print it out and laminate it. The computer takes a little of bit time in preparation of the lesson. . . . In class, it is easier and better, but in preparation it takes a bit of time in typing and organizing.

Both of the science teachers from the I. S. School also concurred that they initially faced the issue of more time spent in lesson preparation, but over time they got used to it. Asmaa discussed that because there was no Internet at school, she did the preparation at home in the evenings, which took time away from her family obligations. However, during class she didn't feel anxious when using technology; on the contrary, she felt at ease. Lojain talked about not having sufficient time to utilize computers in the best manner possible:

It affected me because it [takes] time. The number of grades; for example, I am responsible in one grade level for one or more classes, [and] for grade two, one class, and so this takes a lot of time . . . time in preparing the lesson. It takes time using the computer. The way of preparing the lesson takes time; I mean you need to think of a story or a representation or a quiz . . . this takes time, so there is no time, so this was the problem for me.

Lack of Training

While preparation was a concern for some of the teachers, others thought that lack of training was the main issue in adopting new instructional technology. Mariam, the social studies teacher from the I. S. School, emphasized that not being trained in using the computer and other technologies was a problem at the beginning, but over time it became easier and the change affected her positively. She said, "At the beginning, yes, it was a

problem because I did not take the computer training, the ICDL.” She explained that she taught herself the use of computers, so it was difficult for her at first. For example, she said, “if I want a song or anything, to upload it on a CD, I did not know how to do it, so definitely it was difficult at the beginning to use technology . . . but with trying it became easier, later.” She continued by saying that “change affected me positively; change affected me in a better way.”

Technology Functionality

The other concern for some teachers was not being able to trust the technology to function. For these teachers, change itself was not a problem. Abeer, the science teacher at the A. E. School, discussed how technology allowed her to be more prepared before the lesson, since technology tends to motivate the student to ask a lot of questions. She gave an example: “If you need to search 30% of the subject area, you prepare 70 to 80% of it because this is going to encourage them to ask questions and this affects the way you prepare the lessons.” On the other hand, she discussed that technology use led to anxiety because of malfunctions. She gave an example that if the laptop connection or electrical power failed, this affected the teacher and the class. She stated, “you need to prepare for the lesson mentally and the tools you are going to use, and this frustration sometimes doesn’t make you want to you use technology because you do not trust the technology.” She continued, “You trust your hands and materials. Sometimes in the lesson I had the option to use or not use the technology, so I did not use it.”

During my observation of her fifth-grade class, she faced a technical issue, and the following description is how Abeer dealt with the issue.

The teacher began her lesson by asking the students, “What are the types of energy that we have? I will show you types of energy.” She had her laptop, and it was connected to the Data Show. She used a remote control, but the Data Show did not turn on. During the time she was attempting to solve the problem, the students were saying, “Teacher, put the plug on; teacher, the batteries are not working; teacher, stand on the chair.” The teacher then stood on a chair, pointed the remote control close to the Data Show button, and after several attempts, the device worked.

In conclusion, despite their worries about the challenges of learning to use and using technology, these teachers were able to view technology use as a positive change for them and for their instructional needs.

Technology Use

A second topic related to the theme of the teachers’ characteristics and the support environments is the various types of technologies used by the teachers and the format in which they were used. *Technology*, in this context, refers to all teaching tools used by the teachers in teaching the students. The reason for asking these research questions was to get a clear view of what and how the teachers utilized technologies and how they integrated them into their profession. In addition, the questions would provide an understanding of the sort of technologies used in each subject area. The following is an integrated presentation of the types of technologies and the extent of their use in teaching and administration tasks. This presentation will include each teacher in the study.

Employing Technology in Teaching and Administrative Tasks

The teachers in the study used a variety of devices in their work. The types of devices used included laptops, overhead projectors, Data Show, audio-recorder, plasma TV, DVD, and cellphones. The teachers also used flash cards, posters, real objects, and experimental kits. Applications used were Word, Excel, PowerPoint, the Internet, and MovieMaker. An illustration of the devices used by each teacher follows.

Abeer, the science teacher, used PowerPoint “for presentations of the lesson and to show pictures.” She also used her laptop “to show movies on it using the Data Show.” In addition, she used the overhead projector “to tell a story about the lesson or the topic of that day.” Sometimes she also used the TV “for showing movies.” Furthermore, she used the computer in the department office to enter students’ grades and type certificates/transcripts for the students. In her opinion, she used technology more in teaching. For example, she explained that she used computers with fifth graders more than with the first graders because she believed that “there is more need for communication between the teacher and student” in first grade. In the case of the overhead projector, she indicated that she “use[d] it all the time for first graders, once a week for fifth graders.”

Amira, the social studies teacher, used various technologies for teaching. She used a laptop “to show videos with songs.” She connected the laptop to the Data Show or to the TV in the club. She also used the DVD player and connected it to the TV “to show videos.” She also used the overhead projector and audio-recorder. Amira talked about the applications she used. Word was used “for typing and printing tests, students’ worksheets, and lesson preparation.” She also used PowerPoint “to present the lesson itself” and Excel “if the lesson has tables, charts, percent of population, percent oil, exports, etc.” For

administrative tasks such as entering grades, she used the computer in the department office. She also used the laptop. She said, "I have a page with the names of the students, their grades, performance, and observations that I make." For Amira, using technology was equal in usefulness for teaching or administrative tasks. She said, "Before I teach my lesson, I do the administrative work in preparing for the lesson, so I cannot teach without doing the administrative task[s]." Finally, she discussed that in teaching she used technology daily; she indicated, "the least I can use is the overhead projector."

Nodah, the English teacher, used technology for a variety of purposes to enhance instruction. She also had students interact with the technology. She began by saying that she used the Data Show "for reading, playing educational games, numbers, letters, [or] showing them a movie about the lesson." She believed that there are many things that can be done with a Data Show. She also used the laptop "for presentation of lessons." She added that she used the Internet to download games. Nodah also had computer games, which she connected to her laptop for her students so that they could practice colors and shapes. She explained, "There are colors and shapes. I ask the girls questions and each one of the girls goes to the laptop and presses on the correct answer using the pen, which comes with it."

Nodah also sometimes used the overhead projector and the audio-recorder to listen to the tapes that came with the lessons. "We have a lesson in the pupil's book [in which] they have to listen to the native speaker, not to my voice, so they listen to the tape the first time, and the second time, they listen and repeat." Nodah stated that she used technology more for teaching. She explained how much time she spends using the technologies. "I use the cassette player, flash cards, and real objects daily." Similarly, she used the overhead projector on a regular basis—"three to four times a week"—and the audio-recorder "four

to five times a week.” When teaching reading, she used PowerPoint, as it was more appealing to students than black and white flash cards. For administrative work, she used the computer to enter grades, for worksheets, and for lesson preparation.

Leila, the Islamic studies teacher, described that she did not use the laptop but mostly used the overhead projector for showing “a verse, a prayer, the Quran, [and] the Surah using slides.” She also used the audio-recorder “for Quran recitation, or Hadith recitation,” because the schools were provided with these cassette tapes for memorization. I observed Leila with fifth graders during her Islamic studies class, where she used the flashcards, posters, and audio-recorder. The following are my observation notes:

The teacher attached two flash cards, which are laminated, on the blackboard. The flash card has the name of the lesson, which is “Quranic Studies.” She writes on the blackboard: “Surah Al-Insan (Madaniya).” She hangs a large poster, which is laminated, showing the verses of the Surah. She tells the students to open page 48. The teacher has an audio-recorder in front of her. She looks at what is in the textbook and allows the students to listen to the verses. She repeats the tape four to five times. She then asks the students to repeat the Surah with the tape. The tape plays the verses and then the students repeat it. She then reads out the verses of the Surah from the textbook in her own voice. She then asks the students who would like to read the Surah and allowed two students to read it aloud to the class.

After the lesson I asked Leila who provided her with the poster. She explained that one of their colleagues in the department brought it from the bookstore and laminated it. Neither were provided or laminated by the school administration or the MOE.

Leila also used the computer for entering students' grades and to type exams and tests. Except for when she made a worksheet for her class, she didn't often use the computers. She only made tests one to two times per semester. She explained, "We take turns between the teachers on who will type the tests." She gave an example. "If three teachers teach fifth grade, each one takes [a] turn on typing the tests each semester." As for teaching, she used the overhead projector and audio-recorder. "The overhead projector—I use it once in a week. The audio-recorder—I use it four to five times a week."

Teachers at the I. S. School also discussed technology uses. Mai, in the Social Studies Department, provided a description of how she utilized technology in teaching. She began by stating that she used the Data Show for PowerPoint presentations to explain lessons and concepts: "In teaching, I use the Data Show. I prepare a topic on the PowerPoint and then I show it to the students." In her opinion, through the use of PowerPoint, students were able to see something new. The format of the lesson was not traditional; rather, it included discussion or dialogue. She also used the overhead projector. She used transparencies and photocopies of some of the textbook activities and presents them. She believed transparencies were better than using textbooks because students tended to flip from one page to another and lose concentration, but when she closed the textbook, the student focused on the information. She said that a student's "eyes are on the slide she is attached to the slides more than the textbook." In addition, Mai used the audio-recorder or CDs for songs because the students become happy if there was movement. Lastly, she mentioned the use of the cell phone, which she used to call the Weather Channel. She explained that they had a lesson on the weather and they called 116 for weather information, which

students really enjoyed. She explained, “They really liked it when we rang the weather. All were listening to what was said about the weather; all of them tried it at home.”

Furthermore, Mai used the laptop for obtaining reports from the Internet. She explained that they looked up “Kuwait’s outside investments, Kuwait’s petroleum companies, etc. We search on the net and we print it out.” She also used Excel for inserting grades, and Word for writing exams. Mai also indicated that they have a listserv in the department, which they use to send their work to the department head for revision. She said, “I send an email with the work; she sees it, does the corrections, and sends it back to me. I do the changes and then we print it out and it is ready for the students.” She emphasized that her use of technology for administrative and teaching tasks was equal in level. She gave an example: “Look, at the end of the month, most of the time the computer is used for administrative work when we put exams and when we put the grades [in the computer].” But, she said, “if I write a report or something, I can use it 24 hours, I use it a lot.” As for the overhead projector, since was is available in each class, she used it daily. She stated, “there is an overhead projector, so the person automatically will think to put a slide in to make it easy for the students. I use it everyday.”

During my observation of Mai’s practice teaching fifth grade in the Social Studies Club (see Figure 4), she used the overhead projector. The following is an illustration of how Mai used the overhead projector:

She began by using an overhead projector and slides. She has a slide that had the map of Kuwait drawn on it and asked the students to write percentage of population in each state. Each student took turns indicating the population percentage and wrote the answers in their textbooks. After the students completed the exercise, the

teacher started another exercise. She used another slide that had a graph on it showing the percentage of Kuwaiti and non-Kuwaiti population in the country and asked the students questions. She would then write the correct answers on the slides while students wrote in their textbooks.



Figure 4. The Social studies club for grades 4 and 5 at the I. S. School.

Mariam, the social studies teacher, began by saying that she used the audio-recorder for music, especially for the first, second, and third grades. She explained, “When they listen to a song linked to a lesson, they interact more with the teacher through movement, I can let them dance or interact more.” For example, she said, “Today, the lesson is about the GCC countries. The song is about the Gulf.”

She also used the overhead projector and provided an example: “When the textbook has questions, I photocopy the questions without the answers on slides and I present it through the overhead projector.” She indicated that “it becomes easier for the girls; they see the questions on the blackboard and I solve [them] with them.” She also showed maps the same way. In addition, she used the Data Show for showing many things on it such as “songs, movies, and PowerPoint.” She used the TV for videos or DVDs.

After discussing the devices, she talked about the applications. She said that she used Excel for tables and PowerPoint if the lesson needed it. She also used Word for making tests and for reading paragraphs. For instance, during one of the lessons, she had a paragraph on the prince, added pictures to it, and used the Data Show and the laptop to present the information.

Furthermore, Mariam used the school's computer to enter students' grades but used her personal laptop for lesson preparation. When discussing what she used technology most for, she indicated that it was for teaching. She stated, "We enter grades once per month but teaching is everyday." As for preparation, she explained that she does it every day for her lesson. "My preparation is my teaching; each lesson has its preparation, its tools, [and the] methods that I use." She indicated that she had eight lessons per week, so she used her laptop eight times in a week. The following illustration from my observations explains how she used technologies in teaching her students:

The teacher opened the lesson by asking, "What are the GCC countries?" The students responded and the teacher explained the similarities in the GCC. She began the lesson using textbooks and asked the students to identify the GCC countries on a map. The teacher transitioned to using technology by using an overhead projector, which has slides of the presidents. The students were asked to identify the presidents on each slide. She then used another slide with important locations in each of the GCC countries and asked the students, "What are these places and where are they located?" After this interaction, the students returned to the textbook to complete a task. As the students worked, the teacher played different songs from the GCC countries using the audio-recorder.

Lojain, the science teacher, also provided a description of the technologies she used. She began by discussing that she used the overhead projector when the lesson didn't include the use of tools or if she had no tools for it. She gave an example about a lesson in desertification. "I cannot bring sand to the class, or desert sand, or make sand bars in the class, so I try to make a transparency and show them how sand bars form, and the students see it." She also indicated that she used PowerPoint when the lesson had a lot of pictures. She downloaded pictures from the Internet and added them to the PowerPoint in a nice, organized way to show them to the students. She gave an example about a lesson about insects, which the students enjoyed seeing because of the animation. "I mean, I used Flash in the PowerPoint so that they can see the butterfly movements, number of legs, and so everything was clear to the students and was interesting."

Furthermore, Lojain used Word when there was a worksheet or a test. She also uses the Internet: "I download all the pictures associated with the topic or [that] I need . . . for the PowerPoint or Moviemaker, anything I can take it from the Internet." She also indicated that sometimes she used Moviemaker to show a movie on parts of a flower or a plant. She commented, "[The movie] was clear in showing how the seeds grow till they become a complete plant. It was very interesting to the students since they do not always see it but they saw it when I used Moviemaker."

