Victoria University
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An Analysis of Experiences and Perceptions of Technology-based Learning in Higher Education Institutions in Libya: Informing the Advancement of E-learning

by

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I, Amal Rhema, declare that the PhD thesis entitled *An Analysis of Experiences and Perceptions of Technology-based Learning in Higher Education Institutions in Libya: Informing the Advancement of E-learning* is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

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To my mother, my husband, my children, my sisters, my brothers, every member of my family, and particularly to the spirit of my father, with all love and respect.

ABSTRACT

E-learning is increasingly becoming a vital component of education worldwide, and educators acknowledge the importance and potential of information and communication technologies (ICTs) in facilitating the educational processes. Developing countries, including Libya, are lagging behind the expansion of e-learning, mainly because they lack the necessary infrastructure and resources to support it. While the adoption of e-learning in higher education has been well researched internationally, research relating to the Libyan higher education is very limited, and studies exploring the experiences and perceptions of students and instructors involved in e-learning are particularly scarce.

This study investigated how ICTs and e-learning were experienced and perceived at two higher education institutions in Libya: University of Tripoli in Libya's capital, and a regional University of Al-Jabal Al-Gharbi. The study focused on identifying the characteristics, enablers, and barriers of educational settings as related to e-learning from the experiences and perceptions of students and instructors in engineering courses. An interpretative methodology using questionnaires and phone interviews was employed to gather information from the study participants.

This study provides evidence that the adoption of ICTs and e-learning in Libyan higher education is relatively unestablished and faces great challenges; among them, the "immature" infrastructure remains one of the biggest obstacles. The study found that the e-learning skills and experiences of the participating students and instructors were limited by poor access to computers and web-based technologies, and a lack of ICT-trained educators and ICT-enabled educational materials. However, despite limited experiences of e-learning, students and instructors held positive attitudes towards ICT and e-learning, and perceived technology-based tools as very useful for learning and teaching. Based on these findings, a set of suggestions was developed to inform the integration of e-learning in higher education in Libya.

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Rhema, A., & Miliszewska, I. (2011). Reflections on a trial implementation of an e-Learning solution in a Libyan university. *Issues in Informing Science and Information Technology, 8*, 61-76.

Rhema, A., & Miliszewska, I. (2012). The potential of e-learning in assisting post-crisis countries in re-building their higher education systems: The case of Libya. *Issues in Informing Science and Information Technology, 9*, 149-160.

Rhema, A., Miliszewska, I., & Sztendur, E. (2013). Attitudes towards e-learning and satisfaction with technology among engineering students and instructors in Libya. In *Proceedings of Informing Science & IT Education Conference*, InSITE (pp. 157-171). Porto, Portugal: Informing Science Institute.

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INTRODUCTION

1.1. BACKGROUND TO THE RESEARCH

Over the last twenty years, developed countries and emerging economies have introduced ICT to enhance all their sectors of society including the educational sector. The evolution of ICT in education over those years has shifted from the use of standalone data processors in computer labs, through to accessing the web, to using complex integrated web services for teaching and learning (Gerry, 2005; Pass & Creech, 2008). Online teaching and learning (which refers to the use of ICT), nowadays also called *e-learning*, is becoming an essential method of delivering education. Ma, Wang and Liang (2008), defined e-learning as:

> An ideal learning environment using modern means of information technology, through the effective integration of information technology and the curriculum to achieve, a new learning style which can fully reflect the main role of the students to thoroughly reform the traditional teaching structure and the essence of education, to train large numbers of high quality personnel. (p. 54)

Higher education institutions throughout the world are in a period of rapid change as a consequence of the development of technology and ICT in particular, as "Changes occurring in the primary processes of higher education courses and degree granting are closely related to the contextual trends of virtualisation, internationalisation, lifelong learning and customer orientation that are part of society in general" (Collis & Moonen, 2001, p. 30). Thus, traditional universities have no choice but to alter significantly their instructional methods to keep pace with developments spurred by the Internet. Adopting and adapting to "the technology of the 21st century" is unavoidable for everyone in society and in particular in the educational milieu (Ali, 2003; Collis & Moonen, 2005; Shank, 2011). In this context, ICT provides "significant potential for the social and economic progress" (United Nations, 2004, p. 1), especially in developing countries; a view supported by Nafukho (2007) and UNESCO (2006).

The advancements of new technologies and the Internet have had a significant impact on teaching and learning in higher education, leading to a greater distribution of knowledge transfer. This change is particularly significant for developing countries which lack the infrastructure and resources (Dhanarajan, 2001; Heeks, 2002; Rajesh, 2003; Williams, Mayer & Minges, 2011); the active, participative student who is required for interactive learning is rare in those countries and the traditional methods prevail in teaching and learning (Andersson & Grönlund, 2009; Eastmond, 2000; Evans, 2005; Sehrt, 2003); and, the countries lack the ability to implement advanced educational practices on their own (Andersson & Grönlund, 2009). While *technology transfer*, defined as "the movement of know-how, technical knowledge, or technology from one organisational setting to another" (Bozeman, 2000, p. 629), could be of assistance, it is not easy to implement, as observed by Klauss (2000):

> It is evident that both the selection of a technology and the strategy of transfer to developing countries have to be very carefully considered to ensure that an appropriate technology is chosen, that it is effectively adopted/adapted and institutionalized, and that it is sustainable over time. (p. 277)

Currently, a large number of initiatives are in progress in developing countries to reuse existing technologies in higher education institutions. During this process, various kinds of customisations and modulations have to be considered to account for country-specific differences such as learner backgrounds, culture, and language, as these differences can be a barrier to achieving the objectives of e-learning programs (Hodgkinson-Williams, Siebörger & Terzoli, 2007; Richter & Pawlowski, 2007). Andersson and Grönlund (2009) present a critical review of research pertinent to challenges to e-learning particularly in developing countries. The review identified thirty challenges which were grouped into four main categories: (1) challenges pertaining to *individuals' characteristics* (of students and teachers); (2) *technological* challenges; (3) *course* challenges (different support functions, and course pedagogy and activities); and, (4) *contextual* challenges (the institutional management and organisation, as well as the surrounding society with its values and regulations).

As in most developing countries, the implementation of e-learning in Libya is still in an early stage, and the level of educational technology awareness, and even basic computer skills, is generally low among educators in all types of higher education institutions. This, in turn, leads to resistance in adopting ICT for teaching (The General People's Committee of Education, 2008). While some Libyan universities have basic ICT infrastructure (such as computers, Internet access, and a local area network), they still use the *traditional* model of education (Rhema, 2005). In recent years, the Libyan government has started investing heavily in updating and improving its education system by initiating national programs to introduce ICT into education (The General People's Committee of Education, 2008). The national policy for ICT in education aims to improve Libya's ability to enable ICT access, provide ICT infrastructure and tools, and help develop ICT skills on a large scale in all sectors of the community (Hamdy, 2007a).

The political and humanitarian crisis in Libya represents an educational disaster. Education systems are destabilized, disrupted, or even destroyed. The escalation of the conflict has had serious impact on the service provision and delivery in the education sector, as the educational infrastructure has been severely damaged and schools, universities, and institutes became a place of recruitment for soldiers. Therefore, higher education system in Libya needs to be re-built and re-developed. The use of ICT and e-learning could play a vital role in this process. ICTs are key elements of the universal response to crises, whether natural or man-made disasters. They are also fundamental enablers of the coordination mechanisms that educational organisations need to restore in order to assist the affected learners and instructors. Libya is a developing country and the use of ICTs and the implementation of e-learning were still in an early stage even before the 2011 armed conflict. The conflict resulted in a setback to Libya's e-learning efforts. However, the deployment of ICT and e-learning can provide Libya with the opportunity to re-construct its education system significantly, modernise

instructional methods, and widen and improve access to higher education (Rhema & Miliszewska, 2012).

E-learning appears to be a promising alternative, as it can provide learning opportunities anytime anywhere, which is particularly important considering Libya's vast rural population (Rhema & Miliszewska, 2011). ICT and e-learning could be used, as a reconstructive and attractive measure, to support the affected learners and instructors in Libya by creating an accessible learning environment for collaborative teaching and learning. Furthermore, e-learning seems to have provided solutions to several problems identified by students. It afforded alternative ways of communicating with teachers and fellow students, provided a greater variety of learning resources and modalities, extended the flexibility and quality of group-work, and improved the opportunities for providing students with feedback on assessment tasks (Rhema & Miliszewska, 2011).

1.2. RESEARCH PROBLEM AND QUESTIONS

E-learning has become popular in higher education institutions worldwide, as it continues to present new learning and teaching opportunities for students and instructors. This is particularly significant for developing countries, as they seek to improve their education systems; however, students and instructors in those countries are still not fully aware of the potential of ICT and e-learning. Developing countries have problems with providing their educational institutions with the required digital infrastructure, computers, and Internet access for e-learning. In spite of these challenges, an increasing number of higher education institutions in developing countries have started to consider e-learning as an alternative method to traditional face-to-face interactions and campus-based learning activities, and are already offering e-programs or web-facilitated courses (Abdel-wahab, 2008; Bandalaria, 2007; Gronlund & Islam, 2010; Rhema & Miliszewska, 2010). However, e-learning still remains largely unexplored, particularly in Arab countries. Many conceptual boundaries such as technological, pedagogical, and contextual are yet to be fully understood and explored (Duan,

He, Feing, Li, & Fu, 2010; Rossiter & Crock, 2006). Libya is a developing country with a traditional education system based on face-to-face interactions and campus-based learning activities (Rhema & Miliszewska, 2010). The adoption of e-learning was still in a quite early stage even before the 2011 armed conflict. The political and humanitarian crisis that followed the 2011 conflict, destabilised, disrupted, or even destroyed the existing education system in Libya.

Libya has started to examine e-learning as a promising field in which to invest its educated human resources. It has started investing heavily in the reconstruction of its education system, and in initiating national programmes to introduce ICT into education (Austrade, 2009; Libyan Ministry of Communication and Informatics, 2012; Sawahel, 2013b; The General People's Committee of Education, 2008). In addition, there are plans to establish virtual campuses in many universities and colleges to provide an advanced platform for students and instructors (The General People's Committee of Education, 2008; Libyan Ministry of Communication and Informatics, 2012; Sawahel, 2013b). With these new technological developments in Libya, there is a need to explore the readiness of students and instructors for accepting ICT-supported teaching and learning.

This study aimed to investigate the experiences and perceptions of ICT among students and instructors in selected higher education institutions in Libya to determine their preparedness for e-learning. To this end, the study determined the characteristics, enablers, and barriers of educational settings as related to e-learning in engineering programs at two typical public Libyan universities: University of Tripoli University and University of Al-Jabal Al-Gharbi. The findings generated in this research study were used to develop a set of recommendations that will assist Libyan higher education institutions in developing future e-learning initiatives.

The overall research question for this study was:

What are the experiences and perceptions of ICT and e-learning among students and academics in higher education engineering programs in Libya?

In order to explore the research question, the following sub-questions were developed:

1. What are the differences in the participant access to technologies?
2. What are the differences in the participant levels of use of ICTs for learning/teaching?
3. Given the participants' experiences with ICT, what are their perceptions of the usefulness of technology for learning/teaching?
4. What is the participants' satisfaction with the available institutional ICT infrastructure?
5. Given the participants' experiences with ICT, what are their attitudes towards ICT and e-learning?
6. What are the challenges faced by the participants when using ICT and e-learning?

1.3. METHODOLOGY

Following a wide literature search on various aspects of technology-based education in developing countries, including Libya, a review of the evolution of e-learning and the impact of technology was carried out to provide a basis for understanding the current state of technology-based education in developing countries, and frame this research study. The following areas of focus have been identified: higher education context in developing countries, challenges, barriers and enablers of e-learning settings in developing countries, characteristics of successful e-learning initiatives, and the experiences and perceptions of using technology in education of students and instructors in developing countries.

This research study involved, as mentioned earlier, two typical Libyan higher education institutions: University of Tripoli and University of Al-Jabal Al-Gharbi. University of Tripoli is the oldest and the largest university in Libya and is located in the capital city. University of Al-Jabal Al-Gharbi is one of the biggest regional universities, located nearly 100km southwest of Tripoli.

In addition to examining the background of the selected institutions, information was gathered about the experiences and perceptions of technology-based learning from students and instructors in those institutions. Mixed methods, including a written survey and phone interviews, were used for data collection. Permissions to conduct data collection were obtained from the Victoria University Human Research Ethics Committee and the Libyan institutions participating in the study.

The collected information was analysed to determine the preparedness of the participating students and instructors for e-learning. The findings led to the development of recommendations to guide future e-learning initiatives in Libyan higher education institutions.

1.4. SIGNIFICANCE OF THIS STUDY

The provision of e-learning in higher education in developing countries has grown significantly over the recent years. This growth has been accompanied by research investigating the challenges and enablers of ICT-supported learning in different countries including Nigeria, Tanzania, and Egypt (Ajadi, Salawu, & Adeoye, 2008; El-Gamal, 2005; Sife, Lwoga, & Sanga, 2007).

While e-learning is increasingly considered as an important success factor in building the new Libya, research pertinent to ICT-supported learning in Libya is scarce. Thus, this research study contributes to the current limited body of knowledge, and provides an evidence-based source of information for academics, administrators, and decision-makers involved in planning, design and implementation of e-learning in Libya.

1.5. OVERVIEW OF THESIS CHAPTERS

Chapter 2 reviews the literature related to e-learning and tertiary education in developing countries in areas relevant to the current study, including: higher education context in Libya and other developing countries; e-learning in Libyan higher education and in other developing countries; the role of ICT and e-learning in education; challenges and prospects for e-learning in Libya and other developing countries; effectiveness of e-learning in higher education; and the main factors contributing to e-learning success. Chapter 3 details the methodology and research design along with the data collection and analysis methods used in the study. Chapter 4 presents the analysis of the collected data on student and instructor experiences and perceptions of ICT and e-learning. Chapter 5 discusses the study findings, provides a set of recommendations for the integration of e-learning in Libya, and outlines suggestions for further research.

1.6. CONCLUSION

This study involved an investigation of ICT and e-learning in higher education institutions in Libya. Information was collected from students and instructors in two Libyan universities to determine their level of preparedness for e-learning. Based on the study findings, a set of recommendations for the integration of e-learning in higher education Libya was developed.