Lojain continued by describing other teaching tools and methods, that she uses. For her, technology includes experimental kits, "I have an experimental kit—the one offered by the MOE. It is every easy because it has all the instructions." She explained that the students tried to follow the directions given because the instructions were clear and short so they could read it. The kit also had magnetic/electrical tools, making it easy for the students to

experiment with the circuits and magnetic shapes. She then discussed how certain concepts in science could be illustrated by role-playing. She gave an example: “Today we started the lesson [with] a story about two circuits. Two students [are involved]; one acts as [a] series connection and another one acts as if connected in parallel, and so I try to make an acting situation.” But she further stated that this method didn’t work with all ages. “I used to follow this with the younger stage in order to convey the information, but the older students do not need this type of role acting; [they prefer] only the modern things like PowerPoint and Moviemaker.”

Lojain, like many of the teachers, indicated that she used technology more for teaching than for administrative work. She stated that she used various types of technology throughout the week: “A day doesn’t pass unless I use technology.” When I observed her fifth grade class in the science lab (see Figure 5), students worked in groups to carry out scientific experiments, using the experimental kits she talked about.



Figure 5: The Science lab at the I. S. School.

Asmaa, the second science teacher, also provided a description of the technologies she used. She used her laptop for typing and accessing the Internet: “[I use it for] anything that I need to type or when I want to download a picture from the Internet and download

short movies.” She also used PowerPoint in presenting lesson and used the Data Show for presentations. She used the overhead projector for transparencies, such as for “a picture that I need to enlarge for the girls.” Similarly, if they have movies to watch, she used the TV.

Asmaa indicated that she used the audio-recorder for songs, which they used at the beginning of the lesson. These songs are made by some teachers. For example, for “a lesson about magnets, we have a song about magnets. I turn it on for them because when the girls hear it, they get to know the scientific terminologies through the song and so they will memorize [them].” Asmaa further explained that she mostly used technologies, in this case, computers, for administrative tasks such as “typing and printing worksheets, lesson preparation, [and] typing and printing grades.” She further stated, “In a week we make three worksheets and in a month we make a small test.” Furthermore, she said, “We extract words of the lesson and we write it on A4 paper and photocopy it. Preparation is more than teaching.”

In conclusion, teachers at both schools used various types of technologies, whether devices or applications, to assist them in carrying out their teaching and administrative activities.

Prior Knowledge and Experience

The second aspect related to teachers’ characteristics is prior knowledge and experience. Teachers were asked whether they thought that prior knowledge and experience encouraged them to use technology and whether they believed that it played a role in their continuous use. This question was designed to provide an understanding of how previous knowledge and exposure to technology in general reflect its use.

Experience and Practice

All of the teachers in the research study were of the same opinion that prior experience and the daily use of technology played a role in influencing them to use technology in their profession. Amira, the social studies teacher from the A. E. School, explained that using her laptop on a continuous basis made her like using it and made tasks significantly easier for her. At the same time, she pointed out her colleagues who had laptops too but who had limited use due to lack of experience. She said, "I know teachers [who] do not have prior experience with the laptop, [and] their use is limited, even . . . use during tests. Despite the fact that they have a laptop, they don't have prior experience, [and] prior experience is beneficial."

Nodah, the English teacher, supported the benefits of and need for prior experience and continuous practice. She stated that "by [practicing] everyday, I learn something new. . . . For the PowerPoint, I learned it before I became a teacher, and when I became a teacher, I used it. . . . daily." Similarly Lojain, the science teacher at the I. S. School, talked about experience and practice, "Yes of course, with continuous experience." She believes that "regardless of the number of courses that a person takes, they won't learn as much as when they have experience and practice." Mai, the social studies teacher, talked about how her experience with the Internet drives her to use it now. She explained that when she began to use the Internet and she learned how to extract information, she would bring her USB Internet modem to school and use it.

A conclusion from these study results is that teachers see prior experience as an important factor, but daily practice is more crucial for their continued use of technology.

Administration Support

Inquiring about whether teachers received support from the administration and department head provided an understanding of the type of support available and how this reflected teachers' use of technology. Support provided by the school administration for each school will be discussed, followed by support of the department head.

Supervision and Management (Motivational Support)

Teachers from the I. S. School indicated that they received support from the school principal by receiving excellent evaluations, being praised, and, in some cases, being provided with the technologies that they needed. Lojain, the science teacher from the I. S. School, responded, "There is encouragement by the principal entering the class and encouraging us. She likes us to use technology all the time inside the class and enjoys it when she sees the teacher use the computer and there are presentations." Lojain further explained that the claim of principal is that "students can benefit from the use of technology,' and she likes that the student tries to use the computer." In addition, she added, "this is the only motivation we get, but [monetarily] or spiritually, there is none. Only one thing gets affected and [this is] the teacher's assessment. Those who use technology excel in their final assessment."

Teachers also discussed how the department heads provided guidance regarding the types of technologies to be used, carried out weekly meetings, assisted them with technological issues, and tried to order devices for them. Only Lojain, the science teacher at the I. S. School, indicated that her department head didn't support her. Mariam, the social studies teacher from the I. S. School, responded:

[My department head] gives us weekly meetings; she is *Mashallah* clever on the use of technology, so she shows us things that she does, and she tells us to do the same; she attends our lessons and she sees the teachers that excel in the use of technology, and she honors us in our office, nearly every week.

Mai also found the department head supportive of her efforts:

Our department head, yes, very much. . . . For example, she bought us the lamination device. She is always keen on getting us new things; she makes us aware of new devices. She made the email listserv for the department to collaborate together; we send her personal comments about the problems related to the department through the [listserv].

During my fieldwork, I was invited to attend a social studies weekly meeting led by the department head at the I.S. School. During my observation of the social studies weekly meeting, which took place in the club room (see Figure 6) that is designated for grades 1, 2, and 3, the department head provided the teachers with a PowerPoint presentation using the Data Show. The presentation on Japan exemplified the type of activities that teachers carry out with their students. The department head thought this discussion was important because it exposed the teachers to teaching techniques followed in other cultures, which would assist them in learning and adapting new teaching trends for the benefit of the students. The club had an overhead projector, TV, and videotapes.



Figure 6. The Social studies club for grades 1, 2, and 3 at the I. S. School.

Lojain, the science teacher at the I. S. School had a very different experience with her department head and did not feel the same contextual support. She stated, “My current head does not [support technology use]. It is related to the type of environment. She is from a certain environment, and we are from another background. Differences in background have led to little or no use of technology and encouragement.”

The experience of teachers being supported was similar at the A. E. School, where teachers also indicated that they received support from the school principal by receiving excellent evaluations, being praised, and in some cases being provided with technologies that they needed. Leila, the Islamic studies teacher, commented:

[The principal] always prefers the teachers who constantly use technology tools. If the administration or the superintendent attends the teacher’s class, they evaluate her well; they enjoy seeing her using technology, projector, a laptop, tools, etc. There is action; it is better than the teacher who doesn’t use anything.

The teacher also reinforced that the school administration “provide[s] us with the equipment, like the overhead projector, teaching tools, [and] the TV [that] is available in each department.”

The A. E. School's teachers also discussed the support initiatives provided by the department heads. Nodah, the English teacher, viewed her the department head not only as supportive but also as a resource. She enthusiastically stated:

Yes. . . . Well, she always says it, she says use this and use that; she always give us many ideas. For example, the PowerPoint today, she suggested it for me; [she said] instead of using the flashcards, make it a PowerPoint, it is more colorful, it's more attractive. She always gives us many tools to use it in the classroom. She gets it for us from the budget of the ministry of the school.

During my observation of Nodah's first grade class in the English Club the following interaction occurred, which exemplified the teacher's use of technology:

The teacher connects the laptop to the Data Show. There is a TV and DVD in the room. A movable screen and Data Show was brought from the administration. She begins by stating, "We are going to do sounds today." She uses flash cards. She says, "My name is . . . my sound is Wa. W is for white," then, "My name is . . . my sound is Pa. P is for pink." The teacher then uses the Data Show with picture and words written on it and makes the students read the sentences by pronouncing "Ca Aa Ta = cat," "Ra Aa N = ran" (see Figure 7). After the presentation, she asks the students how to write the letter *O*. She uses a plastic-covered flash card and asks them what *O* looks like. She writes the letter *O* on the blackboard and asks one of the students to come and match it with a small letter. She uses plastic, magnetic letters.



Figure 7. Using the Data Show to teach English at the A. E. School.

Other teachers at the A. E. School also indicated that their department head is supportive. Abeer, the science teacher, explained that their department head advised them about what movies to use for their lessons. “She sometimes downloads movies from the Internet at her home so that we can present [them] to the class.” In addition, she indicated that the department head took full responsibility for getting and keeping the remote control for the Data Show from the school administration so that the teachers could use it.

Amira, the social studies teacher, stated that the teachers feel comfortable suggesting the purchase of equipment to the department head. For example, she said, “Yesterday, we found a Data Show in one of the stores with a good price, so the department head volunteered that she will help us buy it and we can leave it here in the department.” Amira also indicated that the teachers received recognition through a certificate for their work and enthusiasm in using technology.

In summary, the school administration and department heads provided support in various ways and encouraged the teachers to use technology with their students.

Decision-Making

The discussion touched upon whether the teachers were involved in the technology-related decision-making process. This information provided an overview of the degree to which teachers were involved in decision-making and how it impacted their instructional technology use. Teachers were found to be either directly or indirectly involved in decisions regarding technology.

Direct and Indirect Involvement

Teachers from both schools were directly involved in deciding the appropriate technology to use with their students inside the classroom, but they were indirectly involved in the decision-making process related to purchasing of certain technologies since these decisions were carried out by the MOE and school administration. Teachers from both schools also indicated that they had freedom to use various teaching tools as they saw fit.

Leila, the Islamic studies teacher from the A. E. School, stated that the school administration provided them with several tools and that she chose what to use or not to use. "They leave it free for me to decide . . . I have to use it. It's a must." Nodah, the English teacher, supported Leila's assertion by saying that she decided whether to use a PowerPoint or the TV, for example, but there were certain things that she had to use. "For the CD player, I have to use it because the students have to listen to the native speaker . . . as the CD comes from the MOE." Similarly, teachers from the I. S. School indicated that they had the freedom to choose the technologies they wanted to use in their lesson. Asmaa, the science teacher, responded, "It's my decision. Nobody tells me . . . even the department head has no say in this, it's my decision; she doesn't interfere."

She explained that it was her lesson and that each teacher had her own method of teaching and delivering the information to the student. “The most important thing is to convey the information . . . every teacher has her own style.” Mariam, the social studies teacher, responded, “I have many technologies available—audio-recorder, overhead projector, Data Show, etc.—but I am not forced to use it in one lesson.” She explained that sometimes she did not use technology: “I can come out of a lesson without using any type of technology, so I am not forced to use them all.” She added that the school administration didn’t force her to use a certain type in the class: “I decide what I need to use.”

The interview and discussion then moved to the types of technologies purchased and whether the teachers were involved in the decision-making process. Some of the participants discussed that the MOE and the school administration decided on the technologies to be purchased but that their suggestions were taken into account, while other teachers stated that their advice was not taken into account. Teachers from the A. E. School such as Amira, the social studies teacher, stated that the school administration did not buy equipment unless there was pressure from the teachers. She stated, “When we say we need this technology, it will develop learning, [the principal] then takes steps in doing so, she buys it.” Nodah, the English teacher, supported this notion: “the ministry (principal) [listens to] the suggestion of the teachers. . . . Sometimes we have [a] general discussion and the department head conveys the information. . . . If we need anything, we just say it, we need this one, we need that one.” On the other hand, Leila, the Islamic studies teacher, commented that their advice was not taken into account “because it is not the administration, it’s the Ministry who decides . . . they do not take our advice.”

By the same token, the I. S. School's teachers discussed how they are not involved in the technology decision-making process. Mai, the social studies teacher, indicated that the department head took their advice and conveyed their viewpoints to the principal of the school, but they did not directly request it from the school administration. "The principal consults with the department head. I think she provides things if she is convinced that [they] will benefit the teachers." She further explained that their principal knew the "advanced things" and was always researching. "She sees the things that are useful to the school. There are schools that do not have the technology we have."

Asmaa, the science teacher, discussed that the principal held meetings with the department heads of the school, who told her what technologies the teachers needed. She further explained that the principal would consult with those in charge within the MOE and discussed with them her plan to provide devices such as whiteboards. The principal then informed the department head of the outcomes, and the head then informed the teachers of the decisions made. She said, "This [meeting between the principal and department head] happens every week. [The department head] tells us, definitely. But whether we approve or not, we are not asked." Lojain, the science teacher, concurred that the principal did not take the teachers' advice, but she took the advice of the department head, who would ask them what they wanted. In her opinion, the principal bought things according to what she saw was beneficial "There are things that are important; maybe the science department doesn't benefit from it, but other departments do."

The conclusion about decision-making regarding technology is that teachers did not take part in decisions related to purchasing technologies, but teachers did decide on the type of technologies they used inside the classrooms.

Budget Constraints

Financial issues related to technology use emerged during the interviews. Numerous times, teachers talked about how they purchased school supplies with their own personal money, which in their opinion was not fair to them; it was due to lack of appropriate budget planning by the MOE as well as the school administration. Amira, the social studies teacher from the A. E. School, commented:

The school budget should go to printing paper, ink for exams and tests, certificates, recognition cards, gifts, stickers—this should be bought by the school’s budget, but technology as educational methods, the MOE itself must provide it. . . . *Alhamdulillah*, we are a country that has a budget, the financial issues are good, so there must be an interest on technology and its provision in the school. . . . The administration provided us with the whiteboard from its budget, despite the fact that the MOE should provide it. Even the TV is from the school budget.

Leila, the Islamic studies teacher, concurred by saying:

For example, I buy the posters and sometimes the MOE provides it and sometimes they don’t; we buy it and the school or us pays for it. Lamination is the same thing, I go to the administration, they laminate it for me, and I get charged for it. . . . [The] school or the MOE should offer this.

Likewise, teachers from the I. S. School discussed this issue from their perspectives. Lojain, the science teacher, emphasized that they bought things not only for the lab but also for other activities. “For example, [for] the workshop you attended, we put [in] like 500 dinars; for two month the teachers put [in] \$50 dinars and so we gathered this amount for the food, themes, organization, etc. It was all from our personal money.” She discussed how

teachers got tired of trying to get things done at the school “Any employee from around the world doesn’t get tired like the teacher. In the Arab countries, the teacher spends from his/her own pocket.”