Chapter 2

LITERATURE REVIEW

2.1. INTRODUCTION

This chapter provides a review of literature in five areas related to the present study: higher education context in Libya; e-learning in Libyan higher education; challenges and prospects for e-learning in Libya; success of e-learning in higher education; and the main factors contributing to e-learning success. Section 2.2 gives an overview of higher education in developing countries and Section 2.3 presents in detail the higher education context in Libya. The following section (Section 2.4) explores the fundamental role that ICT and e-learning have played in education. Section 2.5 presents the applications of ICT and e-learning in developing countries, and discusses the challenges and prospects for e-learning in those countries. Following on, Section 2.6 focuses on e-learning in Libyan higher education and discusses the issues that need to be considered and addressed in adopting ICT for learning and teaching including technological infrastructure, curriculum development, cultural and linguistic aspects, and administrative support. Then, Section 2.7 examines the success of e-learning in higher education including the determinants and measures of success. As this research study investigated the readiness for adopting e-learning among students and instructors in selected higher education programmes in Libya, Section 2.8 considers how their experiences and perspectives of e-learning influence the success of e-learning programmes. Finally, Section 2.9 summarises the chapter.

2.2. HIGHER EDUCATION IN DEVELOPING COUNTRIES

Most countries in Africa, Southeast Asia, Middle East, Latin America, and some parts of southern Europe, are categorised as *'developing countries'* by the United Nations Development Program (UNDP), because of their lower rank in the Human Development Index (Cheibub, 2010; Gulati, 2008; Saheb, 2005). These countries differ in their political circumstances, the history of their educational

developments, culture, language, religion, gender issues, population size, resources, and availability of modern technology (Gulati, 2008). While these countries generally lack rich educational traditions, there are exceptions including the Indian Gurukul system, the first schools in Egypt, and the first universities in Babylonia (Gulati, 2008; Saheb, 2005).

Educational settings in developing countries are typically different from those in developed countries and are characterised by a lower quality of education, limited access to schools and universities, and high fees (Chimombo, 2005). However, national policies for higher education indicate that a higher education system is regarded as an asset that provides competitive advantage to individuals and nations. Consequently, the need for reform is even more compelling in view of growing competition amongst countries in an era of increased globalisation (Collis & Moonen, 2001; El-Hawat, 2007; UNESCO, 2009a, 2009b). According to Mohamed (2005), "Arab countries have adopted radically new visions that would prevent Arab societies from lagging behind other socio-economically advanced nations" (p. 2).

During the 1950s and 1960s, after gaining independence, most Arab countries struggled to build and develop systems of higher education (El-Hawat, 2007; Mohamed, 2005; Samoff, 2003). This has changed in recent times, as a great number of universities have been established in the Arab countries, and currently, the region has over 200 higher education institutes, universities, and colleges (El-Hawat, 2007; Gitsaki, 2011; Mohamed, 2005; UNESCO, 2003). Likewise, there has been a remarkable increase in higher education enrolment rates (El-Hawat, 2007; Mohamed, 2005). As depicted in Figure 2.1, in 2008, enrolments in five Arab countries (Jordan, Kuwait, Lebanon, Libya and Palestine) exceeded the rate of 4,000 students per 100,000 inhabitants, reflecting a growth of more than 40% in comparison to 1998 enrolment levels (UNESCO, 2009c).

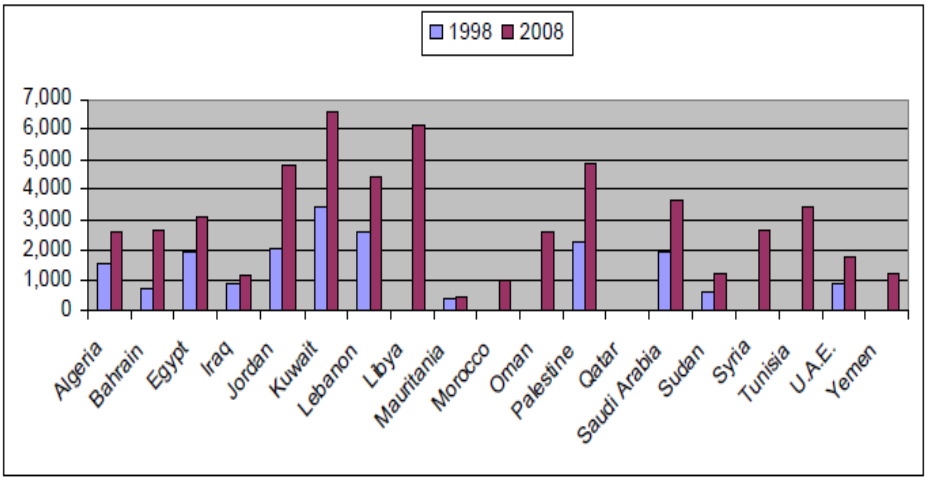

Figure 2.1. Number of higher education students in Arab countries per 100,000 inhabitants (UNESCO, 2009c, p. 9).

In addition to universities, institutes of technology were established in many Arab countries to provide a wide range of educational opportunities for students:

> Institutions and colleges of *technology* established in many Arab countries show that almost 30% of all such institutions were established during the last decade, totalling no less than 170 institutions and spreading all over Arab Countries with a concentration in Lebanon, Egypt, Libya, Oman, Algeria, Sudan, the United Arab Emirates and the Palestinian territories. (El-Hawat, 2007, p. 6)

However, the development of suitable regulatory frameworks seemed to lag behind the rapid growth of educational providers, as pointed out in a study conducted by UNESCO (2002):

> Higher education authorities seem to be absent from regulating providers of higher learning that are outside the mainstream of the education system, such as corporate institutions and providers of education opportunities through non-traditional delivery means, i.e. open learning, e-learning, virtual universities, etc. (p. 9)

The current state of higher education in most developing countries is generally weak, as most higher education institutions suffer deficiencies in:

- infrastructure and resources (Andersson & Grönlund, 2009; Dhanarajan, 2001; Gulati, 2008; Heeks, 2002; Rajesh, 2003);

- well trained and qualified teachers needed to carry out the development and to manage the change (Gulati, 2008);
- active, participative students, familiar with interactive learning (Andersson & Grönlund, 2009; Eastmond, 2000; Evans, 2005; Sehrt, 2003); and,
- the ability to implement advanced educational practices on their own (Andersson & Grönlund, 2009).

The traditional means of learning, which are paper-based, are still the most commonly used methods compared to the web-based and online learning methods. According to Gulati (2008), developing nations find the traditional means of learning more reliable and sustainable. However, Omidinia, Masrom and Selamat (2011) reported that the use of ICT for learning purposes is widely accepted in Iran's educational institutions. The authors noted that securing the necessary e-learning content and infrastructure is still the main problem.

2.3. HIGHER EDUCATION CONTEXT IN LIBYA

Currently, Libya has the highest literacy rate in the Arab world. According to the United Nation's Human Development Index, which is composed of the standard of living, social security, health care and other factors for development, Libya is ranked at the top of all African countries (Hamdy, 2007a). In today's Libya, education is valued and regarded as a door opener to new opportunities and secure employment.

The Libyan government is seeking to develop new policies for higher education with the proposals designed to deal with funding, quality, and management through a long-term strategy for investment and reform (The General People's Committee of Education, 2008). The adoption of ICT in education is an essential element in Libya's overall development plans. The government aims to improve the ICT infrastructure and revamp the entire education system, including the development of new curricula and teaching methods. However, poor

infrastructure and a lack of skilled, qualified and ICT-savvy teachers present a great challenge to the reform process (Hamdy, 2007a).

In Libya, higher education is offered in universities, both general and specialised, and in higher vocational institutes. These include higher vocational institutes for teacher training; higher institutes to train trainers and instructors; polytechnic institutes; and, higher education institutes for technical, industrial and agricultural sciences. In addition, new scientific institutions called Scientific Research Centres have been created in such fields as Health and Pharmacy, Education, Environment, and Basic Sciences; they serve both as educational and research institutions.

The National Authority for Scientific Research is responsible for higher education and research and The University People's Committee, chaired by a Secretary, manages university education. Each faculty within a university also has a People's Committee, chaired by the Dean and heads of departments as members. Each university manages its administration and its budget. University-level education includes three major sections: university education (lasting four to seven years), university vocational and technical education (lasting three to five years), and advanced graduate studies. Education in Libya is free for everyone from elementary school right up to university and postgraduate study, including study abroad. While postgraduate studies are fee-paying, the government provides generous subsidies which cover nearly 80% of the fees.

Schools and universities are located throughout the country to facilitate good access to educational opportunities and, to meet the needs of students from remote areas, mobile classrooms were introduced in 2006 to cover all parts of Libya (Hamdy, 2007a).

2.3.1. History of Libyan higher education

At the time of independence in 1951, Libya was one of the poorest countries in the world. It had few known natural resources, and its population was small, poor and largely illiterate; literacy levels were particularly low among girls and women at that time (Alhmali, 2007). Since 1963, owing to substantial oil revenues and increased government investments, Libya has experienced a rapid development in the education sector.

After Libya's independence in 1951, its first university, the Libyan University, was established in Benghazi. It was named the Faculty of Arts and Education and was followed in 1957 by the establishment of the Faculty of Science in Tripoli. In 1957, the Faculty of Economics and Commerce was founded, followed by the Faculty of Law in 1962, and the Faculty of Agriculture in 1966; by 1967, the Libyan University had witnessed further expansion with the inclusion of the Faculty of Higher Technical Studies and the Higher Teachers' Training College. The Faculty of Medicine was founded in 1970, and in the same year the Islamic University in Al-Bayda was incorporated by the Libyan University under the name of the Faculty of Arabic Language and Islamic Studies. In 1972, the Faculty of Oil and Mining Engineering was established and then moved in the late 1970s to the Brega Oil Terminal Complex.

In 1973, the Libyan University was divided into two independent universities: the University of Tripoli and the University of Benghazi; these universities were later renamed as the University El-Fateh in Tripoli and the University of Garyunis in Benghazi respectively (Encyclopedia of the Nations, 2009). After the battle of Tripoli and the downfall of the Gaddafi government in 2011, the University of Tripoli returned to its original name.

The steady increase in higher education enrolments over the past three decades has resulted in a major transformation of the Libyan university system from a single, state-run multipurpose university into a decentralised group of general and

specialised universities (El-Hawat, 2003). Currently, there are 18 public universities in Libya; they include nearly 150 specialised faculties and more than 500 specialised scientific departments, and cover four major disciplines: Arts, Science, Technology and Medicine (El-Hawat, 2003).

The overall responsibility for all aspects of education in Libya lies with the Libyan Ministry for Education. The Ministry shares this responsibility with local education committees that control the education programmes within their geographical area. The Ministry controls all the committees in the country and its Higher Education Department oversees the operations of all universities in Libya.

2.3.2. Types of educational institutions

Higher education in Libya can be provided by universities, higher vocational institutes, and open universities:

- Universities (government and private) include three types of education: university education (lasting four to seven years), university vocational and technical education (lasting three to five years), and advanced graduate studies.
- Higher education institutes provide education in the areas of administration and management, technology, creative arts, and teacher development.
- Petroleum training and qualifying institutes are dedicated to the training and education of personnel for the oil industry.
- Higher institutes for teacher training produce qualified educators.
- Open universities offer distance education.

In addition, higher education institutes provide higher vocational and technical education of three to five years' duration in such fields as Electrical Engineering, Mechanical Engineering, Finance, Computer Studies, Industrial Technology, Social Work, Medical Technology and Civil Aviation. The qualification awarded after three years of study is a Higher Technician Diploma; after four or five years,

a Bachelor degree is awarded. Upon completion of their studies, graduate technicians are assigned to work on development projects.

Universities

Currently, there are 18 government universities in Libya; Tripoli University and Garyounis University are the oldest and the largest, with student populations of 115,000 and 60,000 respectively (Rhema & Miliszewska, 2010). In addition to universities, there are 264 government-funded higher education institutes that provide education in the areas of administration and management, technology, creative art, and teacher development. Finally, another eight institutes – petroleum training and qualifying institutes – are dedicated to the training and education of personnel for the oil industry. Five of these institutions are located in the capital and main cities, and three of them operate in regional areas. Figure 2.2 shows the locations of higher education institutions in Libya.

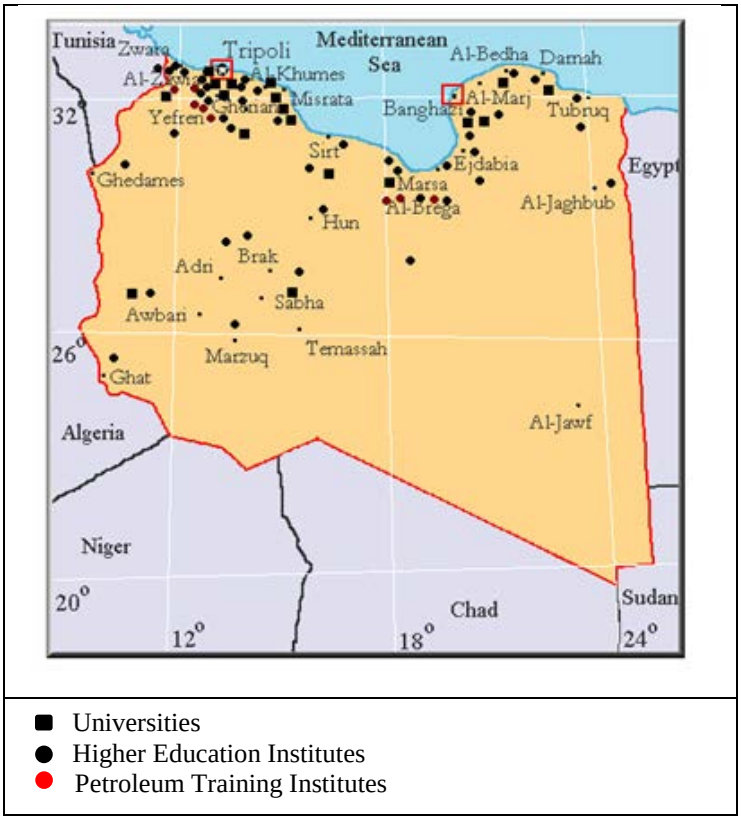

Figure 2.2. Higher education institutions in Libya (Sourced from Rhema & Miliszewska, 2010)

In the late 1990s, Libyan authorities invited the private sector to play a role in the nation's education system. Since then, more than 30 private universities have been founded; they provide education in all disciplines (Rhema & Miliszewska, 2010).

Consistent with other countries, university level studies are divided into three stages: Bachelor, Master, and Doctoral degrees, as described in the following:

1. Bachelor Degree. Conferred after four to seven years' university study (five years in Architecture and Engineering, and five to seven years in Medicine) in universities and higher institutes.
2. Master's Degree. Conferred after two years' study following a Bachelor Degree and offered mostly by large universities, such as Garyounis and El-Fateh.
3. Doctorate. May be awarded after a further two years of research in such fields as Arabic, Islamic studies and Humanities and is conditional upon the completion of a thesis. Many students still travel abroad to pursue doctoral degrees in other disciplines (Clark, 2004).

Teacher training

There are several types of teacher education in Libya including courses for pre-primary and primary/basic school teachers, secondary school teachers, and higher education teachers. Primary school teachers are trained in three to four years in State Higher Teacher Training Institutes at intermediate school level. A number of centres for in-service training were opened in 1995-96. In addition, a centre to train teachers for technical and vocational education, at basic and intermediate levels, was opened. Secondary school teachers require four years of higher education studies.

Master degree holders can become assistant lecturers at universities. They can be promoted to lecturer after three years of teaching. They are promoted to Assistant Professor after having taught for four years and submitted three research articles

evaluated by a scientific committee. PhD holders are appointed as lecturers and promoted to Assistant Professor after four years of teaching. They are then promoted to Joint Professor after a further four years of teaching, and submission of a published scientific thesis evaluated by a scientific committee. Joint Professors are promoted to Full Professor after having taught for a further five years and published three more research articles evaluated as above (Clark, 2004; Rhema, 2005; Rhema & Miliszewska, 2010).

Non-traditional studies

The Libyan education system offers possibilities for non-traditional studies including distance higher education and non-formal higher education studies. Distance education is provided by the Open University, created in 1990. Its main centre is in Tripoli, but it has opened 16 other centres around the country in Benghazi, Sebha, Ejdabia, Derna, Misurata and El-Kufra. For graduation they need 120 to 150 credit hours depending on the study major. Curricula and teaching programmes are conveyed via written and audio-visual material (learning packages). Non-formal studies include short postsecondary courses for training paramedical personnel and health inspectors (Hamdy, 2007a).

2.3.3. Admission requirements

Prior to admission to universities, higher technical, and vocational education institutions, students are required to complete pre-university schooling which is divided into three stages: Primary, Preparatory and Secondary; Secondary schools can be specialised or general. Secondary school graduates can either continue their study in universities, or join the labour market (The General People's Committee of Education, 2008). Since 1990, students are also required to obtain a score of 65%, or more, in the secondary education examination in order to be admitted to university; some faculties, such as medicine and engineering, require scores exceeding 75%. Students with scores below 65% can be admitted to higher training and vocational institutes. Students from specialised secondary schools are

strongly encouraged to continue higher education in their field of specialisation (for example medicine, engineering, economics). The qualification awarded after three years of study at universities, vocational institutes and centres is a Higher Diploma; after four to five years, the qualification awarded is a Bachelor Degree.

2.3.4. Student profile

Higher education students in Libya include local Libyan students and non-Libyan students from neighbouring Arab countries. With a common Arabic language and almost everyone following the Islamic religion, Libya appears socially homogenous, as students share values, ideologies, and needs (Alhmali, 2007). More students are enrolled in the humanities and arts than in science and technology; currently, 60% of the total number of higher education students study humanities and arts. The average age of students starting higher education is between 18 and 21 years (The General People's Committee of Education, 2008).

Libya's population of approximately 6.2 million includes around 2.7 million students. There were 19,300 university students in the academic year 1980-1981; that number grew to 280,000 in 2006-2007, and up to 300,000 in 2008-2009, as illustrated in Table 2.1. An extra 90,000 students were enrolled in the higher technical and vocational sector in 2009. It is expected that this number would increase to reach more than half a million by 2025 (The General People's Committee of Education, 2008).

Table 2.1. Number of university students in Libya in 2008-2009 (sourced from the General Authority for Information, 2008, p. 140).

الجامعات Universities	ليبيون Libyan			غير ليبيين Non Libyan			المجموع Total		
	ذكور Male	إناث Female	المجموع Total	ذكور Male	إناث Female	المجموع Total	ذكور Male	إناث Female	المجموع Total
طرابلس Tripoli	17,141	25,059	42,200	658	400	1,058	17,799	25,459	43,258
قار يونس Garyounis	16,411	29,100	45,511	412	459	871	16,823	29,559	46,382
عمر المختار Omar El-Mokhtar	10,107	18,428	28,535	357	335	692	10,464	18,763	29,227
سبها Sabha	5,698	12,810	18,508	411	302	711	6,114	13,110	19,224
السابع من ابريل 7th of April	13,087	22,415	35,502	460	387	847	13,545	22,802	36,347
الجبل الغربي Al-Jabal Al-Gharbi	6,871	12,402	19,273	109	130	239	6,980	12,532	19,512
التحدي Al-Tahadi	2,324	6,027	8,414	66	105	171	2,390	6,177	8,567
ناصر الأممية Naser	257	91	366	376	198	574	651	289	940
المرقب Elmergib	9,962	16,687	26,649	129	127	256	10,091	16,814	26,905
7. أكتوبر 7th of October	8,953	12,629	21,562	185	258	443	9,138	12,867	22,005
الأسمرية Asmarya	2,225	1,669	3,894	8	2	10	2,233	1,671	3,904
طرابلس للعلوم الطبية Tripoli of Medical Sciences	9,907	20,546	30,453	680	1,942	2,622	10,587	22,488	33,075
العرب الطبية Medical of Al-Arab	2,626	7,509	10,135	53	107	160	2,679	7,616	10,295
الجامعة المفتوحة Open University	766	528	1,294	17	9	26	783	542	1,325
المجموع Total	**106,353**	**185,880**	**292,296**	**3,921**	**4,761**	**8,680**	**110,277**	**190,689**	**300,966**

2.4. E-LEARNING IN EDUCATION

Over the last twenty years, developed countries and emerging economies have introduced ICT to enhance all their sectors, including education. This change has had a significant impact on the curricula, as it involves revised and updated curriculum, textbooks, creating lesson plans and exams (Olson, Godde, de Maagd, Tarkleson, Sinclair, Yook & Egidio, 2011). It also influences the methodology of teaching, and the learning processes. The most dramatic growth of e-learning has occurred since the 1980s and evolved from using standalone data processors in computer labs, through accessing the web, to using and providing integrated web services for teaching and learning (Gerry, 2005; Holmes & Gardner, 2006; Moore, Dickson-Deane, & Galyen, 2011; Pass & Creech, 2008).

2.4.1. Overview

The new technologies, including computer conferencing, interactive media, digital technologies, and the Internet significantly increase the reach of e-learning provision. They enable content to be current and accessible, allow students to communicate and interact with each other and with instructors at any time, and they open up a universal market. Consequently, many institutions have been attracted to e-learning systems and the e-learning market has grown continuously (Harun, 2001; Olofsson & Lindberg, 2006). By 2003, industry analysts put the size of the e-learning market at USD 3 billion in the United States alone; the number grew to almost USD 15 billion by 2005, USD 18 billion in 2010, and it is expected to reach USD 24 billion by 2015 (Adkins, 2013; Keegan, 2005).

E-learning is a mode of education based on network technology that uses ICTs to deliver content and instruction to learners across time and place, and provides access to resources of information (Duan et al., 2010; Liaw, 2008; OECD, 2005; Wallhaus, 2000). It is broadly inclusive of all forms of educational technology in education, and the use of information and communication technologies in learning and teaching (Devedzic, 2013). Xhaferi (2014) defines e-learning as systems that

are a technological development aimed at the use of the information and communication technology for the delivery of teaching materials and interaction between students and teachers. Holmes and Gardner (2006) defined e-learning as "online access to learning resources, anywhere and anytime" (p. 14), and added that:

> e-learning offers new opportunities for both the educator and the learner to enrich their teaching and learning experiences, through virtual environments that support not just the delivery but also the exploration and application of information and the promotion of new knowledge. (p. 14)

The term *e-learning* is often used interchangeably with *distance learning* (Holsapple & Lee-Post, 2006). However, some authors argue that e-learning represents a new generation of distance learning, and they point to significant differences between the two including the fact that: "E-learning does not represent more of the same (…) [It is] about doing things differently" (Garrison & Anderson, 2003, p. 7). E-learning offers potential learners an alternative means of learning, compared with the traditional way, and thus represents an innovation in education (Duan et al., 2010; Ma et al., 2008). The arrival of mobile learning (*m-learning*), too, has been heralded as the next progressive step from e-learning by some authors, while others viewed it merely as *'e-learning using mobile devices and wireless transmission'* (Caudill, 2007; Iqbal & Qureshi, 2012; Orr, 2010). Nash (2011) noted that while desktop based e-learning offers solid, multimedia-rich, web-based solutions, it lacks the portable and ubiquitous nature of mobile learning.

The different understandings of e-learning are conditioned by particular professional approaches and interests (Stein, Shephard, & Harris, 2011). Sangra, Vlachopoulos and Cabrera (2012) presented an overview of e-learning based on different definitions gathered from the literature and an online Delphi survey evaluated by experts in the field of education and ICT. They identified four general categories of definitions: technology-driven, delivery-system-oriented, communication-oriented, and educational-paradigm-oriented. They stated that:

> E-learning is an approach to teaching and learning, representing all, or part, of the educational model applied, that is based on the use of electronic media and devices as tools for improving access to training, communication and interaction and that facilitates the adoption of new ways of understanding and developing learning. (Sangra et al., 2012, p. 152)

E-learning is an integral component of blended learning, which integrates online technology-based learning with traditional face-to-face learning (BECTA, 2004; Garrison & Vaughan, 2008; Macdonald, 2008; Masie, 2001; Singh, 2003; Stubbs, Martin, & Endlar, 2006; Tallent-Runnels et al., 2006; Welker & Berardino, 2005). The blended model plays a significant role in improving the quality of instruction and student learning, particularly for students from diverse cultural backgrounds, as it enables customised interaction with the learning environment (Al-Hunaiyyan, Al-Huwail, & Al-Sharhan, 2008; Vaughan & Garrison, 2006; Oh & Park, 2009).

Placed within the e-learning framework, mobile learning has emerged as a tool which allows students to use mobile devices to access learning materials, perform learning tasks, participate in learning interactions, undertake assessment tasks, learn work processes, access learning support, and evaluate teaching (Uys, Brann, Klapdor, & Smith, 2012). Traxler (2007) as well as Uys and colleagues (2012) proposed that "mobile learning deals with the mobility of the learner, so that learning can occur anywhere/anytime" (p. 575). Thus, it supports and promotes personalised learning, as mobile devices are focused on the learner rather than the institution. Learners use some type of mobile handheld computer, such as a PDA, smartphone, tablet PC, games console or other portable device and make use of the device's connectivity, as well as its tools and content, to learn regardless of where they are and what time it is. Mobile learning also has the ability to provide opportunities for learning embedded in a natural environment, allowing learners to engage in learning-related activities in diverse physical locations, supporting group work on projects, and enhancing collaborative learning in the classroom (Liu et al., 2003; Suki & Suki, 2007). Mobile learning has great potential to relieve educational disadvantage by providing opportunities for increased access to education, particularly to the poor:

> Because mobile phones are increasingly becoming part of the everyday lives of the poor, it is argued that they have potential to become a low cost accessible delivery channel for learning services, thus facilitating innovations including m-learning. (Kok, 2011, p. 69)

2.4.2. The impact of technology on learning

Over the past decade, the new technology tools have dramatically transformed people's perspectives and practices with respect to communication methods, business practices, as well as learning processes (Mikre, 2011; UNESCO, 2002). This shift has influenced societies, lifestyles, and educational systems giving high priority to technology as a tool. Tertiary institutions are changing and adapting mainly in response to the various pressures associated with widening access, financial viability, and developments in ICTs. The use of ICTs in education does not mean that ICT applications replace other traditional teaching and learning methods (e.g. face-to-face interactions); rather, it indicates a paradigm shift in the provision of quality teaching and learning (Yang, 2009). The adoption of flexible delivery model has been a key initiative in many institutions. While this model has been interpreted in many ways, it generally means the introduction of web-based design and delivery of courses (The ICT Cluster, 2010; McDonald & Postle, 1999).

Supporting learning with a web-based system and ICTs can become '*the fruit of the incorporation of technology into education'* (Ali, 2003; Cameron, 2003; Ingram & Hawthorn, 2003). Thus, depending on how ICT is integrated into the curriculum and into learning activities, it can highly influence teaching and learning processes and experiences. Boon (2001) suggested that e-learning involves more than uploading course materials online, it "involves teaching strategies like communication, formative assessment, participation, case studies and problem solving, assignments, demonstrations, simulations and record keeping" (p. 162). According to Watson (2001): "ICT is not only perceived as a catalyst for change, but also for change in teaching style, change in learning approaches, and change in access to information" (p. 251).

With the proliferation of technologies in every day lives, ICTs have become indispensable components of teaching and learning in tertiary education (Oliver, 2002; Yang, 2009), not least because of student expectations. Prensky (2007) observed that:

> …our students are clamouring for these technologies to be used as part of their education, in part because they are things that the students have already mastered and use in their daily lives, and in part because they realise just how useful they can be. (p. 41)

Kennedy, Churchward, Judd, Gray, and Krause (2008) have also provided evidence of a substantial positive association between effective use of ICT and success in tertiary studies. The researchers stated that students were overwhelmingly positive about the use of ICTs to support their studies, and a high percentage of students used different kinds of technologies and technology-based tools in their university studies.

The evolution of technologies and the penetration of e-learning have impacted the roles of teachers and students. In the new learning environment, teachers are becoming problem solvers, rather than direct knowledge providers. Students are transforming from being primarily the receivers of information to more self-directed learners. Yang (2009) agreed that the use of ICTs has the capacity to promote the shift towards a student-centred learning, as it provides students with opportunities to "search for the ways of learning, make choices about their own learning methods, and self-evaluate learning progress" (p. 9). Oliver and Goerke (2007) supported this view, particularly in relation to mobile learning. Presenting a critical review of research pertinent to the use of mobile learning at Curtin University of Technology in Western Australia, they reported that:

> Emerging technologies owned and used by students, and incorporated wisely into university curricula, can go some way towards enhancing high quality, face to face learning experiences, where articulated knowledge is constructed and student achievement of intellectually challenging outcomes is effected. (p. 12)

As university students have become increasingly busy and physically mobile, their use of a variety of technologies has also increased. Smartphones, tablets, laptops, and other portable devices have become indispensable for the majority of young people in developed countries. In 2008, the Horizon Report suggested that the increased need for delivery of services and content to mobile and personal devices would be one of the greatest challenges that higher education would face (Johnson, Levine, & Smith, 2008). The future envisioned in the Horizon Report was echoed in Kim, Lee, Merrill, Spector, and van Merriënboer (2008), who predicted that mobile technologies will have an important place in learning and teaching, giving new opportunities to move learning out of the classroom.