Asmaa talked about buying ink cartridges all the time, which were very expensive, so the principal had to sign off on all the papers that needed to be printed “We have many problems—a bigger problem is the ink. We provide the ink cartridge[s] all from the school’s budget, so that’s why the principal signs [off] on the paper[s] [to be printed], not all the papers.” Furthermore, she explained that they sometimes purchased items from the budget allocated for the science department. “Sometimes, for example, we make a brochure [or] copy transparencies, [and] the ink [and] the transparencies we have to provide . . . from the budget of science that is allocated for tools.”

Other teachers, such as Mai and Mariam, the social studies teachers at the I. S. School, talked about how the MOE should provide certain devices for the school. Mai stated that “the Internet has to be present, connected so that I can provide it for the students [and] I do not have to get the USB Internet modem.” She explained that there were teachers who did not possess laptops and this limited their technology use in class. In addition, she believed that a laptop should be provided. She said, “There are teachers who do not have a computer, so [they are] obliged to buy one to provide the students with the technology inside the class. So, all this should be provided by the MOE or the administration.” Mariam explained that they had an evaluation form at the end of the first term where they could make a request for the items needed. “For example, what are the things that I want to add to the school so [that] we can write training programs for computers, for example, adding Data Show to each class.” She added that the form went to

the MOE and they looked at it, but unfortunately it took a long time until they were provided with their needs, as in the case of the Data Show. “The Data Show, we have asked for it three years ago to be in each class and until now we did not get it.” She believed that the main issue for not having technologies was the lack of financial resources. “The Data Show is expensive and the MOE saw that they would lose [money] if they provide it for each class.”

The conclusion on this topic is that teachers were faced with a lack of technologies due to limited budgets and overcame this constraint by purchasing items from their own personal funds.

The following section will describe the themes that emerged from the research relevant to the attributes of technology. Under each attribute, the themes that emerged will be illustrated.

Relative Advantage and Compatibility

One category of research questions focused on asking the teachers about whether they believed technology was useful and beneficial (relative advantage) in their profession and whether technology was consistent with the teachers’ pedagogical beliefs and needs (compatibility). The issues that emerged showed an interrelated connection between the advantage and need of using technology by the teachers.

Information Access and Sharing

One point that emerged when discussing usefulness and benefits of technology was that teachers from both schools noticed that technology saved resources, saved

preparation time, reduced effort, and even saved on stationery supplies. Abeer, the science teacher at the A. E. School, emphasized that by using technology “less time is spent in delivering the information to the student. . . . It also saves time, saves effort, saves office work, and saves a lot of paper.” Amira, the social studies teacher at the A. E. School, discussed how technology helped her in teaching the students. She said, “Instead of explaining and 45 minutes gets wasted all on explanation, I get tired. But when I show a video, I drew the attention of the students.” She continued, “So it is beneficial for me as a teacher and making the information understandable to the student.” The case of Asmaa and Mai from the I. S. School was similar. Asmaa, the science teacher, stated that before she used technology, she would talk a lot about the topic to the students, but then she noticed that the effort exerted in discussion inside the class seemed to decrease. She explained, “For example, . . . I downloaded [a video] from the Internet, a short movie, [and] instead of explaining the lesson, the girls watch it and understand the points given to them, and so I reduce explanation and so it [relieves] the teacher.” Mai, the social studies teacher, concurred by saying that the Internet saves time and effort. “It shortens for us the time [and] effort, so I see it is better to use the Internet.” She further explained, “Even sometimes [a] magazine is considered a technological tool; the students see it [and] I feel it is useful [and] better than anything traditional or writing on the blackboard.”

In addition, teachers believed that through the use of technology, obtaining information was easier and faster. They discussed how the Internet facilitated getting access to any information they needed, whether for their profession or life activities. Leila, the Islamic studies teacher at the A. E. School, gave an example of how the Internet helped her in finding resources and carrying out personal tasks such as making travel

arrangements. She stated, "It saves time and effort and being able to get anything, I mean if I need any information, I can get it." Mai, the social studies teacher at the I. S. School, concurred that instead of going and looking for educational materials in the bookstores, everything nowadays could be found in the Internet. "I can search for a certain topic on the Internet, print it out, show it to the students, and it is considered an advanced method."

This concept was illustrated during my observation of Mai with the fourth graders. The topic of that day addressed the various types of resources found in Kuwait. She used an overhead projector and slides to write Kuwait's outside investments as well as the types of manufacturing industries found in Kuwait. She also used her laptop and read excerpts on Kuwait's foreign investment, which she downloaded from the Internet.

Organization of the Lesson

One discussion point that emerged related to whether technology was consistent with the teachers' pedagogical beliefs and needs was that teachers perceived technology as better than the traditional method as it allowed for better organization of their lessons. Teachers from both schools discussed that technology helped them in organizing their lessons, as well as their thoughts and ideas when they prepared lesson material and even when they taught the curriculum. The thoughts of Nodah, the English teacher were, "It organizes my lesson, I know where to use the word cards, I know where to use the real objects, I know where to use the real numbers, I know where to use the pictures, it organizes the lesson." Amira, the social science teacher, also supported this premise by saying:

It organizes the way I teach, the way I search. When I prepare a lesson without technology, the lesson is unclear/fuzzy/not well-organized. So when I see the lesson . . . I can use technology, I can use video, music, the overhead projector, so the ideas come out and preparation becomes more organized and doesn't tire me. Even the time is less in comparison to preparation that does not have technology.

Asmaa, the science teacher from the I. S. School, also indicated that that she felt the lessons were more organized, especially when using PowerPoint. She commented, "When I prepare the PowerPoint, the steps are all in order. I mean, when I explain it, it is in order, but with PowerPoint it is more organized."

Facilitation of the Learning Process

Teachers indicated that by teachers using a variety of technology tools, students learned the topic at hand with more ease. Amira, the social studies teacher at the A. E. School, stated:

[In] the old teaching, only discussion, only questions and answer, question and answer, there is no variation on the methods. [Now] there is a TV, a DVD, [a] laptop, and so having a variety of tools makes my lesson enriched. It becomes excellent; even when a visitor enters my class, they also have fun, they will not be bored of the lesson. It helped me in teaching, helped the students, and helped everybody.

During my two observations of Amira teaching social studies for fifth grade, I noticed that she used several technologies ranging from her personal laptop, plasma TV, newspaper articles, overhead projector, posters, flash cards, and downloaded movies from YouTube. In both observations she used the Social Science Club, in which a plasma TV and

an overhead projector were installed. Here is an illustration of what took place in one of the observations:

She writes on the blackboard the title of the lesson. She then connects her laptop to the plasma TV. Her lesson begins by talking about how the 14th prince of Kuwait became prince and what his achievements were during his reign. Using magnetic flash cards, she sticks them on the board every time she discusses with [students] a certain issue regarding the prince. Following the discussion, she shows them a documentary, which talks about the prince and his achievements. Some of the students were taking notes in their textbooks, while others just concentrated on the movie shown. As the movie continues, she writes on the blackboard and makes a table using three different colors. After the movie finished, she asked the students what achievements were mentioned in the movie. When students answered correctly, she used the oval-shaped flash cards that had statements of the correct answer and stuck them on the blackboard using magnets. She then asked students to work on the exercises in the textbook. She used an exercise worksheet and placed it on the projector, which was directed toward the blackboard. The exercise was composed of questions related to the topic. When the students gave the correct answers, the teacher motivated them by asking each student to come up and write the answer on the worksheet on the overhead projector.

Similarly, teachers from the I. S. School used various teaching tools to assist the students during the learning process. Mariam, the social science teacher from the I. S. School, indicated that she used technology especially for children; since it enabled her to extract pictures or materials that were attractive to them, she could gather and present

new information and accordingly facilitate learning for the students. She commented, “I facilitate their understanding of the lesson by getting stuff from outside, not only from the school textbook, so I make it easier for them. For my topic, social studies, I get pictures, objects, things from the Internet.” Furthermore, she added that the superintendent or the principal enjoyed her class because of the extra information she gathered. “They enjoy my lesson because I get information from the Internet. I correct information found in the textbook; I enter the class and I am comfortable, and I have extra information and self-confidence.”

Dissemination of Information

Teachers also emphasized that certain information could only be conveyed using technology and that the topic as well as the subject area determined whether technology was used. Abeer, the science teacher from the A. E. School, provided an example of her thoughts:

It depends on the nature of the lesson; some lessons you do not have to use technology, you must communicate directly to the students, you must see their eyes, their faces, their reactions, it helps them; but sometimes you need to use technology because they cannot imagine the picture that you want them to imagine.

She gave the following as an example: “How a bird flies. Technology shows them visually how a bird can fly and if you acted how a bird flies you will not convey the same message like when using technology.” Another example which she described was “burning of the candle, it is better they see it with their eyes. You need to use tools in this case.” She further indicated that there were certain topics for which technology was not required and

you needed to convey the information in front of the students. Her example was “in the lesson regarding movement. How do you do sport exercises, it is not possible that you use technology because the student has to do the exercise.”

During my observation of Abeer teaching first graders, the topic was “How things move,” during which she performed the movements to communicate the message in a manner that was understandable to the students and that conveyed what moving meant and how objects moved. The following is an excerpt of what took place:

The teacher asks the students to open their textbooks and look at the pictures that show the types of movement. The first picture shows someone jumping. She performed the action of jumping and the students stood up and copied her. The second picture showed a person walking on toes. She performed it and students did the same.

When it came to the next exercise, the teacher used a different way of explaining:

The second exercise was a poem on rabbits. She used a PowerPoint presentation to show them a picture of a rabbit so that the students knew what it looked like. The teacher told them that the poem says “pretend you are a rabbit.” So the teacher puts her hands on top of her head showing them how the ears of a rabbit look like and the students imitated her.

Abeer used a different approach in another situation during my observation of her teaching fifth graders a lesson on energy. In this case she used a movie to explain kinetic and static energy. The movie showed a high swing movement and how it swings up and down. There were no sound linked to the movie, just movement. The teacher discussed with the students the actions that were taking place in the movie, emphasizing that when

the swing sways up, this is called [kinetic] energy. When the swing moves down, it is called static energy. After the movie finished, she drew on the blackboard a movement (see Figure 8), and then made the students come up to the blackboard to indicate the locations of the static and kinetic energy.

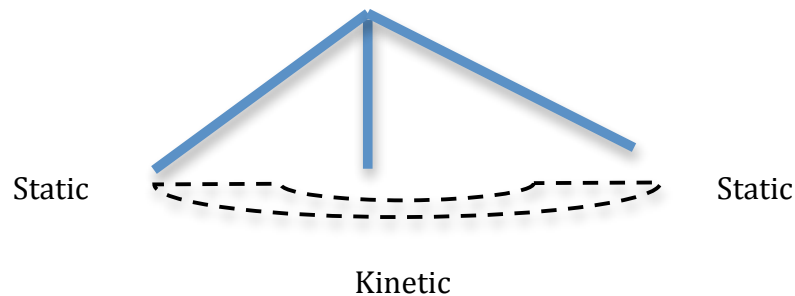


Figure 8. Diagram of kinetic and static movement used during Abeer's fifth-grade science lesson.

After the lesson I asked Abeer where she got the movie. She explained that the movie was provided by the MOE and that the MOE provides the movies for some of the lessons but when they donot, then the teachers get their own.

When discussing whether technology can be used in all subject areas, teachers had various ideas. Leila, the Islamic studies teacher, discussed how technology, in her opinion, would not be useful when teaching her topic. Her response was as follows:

I use also the audio-recorder more than anything because Islamic studies are different, maybe other subjects use other things. The type of subject affects my use of technology. For example, in social studies they use maps, and in science they use a lot of pictures. As for religion, most things are static; most of the things that get presented are verses, Hadith, simple pictures . . . for me the type of topic controls the

technology used. [To teach the] Quran, I use the audio-recorder and textbook; [that] is all that we use.

In conclusion, teachers from both schools perceived technology to be useful and applicable to their needs as they were able to carry out their teaching tasks with more ease and it matched their needs and style of instruction.

Complexity

During the interviews, the teachers were asked about the challenges and difficulties they faced when using technology. These questions provided an understanding of whether teachers faced problems when utilizing technology and what those problems were. From the discussion, emphasis was made on difficulty in using some of the devices and applications and not being able to deal with troubleshooting issues.

Difficulty of Use of Devices and Applications

Two teachers at the A. E. School responded to the issue of difficulty of use by indicating that the Data Show and Moviemaker were the most difficult technology. The English teacher indicated that getting access to the Data Show and getting it ready was difficult, and the Islamic studies teacher emphasized that she avoided using any technology that she perceived as difficult; these two testimonies showed that each teacher had her own thoughts and levels of comfort with technology use. The following are the teachers' statements regarding this issue.

Leila, the Islamic studies teacher, stated that she did not use anything that was complicated. "Anything that is complicated I do not use at all. Anything that is easy I choose

and use it, even if it is a device like a cell phone.” She explained that computers were not complicated but required practice and time that she felt she did not have. “I feel I do not have time so I do not use it at all. I like it I would like to learn on it things, but I do not have time.” She elaborated that she checked emails only every two to three weeks and that using online chatting needed time at home and she did not have time.

Nodah, the English teacher, found the difficulty in obtaining the devices, as they were not installed in the classrooms. She discussed that preparation of the devices took time, but once everything was connected, it was easy for her to use. For example, she said, “the Data Show [is not in the classroom, so] I have to ask permission from the administration, they may give it to me, then I take it to my classroom and I have to call another teacher to open it for me.” However, she said, “Using technology is very easy.”

In contrast, the science teacher Abeer was concerned about not being able to deal with the devices if anything went wrong. She identified the Data Show as an example because “if you press the wrong button, you will not be able to return back to the screen. Maybe you will ask for assistance. Sometimes it stops in the middle of the class during the explanation.” The perceived unpredictable nature of technology was an issue for Abeer.

On the other hand, Amira, the social studies teacher, thought of using technology as not being difficult except for the Moviemaker. “I do not know because I love technology; I do not feel that it is complicated. . . . Maybe the Moviemaker . . . I did not study it so it’s a bit difficult for me. Everything else is fine.”