Consistent with recent reports, mobile applications have been "the fastest growing dimension of the mobile space in higher education right now, with impacts on virtually every aspect of informal learning, and increasingly, every discipline in the university" (Johnson, Adams, & Cummins, 2012, p. 6). Mobile devices with numerous applications and connection to the Internet have the capacity to create collaborative learning environments, and permit efficient communication regardless of time or location. Constant connectivity via mobile broadband networks allows access to tools for searching and browsing, publishing, communication via email, video and audio conferencing, and access to social networking (Andrews et al., 2011; Johnson et al., 2012). The rapid expansion of mobile technology has been heralded also as a key means for providing access to those who are currently missing out on education:

> Mobile technology may have its greatest impact in the developing world, because it brings telephony to districts [that] fixed-line telephones formerly never reached. However, as data has not been available until recently, empirical evidence on mobile telephony impact or diffusion in developing countries is scarce. (Puumalainen, Frank, Sundqvist, & Tappura, 2011, p. 2)

2.5. E-LEARNING IN DEVELOPING COUNTRIES

ICT and e-learning have been considered an invaluable platform for economic growth and educational development particularly for developing nations.

Technology enhanced education is generally perceived as a way to relieve poverty and social division, and improve living standards; this is especially meaningful in countries with poor infrastructure, limited Internet access, and inadequate supply of computers in their educational institutions (Gulati, 2008). Adoption and proper utilisation of ICTs lead to increase yields and quality production of goods and services. ICT industry can be resourced, properly managed and mainstreamed into a significant contributor to the national gross domestic product (Belloo & Aderbigbe, 2014). According to Kozma (2008) and the United Nations (2005), ICT in developing countries can expand access to quality education, boost literacy, provide universal education, and facilitate the learning process itself.

According to Sawahel (2013a), Africa has become the most dynamic e-learning market in the world – with Senegal in first place followed by Zambia, Zimbabwe and Kenya. Adkins (2013) reported that the overall growth rate for self-paced e-learning in Africa is over 15%. Senegal has the highest growth rate in Africa at 30%, followed by Zambia, Zimbabwe and Kenya at just over 25% each. The continent has the highest growth rates in the world in the areas of packaged content, custom content development services, cloud-based authoring tools and learning platform services, installed authoring tools, and installed learning platforms (Adkins, 2013).

Despite the progress, most African universities are still struggling to integrate e-learning into their teaching and learning (Tagoe, 2012). A survey by UNESCO on e-learning in Africa revealed that “e-learning is still very much in its infancy across most of the continent” (Macharia & Nyakwende, 2010, p. 73). Many countries are yet to establish a reliable and equitable e-learning system and e-learning has yet to become an important government agenda (Akbar, 2005; Rhema & Miliszewska, 2011). Likewise, technological, pedagogical, social and economic boundaries, as well as the ability to contextualise the benefits of ICT in improving the quality of life, are yet to be fully understood and explored (Duan et al., 2010; Nair, Han, Lee, Goon & Muda, 2010; Rossiter & Crock, 2006; Tortora & Rheault, 2011).

Successful implementation of e-learning in developing countries requires great effort and resources (Ferrer, 2009). In an institutional setting, it demands a significant change in teaching practices, requires inclusive strategic planning, and needs to be carefully managed using appropriate organisational strategies (Mohammad, 2008). For instance, e-learning course planning is needed to develop course content that includes pedagogical underpinnings and is suited for e-learning delivery (Boulton, 2008; Khan, 2005). Careful attention to various sub-strategies and adequate preparation to facilitate the e-learning adoption are also required to ensure smooth and successful integration of e-learning across an organisation (Lin, 2008). Kituyi and Tusubira (2013) designed a framework for integrating e-learning in higher education institutions in developing countries. They put emphasis on the infrastructure and the ICT skills that must be attained by management, teachers, and students. They found that the use of projectors, mixing face-to-face and e-learning, and harmonising course content for both modes of learning are the most important requirements for e-learning integration, they were also the most relevant features of e-learning information systems. In addition, the use of videos, audio tapes, guest lecturers, textbooks, and other reading materials and training were considered important contributes to successful integration of e-learning.

2.5.1. ICT initiatives and projects

Since the mid-1990s, numerous Interactive Radio Instruction (IRI) initiatives have been initiated in Africa to improve the quality of education. In most cases, students demonstrated progressive improvements in achievement over time (Bosch, 1997; Murphy, Anzalone, Bosch, & Moulton, 2002); improvements in enrolment and attendance were also recorded for both boys and girls in urban and rural settings (The World Bank, 2005). Moreover, interactive radio made students willing to listen and participate in the lessons being delivered (Achimugu, Oluwagbemi & Oluwaranti, 2010; Aktaruzzaman, Shamim & Clement, 2011).

In Tanzania, a national policy for ICT in education and the Tanzania Communications Regulatory Authority Act were established in 2003. The policy aimed to provide access to ICT tools, build a strong infrastructure, expand and develop the teaching of ICT at all levels of the national education system, and use ICT to improve the quality of education and training in all areas including distance learning. The policy planned to develop and deploy a nationwide e-education system that interconnects all schools and higher education/training facilities across the country (Hennessy et al., 2010). Furthermore, by 2007 licences were issued for two basic telephone service providers, four land cellular mobile telephone operators, one global mobile personal communication service, eleven public data communication companies, nine private (dedicated) data services companies, and twenty four public Internet service providers (ISPs); all taxes related to computers and allied equipment were eliminated, and license fees and royalties payable by the telecommunication operators were reduced (Sife et al., 2007).

In Iraq, a TV channel *Iraqi Edu* has been used to increase access to education for affected Iraqi students enrolled in the formal schooling system and out-of-school, and refugee students (UNESCO, 2011). The *Distance Learning/Educational TV* project has assisted Iraqi people in anticipating and addressing the difficulties associated with the reform of the Iraqi educational system; these difficulties included shortage of trained and qualified teachers, administrators, and planners, lack of teaching/learning materials, poor teaching facilities, and the deteriorating economic conditions that led the youth to seek gainful employment during school hours (UNESCO, 2011).

In the Arab States, where the official language, religion and culture are similar, the national ICT policy in the area of education is jointly co-ordinated by the Ministry of Communications and Information Technology and the Ministry of Education (Hamdy, 2007b). In an Arab League meeting of the Ministers of Telecommunications and Information Technology, Egypt was selected to become the hub of e-learning in the Arab Region, largely due to the leadership of the

Egyptian Minister of Communication and Information Technology (Beckstrom, Croasdale, Riad, & Kamel, nd). In its effort to spread internet usage across the country and transform Egypt into an information society:

> The Ministry of Communications and Information Technology is publicising the coming advent of free internet access in the country. In partnership with licensed ISP's, MCIT affiliate Telecom Egypt will set-up an estimated 15,000 ports, capable of serving 2 million internet users, with users having to pay only for the local dial-up phone tariff. The service is effective as of Jan 1st, 2002. Companies are eligible to apply for a Free Net number from the Telecommunications Regulatory Authority. (Beckstrom et al., nd, pp. 7-8)

In 2002, a large-scale ICT project, entitled the *Higher Education Enhancement Project*, was launched with a loan from the World Bank and partial funding from the Egyptian government. The project included six sub-projects: Higher Education Enhancement Project Fund; Faculty Leadership Development Project; ICT Development Project; Faculty of Education Project; Egypt Technical Colleges Project; and, Quality Assurance and Accreditation Project. Some of these sub-projects were implemented in cooperation with other Mediterranean countries, and with the participation of universities and Egyptian educational institutions, while others were carried out in cooperation with France, Germany, and the European Union. In addition, a central unit for digital libraries and automation of university libraries has been established (UNESCO, 2009c).

The Supreme Council of Universities (SCU) has established a National E-Learning Centre and charged it with the task of integrating ICTs into Egyptian higher education. SCU aims to advance higher education in Egypt by harnessing the potential of ICTs for learning and capacity building. To achieve this goal, SCU will set national standards for e-learning, develop e-learning policies, promote the culture of e-learning nationwide, promote research and innovation in e-learning, establish e-learning centres in all public Egyptian universities, and assure the quality of e-learning in Egyptian universities (Mohammad, 2008).

2.5.2. Growth of mobile telecommunication

The speedy growth of mobile telecommunications in developing regions has been spurred by unreliable fixed ICT infrastructure as well as "liberal regulatory environments and global market penetration" (Uys et al. 2012, p. 579). The rapid acquisition of mobile technologies among the poorest nations enables people to create significant opportunities for economic growth, health care enhancement and increased access to education for people living in these countries (Andrews et al., 2011). Zuckerman (2009) reported that 80% to 90% of the public in some poor countries have at least minimal access to a mobile phone. Furthermore, nearly 80 million mobile subscribers, most of them in developing countries, use a mobile phone although they have no access to the electrical grid (United Nations, 2012).

In the Middle East (excluding the North African countries) mobile penetration rates were anticipated to reach 94% in 2011 and 126% in 2015. Iran and Afghanistan have reported significant subscription growths. In 2010, Iran ranked as the single biggest mobile market, with 66 million subscriptions, followed by Saudi Arabia with 43 million subscriptions and revenues of more than USD 11 billion. It is expected that mobile subscriptions in the Middle East will reach 327 million by 2015 (Cherrayil, 2010). In the Gulf region (countries such as United Arab Emirates and Qatar), the mobile phone penetration rate is more than 100%. Even in poorer countries affected by war, like Palestine and Yemen, an increase in mobile phone penetration is expected in the next few years because of a growing youth market and the emergence of new telecommunication operators (Muttoo, 2011; UNESCO, 2012). Cherrayil (2010) reported that the Palestinian market recorded the fastest growth in 2010, with mobile subscriptions increasing by 56%.

The Arab region represents one of the fastest growing mobile phone markets in the world with mobile phone penetration overtaking Internet penetration (Muttoo, 2011). According to a study conducted by Gallup (2011), 87% of young Arabs aged between 15 and 29 reported having access to mobile phones in 2010, an

increase from 79% in 2009. Arab countries have utilised mobile phones to empower communities through various innovative mobile phone applications. For example, in Jordan, the Bedouin women, who are not culturally allowed to seek help without their husband's permission, consult doctors via mobile phones. Mobile phones have given these women the opportunity to ask for medical advice which has the potential to generate long-term positive impact on their health. In Syria an *Electronic Voucher System* was introduced in 2009 to alleviate food insecurity among Iraqi refugee families in Damascus. Through this programme, which is the first of its kind in the world, Iraqi refugees receive vouchers on their mobile phones to purchase food items from government-owned stores (Muttoo, 2011). The local telecom operator provides SIM cards to refugee families free of charge. In addition, mobile phones have the potential to organise political action and boost the functional capacity of organisations and individuals during demonstrations, for example during the Arab Spring. Having assumed a significant role in the political settings of Arab countries, mobile phones will continue to mobilise people during elections and future social movements (Muttoo, 2011).

2.5.3. Implementation of e-learning in education

Several initiatives are currently in progress in many developing countries to reuse existing technologies transferred from developed countries, to adopt e-learning, and to integrate ICTs into their educational systems. In Tanzania, the University of Dar es Salaam has managed to implement an e-learning platform by using WebCT and Blackboard as learning management systems; a video conference facility is also available. Other universities, including Sokoine University of Agriculture (SUA), Mzumbe University, and Open University of Tanzania (OUT) have the basic ICT infrastructure such as Local Area Network (LAN), Internet, computers, and multimedia facilities to enable the establishment of an e-learning platform. SUA has started using Moodle as a course management system. OUT is piloting an open source learning management system called *Atutor* for students in a BSc (ICT) degree. It has also launched several initiatives to prioritise e-learning

Management Systems including the formulation of comprehensive institutional frameworks such as ICT Policy, ICT Master Plan and E-learning Implementation Strategy (Bhalalusesa, A Lukwaro & Clemence, 2013; Nihuka, 2011). In addition, Tanzania Global Learning Centre offers open and distance learning to university students and community (Sife et al., 2007).

In Egypt, an open source Moodle e-learning platform has been implemented at universities as an aid to deliver e-content and to provide the institution with various possibilities for delivering asynchronous e-learning web-based modules; eighteen e-learning labs (6 PCs, server, LAN) have been installed at all universities (El-Seoud, Seddiek, Taj-Eddin, Ghenghesh & El-Khouly, 2013). The use of e-learning at Cairo University includes activities such as conversion of text books to interactive CD-ROMs and pilot projects in virtual classrooms. The American University in Cairo uses WebCT as a learning management system and provides a centre for assisting faculty members in adapting their teaching materials to a web-friendly format. In addition, the Global Campus within Egypt currently includes web-based, and CD-ROM, modules in a blended learning environment. Students are provided with personal management tools such as a calendar, profile for grades and assessment, communication tool to contact local and UK-based tutors, access to discussion groups, and access to online libraries (Baraka, 2005). Currently, various Learning Management Systems are in use in Egyptian institutions as shown in Table 2.2.

Table 2.2. Learning Management Systems in Egypt (Beckstrom et al., nd).

Learning Management Systems	**Organisation**
Centra	Ministry of Education
WebCT	American University at Cairo
eKnowledge/Bredge; Edline; Cyberlearning	RITSEC
eClass –(hardware only); Oracle iLearning; Lotus Learning Management System	National Technology Institute
Custom solution	(Arab Academy of Science and Technology); (UNESCO) and NetVarsity
Moodle	Ain Shams University

2.5.4. Implementation of m-learning in education

Owing to their highly portable and wireless nature, mobile phones and mobile learning have been seen as a means of extending learning opportunities to remote areas, thus supporting the expansion of educational access. According to Nash (2011), "in some countries, m-learning is more of a necessity than a luxury due to limited connectivity to the high-speed Internet at homes and profusion of mobile phones" (p. 93). However, Kok (2011), in her review of the current state of knowledge about mobile learning in developing countries, pointed to the absence of a strong evidence base, and warned about the tendency to exaggerate the potential of mobile learning applications for poor users. On the other hand, according to UNESCO (2012), the continuous advances in technology and the rapid and widespread uptake of mobile phones across developing countries have led to positive educational transformation over the last few years.