Similarly, the I. S. School’s teachers indicated that they found difficulty in using the Data Show, PowerPoint, and Flash. Asmaa, the science teacher, considered PowerPoint to be the most difficult, and so she asked her colleagues for assistance if she wanted to make

an index. She explained, “When I make my questions, I do not know how to make an index . . . not that I do not know the whole application, but I find difficulty in it. Now I am learning these things.”

Mai, the social studies teacher, found the Data show to be difficult since she and her colleagues were not used to it because it is a new technique. With experience, they started to know how to use it and how to make a PowerPoint presentation. “Installing the device itself and showing it to the students, connection to the laptop was difficult, but when we used it a lot, it became easy.”

Lojain, the science teacher, stated that Flash is “very, very difficult.” She discussed that she used it for things that need to be animated, “for example to show how a plant grows slowly, so this is somehow difficult.” She further explained that she did not train on using Flash, but learned it by practice, and so she believes that if she had training on the whole program, it might become easier for her. “I want to take this training course so that I feel that it is not difficult for me to use.” She also commented, “It is difficult, it takes time—each animation movement you create, it takes me like half an hour, so for me it is difficult; those who are experienced, [it only] takes them a minute to do it.”

Lastly, Mariam, the social studies teacher, indicated that PowerPoint was somewhat difficult. “It is not that difficult, but because I like to put pictures and shapes to attract [the students] . . . it is difficult for me to extract these things and organize it on a slide.”

Dealing with Malfunctions

After discussing difficulties in using the devices and application, the discussion then focused on issues related to difficulty in dealing with technical issues. Teachers from both

schools had various opinions on how they deal with this matter. Some teachers explained that they dealt with simple malfunctions or called their colleagues for help, but an engineer or a technician fixed the main problems. Others indicated that they tried the devices ahead of time to ensure that they worked or found alternative teaching techniques. The following are their responses that illustrate how technical issues are handled.

Amira, the social studies teacher at the A. E. School, indicated that she tried to use the technology by herself at the beginning but would call an engineer when all efforts failed. She said:

There are times when facilitation comes from Allah; yes, maybe it doesn't work, [but] I make two technical changes, [and] five minutes later it starts to work. Sometimes the issue can be simple but it does not work. . . . We call an engineer, a computer engineer, to help us. . . . If the problem is difficult for us and we asked for an engineer to come, we learn from him so that the same mistake doesn't happen again, so once the engineer arrives all the teachers in the department are there to see the reason of the problem and how it can get resolved.

During my observation of Amira and her fifth-grade class, a technical issue occurred and she demonstrated several attempts to resolve the technological problem. The following is a description of what took place during the lesson mentioned previously about the 14th prince of Kuwait.

The teacher writes the date on the board. She has her laptop attached to the plasma TV. Today's lesson is on the 14th prince of Kuwait. She has a poster, and she sticks magnets to the poster and hangs it on the wall. She begins by asking the students whose picture is on the poster. A student answers, "Princes of Kuwait." She then

asks them who is the prince now in Kuwait and when did he become the prince. One student answers, "Alsheikh Alsabah" and another student answers, "February, 2006." While she is asking these questions, she is trying to show them a movie about the prince. The screen is blank. The connection between the laptop and the plasma TV does not work. The teachers unplugs the connection and then plugs it back in, but it still does not work. She asks one of the students if they know how to do it, but none knows. The teacher then reboots the laptop. While it is rebooting, she asks the students questions related to the prince. The screen on the TV shows, but Real Player does not open the movie. She asks the students to read a section on the prince. While the students take turns reading from the textbook, she troubleshoots the problem on why the movie did not work. After a few trials, the movie works. She shows them the movie about the 14th prince.

After the lesson I asked Amira on what she did if the movie did not work. She explained that she would either let the students read aloud the information from the textbook or get them an external book that talks about the prince's achievements.

On the other hand, Abeer, the science teacher at the A. E. School, did not try to deal with major issues to avoid the implication of liability.

We were not trained on using the machine or we did not use it before. When the machine gets damaged, the responsibility falls on the last person who uses it. So if I face any problem it is better to contact an experienced person because the responsibility will fall on that person and not me. It is better that I don't try by myself because there is penalization if problems occur, and so it is better that I get assistance from an expert. So you become afraid of trying due to the consequences.

To avoid technical issues, Nodah, the English teacher at the A. E. School, prepared the technology prior to teaching the lesson or used alternative teaching tools.

I prepare it before. Like this lesson, I made it last week; two days before my lesson, I took the Data Show from the administration, I plugged it in, [and] I practiced more than once. I was sure it is OK, so when the class begins, I know it's fine. I used it many times before. . . . Sometimes when I go to the class, the tape doesn't work; of course, I can deal with it. I read to the girls. If the overhead projector is not working, it's OK; I tell them, "open your workbook, read the question, answer it for me," and I write the answer on the blackboard.

The social studies teachers at the I. S. School faced the same issue as Nodah. Mai prepared the device and/or application ahead of time, while Mariam used alternative methods, as will be illustrated. Mai stated:

Look, it depends. I mean my personal computer, I know how to deal with it, but for example, like Data Show or overhead projector, I definitely call the technician because she is responsible for this. I try to resolve it by myself; if I do not know how to, I contact the technician, but mostly we try it before we go into the lesson. I mean, if the lesson is in the club, I have my work ready before [by] five or ten minutes to know if it does not work. It is difficult that I embarrass myself in front of the students, so I try it in advance; if it doesn't work I call the technician before the students arrive or get help from other teachers who have more experience. The problems related to my laptop, I learned it by experience and trial and error. Using the computers all the time makes the person aware of the problem.

Mariam also shared the issues related to accomodating the malfunction of technology in the folowing discussion:

Of course, I deal with it. With my experience in teaching, I surpass the problem, so if the recorder doesn't work, I sing with the girls. I sing and the girls sing with me, and we finish the lesson. I can lift the textbook and they can see the map or the questions that I want to clarify, or I write it on the board if the projector doesn't work. Of course, I try, and if I don't know, we have in our department a teacher, she is clever with technology. For example, I was showing a PowerPoint to the girls using the Data Show and the Data Show disconnected. I frankly do not have experience; I just connect the wires and that's it. I asked for help from the teacher. After the lesson I asked her about the problem, as I was afraid that the problem would be repeated.

Lojain, the science teacher at the I. S. School, on the other hand, had a completely different approach to all of this. She saved her work on a USB in case a problem occured. She explained:

Sometimes, for example, we agreed with the teachers to save everything on USB. . . . Yes, we try to save everything on it so that if the computer breaks, Allah forbid, our work will still be there. . . . During the lesson, if I faced a problem or the laptop did not work, I take my colleague's laptop and use the USB, which has all my work on it, so I won't face a problem.

In summary, teachers faced some technical challenges when using technology but managed to deal with the situations by asking assistance from their colleagues, ensuring functionality ahead of time, or substituting technology with other materials that were available.

Observability

Subsequent to finding out from the teachers about the difficulties they faced in using technologies, it was important to find out whether they faced issues in being provided with the technologies they needed and whether they had access to them. This information would show the degree and amount of use. In addition, it was important to determine whether there were tangible consequences that they experienced when using technology.

Visibility and Accessibility

Due to the lack and accessibility of devices and teaching tools, constant use by the teachers at both schools was limited. Teachers resorted to working at home and taking turns in using certain devices as well as the classrooms that had technologies installed in them. Furthermore, the A. E. School's teachers discussed the control enforced by the school administration over the devices.

Amira, the social studies teacher from the A. E. School, talked about how sometimes her hours coincided with those of other teachers in her department in wanting to use the plasma TV in the Club. She gave an example: "Sometimes, like last time I had a problem with the first lesson and that of Abla X [another teacher], I talked to the administration [to see] if they can exchange my lesson or her lesson." She explained that the administration switched the lesson. "They moved my lesson and postponed it to the fourth [period], [and] she gave the lesson here and I gave the lesson here [in the club]." During my observation, I found out that there was one Social Studies Club that had a plasma TV (Figure 9) to be shared by all the teachers of the department. In addition, when talking to Amira, she

indicated that she uses the club when she needs to use technologies for her lesson, and would use the regular classroom when the lesson does not require technologies.



Figure 9. The Social studies club at the A. E. School.

Leila, the Islamic studies teacher, responded that she needed to go and reserve the Data Show, and the school administration would provide it for her, but she found the process too difficult. "I find it difficult; therefore, I use an easier method, or flashcard, or anything that I have. Anything I can use. But if it is provided in the class, it is better."

During my observation of Leila, I discovered that the Islamic Studies Department had one Club (see Figure 10) that had a plasma TV. Due to lack of space in their office, the club has a computer for teachers to type and print out their worksheets and exams.



Figure 10. The Islamic studies club at the A. E. School.

Similarly, Abeer, the A. E. School's science teacher, indicated, "If we had Internet, for example, it [would] make things very easy for us. Instead of doing our school tasks at home, we [would] do it in the school. We depend 90% on the Internet for movies, pictures, etc."

During my observation, I noted that several teachers used an Internet USB modem to be able to access the Internet. The Internet was used only by the school administration, and the teachers did not have access to it. In addition, teachers faced problems due to the lack of Data Show devices. The A. E. School had a Data Show room (see Figure 11) that had a Data Show installed in it, and this was to be shared by the different departments; therefore, it was not available all the time for teachers.



Figure 11. The Data Show room at the A. E. School.

All teachers at the A. E. School emphasized that the administrative procedures in controlling who used the devices limited their use and accessibility of technology. Abeer, the science teacher, commented:

Their concern on the welfare of the machines impedes use because they want the machines to be safe, so they have a lot of complicated procedures to use it because they just want to blame someone, who was the last person to use the machine, so it is your fault, so you must hold responsibility. These are administration

complications. The main issue they are concerned about is the safety for the machines, so they have long, long procedures.

Nodah, the English teacher, reiterated this idea by saying:

Anyone who wants to use the Data Show has to have permission. . . . The Data Show is with the administration; I have to take it from the administration. I use it and return it. I do not have it all the day in my class.

During my observation of both her classes in the English club (see Figure 12), she used her own laptop and connected it to the Data show, which she got from the administration. She also had to get the projection screen and set up everything by herself. There was one English club that was shared between all of the teachers of the department.



Figure 12. The English club at the A. E. School.

Similarly, I found that teachers from the I. S. School had issues regarding accessibility of some of the technologies. Mariam, the social studies teacher, stated that it was easier for her to use the Data Show if it was present in the class, but since it was not, she limited her use.

Before giving the lesson, I ask can I take it or not, because as you can see, it is one device. If I need it, I go and take it, and go to the class, and by the time I prepare it . . . if it is in each class, it is easier and it will encourage me to use it.

Asmaa, the science teacher from the I. S. School, also discussed that not having access to technologies such as the Data Show limited her use:

Now we have one Data Show, and sometimes it occurs that three teachers want to present a PowerPoint, which causes for us a very big problem. Previously, they thought that all the teachers should do a PowerPoint, but they faced problems because it's one device.

She continued, explaining that they carried out what they called "Plan B," which was the normal preparation for group activities and that the problem of technology was that she could not use it at all times. For example, "I come in the morning and I find out that one of the teachers will be doing a PowerPoint, I am OK, I have already arranged for that." She continued, "We do wish that we [had] more Data Show devices." She indicated that one teacher even offered to purchase her own to use for work purposes.

Clearly, having technologies available for use and the accessibility of the classrooms in which they were installed played an important role in the degree of technology usage at the schools.

Tangible Results

Despite all of these complexities, teachers' technology use with their students showed that their experience with technology was not all negative. During our discussions, teachers emphasized that they experienced tangible results when using technology with

their students. Their focus was that students performed better in class and acquired information as well as independence skills.

Class Performance

Teachers from both schools pointed out that when technology was used in class, students tended to concentrate and be attentive to the lesson. They became active in class, memorized things better, and performed better. Amira, the social studies teacher, and Leila, the Islamic studies teacher, from the A. E. School discussed this issue. With technology, Amira said she can “simplify the information to the students and that it draws their attention.” She further explained that when there was only explanation, the students fell asleep and became sluggish or lazy. But when she used a recorded clip, video, or laptop, “it draws the students’ attention.” She noticed that everybody concentrated on the film or song that was being shown. Likewise, Leila stated that she noticed that the students had “more interest and concentrated more.” She explained that students became attentive and interacted with new things that were added because it was more interesting.

Furthermore, teachers at the A. E. School recognized that students tended to make connections of the information to things they knew, absorbed information more rapidly, and remembered the information given to them. Nodah, the English teacher commented, “The information will remain in their minds much longer because they see something, not just talking.” Abeer, the science teacher, talked about how students made sense of the information, explaining:

I noticed that they linked the information with the reality they live in. For example, they see how ice melts through watching the Power Point presentation or through

watching a video, and so they give examples from their life, link things that they see to their reality.

Teachers from the I. S. School supported the premise that students perform better in class when technology is used. Lojain, the science teacher, discussed how technology was better for students than narration. She explained that when she used the old way, was is to narrate by explaining, she used to notice that “the students would not gain any information and the lesson was not interesting.” When the students were given problems to solve, they wouldn’t solve them because the narration was boring, so they wouldn’t listen. She explained that “their concentration disperses; they play with things in front of them, the textbook, whatever.” However, she explained, when she uses technology, which she referred to as “emerging pedagogy,” she noticed that the students’ attention was with the teacher. She said, “you feel that the information remains with the students, so when they go to the upper grades, they have not forgotten the information.” Furthermore, she recognized that students acquire independence when technology is used. She talked about how students depended on themselves when doing experiments, reading, and implementing steps, and that they enjoyed working together in groups.

Mariam, the social studies teacher, talked about using music to encourage students’ interaction. She began by stating that information became embedded in the child’s mind when she shows them a film, put on music, or showed them pictures other than textbook pictures. She gave an example: “I use the audio-recorder for music, especially for the first, second, and third graders who are young in age. When they listen to a song linked to a lesson, they interact more with the teacher.”