In China, an important pilot study of m-learning, the Mobile Campus Program, was conducted at the Shanghai TV University. The programme enabled students in 41 remote branches to use smartphones to access the Short Message Service (SMS) system, allowing a quick delivery of educational and administrative information (Sun, 2008; Yang & Wang, 2011). The study findings revealed that most of the study participants believed that Mobile Campus contributed to their learning, helped them to understand key points of lecture presentations, and increased their access to college services. However, the project identified some issues, such as low learning efficacy, limitations of mobile devices, limited m-learning resources, and little guidance given in the learning process (Sun & Chen, 2007; Yang & Wang, 2011).

The issues of self-efficacy, as well as the importance of guidance and timely feedback, have been discussed by Nash (2011) too. The author presented an overview of mobile learning strategies used in developing countries for learners in remote locations with limited Internet connectivity. Mobile devices were used to provide interactivity and share instructional content for diverse cohorts of students

in different learning environments in Paraguay, Iraq, Afghanistan and Colombia. The author identified several factors to consider when planning mobile instructional strategies; chief among them, an examination of learning objectives and realistic evaluation of student preferences and their learning conditions, such as access to software and hardware.

In South Africa, mobile phones have been used to provide equal access to information and potential collaboration, as well as to extend the availability of lecturers and tutors during non-teaching times. Mobile learning has been adopted for specific teaching and learning purposes at Cape Town University. The Dynamic Frequently Asked Questions (DFAQ) tool, designed and developed at the university as a special-purpose question and consultation environment for students with a SMS interface, allows students and lecturers to ask and respond to questions using their mobile phones; DFAQ has been used in various courses and projects at the University (Williams & Ng'ambi, 2009). In addition, a number of mobile learning initiatives have been launched in South Africa to improve the performance of learners of mathematics. In those projects, learners use mobile phones to access curriculum-aligned mathematics content and to participate in competitions, quizzes and peer-learning based on lessons related to mathematics (Kalloo & Mohan, 2012; UNESCO, 2012). Other m-learning projects in South Africa include the Math on MXit and MobilEd programmes offered by the Meraka Institute, and in Kenya teachers and students use SMS for communication (Farrell & Shafika, 2007).

In Arab countries, m-learning is still in its inception phase. Yet, some universities in Saudi Arabia have already adopted SMS for teaching and learning. For example, recently King Saud University has initiated a new service that offers users the ability to send text messages directly from a personal computer to a mobile phone (Altameem, 2011).

The above initiatives show how innovative mobile phone applications have led to positive educational transformation in the developing world. However, some educational institutions argued that using mobile phones has disrupted teaching

and reduced students' attention in class, resulting in negative educational outcomes (Campbell, 2005). Others claimed that using mobile phones contributed to cheating during exams (Smith, 2006; UNESCO, 2012). Therefore, some government organisations have launched e-Safety Committees to consider ways to raise awareness and promote a safe and responsible use of technologies, particularly in schools (UNESCO, 2012). In Africa and the Middle East, concerns about the disruptive nature of mobile phones expressed by teachers, administrators and parents drove many institutions to ban the use of mobile phones on school premises. Negative attitudes towards mobile phone use stemmed mainly from reports of unacceptable or unsafe behaviour facilitated by mobile phones such as cheating, cyber-bullying, and sexual predation in mobile chat platforms. Parents also raised fears about teenagers using mobile phones to procure drugs (UNESCO, 2012).

According to a study conducted by Attewell, Smith and Douch (2009) to explore the impact of using mobile technologies for teaching and learning, 33% of learners reported a negative impact on their motivation. A 2008 study conducted by the Joan Ganz Cooney Center at Sesame Workshop in collaboration with Common Sense Media and Insight Research Group reported that parents and teachers were distrustful about the educational value of mobile technologies. The study revealed that teachers perceived the Internet, computer programmes, and CD-ROMs as having more educational potential than mobile forms of digital media. Moreover, almost all teachers (85%) perceived mobile phones as distractions; with 64% agreeing that they had no place in school (Shuler, 2009).

2.5.5. Challenges for e-learning in developing countries

The adoption of ICTs and e-learning in the field of education in developing countries is fraught with difficulties and barriers: "Such barriers can be related to, for example, the infrastructural context, the cultural context, and the transferred knowledge" (Kohn, Maier, &Thalmann, 2010, p. 16). Many research studies have been conducted to investigate the use of ICT and e-learning in higher education

institutions, and to determine the challenges and enablers of e-learning in different African countries such as Nigeria (Ajadi et al., 2008), Tanzania (Bhalalusesa et al., 2013; Sife et al., 2007), Ugandan (Kituyi & Kyeyune, 2012), and Egypt (Abdel-wahab, 2008; El-Gamal, 2005).

Many developing countries lack basic components vital to the implementation of e-learning such as computers and Internet access (Bhalalusesa et al., 2013; Omidinia et al., 2011). This is coupled with the lack of technically qualified personnel to carry out necessary installations, lack of finances to acquire all the necessary infrastructure, and poor planning. These factors increase the likelihood of failure of e-learning projects and limit student access to e-learning infrastructure (Bhalalusesa et al., 2013; Omidinia et al., 2011).

Andersson and Grönlund (2009) presented a critical review of research pertinent to the challenges of e-learning, particularly in developing countries. The review identified thirty challenges and grouped those into four types: (1) challenges pertaining to *individuals' characteristics* (both students and teachers); (2) *technological* challenges; (3) *course* challenges (different support functions, and course pedagogy and activities); and, (4) *contextual* challenges (the institutional management and organisation, as well as the surrounding society with its values and regulations). A summary of the challenges is presented in Table 2.3.

Table 2.3. Framework for e-learning challenges (Andersson & Grönlund, 2009, pp. 9-10).

Individual challenges	***Student***	• Motivation • Conflicting priorities • Economy • Academic confidence • Technological confidence • Social support (support from home and employers) • Gender • Age
	Teacher	• Technological confidence • Motivation and commitment • Qualification and competence • Time
Course challenges	***Course design***	• Curriculum • Pedagogical model • Subject content • Teaching and Learning Activities • Localization • Flexibility
	Support provided	• Support for students from faculty • Support for faculty
Contextual challenges	***Organisational***	• Knowledge management • Economy and funding • Training of teachers and staff
	Societal/Cultural	• Role of teacher and student • Attitudes on e-learning and IT • Rules and regulations
Technological challenges	• Access • Cost • Software and interface design • Localisation	

Andersson and Grönlund (2009) pointed out that the reviewed research tended to focus on technological and contextual challenges to e-learning in developing countries, and suggested that aspects pertinent to individuals' characteristics were yet to be addressed:

> For example we found that the hierarchical teaching methods in many developing countries will have to develop into a pedagogy more oriented towards students' activities, self-learning and motivation. This is a step change as it will change inherited roles on part of students as well as teachers. Such a major change will necessitate a focus on individuals' activities and perceptions, and how the changes to education brought about by e-learning affect, and are affected by, these. (p. 10)

2.5.6. Prospects for e-learning in developing countries

While the incorporation of e-learning in many developing countries faces many challenges, the development and adoption of e-learning is likely to be helped by the increasing commitment of many governments towards the modernisation of all sectors of life, including education (Kamel, 2008). Government approval and support are likely to act as a catalyst for change. The investment in ICT diffusion has been perceived as an engine for innovation, better education, better health services, improved government services, and for empowering the private sector (Kamel, Rateb, & El-Tawil, 2009). For example, in Egypt, over a period of five years, the government has commissioned projects in the telecom sector that were worth over USD 1 billion (American Chamber of Commerce, 2007), and the total investment in ICT exceeded USD 44 billion dollars by the end of 2010 (Ministry of Communications and Information Technology, 2013 cited in Amin, 2014).

Most developing countries have realised the need for ICT training for teachers and launched various professional development initiatives. For example, in Rwanda, workshops are provided by the Rwandan Regional ICT Training Centre based at Kigali Institute of Science and Technology to help teachers incorporate ICT in the classroom (Gutterman, Rahman, Supelano, Thies, & Yang, 2009). In Mali, the *Programme de Formation Interactive des Enseignants par la Radio* is the biggest teacher training programme that uses radio and digital technologies to bring the training directly into the communities. Its curriculum includes subject matters such as HIV/AIDS and gender equality. As a result of this programme, an estimated 15,200 teachers and 300 supervisors/principals were trained across the entire nation (Gutterman et al., 2009). In Egypt, one of the goals of the Ministry of Communications and Information Technology and the National ICT Policy is the training of educational cadres (Hamdy, 2007b). In developing countries, ICT capacity building in teachers plays a major role in enabling paradigmatic shift from teacher-centred pedagogy to a more effective learner-centred pedagogy (infoDev, 2010).

Expanding the Internet bandwidth capacity to academic institutions free of charge, or at low cost, is another driver of e-learning adoption in developing countries. For example, in Africa a partnership, referred to as the Bandwidth Consortium, aims to broaden Internet bandwidth capacity with lower fees to educational institutions. The consortium includes eleven universities in Africa and two higher education organisations, Association of African Universities and the Kenyan Education Network, backed by four major United States foundations; of these, six institutions are in Nigeria, two in Ghana, and the others in Mozambique, Tanzania and Uganda (Ekundayo & Ekundayo, 2009; Nafukho, 2007). In Egypt, free Internet and broadband have been provided since the launch of the Free Internet Initiative in Cairo in 2002 (Hamdy, 2007b). The initiative offers subscription-free Internet services to users via dial-up to special-prefix numbers.

2.6. E-LEARNING IN LIBYAN HIGHER EDUCATION

As in most developing countries, the use of ICTs and the implementation of e-learning in Libya are still at an early stage. While some Libyan universities, such as Alfateh University, Garyounis University, and Academy of Postgraduate Studies and Economic Research, have basic ICT infrastructure (such as computers, Internet access, and a LAN), they still use the *traditional* model of education; this model is based on face-to-face interactions and learning activities that are available only on campus. Libyan Open Universities (LOPs) offer students the opportunity to study at home, catering to the needs of students with work and family commitments, and to students from the regional areas of the country. However, the learning experiences tend to be traditional, as the universities rely largely on printed learning materials. This is beginning to change, as several institutions have recently introduced electronic resource repositories, and e-libraries (Rhema & Miliszewska, 2010).

In 2005 a national policy for ICT in education was launched in Libya; the policy was managed by the Ministry of Education and the Ministry of Vocational Training with the support of other parties such as the country's major

telecommunication providers: the General Postal and Telecommunication Company and Libya Telecom and Technology. The co-operation between the government and the private sector aimed to improve Libya's ability to implement large-scale ICT initiatives. In a drive towards modernity, this policy aimed to enable ICT access, provide ICT infrastructure and tools, and help develop ICT skills on a large scale in all sectors of the community. However, its main purpose was to use ICT and e-learning as instruments to improve the quality of Libyan education through:

- adopting modern, technology-assisted educational techniques and methods;
- supporting the scientific community to engage in research within the general Libyan population;
- encouraging the private sector to participate in funding higher and specialist education;
- developing open and distance learning; and,
- boosting the profile of higher education.

The Libyan government agencies have worked hand in hand with UNDP and UNESCO to ensure an appropriate and timely implementation of the ICT policy; this support also opened the door for international partnerships and encouraged investment in Libya.

2.6.1. ICT initiatives and projects

A major project, launched in 2005 and sponsored by UNESCO and the Libyan government, involved the establishment of the Libyan Higher Education and Research Network (LHERN). This included the installation of LANs within all 149 faculties on various university campuses, and a Wide Area Network (WAN) to link the campuses together. The project resulted in the creation of a national ICT resource centre for educators and the automation, through ICT, of university management systems including student information systems, university procedures, and financial operations (UNESCO, 2005b). The project involved the

creation of digital libraries and portals of educational resources, and the development of ICT enhanced learning solutions such as e-learning, tele-education, and tele-medicine. The project also provided training in digital literacy, basic ICT skills, the use of ICTs in teaching and courseware development, as well as system administration and operation of media centres.

In another major development, the government Department of Computers and Networks oversaw the implementation of the National Computer Project, which aimed to supply and install more than 150,000 computers in nearly 5,000 computer laboratories at educational institutions, including higher education institutions. The project linked all educational institutions with an advanced telecommunications network using telephone lines, satellite, and wireless communications (The General People's Committee of Education, 2008). This project assisted particularly in expanding and improving Libya's e-examination system; this system manages the results of final examinations of secondary school students and, based on the results, determines their subsequent university destination (Rhema & Miliszewska, 2010).

In 2013, several new initiatives were launched in Libya. Aimed at reforming Libyan universities, these initiatives will develop ICT infrastructure, connect universities via a modern communications network, and build virtual higher education. The initiatives were announced by Libya's Deputy Minister of Higher Education and Scientific Research at the Arab Education Summit held in May, 2013 in Amman, Jordan. The Summit was themed 'ICT, Learning, Infrastructure, Procurement and Investment' and hosted by Arab Brains, a networking organisation that connects innovative education, and public and private sector leaders (Sawahel, 2013b).

2.6.2. Growth of mobile telecommunication

The mobile phone penetration in Libya has increased dramatically from 1% in 2001 to 171% in 2010, indicating multiple subscriptions per person (International

Telecommunication Union [ITU], 2012). Libya's government leveraged mobile broadband technology in order to compensate for the lack of fixed infrastructure. In 2010, there were nearly 11 million mobile phone subscriptions and 2.7 million active mobile broadband subscriptions in the country (ITU, 2012).

The 2011 armed conflict in Libya halted the country's progress and set back the gains built up over generations in the areas of nutrition, health, housing, education and employment (Rhema & Miliszewska, 2012); it also profoundly affected communication services. Even before the conflict and with a relatively high income level, Libya's ICT networks and projects had remained poor compared to those of similar countries. This was attributed to a political environment in which the ICT market had been controlled by a state-owned monopoly, except for mobile cellular (voice) services, where two state-owned operators were competing with each other. In October 2011, Libya Telecom and Technology (LTT) started its reconstruction and maintenance work and carried out technical operations to reinstate its services in the affected areas such as Misurata and Bani Waleed. LTT set February 2012 as the deadline to return the service to its state prior to the Libyan revolution (ITU, 2012; Rhema & Sztendur, 2013).

ICTs and mobile phones played a vital role in facilitating the communication and organisation of the Libyan revolution in February 2011 (Jones, Kennedy, Kerr, Mitchell, & Safayeni, 2012; Libyan Ministry of Communication and Informatics, 2012). According to Jones et al. (2012), extensive mobile network coverage and high rates of mobile phone use in Libya suggest that mobile devices have a promising role to play in election monitoring. With donor support, the Shahed Network for Election Monitoring could implement a reporting system based on mobile technology, allowing observers to submit data directly via SMS (Jones et al., 2012; Rhema & Sztendur, 2013).

2.6.3. Implementation of e-learning in education

The drive towards the deployment of e-learning in Libya is motivated by the country's desire to further develop and improve its education system. For example, in 2008 Libya introduced an electronic system for submitting specialised secondary education examinations; the project proved to be a success and the General People's Committee of Education aims to expand it to other educational areas.

Further pilot initiatives to implement e-learning have also started, initially in primary schools. A Libyan educational technology solutions provider, MCIT, together with its partner, the Ireland-based Riverdeep, has developed a successful e-Learning pilot project covering six schools in Tripoli where MCIT designed and provided the entire IT network and power infrastructure for the schools and supported the systems and applications under the standards developed by Riverdeep (The General People's Committee of Education, 2008).

In 2009, the Libyan government launched a USD 72 million project to use ICTs in the Libyan higher education and scientific research system. The project included the establishment of LANs in 149 faculties on various university campuses and institutes, and the launch of a wide area network forming the Libyan Higher Education and Research Network (Sawahel, 2009).

2.6.4. Implementation of m-learning in education

Mobile phones are emerging as a particularly useful e-learning platform in Libya at a time when the necessary infrastructure for the Internet connection does not exist (Rhema & Sztendur, 2013). Libyan people are scattered in small communities spread out across huge rural areas. The limited spread of the telecommunication networks into rural areas is a common barrier to the use of ICT. In rural areas, mobile phones can minimise the digital divide and facilitate informal learning (Rhema & Sztendur, 2013).

In 2013, the British Council launched a *'Learn English on your mobile phone'* initiative; its aim is to enable Libyan students to learn English via mini-lessons sent in text messages to their mobile phones. Participation costs only around USD 2 monthly and students receive five lessons/messages a week. Each lesson includes short descriptions of grammar and vocabulary items, and useful phrases and common expressions. The English courses are available at three levels: elementary, intermediate and advanced (Libyan Herald, 2013, 6 Feb).

2.6.5. Challenges for e-learning in Libya

The implementation of ICT and e-learning in Libyan higher education institutions still faces many challenges including: the cultural and linguistic background of students and instructors, and their attitudes towards e-learning; the underdeveloped technological infrastructure and the often prohibitive cost of educational technologies; the lack of local expertise in curriculum development for e-learning; and the lack of educational management mechanisms to support e-learning initiatives (Rhema & Miliszewska, 2010).

Culture and language

Culture is defined "as the collective programming of the mind that distinguishes the members of one group or category of people from another" (Hofstede, 1980, p. 25). Therefore, people's perceptions of ICT and e-learning differ, depending on their backgrounds. Accordingly, the design of an e-learning system needs to consider cultural differences and sensitivities of its users; this includes consideration for the various dimensions of the e-learning environment (Khan, 2003). In designing interfaces for an e-learning system, cultural communication and ethical issues must be taken into consideration, as "cultural factors are increasingly cited as significant influences on IT adoption" (Elbeltagi, McBride, & Hardaker, 2005, p. 46). For example, in Libya and in the Western cultures the "thumbs-up" sign signifies approval, whereas in some other cultures, such as Bangladesh, it is used to challenge people. Attitudes towards eye-to-eye contact

represent yet another example of cultural differences. Eye-to-eye contact is often avoided in Libya and other Arabic cultures because humility is an important aspect of the Islamic religion. However, avoiding eye contact in Western societies might be interpreted as a sign of submission and weakness, and sometimes ignorance.

The design should also consider appropriate reading directions; importantly for Libya, right-to-left to suit the Arabic language. Likewise, text justification and navigation systems should be fixed on the left hand side. In addition, the choice of icons, symbols, objects and colours needs to be carefully considered. For example, many users in the Western countries will find an image of a dog on a Web page harmless, or indeed friendly, whereas users in Libya would find a similar Web page quite offensive.

Libyan families are still mostly traditional in their customs, attitudes, behaviours, and interaction and communication patterns and protocols. Therefore, a Libyan family has a limited ability to follow the developments in ICTs and e-learning, embrace them, and influence the attitudes and behaviours of their children. Also, teachers as well as students are still mostly unaware of the potential of e-learning.

The language barrier is a significant inhibiting factor in adopting e-learning in developing countries. The official language in Libya is Arabic and the level of English skills is low. Arabic is very different from English: the two languages have nothing in common. However, most of the learning resources (including the all-important freeware), software, and web contents are in English, thus rendering them unusable to a great majority of Libyans and making it very difficult to integrate ICT and e-learning into the Libyan education system (Rhema & Miliszewska, 2010).

Attitudes, awareness and motivation

Awareness goes along with attitude and "positive attitude towards ICTs is widely recognised as a necessary condition for the effective implementation" (Sife, et al., p. 7). In Libya, the level of educational technology awareness and even basic computer skills is generally low among educators in all types of higher education institutions, which leads to resistance in adopting ICT for teaching. Most students and teachers have had little, if any, experience in using a computer; and those who are familiar with computers, generally use them only as a tool for entertainment and communication (the Internet). Thus, students tend to feel anxious when engaging with technology for learning purposes, because of their perceived sense of incompetence. On the other hand, they find interacting with computers pleasant, helpful and easy, as they use online chat-rooms, and download music and films (Rhema & Miliszewska, 2010).

Student motivation affects their study performance and satisfaction with the learning experience; it also influences the acceptance and adoption of ICTs and e-learning (Andersson & Grönlund, 2009). And conversely, ICTs may impact student motivation. Many researchers indicate that ICTs increase student engagement because they help students develop new knowledge, concepts, and skills and allow them to work at their own pace and level (Friedman & Coates, 2009; Kay, 2007). They also provide opportunities for student-centred learning, thus creating a potentially more enjoyable learning environment for students (Neal, 2005). However, many Libyan students, particularly those with limited exposure to computers, lack sufficient appreciation for the benefits of e-learning which, in turn, affects their motivation to study with the help of ICT (Rhema & Miliszewska, 2010; Rhema, Miliszewska, & Sztendur 2013).

Technology

Technology is a fundamental factor in the development of e-learning. The technological dimension of the e-learning framework includes infrastructure,

hardware, and software; software and interface design are an integral part of this dimension (Khan, 2003). In addition, adequate technical support is an important part of the implementation and integration of ICT and e-learning in an education system (Sife et al., 2007).

Libya faces a number of challenges on the technological front. The country largely lacks the required technological infrastructure; however, many infrastructure projects are currently in progress. While computer laboratories are available in most Libyan higher institutions, the lack of adequate network facilities places serious restrictions on Internet access. The use of educational software within institutions is also limited, as there are very few products on the market that are available in Arabic, and the country lacks the capacity to develop its own products. Lastly, the technical support is almost unavailable in Libya, which leads to delays in installation, operation, and maintenance of equipment and software, and further discourages users (Rhema & Miliszewska, 2010; 2011).

Curriculum development

The use of ICTs enables the curriculum to become dynamic and interactive (UNESCO, 2005a), as it facilitates the creation of different kinds of courses, each providing learners with a distinctive type of learning experience and each suited to different situations (Horton, 2000). As e-learning is different from traditional learning, the curriculum and pedagogical methods need to be modified and developed to employ ICTs effectively, and they should be specifically designed to fit the e-learning setting (Andersson & Grönlund, 2009). To achieve this, qualified curriculum developers are needed, as emphasised by Baylor and Ritchie (2002), who concluded that "regardless of the amount of technology and its sophistication, technology will not be used unless faculty members have the skills, knowledge and attitudes necessary to infuse it into the curriculum" (p. 398).

In this respect, Libya faces a double challenge: first, Libyan higher education curricula are prescribed and controlled nation-wide by the Ministry for Higher

Education; so, there is a need to overcome the constraints and reliance on standardised curriculum. Second, the development of new pedagogical scenarios for e-learning settings requires willing participation of academics and considerable assistance from educational developers with experience in e-learning; such expertise is not available in Libya yet (Rhema & Miliszewska, 2010). However, the United Nations (2005) reported that:

> The most important output of the first area of cooperation was in Education which concentrated on the development of new curricula for the new specialized schools and vocational training centres, a pivotal action for the future of education in the country. (p. 2)

Institutional support

Teachers generally are more motivated and committed when they feel supported and encouraged by the administrators (Andersson & Grönlund, 2009). According to Mapuva (2009), "Institutional leaders are a determinant factor, given their decision-making roles which could either make-or-break the e-learning projects by either facilitating or impeding its implementation within their institutions" (p. 3). So, administrative support can be regarded as essential for the successful adoption of ICTs into the educational processes. However, administrators in Libyan institutions generally lack the ability to deal with educational problems and tend to struggle with the management of institutional inefficiencies. Therefore, it will take some time and effort for the administrators to come on board of e-learning; they will need to develop an understanding of the technical, financial, pedagogical, and administrative dimensions of ICTs in education (Rhema & Miliszewska, 2010).

2.6.6. Prospects for e-learning in Libya

Recent developments in the Libyan government's direction towards ICTs have opened up promising opportunities and the government's approval and support are likely to act as a catalyst for change. In 2012, the new Libyan government allocated USD 3.7 billion (nearly 7% of the budget) to the Ministry of Education

for educational reforms (Libya Intelligence Organisation, 2013). These reforms include improvements to infrastructure and technical equipment as well as teacher training (Azeemullah, 2012). The development and adoption of e-learning in Libya is also likely to be helped by educational technology transfer from developed countries, growing awareness of e-learning and expectations of students, successful deployment of e-learning initiatives by similar developing countries, and the development of e-learning expertise in Libyan educators (Rhema & Miliszewska, 2010).

Technology transfer

The continuous advances in technology have led to a greater distribution of knowledge transfer. This change is particularly significant for developing countries which lack the infrastructure, resources, and attitude to be able implement advanced educational practices on their own (Iahad, Dafoulas, Milankovic-Atkinson, & Murphy, 2004; William et al., 2011). Bozeman (2000, p. 629) defined *technology transfer* as "the movement of know-how, technical knowledge, or technology from one organizational setting to another". In the educational context, technology transfer includes the exchange of knowledge, techniques and methods of teaching and learning between educational institutions nationally and internationally. Technology transfer to developing countries requires particularly careful consideration (Straub, Loch & Hill, 2001); as Klauss (2000) stated:

> It is evident that both the selection of a technology and the strategy of transfer to developing countries have to be very carefully considered to ensure that an appropriate technology is chosen, that it is effectively adopted/ adapted and institutionalised, and that it is sustainable over time. (p. 277)

Technology transfer has enabled many developing countries to adopt e-leaning applications, for example web-based LMSs such as WebCT and Moodle are widely used in Egypt, whereas Blackboard is being used in schools in Tripoli in Libya. With the assistance of UNESCO and some developed countries, Libya is

also undertaking a curriculum reform taking into consideration the ICT revolution and global changes (Rhema & Miliszewska, 2010).

Changing student expectations

E-learning has the potential to address the educational problems of Libyan students. According to previous research, which reported on the introduction of web-based learning in the Data Analysis Department of the Aljabal Al-gharbi University in Libya (Rhema, 2005), e-learning seems to have provided solutions to several problems identified by students. It afforded alternative ways of communicating with teachers and fellow students, provided a greater variety of learning resources and modalities, extended the flexibility and quality of group-work, and improved the opportunities for providing students with feedback on assessment tasks. Some of the student responses reported in Rhema's study included the following statements:

> "It appeared that the traditional classroom setting is not sufficient to assure effective and efficient communication between instructors and us and that other means of communication and education have to be found."
>
> "We do not have a wider choice of resources and modalities of study materials."
>
> "The possibilities to collaborate in group work assignments are too limited to work at fixed times in the day; we could not work when we are in different places. When ones misses the class session he/she will face difficulties to understand the lesson because the only key learning materials are the instructor notes on the class."
>
> "The instructors stopped giving individual and group assignments to us because they could not find the time to give face-to-face feedback. The only way of course assessment is two exams per semester. Furthermore, there are no collaborations between students to interchange knowledge between each other."

So, while the Libyan students appreciate the difficulties of the Libyan education system, they are opening up to alternatives that could offer improvements. The task is to convince them that e-learning is a viable alternative; well trained teachers with a positive outlook on ICT are likely to play a vital role in this task. Nonetheless, specialist training is necessary to improve teacher awareness of ICT

and its uses. This training will play a dual role: it will improve their own attitudes towards ICT and e-learning and, in turn, will increase student interest and motivation (Rhema & Miliszewska, 2010).

E-education capacity building

While instructors play a vital role in the educational process, most of the instructors in Libya are not familiar with e-learning and they need training. The government has acknowledged the need and provided continuing intensive training courses for instructors through the General Centre for Teacher Training. The Centre also provides workshops for educators to explore the role of e-learning in response to the teaching and learning needs, and to focus more on how to build a consolidated approach to e-learning for capacity development. According to the 2008 report of The General People's Committee of Education, "the Centre has trained thousands of teachers and inspectors, social workers, laboratory technicians, and schools principals, and also plans to re-skill and up-skill more than 15,000 teachers in various scientific and educational fields at different levels". Another centre, the Libyan Dutch Training Centre, was completed in Tripoli in 2010 with the aim of providing services to upgrade the qualifications of teachers and graduates in the field of technology.

The training programmes are considered a vital starting point in the development of e-learning in Libya. While they have a generally positive impact on the development of the Libyan education sector, they specifically encourage the use of e-learning and the adoption of its tools and technologies to facilitate wider access to learning and improvement of educational achievements in Libya (Rhema & Miliszewska, 2010).