She indicated that she encouraged students to gather information from the Internet relevant to the lesson and then she would present their work to the rest of the class. She believed that the students became proud of their work when they saw it shown to others and the class benefit from it. The following is an illustration of what Mariam did during my observation of her fifth-grade class:

The teacher had her laptop connected to the (portable) Data Show and she began by showing a movie on Al-Sheikh Jaber Alsabah. She then read aloud what the movie said. She used a Word document with pictures of the prince on it and asked the students, "When did Al-Sheikh Jaber become a prince?" One student replied, "29 February, 2006." The teacher then asked the students to read out excerpts about him. She had a poster to which the work of each student was attached, and the student read from it. The students' work had pictures, including type-written paragraphs. She then played a song (from a video downloaded from YouTube) about the prince while she circulated among the students and marked their textbooks.

Next, Mariam began to present the students' projects:

She then used her laptop and showed a project made by one of the students that was saved on a CD. The CD consisted of a Word document, and there was information about the prince typed on it. It also had pictures of the prince. The teacher read what was written to the students. Another student had her work saved on the USB, and she gave it to the teacher. The teacher connected the USB and read some of the information gathered by the student.

In conclusion, the teachers observed that technology made students absorb and learn the material, as well as improved their performance in class.

Trialability

After discussing the observable issues from using technology, the discussion turned to where teachers learned to use technology. This helped in understanding the type of skills that were gained and how it these skills contributed to their use of technology.

Professional Development

Teachers from both the A. E. and I. S. Schools indicated that they attended computer courses either through university coursework or training institutes. In addition, some of them stated that they taught themselves the use of some applications. All teachers had the same opinion that prior exposure to technology and the daily use of it played a role in making them use technology in their profession. Teachers talked about the ICDL and the CLP as being the most common training programs recommended by the MOE and the school administration.

Abeer, the science teacher at the A. E. School, commented, "Those who did not take the ICDL take the CLP offered by the MOE, so most of the teachers have either the ICDL or CLP. It is mandatory for us to take it as prescribed by the school administration." She believed that for some teachers, the ICDL and CLP were beneficial, but for others the ICDL was not entirely useful. She personally believed the ICDL was useful and that she learned a lot of things from it. "The ICDL is really important, and I learned a lot of things from it; the ICDL taught me more than the college courses." She explained that there were applications that she learned at college and applications she learned at the ICDL. She gave an example: "Excel, we took it in a basic way at college, but in the ICDL session, we had more in-depth exposure." She also said that she did not learn Outlook at college, but she took it at the

ICDL. She further explained, “Even Word and PowerPoint, how to use it and many of its functions, I learned it at the ICDL, which was a completion to what I learned at the college.”

Mai, the social studies teacher at the I. S. School, reiterated a similar opinion:

In the ICDL, for example I learned PowerPoint. I learned how to show it on the Data Show . . . [and how to] prepare a lesson on it and present it through the Data Show. Using Word, I learned how to type exams and reports, and in Excel I put grades. Previously, during university I took computer programs, but the ICDL strengthened it. I now know more with the ICDL.

On the other hand, I found that Amira, the social studies teacher at the A. E. School, and Lojain, the science teacher at the I. S. School, had a different viewpoint about the ICDL and that they did not entirely benefit from attending it. Amira discussed how the ICDL did not add anything for her. “Frankly, the ICDL did not add or subtract anything, because for me, Excel is the only thing I did not have background information on . . . and did not study.” She said that she stopped attending the ICDL courses for personal circumstances. She continued by saying, “I had previous experience in PowerPoint; I used to make lessons with it before the ICDL. Word, I used to use it before. I think if I completed the Excel, this is the only thing that could have added to me.”

Lojain discussed that the ICDL did not play a role for her, but she took the training course. She explained that “everything they gave us in PowerPoint or the Internet are things I know by practice.” She further explained that if she were to compare what she learned from the ICDL and the things she learned by practice, practice was better than the ICDL because “it is not 100% comprehensive.”

The teachers were then asked about what they would like to see changed in the ICDL. Each of the teachers provided different recommendations on what needed to be changed. Lojain indicated that the ICDL should include the things that are beneficial to the person's specialty and their profession as a teacher "I mean, I am a teacher, what do I need from the ICDL? I need PowerPoint, Moviemaker, and the Internet, so they should concentrate on the things that the teachers need." She also suggested that the trainers should concentrate on specific topics and not provide general topics and that there are topics that would apply more to the administrative personnel and not teachers.

Leila, the Islamic studies at the A. E. School, and Mai, the social studies teacher at the I. S. School, both indicated that the time period of the ICDL exam, which is 45 minutes, was insufficient for them to complete it. Leila said, "The problem with the ICDL is passing the exam, it is very difficult. The exam is 45 minutes and the exam is practical . . . so the time was not sufficient, so any error, you would be accountable for it." Mai concurred by saying:

The exam has a certain time. There are questions and it has a time limit. Yes, it is nice that you work quickly, but the problem is that you feel that mentally you are in a mess, you finish quickly, so maybe you put something instead of another, so that impacts you, so time is a bit of a problem.

Other recommendations for the ICDL were provided by Amira, the social studies teacher at the A. E. School, who suggested:

I think the ICDL should be in two parts, advanced and beginners. When I took it, there were teachers with me who didn't have previous experience, so the ICDL was an achievement for them. If you ask me, the ICDL did not add anything for me, [but for] another teacher, the ICDL added for her so many things. The Moviemaker—why

should it not be as part of the courses—I think it is more advanced than the PowerPoint, so it should be part of the program.

Abeer, the science teacher at the A. E. School, also provided suggestions:

One of the topics given in the ICDL is theoretical, like the computer, computer parts, and its storage capacity. These things are theoretical, it is just information needed for the exam, it is better if it gets removed . . . like how you open [the computer]; I do not think there is anyone who cannot press the button and open the device.

Some teachers who took the CLP discussed the benefits of attending it. Leila, the Islamic studies teacher at the A. E. School, commented, “We took it at the school here. The school organized training. . . . They gave us Word and PowerPoint, so I learned the PowerPoint.” She said “it was nice,” but believed that if they left the training up to the school, it would be better. “Training at school is so much better. . . . The MOE had an instructional book that had PowerPoint and Word, and they trained us. If they give it to us at the school, it is better for us than the ICDL.” Similarly, Mariam, the social studies teacher at the I. S. School, also benefited from the CLP training because she learned how to use features within PowerPoint. She said, “CLP helped me but not significantly because originally I have prior experience with computers, but maybe it helped me more with PowerPoint.” She explained that she had previous experience with Excel and Word, but not so much with PowerPoint. “PowerPoint helped me in inserting pictures; these tasks that were a bit difficult for me. I need a picture or shapes or Flash, [so] it facilitated these things for me.”

Nodah, the English teacher at the A. E. School, despite not taking the ICDL, talked about the advantage and disadvantage of each training program in regards to certification, variety of courses given, and time. She said:

ICDL, it is better than the CLP because it has a test, a certificate, and it includes Word, PowerPoint, Excel, Access, all of them. . . . Well, the ICDL takes more time; if I want to take the ICDL ,now I have to take it from my own time not from the school time because I cannot leave my students and go take the ICDL, so it's a little bit difficult. . . . CLP is shorter . . . they gave us this training during the last two weeks of the end of the school year, so there were no kids, grades were already in, so it was good, the time was good. . . . Well, it was good; I learned a lot. There is nothing to be changed. . . . No, it was good as a starter. I learned a lot.

Overall, the conclusion regarding professional development is that the ICDL and the CLP training sessions provided an opportunity for teachers to gain skills and to try certain applications and accordingly use them in their teaching profession.

Summary

This chapter presented the themes generated from the interviews, which were linked to the participant observation that took place, including photos from the A. E. and I. S. School settings. The following themes emerged regarding teachers' characteristics and support environment: transition and adjustment, experience and practice, supervision and management (motivational support), employing technology in administrative and teaching tasks, direct and indirect involvement, and budget constraint. The themes that emerged related to attributes of technology were information access and sharing, organization of the

lesson, facilitation of the learning process, and dissemination of information. Difficulty of use of devices and application, dealing with malfunctions, accessibility and visibility, class performance, and professional development also emerged as relevant topics. Teachers from both schools showed similarities as well difference in many aspects related to technology use. The key difference was that teachers from the A. E. School spoke about how certain information can only be conveyed using technology and that the subject matter determined whether technology is used. The A. E. School's teachers also spoke about the control enforced by the school administration over use of some of the devices. The I. S. School's teachers did not tackle any of these issues. The I. S. School's teachers emphasized that access to a vast amount of information allowed them to build their self-confidence; the A. E. teachers did not discuss this point. Finally, in regard to class performance, the difference between teachers at the A. E. and I. S. Schools was that the A. E. teachers discussed how students acquired knowledge, while teachers from the I. S. School talked about students becoming independent.

CHAPTER FIVE: DISCUSSION AND CONCLUSION

This chapter will discuss the findings of the study. The discussion of findings will be followed by an overall conclusion of the study and recommendations. Implications and areas for further research will also be highlighted.

Discussion of the Findings

This section will address each research question individually. Under each research question, the themes generated will be discussed, including their relationship to the literature and the theoretical frameworks used in this research.

Research Question One

The first research question addresses the extent to which Kuwaiti teachers have adopted and integrated technology. Teachers' characteristics that affect the way they perceive technology and the support environment that facilitate or impede their use were examined. The following themes that emerged are anxiety, experience and practice, support from administration, decision-making, technology used and its purposes, and budget issues.

Anxiety

Anxiety was one factor that Kuwaiti teachers faced during the transition and adjustment stage as they moved from non-users to users of technology. Feelings of anxiety came from three main issues: time, equipment failure, and lack of training. The first issue, time, can be broken into three challenges. The first challenge relates to the fact that

technology requires a change in how the class materials were prepared—extra time and effort were needed to prepare the lessons. A second problem related to time is that, since most of the equipment was not installed in classrooms, teachers needed to obtain it, whether from the storage room or the school administration. Finally, getting the equipment set up and making sure it functioned also required extra time and effort. In their study, Oncu et al. (2008) found that teachers thought of technology as being convenient during the lesson since it speeds and enhances the presentation of the content. But because the teachers in this study had to “figure out how to use [technology] and where it fits in the lesson” (Oncu et al., p. 35), teachers spent extra time preparing the lessons. Furthermore, Zhao and Frank (2003) emphasize that simple technology options that “require little change and [do] not require reconfiguring teaching practices, cost less in terms of time and energy, are used most frequently” (p. 821).

The second reason why the Kuwaiti teachers reported being anxious was their uncertainty about functionality—the fear of a sudden failure of the equipment in class. This anxiety was heightened because Kuwaiti teachers are bound by a specific timeline and timetable for completing the curriculum. Therefore, any delay would not only affect students’ learning but the teachers’ final professional assessments.

A final issue linked to anxiety was that the Kuwaiti teachers had little or no training in the use of certain applications and/or devices at the time the technologies were introduced in their school. Authors discuss that teachers’ knowledge and skills are an influencing aspect on their use of technology in schools (Hew & Brush, 2007) and that knowledge and skill development are necessary to be able to use the innovation Ely (1999).

In summary, due to feelings of anxiety, Kuwaiti teachers' limited their use of technology. The teachers would often use accessible and simple teaching tools such as the blackboard or flash cards instead of a technology option such as a PowerPoint presentation

Experience and Practice

Experience and practice with the instructional technology options were aspects that positively influenced Kuwaiti teachers' use of technology. Prior exposure and daily use of technology encouraged teachers' usage. Rogers (2003) indicates that previous practice using an innovation decreases the uncertainty of an innovation. With continuous practice, teachers were able to maximize their use of technology for the best interests of their student learning and teaching tasks. Keengwe et al. (2008) emphasize that teachers need to have a "comfort level and consistently implement technology tools as part of their own repertoire of tools in subjects in which they teach" (p. 561). For example, some of the Kuwaiti teachers motivated the students to participate in class projects by asking them to search for information on the Internet and upload it on a CD or a USB to present it to their peers. Other teachers provided experiments and group activities to teach scientific concepts. Nevertheless, the obligation of the Kuwaiti teachers to follow the national curriculum tended to direct their pedagogical orientation. Teachers did not change their overall teaching style. Rather, the Kuwaiti teachers would mostly demonstrate and provide the students with the information and then allow students to follow and replicate the instructions, as well as use the traditional question-and-answer teaching approach. This result supports studies that show that in teacher-centered environments, students are taught through narratives or the use of drills and repetition of information (Wenglinsky, 2005). Drills are used as a reinforcement tool and promote the acquisition of knowledge or

skill through repetitive practice as well as question-and-answer interactions in which students get appropriate feedback.

Support from Administration

The Kuwaiti teachers in the study were motivated to use technology by receiving support from both the school administration and department head. Ely's (1999) condition *commitment* emphasizes that the availability and provision of support by immediate supervisors and administrators can have significant influence on the successful implementation of the innovation. The results showed teachers receive guidance on the appropriate technologies to be used in specific lessons, and, in some cases, were provided with instructional tools. In some cases, the strict rules from the administration regarding accessibility to some devices was surpassed by some department heads who took personal responsibility to ensure that the teachers had access all the time to the technologies they needed.

Furthermore, Ely (1999) emphasizes that rewards or incentives facilitate technology adoption. This is consistent with Rogers' (2003) suggestion that incentives and the types of incentives used can speed the diffusion process of a new innovation. Incentives take a variety of different forms, one of which is monetary and non-monetary incentives (Rogers, 2003). Kuwaiti teachers do not receive any form of monetary encouragement for using technology but receive non-monetary incentives, which is "a commodity or object that is desired by the recipient" (p. 237). In the case of the Kuwaiti teachers, the non-monetary incentives mentioned by Rogers (2003) were in the form of receiving recognitions and excellent end-of-year assessments when they used technology.

In summary, support from the supervision and management of the school was a contributing aspect for Kuwaiti teachers' utilization of technology.