The Libyan government also offers opportunities for students to complete their higher and further education studies overseas; currently, more than 5,000 Libyan students supported by full government scholarships are studying abroad in the UK, Ireland, Germany, Canada, the USA, Malaysia, Indonesia and Australia. In

addition, the government provides further educational support to nearly 1,000 students who have excelled in their studies in targeted disciplines of national importance; these high-achieving students are provided with full scholarships to pursue undergraduate and postgraduate studies and lead the development of model educational establishments for the future Libyan generations (Rhema & Miliszewska, 2010). In May 2013 the Libyan Ministry of Higher Education and Scientific Research announced that it would send abroad over 1,000 technical college staff to complete Master's degrees and over 550 academics to undertake PhD studies; a pilot programme to fund and support research for development purposes was also launched (Sawahel, 2013b).

Successful initiatives in neighbouring countries

There is a need to document and share the best practices in the field of e-learning with other countries; countries that are interested in introducing e-learning and countries that have successfully implemented it in their own education systems. Development partners, particularly organisations that promote e-learning, can facilitate the process of documentation and organise events to share and exchange best practices and experiences.

Many organisations in Libyan neighbouring countries such as Egypt and Tunisia have implemented and continue to expand various e-learning initiatives. Egypt is a particularly interesting case, in that its technological infrastructure is similar to that of Libya (relative to population), as illustrated in Table 2.4. However, Egypt has a much greater number of Internet users (15% of total population) as compared to Libya (5%). On the other hand, Libya has a greater number of mobile phone users (74% of total population) as compared to Egypt (56%).

Table 2.4. ICT usage in Libya and Egypt (adapted from The World Factbook, 2009)

	Libya (pop. 6.5 M)		**Egypt** (pop. 74 M)	
	N	***%***	***N***	***%***
Telephones - main lines in use (2008)	1,033,000	16	12,011,000	16
Telephones - mobile cellular (2008)	4,828,000	74	41,272,000	56
Internet users (2008)	323,000	5	11,414,000	15
Internet hosts (2009)	11,751	0.2	177,443	0.2

In Egypt, numerous e-learning projects have been launched by a number of government universities since 2002. These projects include initiatives at the Cairo University, a nation-wide Higher Education Enhancement Project funded by the World Bank, UNESCO endorsed open source platform for higher education, and the MEDA and Tempus projects supported by the European Commission Directorate General for Education and Culture (Abdel-Wahab, 2008).

In Tunisia, the e-learning team of the Higher School of Sciences and Techniques of Tunis has worked for several years on designing the first Tunisian e-learning platform called *Waheeb*. *Waheeb* provides a fully integrated student environment, LMS, and a range of tools for custom content creation and publication. Importantly for Libya, *Waheeb* can be used completely in Arabic; it also supports English and French (Chorfi & Jemini, 2002; Rhema & Miliszewska, 2010).

2.7. SUCCESS OF E-LEARNING IN HIGHER EDUCATION

Success, in dictionaries, means the accomplishment of an aim or purpose. The success of a programme can mean meeting the human needs for using such a programme. A large number of research studies have investigated the evaluation of e-learning success; these studies reported that the criteria used for measuring e-learning success are numerous and influence one another (Tzeng, Chiang & Li, 2007).

An e-learning programme is perceived to be successful if it fulfils and satisfies the needs, meets the expectations, and addresses the concerns of its stakeholders

(Clayton, Elliott, Saravani, Greene, & Huntington, 2008; Elliott & Clayton, 2007; Merisotis & Phipps, 1999; Wagner, Hassanein, & Head, 2008). Users (students and instructors) will perceive e-learning as successful if they recognise that it would help them improve their learning and teaching effectiveness and efficiency; their initial perceived satisfaction with e-learning will determine whether they will use the system continually.

Students perceive an e-learning programme to be successful if they:

- have a high degree of flexibility in when and where they participate in Internet-based courses (Arbaugh, 2002; Arbaugh & Duray, 2002; Elliott & Clayton, 2007; McGorry, 2003);
- have convenient access to technical assistance and technical support staff;
- have convenient access to institutional resources that facilitate their completion of the course;
- feel comfortable with the technology (Masrom, 2007; McGorry, 2003);
- have an opportunity to interact with their instructors and other students when and where they need; and,
- are willing to participate in another similarly designed program (McGorry, 2003).

Instructors perceive an e-learning programme to be successful if:

- their students are motivated (Wagner et al., 2008), accomplish assessment tasks, communicate and interact with instructors and other learners, participate in discussion (Liaw, 2008), and successfully complete the e-learning course (Levy, 2007);
- the programme content meets the students' needs; and,
- the institution provides the technical infrastructure and support (Wagner et al., 2008).

2.7.1. Determinants of e-learning success

Attwell (2006) developed a comprehensive framework for evaluating and researching the success of e-learning projects and programmes. The framework includes the following five major clusters of variables: individual learner variables, environmental variables, technology variables, contextual variables and pedagogic variables.

According to Roca, Chiu, and Martinez (2006), e-learning qualities can be grouped into three categories: information quality, system quality, and service quality; they also suggested that the information quality had the most significant influence on users' satisfaction. Selim (2007) identified instructor characteristics, student characteristics, technology, and support as the vital success keys of e-learning. Gil (2008) classified the critical incidents affecting e-learning satisfaction into four groups: administration, functionality, instruction, and interaction; among those groups, interaction and instruction were identified as the most important determinants of effectiveness. On the other hand, Castán and Martínez (2006) focused on services as determinants of excellence in online learning. They identified four types of services:

(1) essential services, comprising teaching-related indicators (the knowledge, experience, teaching capacity of the lecturer; feedback; and the speed and efficacy in solving doubts related to the teaching);

(2) support services (administration services);

(3) complementary services (virtual spaces for student interaction such as forums and discussion groups); and,

(4) user interface services (uploading and downloading of pages, navigation speed, and connections with the virtual campus).

2.7.2. Measures of e-learning success

An important question for institutions is how the success of an e-learning programme is assessed. DeLone and McLean (1992) developed a comprehensive measurement instrument comprising six dimensions: (1) system quality, (2) information quality, (3) use, (4) user satisfaction, (5) individual impact, and (6) organisational impact; this model served as a basis for the development of other subsequent models. In 2003, DeLone and McLean (2003) suggested an amended Information Systems (IS) success model and evaluated its usefulness in light of the dramatic alterations in IS practice, particularly the emergence and consequent explosive growth of Internet-based applications. Their amended model included six measurements: (1) information quality, (2) system quality, (3) service quality, (4) use/intention to use, (5) user satisfaction, and (6) net benefits.

Wang, Wang and Shee (2007) used DeLone and McLean's model to measure e-learning systems' success; they focused mainly on the perspective of the e-learner, and used the six IS success dimensions to develop and validate a measurement model of e-learning systems success. Their instrument provided not only an overall assessment but also had the capability to investigate the aspects of e-learning systems that are most problematic (Wang et al., 2007). Lee and Lee (2008) suggested a modified IS success model considering IS attributes and self-regulated learning attributes to measure e-learning effectiveness; this model is composed of independent variables, perceived usefulness and perceived ease of use of an Learning Management System (LMS), satisfaction with learning content, and interaction between teacher and learner. Samarasinghe and Tretiakov (2009) also developed a multi-dimensional model to measure e-learning system's success; it consisted of four dimensions: (1) system use by learners, (2) learner satisfaction, (3) learning effectiveness, and (4) continuance intention (the intention of learners to continue relying on e-learning components in courses they would take in the future).

Hsieh (2004) suggested that e-learning success evaluation criteria must incorporate learning theories, relative website design, course design, and learning satisfaction theories to form an integrated evaluation model. Masrom (2007) focused on the individual users' acceptance of e-learning as an effective learning tool and identified the perceived usefulness of technology and the perceived ease of use as factors influencing the user's attitude towards using technology. Tzeng and colleagues (2007) reported that the multi-criteria decision making (MCDM) model is a suitable approach for evaluating e-learning success.

Student learning outcomes are often used to measure the success of e-learning programmes. Many researches into the learning outcomes of students found that using technology in learning improves learning outcomes (Song & Bosselman, 2011; Yang, 2009). Kekkonen-Moneta and Moneta (2002) reported that using technology applications such as email and online practice quizzes have resulted in improved learning outcomes.

Learners' satisfaction with e-learning has been used often as a method to measure e-learning success. Several empirical studies have been conducted on students' learning along with student satisfaction (Song & Bosselman, 2011). A comprehensive literature review including technology integration, computer-based communication, and distance education was undertaken by Arbaugh (2000a) for the purpose of understanding five broad factors that may influence student satisfaction with Internet-based courses: perceived usefulness of the course, flexibility, interaction, student experience, and engagement (Arbaugh 2000a, 2000b, 2000c). Levy (2007) stated that "students' satisfaction with e-learning is a significant factor in measuring the effectiveness of e-learning" (p. 189). Song and Bosselman (2011) also identified student satisfaction as a good measure of e-learning success. However, Garrison and Kanuka (2004) pointed out the need for a systematic evaluation of satisfaction and success of the teaching, learning, technology, and administration of new e-learning courses.

2.8. E-LEARNING SUCCESS AS A FUNCTION OF STUDENT AND INSTRUCTOR EXPERIENCES AND PERSPECTIVES

The success of e-learning adoption and implementation depends on a multitude of factors among which, student and instructor experiences and perceptions of e-learning play a major role (Lee, 2010; Mosakhani & Jamporazmey, 2010; Roca & Gagné, 2008; Selim, 2007; Wu, Tennyson, & Hsia, 2010).

2.8.1. Student access to infrastructure

In 2002, a survey was carried out at the Pakistan Virtual University in which 387 undergraduate students in their final year participated. The study concluded that over 90% of the students viewed learning through satellite TV and the Internet as highly beneficial (Hussain, 2007). The Pakistani students held these positive views despite having very limited access to the necessary infrastructure. According to Hussain (2007), most students in the country relied on Internet cafes to meet their online learning needs. However, such facilities were very limited in number; for instance, five of these cafes served in excess of 10,000 people. Consequently, the students participating in the study reported difficulties in accessing computers, suitable learning environments, libraries, and professional mentors. It also emerged from the study that the majority of the students experienced dizziness, headaches and computer vision syndrome due to long periods spent on using the computer in order to make up for the limited accessibility (Hussain, 2007).

Similar infrastructure limitations were reported at Terbuka University in Indonesia following a study that involved over 300,000 students. According to Belawati and Zuhairi (2007), students as well as education systems relied heavily on courier services, post, and telephones for distance learning. At the Bangladesh Open University, a vast majority of distance education students in rural, urban and suburban areas relied for their learning activities on print, face-to-face tutorials, audiocassettes, radio and TV broadcasts (Belawati & Zuhairi, 2007).

Students in the developing countries are increasingly utilising Web 2.0 technologies, mainly blogging, social networking, and email, to share learning information and materials (Sighama, Kalema, & Kekwaletswe, 2012). Requiring only a computer and an Internet connection, these technologies are considered particularly valuable. Apart from computers, Internet enabled mobile devices are also used to access blogs and social networking sites for learning purposes.

2.8.2. Student technical knowledge and skills

Over the last few decades, the use of computing devices in educational institutions in developing countries has increased considerably (Trucano, Hawkins, & Iglesias, 2012). The use of the Internet, computers, and mobile-based technologies has generated a great deal of interest among students, who use them for educational purposes as well as social interactions and entertainment; this at least indicates a degree of familiarity with these technologies and skills for using them (Trucano et al., 2012).

Student skills in the use of the Internet-enabled mobile devices and computers to access blogs, wikis, and social networking sites are on the increase, although most students have limited access to the necessary devices. A good example can be Pakistan which lacks the necessary ICT learning facilities, yet its students show good e-learning skills and knowledge. According to Hussain (2007), students participating in an e-learning study reported high levels of ICT skills but indicated difficulties in accessing ICT facilities.

Al-Wahab and El-Masry (2010) described a positive usage pattern of mobile technologies among South African youths. A 2009 study involving 500 students showed high usage of the Internet and mobile technologies for personal communications, instant messaging, downloading songs, videos and games, as well as searching the Internet. This indicated that the students had the skills and interest in using mobile devices.

2.8.3. Student perceptions of usefulness of technology

Student perceptions of the usefulness of technology-based tools for e-learning vary and can be influenced by variables such as gender, age, previous experience in the use of computers, preferred learning style, and technology acceptance (Tagoe, 2012). However, regardless of these variables, students in developing countries generally view technology-based tools as a great aid in their learning activities. For example, Tagoe (2012) reported that many undergraduate students at the University of Ghana perceived technology-based tools as easy to use and highly useful in their learning activities.

The findings of the research undertaken at the University of Ghana (Tagoe, 2012), were reinforced by the findings of a similar study carried out at the Abant Izzet Baysal University in Turkey (Tekinarslan, 2009). The study involved 741 undergraduate students and investigated their perceptions of self-efficacy, web-based learning, and usability. The participating students reported that the Internet-enabled computers and mobile devices were very useful and convenient as learning tools. Online learning students at the Iran University of Science and Technology also perceived the use of computer and Internet-related technologies as greatly beneficial to their learning (Yaghoubi, Mohammadi, Iravani & Attaran, 2008). The students identified online surfing, data banks, email, and Microsoft Office tools as essential tools for their learning activities.

Generally, students in developing countries perceive technology-based tools as highly useful in many learning aspects. Their strong positive perceptions can be attributed to the wide array of advantages these tools offer (Sighama et al., 2012). Though there are learners whose perceptions are not as positive, they are a clear minority (Yaghoubi et al., 2008). The negative perceptions have been attributed to limited access to the necessary devices and lack of e-learning skills (Sighama et al., 2012).

2.8.4. Student attitudes towards e-learning

University students in developing countries generally have favourable attitudes towards e-learning, and many students believe that e-learning positively impacts their motivation and self-esteem (El-Gamal & El-Aziz, 2011; Nassoura, 2012). Students in Pakistan's Virtual University are motivated towards e-learning and they appreciate the advantages of learning through satellite TV and the Internet (Hussain, 2007). This is echoed in Iran, where student attitudes largely influence the adoption of e-learning in the country (Omidinia et al., 2011).

However, in countries where the learning process and adherence to the traditional practices are inseparable, e-learning is viewed as an interference with the practices that have been valued for generations. A good example of this scenario is Botswana. Despite having taken significant steps towards a Western style economy and urbanisation, the country maintains strong connections to its traditional roots. According to Brown, Thomas, Merwe and Dyk (2011), students in Botswana have negative attitudes towards e-learning because they gain most of their knowledge from their communities and are still strongly embedded in traditional values. Other researchers suggested that the physical separation of the learner from the instructor tends to create a feeling of isolation on the part of the learner leading to negative attitudes (Deb, 2011).