Decision-Making

The purchase of equipment was under the direction of the MOE with some latitude given to the local school administration. Teachers were not involved in deciding what technologies were purchased but did provide their recommendations. Purchases were made based on the funds available and on the viewpoints of both the school administration and the MOE about whether these technologies were deemed beneficial. For instance, the overhead projector and the audio-recorder, available in each classroom, were decided upon and provided by the MOE. This instance supports studies that indicate that technology is integrated regardless of teachers' needs and usage and in most cases without their consultation (Baylor & Ritchie, 2002). Rogers (2003) discussed that school administrators who have power and status are likely to encourage their subordinates to adopt new ideas, also referred to as "authority innovation decisions" (p. 38). The rate of adoption is faster when potential adopters' decisions to adopt have been influenced or made by someone in authority (Rogers, 2003). However, authoritative decisions to adopt an innovation "may only help initial adoption but may decrease the likelihood that it will be implemented" (Rogers, 2003, p. 429). When adopters are obliged to use a certain innovation based on hierarchical decisions, they lack the motivation and willingness to proceed unless they perceive that proceeding is useful. In the case of the Kuwaiti teachers they believed that technology was useful and therefore limited their use to what was provided to them.

On the other hand, studies show that when teachers take part in the decision process, two benefits arise. The first benefit is that it improves “teachers’ competency and morale and allow them to make decisions that accomplish their specific goals” (Baylor & Ritchie, 2002, p. 19). This supports the condition of participation (Ely, 1999), which suggests that shared decision-making and communicating among all parties develops a sense of ownership of the product and thus, increases, the likelihood that it will be implemented successfully (Ensminger & Surry, 2008). Second, taking part in decision-making determines the most important technologies needed by the teachers and eliminates those that are not needed. Oncu et al. (2008) emphasized that “fine tuning technologies according to teachers’ needs, instead of making decision in a top-down fashion can help to wisely use limited resources” (p. 43).

While they did not have control over the technologies purchased, teachers from both schools had full discretion on the use of technologies inside the class. Teachers decided whether technology was needed or not needed for the lesson and used various types of technologies based on what they perceived as appropriate to help the students understand the material. This supports Moore and Benbasat’s (1991) construct *voluntariness of use*, which is the “degree by which the use of an innovation is perceived as voluntary or free will” (p. 195). Having this type of authority allows the teachers to cater specifically to students’ needs and to be creative in utilizing technology. This discussion will lead to the type of technologies used by the teacher and how teachers use them, thus showing the most and least useful technologies as perceived by the teachers.

In summary, the hierarchical decision-making was a limiter, while the voluntary decision-making was a contributor to their use of technology.

The Technology Used and Its Purposes

Teachers from both schools utilized technology in both teaching and administrative tasks. The variation in use as will be shown, indicates that Kuwaiti teachers were able to apply technology as they saw fit in order to be able to achieve their needs. Teachers used a variety of tools and applications in teaching. These included using PowerPoint presentations, using the overhead projector for transparencies and slides, inserting pictures and text in Word, using the Data Show to present movies from their laptops or PowerPoint presentations, and using the audio-recorder for playing music, and learning English language and Quranic verses. The cell phone was also used for activities such as listening to the weather forecast.

Furthermore, teachers used both the department computers and their personal laptops for administrative tasks. Word was used for typing tests, preparing worksheets and inserting pictures to make flash cards. Excel was used for students' grades. Teachers used their personal USB Internet modem for access at school to download pictures, movies, and information linked to the lesson. The teachers to exchange information with the department head about tests, preparation, worksheets, etc also used email. Some teachers also had experience with Moviemaker to edit video footages. Other than computers, teachers also used videotapes, DVDs, and CDs.

Teachers used different devices and applications according to the content area and grade level. Presentations, transparencies, and Word documents were used with older students in grades three to five, while tools promoting interactivity, role modeling, and hands-on skills were used with the younger students in grades one and two. Teachers in each content area also had certain technologies that were commonly used. For instance, the

Islamic studies teacher mostly utilized the audio-recorder and posters, while in social studies the teachers used the overhead projector and the Data Show. These findings support studies that indicate that teachers' uses of technology vary from one grade level to another (Niederhauser et al., 2006) and the content area determines computer applications utilized (Alkhezzi & Alqahtani, 2007).

Budget Issues

Both schools featured in the study lacked technology tools and resources due to budget constraints, which had an impact on teachers as well as the department heads and school administration. This supports Ely's (1999) condition of *adequate resources*, which refers to the need to have available and accessible resources to implement the innovation. Teachers often purchased their own tools and stationeries to overcome the scarcity and the mismanagement of the funds. Furthermore, the department head as well as the school administration utilized part of their allocated budgets for purchases, despite being these being the responsibility of the MOE. Studies have shown that funding is a constraint on technology adoption since it hinders the purchase and use of technology (Rogers, 1999). Even when funds are available, these funds are often not geared toward technology. Rogers (1999) emphasizes that the viewpoint and attitude of those in charge toward the importance of technology determines where funds are placed. This was the situation found in both schools—the budget was spent on activities and an insufficient amount was allocated for purchasing technological tools and supplies.

In summary, insufficient funds is allocated for technology purposes leading to the scarcity of technological resources in both schools. This shortage limited teachers' use of technology.

Research Question Two

The second research question examined in what way do the attributes of technology affect the perceptions of Kuwaiti teachers' towards technology adoption and use by examining the attributes relative advantage, compatibility, complexity, trialability, and observability (result demonstrability, visibility) and accessibility.

Relative Advantage and Compatibility

Kuwaiti teachers perceived technology to be useful and advantageous for several reasons. Technology saved time and effort because it facilitated access to all types of information and allowed for rapid delivery of information to students. This supports a study by Oncu et al. (2008), who found that time-saving in presenting information, preparing class materials, and locating educational resources with ease were among the aspects that encouraged teachers to use computers. The teachers also found that technology was consistent with their pedagogical beliefs and needs. Technology allowed for better organization of their lesson. Teachers were able to have a clear sense of what to present in what order and how to organize their material in a manner attractive to the students. By using a variety of technologies, teachers were able to provide an enriching environment for students that contributed to their learning goals. Teachers also found that certain information could only be conveyed to the students when technology was used. Examples included prehistoric periods or scientific concepts that could not be carried out in classrooms. Rogers (2003) refers to this as compatibility with needs. The topics addressed by the Kuwaiti teachers were interrelated and reciprocal in nature. This supports studies that indicate that there is a high correlation between compatibility and relative advantage (Al-Gahtani, 2003; Moore & Benbasat, 1991).

In summary, Rogers' concepts of relative advantage and compatibility were two attributes that contributed to teachers' use of technology in this study. Kuwaiti teachers perceived technology as being advantageous and in harmony with their needs because it allowed them to accomplish their curricular activities.

Complexity

Teachers faced difficulties using devices and applications due to malfunctions. The most difficult device for the majority of teachers was the Data Show, although difficulty in using applications varied from one teacher to another. For some, the most difficult application was PowerPoint, while for others it was Flash and Moviemaker. In regards to technical and troubleshooting issues, teachers from both schools did not deal with major technical issues but resorted to receiving assistance from a technician or a colleague, or ensuring equipment functionality ahead of time. Others used alternative teaching tools such as textbooks, flashcards, or any teaching tools that could communicate the intended information to the students when technical issues occurred during the lesson. On the other hand, teachers were able to manage minor issues such as the connection problems between the laptops and the Data Show.

Furthermore, when the Kuwaiti teachers were unable to resolve major technical issues due to their lack of expertise, they were concerned that the problem might worsen if they tried to address it by themselves and that they might be held accountable. A study by Al-Gahtani (2003) showed that training alleviates this type of complexity. Hands-on and user-friendly interfaces would also lead to familiarization. This familiarization can "overcome the issue of fear and inherited complexity arising from uncertainty of using technological tools" (p. 66).

In summary, Rogers' complexity was an attribute that limited teachers' use of technology. The Kuwaiti teachers perceived some technologies to be difficult in terms of usage and lack of functionality.

Trialability

Kuwaiti teachers at both schools were exposed to instructional technology during college coursework, by attending various training programs, and from the mandatory ICDL or CLP training programs. Some of the teachers found the ICDL to be beneficial because they learned how to use some applications and added technology skills to what they had learned during college. For others, the ICDL did not match their needs in class, nor was it useful to them. Studies have shown that "training programs tend to be too theoretical or do not apply to their classroom applications" (Venezky, 2004, p. 14). This was the case for some of the Kuwaiti teachers, who were already acquainted with using computers and their applications. The teachers' viewpoint was that not all of the courses offered by the ICDL were comprehensive, that the ICDL should be split into beginner and advanced levels, and that the theoretical sections should be removed. In contrast, the CLP provided by the MOE for those who did not complete or take the ICDL was considered useful for those who took it. It provided basic instruction in PowerPoint, Word, Excel, and the Internet, and it included an instructional handbook.

Studies have shown that not all schools provide professional development to their teachers, nor is time allocated for them to attend training classes outside of the school (Venezky, 2004). In the case of these two schools, it was mandatory for the teachers to take the ICDL or the CLP training program, thus contradicting this concept. However, the time allocated for the ICDL was not convenient for some teachers because it was offered in the

evenings after school hours. The ICDL also offered classes during the weekdays, which did not align with teachers' schedules and school hours. The CLP was offered during the last two weeks of the school year and on the school premises, which was more convenient for the teachers, but it did not offer or cover diverse topics or a certificate of completion as with the ICDL, which was considered a drawback.

In summary, Rogers' trialability is an attribute that contributed to teachers' use of technology. The ICDL and the CLP offered an opportunity for them to experiment and use various computer applications.

Observability

Teachers from both schools were able to observe that students performed better in class, became more attentive, and were more interested in the topic when technology was used. The difference was that teachers at one school noticed that students were able to acquire a lot of knowledge by connecting what they saw or did in reality with the material to be learned through the use of movies or experiments. Teachers from the other school noticed that students became more independent, carried out their own projects, and worked and collaborated together in groups as a result of the technology used in instruction. This supports a study by Oncu et al. (2008), which found that teachers used technology because it helped the students to apply what they had learned, encouraged them to become more involved within the classroom, and helped them to carry out activities more quickly.

The lack of some devices limited teachers' use of those technologies. Studies have shown that a scarcity of technology resources still exists, which refers not only to the technology itself but also includes accessibility issues (Hew & Brush, 2007). This was

supported in the study when Kuwaiti teachers used their own personal laptops, USB Internet modems, and often worked at home to overcome the shortage. The lack of devices also led to two inconvenient circumstances for the Kuwaiti teachers; first, sharing of devices such as the Data Show, and second, sharing of classrooms that had devices installed. These circumstances led to problems of scheduling and continuous accessibility. Adding to that, teachers from one school specifically discussed administrative control of some of the devices and not having continuous access to them due to fear of misuse. This support Oncu et al. (2008), who found that teachers had to get permission/authorization to use some of the technologies and, in some cases, might not be permitted to use them.

In summary, Rogers' observability is an attribute that contributed to teachers' use of technology, as they were able to observe students' improvement in the classroom. By the same token, observability related to visibility and accessibility limited teachers' use due to the lack of devices and accessibility to where they are located.

Associating the Findings with Rogers and Farquhar and Surry

Teachers' characteristics, the attributes of technology, and the support environment provided influenced the Kuwaiti teachers' use of technology. Teachers' perceptions and attitudes towards the change process were positive; however, there were various aspects that influenced the teachers' extent of technology use. Rogers' (2003) theory on consequences of innovation, which are "changes that occur to an individual or to a social system as a result of an innovation" (p. 31), is supported in the case of the teachers studied. Desirable consequences, "which are the functional effects of an innovation" (p. 470), are recognizable when teachers discussed how technology tended to facilitate the

implementation of many professional and personal activities. Furthermore, the teachers were also exposed to undesirable consequences, “which are the dysfunctional effect of an innovation for an individual” (p. 470). In this regard teachers were exposed to feelings of anxiety due to the fact that the devices often did not function correctly and because extra time was needed for preparing class materials. Furthermore, anxiety was also linked to lack of skills and know-how in dealing with technologies, which had negative consequences on the teachers, but which dissipated with continuous use. This supports the first step of Yildirim (2000), who emphasized that individuals go through three stages during technology adoption: anxiety, confidence, and liking.

Farquhar and Surry (1994) indicate that the characteristics of individual who will ultimately use an innovation play an important role in whether or not the product is adopted. There were several teachers’ characteristics that played a positive role on the teachers. Motivational support provided by the school administration and department head, the voluntary decisions on the type of technologies they could use, and teachers’ daily practice and prior experience encouraged them to use technology. Some Kuwaiti teachers were able to adapt to the technology more rapidly and used technology extensively in comparison with others.

Rogers (2003) talked about innovativeness and how each individual decides to adopt an innovation differently based on his or her viewpoints. Reflecting on the situation in these schools, it is possible to identify that some of the teachers were “early adopters.” These teachers not only perceived technology as very useful for their profession and used it constantly, but they strove to try new devices and applications. For instance, one of the teachers introduced the interactive whiteboard to her colleagues and school

administration, and provided an illustration of how it could be used. Another teacher learned to use advanced applications such as Moviemaker and Flash. Other teachers represented the “early majority” group. These teachers believed the importance of being aware of and using new technologies to meet the demands of the present time, and, thus, used various tools in class. In addition, they focused on updating themselves with new trends, teaching themselves to use certain applications, and attending training programs to gain more experience. The teachers who fell into the category of “late majority” used technology but had doubts and uncertainty while using them. Thus, in some cases, they avoided using technology and instead relied on typical materials and experiments. Finally, one teacher studied was a “laggard” and did not use any technology perceived to be difficult or taking time and effort to learn. Preference was given to the simplest and easiest teaching tools and, in some cases, to non-use.

The attributes of the instructional technology also contributed to and limited teachers’ use of it. The contributors were that teachers were offered two training programs—the ICDL and the CLP—(trialability) to be able to gain skills and the know-how to use technology. Technology use can be facilitated when teachers observe that the skills they gained through training and professional development sessions can be linked to the contents of the curriculum and their teaching strategies, as well as when they are able to observe an improvement in students’ achievement (Byrom & Bingham, 2001). This idea was supported in this study. First, by using a variety of technologies, teachers were able to carry out their administrative tasks and teaching activities (relative advantage) and were able to achieve their goals and needs (compatibility). Second, through the use of technology, teachers also observed that students gained and improved their learning skills

(observability). On the other hand, the attributes that limited teachers' use were difficulty in using some devices and dealing with malfunctions (complexity), and the lack of devices and access to classrooms in which they were located (visibility and accessibility). Providing the proper amount and the right types of technology in locations where they can be used is relevant for technology usage (Fabry & Higgs, 1997).

Surry and Farquhar (1994) indicate that the role of the organizational factors—whether physical or support environment—plays a major role in the initial adoption of an innovation as well as in whether it will facilitate or hamper the continuous use of the innovation by the adopters. The factors of the support environments (Farquhar & Surry, 1995) that limited the use of technology by the Kuwaiti teachers were limited budget, centralized decision-making, and formalization. Limited budget led to lack of devices and office supplies, and therefore teachers spent from their own personal funds to overcome the shortage. Centralized decision-making on technology purchases limited the amount and types of technologies provided. Centralization is “the degree to which power and control in a system are concentrated in the hands of a relatively few individuals” (Rogers, 2003, p. 412). Formalization is the “degree to which an organization emphasizes its members following rules and procedures” (Rogers, 2003, p. 412).

Rogers (2003) talks about how centralization is usually found to be negatively associated with innovativeness. The means by which the decisions are made regarding technology purchases shows that hierarchy is central to the public educational systems in Kuwait. A similar situation is the case with the school administrations that follow the guidelines set by the MOE and accordingly run the school in a top-down fashion. Formalization was also observed in these schools. Formalization tends to inhibit the

consideration of innovation by members of an organization but encourages the implementation of innovations (Rogers, 2003). The teachers studied were bound by policies and procedures, including those related to accessibility to certain technologies and not taking part in decisions regarding technology-related purchases.

In conclusion, various individual and organizational aspects that were close in nature and overlapped each other determined technology use by the Kuwaiti teachers. These aspects are shown in Table 4.

Table 4
Individual and organizational attributes affecting technology use

Influencing Aspects	Teachers' Characteristics	Technology Attributes	Support Environment
Contributors	Support from the Administration	Relative Advantage	Voluntary decisions
		Compatibility	
	Experience and practice	Trialability	
		Observability (result demonstrability)	
Limiters	Anxiety from extra time needed to prepare materials, lack of functionality, and lack of training	Complexity	Centralized decision-making and formalization
		Observability (visibility and accessibility)	Budget issues

Conclusions and Recommendations

Technology is a social phenomenon and is developed by people in a particular environment and culture. The study of adoption, diffusion, implementation, and institutionalization of an innovation is an inherently social process (Surry & Farquhar,

1995). Many factors combine and affect technology adoption and use, and, thus, it is essential to understand the underlying aspects involved (Surry & Ely, 2002). Studies have postulated that the focus should not solely be on technical superiority of the innovation; rather, the adoption/diffusion process should start at the level of the potential adopter and address the issues in the context of the environment in which they will use the technology. This study focused on teachers' perception towards technology by examining teachers' characteristics, attributes of technology, and the support environment that might have contributed to or limited their adoption to show whether Rogers' (2003) DOI theory is applicable in Kuwaiti primary public schools. By examining these aspects, the study showed that Kuwaiti teachers perceived the adoption and utilization of technology as being constructive. They were able to go through the change process and accustom themselves to technology despite their feelings of anxiety. Some teachers adapted easily to technology, while others took more time. However, in all cases, technology acted as a facilitating mechanism in carrying out both their teaching and administrative tasks. Technology did not alter their teaching styles, and classes continue to be teacher-centered. Overall, the teachers tended to utilize technology to their best of their ability per what was provided in both schools.

While there were several contributors to technology use, there were also limiters. It is recommended that support initiatives be provided from leaders at each supervision level to facilitate technology use for future innovations. Yavas et al. (1992) emphasize that leadership is considered a facilitating mechanism for the adoption of innovation; however, "its role in achieving this end with respect to diffusion of computers is overlooked in high context cultures like the Middle East" (p. 76). The MOE's ultimate authority regarding

technology initiatives and their perceptions toward the effectiveness of technology tends to be reflected in the type of technologies available in the schools as well as in the technology-related training programs provided. The MOE needed to ensure that there were a sufficient number of technologies available in schools and a budget that would cover technology-related expenditures. Initiatives were needed that would lead stakeholders within school contexts to be updated with new technologies that adhered more to effective learning processes. Training sessions prior to and during technology adoption and use were also required.

Training should not only focus on operational skills but should include personal skills that build self-confidence to overcome technological-related fears and anxieties, as well as technology-related teaching techniques that promote more critical thinking and problem-solving skills for the students. In addition, technical skills that are parallel to the needs of the teachers should be included in the training sessions. The school administrations needed to provide support initiatives for teachers by reducing the restrictions placed on access to devices or to classrooms in which devices are installed to ensure constant use of technology. The school administration needed to ensure that the funds allocated by the MOE were earmarked for buying such things as teaching tools and technologies, which benefit students' learning, rather than on recreational activities.

The most crucial recommendation to be taken into consideration was the need to involve teachers in the technology-related planning and decision-making process. This would ensure that the technologies made available were those perceived by teachers as significant and required in accomplishing their teaching needs. Rogers (2003) talks about how decentralized systems allow the users to participate in key decision such as which

innovation best meets their needs and which of their perceived problems most needs attention. The “high degree of user control over these key decisions means that decentralized diffusion is geared closely to local needs” (p. 395). Furthermore, it will help ensure that teachers do not make a disenchantment discontinuance decision (Rogers, 2003) and reject the technology as a result of dissatisfaction with its performance. Overall, the MOE needed to work very closely with the school administration to provide the appropriate solutions to ensure that the teachers utilized technology in an effective manner. These recommended support initiatives are illustrated in Figure 13.

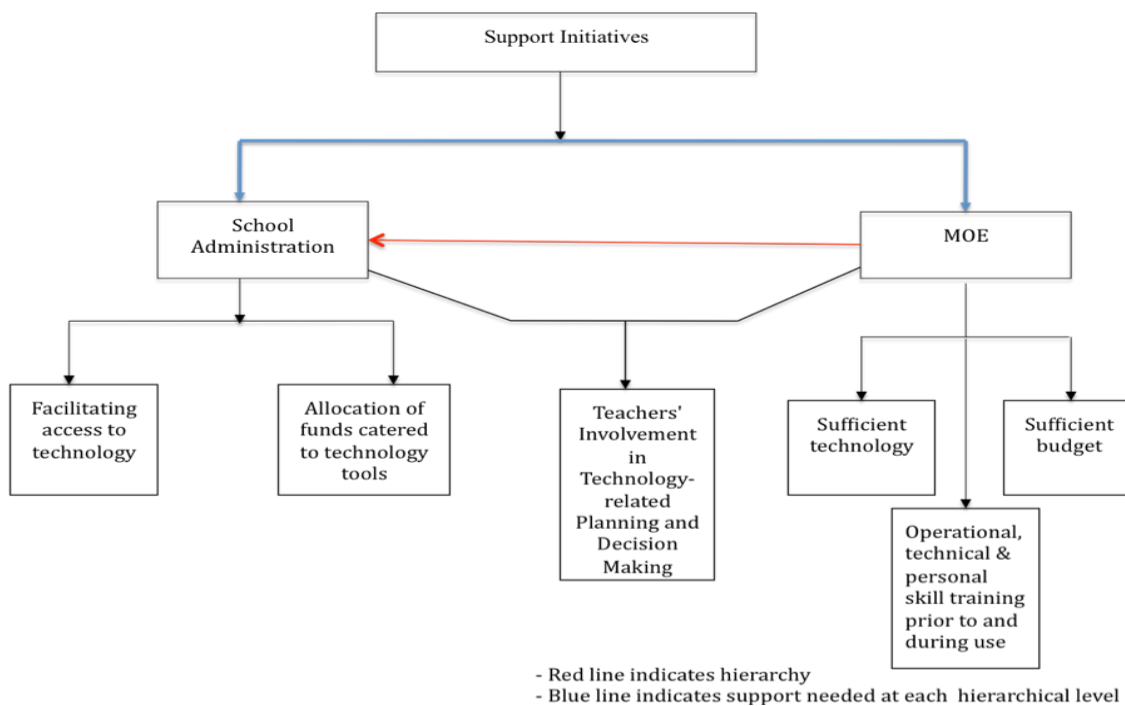


Figure 13. Support initiatives from the MOE and school administration.

Implications for Future Research

This study shows that there are three main propositions that would benefit future research studies in similar contexts:

1) The constructs of visibility, in terms of lack of technologies in locations, and of accessibility, in terms of not having regular permission to all technologies or conflicting classroom scheduling, were very important factors in determining the degree of use of technology by the teachers. These two constructs show a slight divergence from Rogers' (2003) five perceived attributes. In addition, the construct of accessibility also shows a divergence from Moore and Benbasat's (1991) criteria of perceived attributes. Therefore, further research is warranted on how the constructs of visibility and accessibility affect teachers' technology adoption.

2) The AA model (Farquhar & Surry, 1994) described the organizational and individual attributes that affect technology adoption but neglected to refer to the impact of the outside environment on these attributes. Future research on schools that are governed by centralized systems, such as in this study, needs to focus on analyzing both the internal as well as the external environment in order to have a more precise and accurate interpretation of the factors that play a role on technology adoption.

3) Several approaches are useful for helping predict the rate of adoption in the future. One of these factors is "extrapolation from the rate of adoption of past innovation into the future for other similar innovation" (Rogers, 2003, p. 227). This research study recommended support initiatives based on the findings. Kuwaitis working in the public sector can refer to these suggested support initiatives at the planning stage to facilitate the adoption and integration process.

Areas for Further Studies

Several future research investigations related to this study can be beneficial for the field of instructional technology in order to bridge a gap in the literature. Based on the limitations of this study, research that involves teachers from other disciplines would provide a more inclusive overview on how other content areas and their need for technology affects their use. Another study that would address the limitation of this study is to carry out research that caters for teachers ages 40 and above or teachers who had ten years of teaching experience. This would portray how that particular age range and years of teaching experience contribute to the use or no use of technology. Furthermore, other recommended studies either qualitative or quantitative in nature that aligns with this study can also fill the gap in literature. A comparison study between primary teachers in Kuwait and the United States would identify the challenges that teachers face and how different or similar the issues are regarding technology use. A study involving Kuwaiti professors of education in higher education and their perceptions towards the use of technology in their teacher-preparation programs would show how and in what ways technology will be applied in schools. Finally, an experimental study examining primary, middle, and secondary students' use of computers and other technologies and its role in the learning process will illustrate the positive or negative outcomes technology has on students' educational achievements.

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Appendix A Invitation Letter

Date: February 2010

Dear Volunteer:

As many of you know, technology integration is beneficial as it can facilitate your teaching methods and assist you in teaching students. This study is designed to better understand the perceptions of female teachers on technology based on Rogers' theory on perceived attributes and whether this theory is applicable in Kuwaiti schools. The study is being conducted as part of my dissertation project through the Department of Curriculum and Instruction and is being supervised by Dr. John Burton. To investigate this aspect, we ask for your assistance by sharing your viewpoints with us. We believe that your experiences and those of other female teachers will help us to become aware of the issues you face and accordingly how to better integrate technology within the public school systems within Kuwait.

The study consists of two phases. You will be asked to participate in a 45 minute to one and a half hour interview by me in the first phase. In total, the time commitment is not expected to be longer than one-and-a-half hours. However, we would appreciate you answering all of the interview questions because we feel that each question is relevant to understanding your experiences. Furthermore for verification of some of your answers, I might need to get in contact with you again. You will not be identified by name in the written paper, or in any report or dissertation resulting from this study. The second phase would be to observe you for an hour or so each week. I will be taking notes related to how you deal with technology whether with your students or in your administrative work etc. Please be aware that I will not distract you in any way during your teaching but I would need to be in class or in your office when doing that. After taking the notes I might need you to clarify some aspects of my notes so I might contact you again whenever you your time permits.

The final decision about whether to participate in this study is yours. All information provided by the participants will be combined, and the findings from this study will be shared in the dissertation but the names of the participants will not be revealed and will be assigned pseudonym. These findings may prove to be a valuable resource for other primary public schools in Kuwait and other GCC countries as well as school administrators and teachers.

If you would like more information concerning this research project to help with your decision about participating, please feel free to email Dr. John Burton at jburton@vt.edu. I would like to assure you that this study has been reviewed and received approval by the Institutional Review Board at Virginia Tech. If you have any comments or concerns resulting from your participation in this study, please contact Dr. John Burton at jburton@vt.edu.

Thank you, in advance, for your consideration of this request. We hope this study will further strengthen the ability of people to help one another.

Yours sincerely,

Randa Abdelmagid
PhD Graduate Student
Virginia Tech

Appendix B
Sample Selection Questionnaire

Please answer all the following questions:

1. What is your full name?
2. What is your nationality?
3. How old are you?
4. What subject area do you teach?
5. What grade level do you teach?
6. How many years of experience do you have in teaching?
7. Do you teach only ____ or do you teach and supervise ___?
8. Do you use technology (computers, projectors, laptops, TV, CD-Rom, and DVD etc)?
9. Are you willing to be interviewed (audio recorded)?
10. Are you willing to be observed?

Appendix C IRB Approval Letter



Office of Research Compliance
 Institutional Review Board
 2000 Kraft Drive, Suite 2000 (0497)
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 540/231-4991 Fax 540/231-0959
 e-mail moored@vt.edu
 www.irb.vt.edu
 FWA00000572 (expires 6/13/2011)
 IRB # is IRB00000667

DATE: January 22, 2010

MEMORANDUM

TO: John K. Burton
 Randa Abdelmagid

FROM: David M. Moore 

Approval date: 1/22/2010
 Continuing Review Due Date: 1/7/2011
 Expiration Date: 1/21/2011

SUBJECT: **IRB Expedited Approval:** "Technology Adoption and Integration: A Multiple Case Study of Roger's Diffusion of Innovation Theory in Kuwait" , IRB # 10-026

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective January 22, 2010.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.
3. Report promptly to the IRB of the study's closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher's responsibility to obtain re-approval from the IRB before the study's expiration date.
4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

Important:

If you are conducting **federally funded non-exempt research**, please send the applicable OSP/grant proposal to the IRB office, once available. OSP funds may not be released until the IRB has compared and found consistent the proposal and related IRB application.

cc: File

Invent the Future

APPENDIX D
Kuwaiti Ministry of Education (MOE) Approval Letter

Letter # 1



وزارة التربية
الإدارة العامة لمنطقة العاصمة التعليمية
مكتب مدير الشؤون التعليمية

السيدة المحترمة / مديرة مدرسة أشييلية الابتدائية بنات .
/ مديرة مدرسة أمّنة الابتدائية بنات .
/ مديرة مدرسة لطيفة البراك الابتدائية بنات .
/ مديرة مدرسة سمية الابتدائية بنات .

تحية طيبة وبعد،،،

يرجى التكرم بتسهيل مهمة الدكتور / فهد عبدالله الخزي وفريق العمل من شعبة تكنولوجيا التعليم / كلية التربية - جامعة الكويت لزيارة مدارسكم وذلك لجمع المعلومات المكتملة للدراسة الخاصة باستخدامات التكنولوجيا في التعليم وذلك خلال الفترة من (1 فبراير الى 13 مارس 2010 م).

شاكرين على حسن تعاونكم معنا ،،،

مدير
ادارة الشؤون التعليمية

وزارة التربية
منطقة العاصمة التعليمية
ادارة الشؤون التعليمية

نسخة لكل من:
• ادارة الشؤون التعليمية
• قسم التخطيط والمعلومات

Letter # 1: Translation



**Ministry of Education
Capital Region Educational Administration
Office of the Director of Educational Affairs**

وزارة التربية
الإدارة العامة لمنطقة العاصمة التعليمية
مكتب مدير الشؤون التعليمية

Madam: Director of Alishbiliya Elementary School for Girls
Director of Aamina Elementary School for Girls
Director of Latifa Albarak Elementary School for Girls
Director of Sumaya Elementary School for Girls

Greetings

We are asking your assistance in facilitating the mission of Dr. Fahad Abdallah Alkhezzi and the working team from the Instruction Technology Division, College of Education, Kuwait University during their visit to your schools. Their mission is to gather information needed for a study regarding the use of technology in education. They are expected to visit your schools during the period February 1 – March 13, 2010.

We appreciate your cooperation in this matter

Signed
Manager
Administration of Educational Affairs

Letter # 2



وزارة التربية
الإدارة العامة لمنطقة العاصمة التعليمية
مكتب مدير الشؤون التعليمية

السيدة المحترمة / مديرة مدرسة مريم عبدالمك الصالح الابتدائية بنات .
/ مديرة مدرسة العدلية الابتدائية بنات .

تحية طيبة وبعد،،،

يرجى التكرم بتسهيل مهمة الدكتور / فهد عبدالله الخزي وفريق
العمل من شعبة تكنولوجيا التعليم / كلية التربية - جامعة الكويت لاعادة
زيارتكم وذلك لجمع المعلومات المكتملة للدراسة الخاصة باستخدامات
التكنولوجيا في التعليم وذلك خلال الفترة من (1 فبراير الى 13 مدارس

(2010 م)

شاكرين على حسن تعاونكم معنا ،،،

مدير
ادارة الشؤون التعليمية

(Handwritten signature)



وزارة التربية
منطقة العاصمة التعليمية
ادارة الشؤون التعليمية

نسخة لكل من:
• ادارة الشؤون التعليمية
• قسم التخطيط والمعلومات

(Handwritten signature)

٢١



Letter # 2: Translation

**Ministry of Education
Capital Region Educational Administration
Office of the Director of Educational Affairs**

وزارة التربية
الإدارة العامة لمنطقة العاصمة التعليمية
مكتب مدير الشؤون التعليمية

Madam: Director of Maryam Abdelmalik Alsaleh Elementary
School for Girls
Director of Al'adiliyah Elementary School for Girls

Greetings

We are asking your assistance in facilitating the mission of Dr. Fahad Abdallah Alkhezzi and the working team from the Instruction Technology Division, College of Education, Kuwait University during their re-visit to your schools. Their mission is to gather information needed for a study regarding the use of technology in education. They are expected to visit your schools during the period February 1 – March 13, 2010.

We appreciate your cooperation in this matter

Signed
Manager
Administration of Educational Affairs

Appendix E Interview Questions

Interview protocol

My name is Randa Fouad Abdelmagid and I am doing my research on the adoption and use of technology by Kuwaiti teachers and whether Roger's theory is applicable on the Kuwaiti school system. The questionnaire will be divided into groups addressing several core issues.

General information

1. What is your name?
2. How old are you?
3. What is your educational level?
4. How many years have you been teaching?
5. How many years have you been teaching at this school?
6. What subject area do you teach?
7. Did you take the ICDL training?
 - If yes, did you complete it?
 - If no, why did you not take it or why did you not complete it?

Usefulness and Applicability (Relative Advantage and Compatibility)

8. Do you believe that technology is useful?
 - If yes, in what way is it useful? Do you see any benefit for your profession?
 - If no, why do you believe that is not useful?
9. Do you believe that technology should be used in teaching children? Give reasons?
10. Do you believe that using technology in teaching is better or not than teaching the traditional way and give reasons for that belief?

Change Process

11. In your opinion did the use of technology change the way you teach?
12. Did that change affect you? In what way? Was it a problem? (anxiety teacher characteristics)

Results & Outcomes (Observability)

13. Did you witness any change in your students when you used technology with them?
14. Did you witness any change in yourself when using technology?

Accessibility Issues (Observability)

15. Do you have access to the technology?
 - If yes, do you have access to the technology at all times? Where do you find and use them?
 - If you do not have access what are the reason behind not having access to them?
16. Do you think that having technology accessible will encourage you to use it?
17. If you had the chance to have access to technology

- What technology would you mostly use?
- What technology you would least use?

Technology Use

18. What type of technologies do you use and what do you use them for?
19. Do you use technology for administrative or teaching or both? How do you use it in either?
20. Which of the two do you mostly use technology for? How frequent do you use it?

Ease of Use (Complexity)

21. What is the most difficult technology you use and in what way is it difficult?
22. What is the least difficult technology used and in what way is it not difficult?
23. What other difficulties do you face when using technology?
24. Are you able to deal with trouble shooting issues?
 - If yes, how did you learn to do that?
 - If no, who does it for you and why are you not able to do it by yourself?

Training (Triability) and Prior Knowledge and Experience

25. Where did you learn to use technology and what technologies were you taught to use?
26. Are these the same technologies you are using now?
 - If yes, how long have you been using it?
 - If no differentiate between what you learnt before and what you are using now?
27. Do you think your prior experience with technologies make you use it now in your profession?
28. In what way did the ICDL/ Computer Literacy training play a role in your use of technology?
29. What aspects of the ICDL/ Computer Literacy did you benefit mostly off?
30. What aspects of the ICDL/ Computer Literacy would you like to see changed?
31. Do you think other training programs would be beneficial?

Administrative Support

32. Does the school administration promote the use of technology?
 - If no, what do you think is the problem?
 - If yes, how do they encourage you?
33. How can the school administration improve their support to you?
34. Does the department head promote the use of technology?
 - If no, what do you think is the problem?
 - If yes, how does she encourage you?
35. How can the department head support you more?

Decision-Making

36. Are you involved in deciding to use or not use the technology?
 - If no, what do you think is the problem?
 - If yes, how are you involved?
37. Are you involved in deciding what type of technologies you use?

- If no, what do you think is the problem?
- If yes, how are you involved?

Closing Question

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

Appendix F
Technology-related Learning Programs Questionnaire

Technology-related Learning Programs

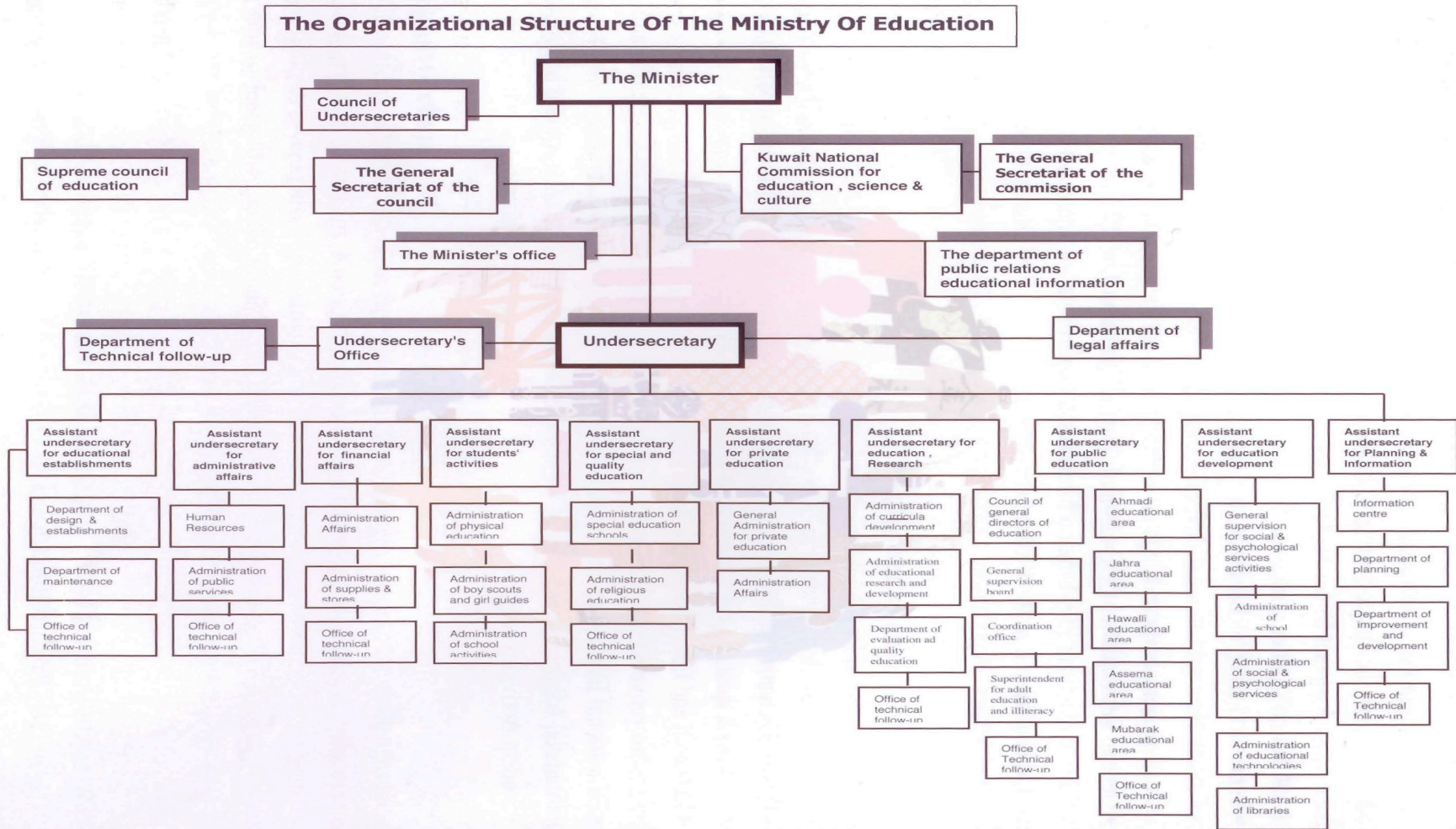
Please complete the following table in detail in Arabic. Please return to me as soon as possible. For any questions, please do not hesitate to contact me by email rfabdelmagid@gmail.com or by phone at 99592478. Thank you for all your kind efforts.

Where did you learn technology? e.g. college, training programs, etc. □□□ □□□□□□ □□□□□□□□□□□□□□ □□□□ □□□□□□□□ □□□□□ □□□□□□□□ □□□.	What is the name of the training course? □□ □□□ □□□□□□□□□□ □□□□□□□□□□ / □□□□□□□ □□□□□□□□□□	When did you learn it? □□□□ □□□□□□□□□□	How long did it take? □□ □□□□ □□□□□□□□□□ □□□□□□□□□□ / □□□□□□□□ □□□□□□□□□□ □□□□□□□□ □□□□□□□□□□	What topics did you learn? □□ □□□ □□□□□□□□□□□□ □□□□□□ □□□□□□□□□□□□□□	Did you complete it? □□ □□□□□□□ □□□□□□□□□□□□□□	Who arranged it? □□ □□□□ □□□□□□□□ □□□□ □□□□□□□□□□□□□□
1.						
2.						

Appendix G
Observations of Physical Artifacts

Description	Case Study No.____
Department Head & Teachers Room	
a) Settings How many teachers stay in the room?	
What is the room size?	
How is space organized to fit all?	
Are there any computers available and how many?	
Are the computers shared or is there available ones for each?	
What other technologies are available for their use?	
What is the physical environment of the room? E.g. lights, fans, electrical sockets etc	
b) Teachers Use What do the teachers use the computers for?	
What do the teachers use the other technologies for?	
Do teachers assist each other with technology issues?	
Do teaches discuss issues regarding technology?	
Do teachers discuss technological issues regarding the subject area taught?	

Appendix H Organizational Structure of the Kuwaiti Ministry of Education



Adapted From: The National Report, 2004-2008, Ministry of Education, State of Kuwait. Used under Fairuse guidelines, 2011

Appendix I

Definitions of Terms and Abbreviations

DOI:	Diffusion of Innovation Theory.
GCC:	Gulf Cooperation Council Countries. These countries are Oman, Bahrain, Kuwait, Qatar, Saudi Arabia and the UAE.
MOE:	Ministry of Education.
ICDL:	International Computer Driving License. It is composed of 7 units: Information Technology; Using Computer and Managing Files; Word Processing; Spreadsheets; Presentations; Database and Email and Internet.
CLP:	Computer Literacy Program. It consists of Word, PowerPoint, Excel and the Internet.
Abla:	Refers to teacher in the Arabic language specific to females.
Data show:	A terminology used by Kuwaiti teachers to refer to a document projector.
Overhead Projector:	A projector that uses transparencies and slides.
The Club:	A terminology used by the teachers to refer to the rooms where technologies other than the audio-recorder and overhead projector are installed and used. Each content area has its own club and is decorated with representations related to the content area.
Technology:	Comprises all devices, applications and teaching tools that are used by Kuwaiti teachers.
Traditional Teaching:	Refers to teaching using narration, repetition of information, and students are activity-directed in this type of teaching style.