Despite resistance, the attitudes towards e-learning in Botswana and some other developing countries are gradually improving. As Internet enabled mobile devices are becoming more and more popular, so is the range of areas in which they are applied, and this includes e-learning.

2.8.5. Instructor access to infrastructure

In most Sub-Saharan African countries distance education is mostly carried out through print materials and occasional face-to-face sessions. In those countries, insufficient accessibility to ICT infrastructure at most universities limits the

instructors' ability to apply e-technologies to deliver distant education (Nihuka, 2011).

At the Open University of Tanzania (OUT), for instance, student support and course delivery were based on printed materials; this is according to Nihuka (2011), who generalised the scenario to include other higher education institutions in Sub-Saharan Africa that offer distance learning. Instructor access to e-learning infrastructure was very limited, and instructor and student access to mobile phones, CDs and DVDs was below 50%. However, since 2004 the technological infrastructure and access to such infrastructure have improved significantly at OUT. This included the establishment of several computer laboratories at the OUT headquarters and an increased number of Internet connections, particularly through Virtual Private Networks (VPN) (Nihuka, 2011). The OUT instructors gained wide access to a LAN and Voice of Internet Protocol (VoIP). These tools greatly improved the instructors' ability to communicate and interact with students.

In the Middle East region, access to different technologies has improved too. For example, Qatar is developing and expanding its e-learning facilities (ITP, 2008). According to Al-Asmari (2005), all the universities in the Arab Gulf countries provided Internet access for faculty, staff, and students. In addition, most universities in those countries adopted Internet-based LMSs to supplement face-to-face courses (Taha, 2007). According to Gasaymeh (2009), instructors at two Jordanian public universities reported high level of access to computers and the Internet; the universities had several computer laboratories and all computers in these laboratories were connected to the internet.

Generally, it can be noted that instructor accessibility to infrastructure and Web 2.0 technologies in developing countries varies; it continues to improve thanks to national efforts to integrate technology into the education systems.

2.8.6. Instructor technical knowledge and skills

Developing countries are in the process of implementing ICT policies and enhancing skills and competence in using technology-based tools are among the chief objectives of these policies. While instructors are expected to play a key role in the implementation of the ICT policies, presently only a small proportion of instructors have sufficient knowledge and skills to use e-learning tools (Nihuka, 2011). In this context, mobile learning appears to be an exception. The increasing accessibility of mobile devices in developing countries has been accompanied by the development of skills that have enabled instructors to apply them with ease in their teaching; the use of mobile devices does not require advanced skills or expertise, and the necessary skills are easy to learn.

While the up-skilling of instructors in the use of ICT for teaching and learning is progressing in developing countries, most of the instructors are yet to experience the full capacity of e-learning tools which, in turn, limits their opportunities to develop a wide range of e-learning skills. Nihuka (2011) noted that the use of ICT by instructors in educational institutions does not necessarily imply its use for teaching and learning. For instance, in Sub-Saharan African countries the main purposes for which ICT infrastructure is used by instructors are administrative tasks rather than the delivery of education to students (Nihuka, 2011).

2.8.7. Instructor perceptions of usefulness of technology

Instructor perceptions are influenced by the quality of their experiences with technology-based tools. Various factors, positive as well as negative, can determine if instructors will perceive ICTs to be useful in their teaching activities. The positive factors include the belief that ICTs will: make lessons more interesting, improve the presentation of lesson materials, create a feeling of prestige, increase student confidence, make lessons more enjoyable, and make administrative tasks more efficient. The negative factors include the belief that ICTs will: make lessons more difficult and less fun, reduce student motivation,

impair student learning, restrict lesson content, and consume too much time for lesson preparation (Nihuka, 2011).

Generally, the instructors perceive as useful the use of computer, and web-based and mobile-based technologies in their interactions with students; the increasing adoption of e-learning tools for delivering course materials confirms their positive perceptions of the usefulness of these tools (Buabeng-Andoh, 2012). Instructors at the Open University of Tanzania perceive e-learning as a method of facilitating teaching and the delivery of educational content, as well as fostering global participation (Nihuka, 2011).

Lack of sufficient competence, skills, and experience has been noted as a factor that leads to negative perceptions among instructors. Instructors who lack the necessary skills are likely to perceive ICTs as complicated, difficult, and ineffective (Selim, 2007). Nihuka (2011) further stated that the infrastructural limitations of the developing countries make instructors perceive technology-based tools as unreliable and inadequate for their teaching activities.

Consequently, perceptions of the usefulness of e-learning technologies for teaching vary among various groups of instructors. Importantly, those who have sufficient experience, knowledge and skills perceive e-learning as an essential element in the educational systems of the developing countries.

2.8.8. Instructor attitudes towards e-learning

Attitudes are often regarded as an important determinant of driving a positive change. According to a research study conducted in Jordan by Gasaymeh (2009), the most important factors influencing instructor attitudes were their perceived value of Internet-based distance education, the level of computer and Internet access, the level of institutional support, their readiness for time commitments required for Internet-based distance education, and their level of computer and

Internet skills. Instructors skilled at using e-learning are likely to have a favourable attitude (Selim, 2007).

According to Adeyinka, Adedeji, Toyobo, Adika and Adeyinka (2007), various developing countries are taking steps to improve attitudes towards technology use among instructors in educational institutions. They note that unfavourable attitudes towards technologies stem largely from the lack of knowledge and expertise pertinent to their use. They state that without such expertise and knowledge, it is more difficult for the instructors to evaluate how ICTs are used and the role they play in teaching. As a result, instructor confidence and readiness to use ICTs are hindered. Thus, increasing instructor training can help reform their attitudes towards the use of ICTs for teaching and administrative tasks (Adeyinka et al., 2007; Fu, 2013).

2.9. CONCLUSION

E-learning is rapidly becoming an essential method of delivering education thanks to the proliferation of ICTs; even traditional education systems in developing countries have started shifting towards new methods of teaching and learning. In many developing nations, including Libya, e-learning remains an unexplored entity which has prompted research studies to illuminate e-learning developments.

The literature review presented in this Chapter outlined and discussed the context of ICT and e-learning in higher education in developing countries and in Libya. The literature on student and instructor experiences and perceptions of e-learning indicated that high levels of satisfaction and positive attitudes towards e-learning tend to contribute to e-learning success.

Numerous studies have focused on determining the individual, course, contextual and technological challenges of the adaptation of ICT and e-learning in developing countries. Literature sources dealing with students' and instructors' experiences of e-learning revealed satisfactory level of quality learning/teaching

for both groups. Research related to students' and instructors' perceptions has focused on determining their level of satisfaction and attitudes. It has been suggested that a high level of satisfactory and positive attitude towards ICT and e-learning among all concerned parties are often considered to be the main factors contributing to e-learning effectiveness.

Chapter 3 presents the methodology and research design and discusses the approaches used to generate data on student and instructor experiences and perceptions of e-learning used in this study.

Chapter 3

METHODOLOGY

3.1. INTRODUCTION

Chapter 2 presented a review of literature pertinent to the current study. It provided an overview of higher education context in Libya and other developing countries and discussed the state of e-learning in those countries. This chapter presents the methodological approaches used in this research. Section 3.2 describes the research design; Section 3.3 identifies the participants and settings; Section 3.4 describes the data collection instruments and strategies used in this study; Section 3.5 covers ethical considerations associated with data collection; Section 3.6 describes the methods used for data analysis; and, Section 3.7 summarises the main points of the chapter.

3.2. RESEARCH DESIGN

A mixed methods approach was used as the primary research design in this study. Several definitions for mixed methods have been proposed in the literature. According to early adopters of mixed methods, Greene, Caracelli and Graham (1989), mixed methods designs are “those that include at least one quantitative method (designed to collect numbers) and one qualitative method (designed to collect words)…” (p. 256).

Creswell (2009) discussed the most important aspects that influence the design of a mixed methods study. These aspects are presented and explained in Table 3.1.

Table 3.1. Aspects influencing the design of a mixed methods study (adapted from Creswell, 2009, p. 207).

<table>
<tr><th>Timing</th><th>Weighting</th><th>Mixing</th><th>Theorising</th></tr>
<tr><td>No sequence concurrent

(qualitative and quantitative data gathered at the same time)</td><td>Equal

(equal emphasis on qualitative and quantitative data)</td><td>Integrating

(merging the quantitative and quantitative data)</td><td rowspan="2">Explicit

(guiding theories are made explicit)</td></tr>
<tr><td>Sequential Qualitative first

(data collected in phases – qualitative first)</td><td>Qualitative

(the emphasis is on qualitative data)</td><td>Connecting

(the quantitative and qualitative research are connected between a data analysis of the first phase of research and the data collection of the second phase of research)</td></tr>
<tr><td>Sequential Quantitative first

(data collected in phases – quantitative first)</td><td>Quantitative

(the emphasis is on quantitative data)</td><td>Embedding

(a secondary form of data is embedded within a larger study having a different form of data)</td><td>Implicit

(guiding theories are made implicit)</td></tr>
</table>

Following Creswell's classification of mixed methods strategies, this research study employed *a sequential explanatory design*. In this type of design, findings from the initial data collection phase inform the subsequent phase of the enquiry. The first phase of this study involved the collection and analysis of quantitative data, followed by the collection and analysis of qualitative data in the second phase. The design of this study is illustrated in Figure 3.1; the capitalised entries for the quantitative phase (QUAN) indicate the emphasis on the quantitative rather than qualitative (qual) data.

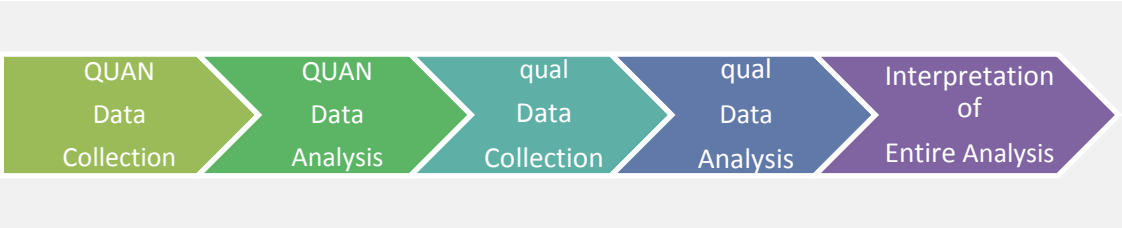

Figure 3.1. Visual representation of a sequential explanatory design.

The quantitative phase of the research was based on a cross-sectional survey – data was collected from participants at a single point in time to assess how their experiences with technology-based learning correlated with their attitudes and perceptions of e-learning.

The analyses of survey results were followed up by short phone interviews conducted with one type of participants (instructors) only. The interviews enabled further exploration of issues related to the integration of technology into teaching and learning.

Chute, Thompson and Hancock (1999) stated that qualitative research facilitates the exploration of a specific purpose as deeply as possible. Thus, the number of interviewees is smaller and interviews are less formally controlled. Interviews "allow greater spontaneity and adaptation of the interaction between the researcher and the study participant" (Mack, Woodsong, MacQueen, Guest, & Namey, 2005, p. 4); they generally involve open-ended questions that help elicit meaningful insights. Participants can use natural language to express themselves so that in-depth information may be gathered directly from their own words (Cohen, Manion, & Morrison, 2000).

3.3. PARTICIPANTS AND SETTINGS

Participants in this research study were students and instructors from four engineering departments in two Libyan higher education institutions, the University of Tripoli and the University of Al-Jabal Al-Gharbi. Table 3.2 provides

general information about the participating departments including student and instructor population as at 2013 (sourced from the respective university websites).

Table 3.2. Characteristics of participating institutions.

	University of Tripoli		University of Al-Jabal Al-Gharbi	
Location	Urban		Regional	
Established	1957		1985	
Student population	115,000		20,000	
Instructor population	1,800		1,000	
	Faculty of Engineering		Faculty of Engineering	
Established	1961		1991	
Student population	8,500		1,300	
Instructor population	300		100	
	Group A Elec. Eng.	Group B Petr. Eng.	Group C Elec. Eng.	Group D Petr. Eng.
Established	1961	1970	1991	2004
Student population	1,200	700	150	160
Instructor population	80	12	20	13

The choice of participants from the engineering departments was based on the need for the respondents to have experienced using ICT for learning and teaching. In the Libyan context, engineering students and instructors are generally regarded as the most frequent and advanced users of technology and their views were considered to be particularly valuable.

3.3.1. University of Tripoli

University of Tripoli, located in the capital city, Tripoli, was established in 1957. It is a government-funded university, and one of the oldest and largest universities in Libya. The University was renamed to Al-Fateh University in 1976. After the battle of Tripoli and the downfall of the Gaddafi government in 2011, the University returned to its original name. The University offers qualifications in the disciplines of engineering and science, agriculture, education, medical science, accounting, economics, management, information systems, law, languages, social science, political science, Arabic and Islamic studies, and arts and media.

Throughout 2011, the escalation of the armed conflict in Libya has impeded the provision of educational services at the University. The conflict has resulted in extended closures of campuses, displacement of students and instructors, and destruction of educational infrastructure and equipment.

The Faculty of Engineering was established in 1961 with the assistance of UNESCO (Tripoli University Website, 2011; Wikipedia, 2013); it was the first engineering faculty in Libya. The Faculty offers qualifications in various engineering disciplines including: civil, mechanical and industrial, electrical and electronics, architecture, petroleum, chemical, geological, mining, aerospace, nuclear, metallurgical, computer, marine, and management engineering.

Department of Electrical and Electronic Engineering (Group A)

Established in 1961, the Department of Electrical and Electronic Engineering is the oldest department of the Faculty of Engineering. As one of the leading departments in the Faculty, the Department has contributed to the preparation of the necessary engineering workforce and provided important scientific and advisory services to the Libyan industry and community.

Department of Petroleum Engineering (Group B)

The Department of Petroleum Engineering, founded in 1970, offers courses in oil exploration, oil and natural gas processing, and environment and safety controls in oil industry. The Department focuses on producing graduate engineers for various areas of the Libyan petroleum industry. Since the petroleum industry has increasingly dominated the whole economy, and the development of Libya has been greatly dependent on the oil sector, the Libyan government has heavily invested in the sector including training centres and petroleum institutes. Through government support, the Department of Petroleum Engineering owns a suite of fully-equipped laboratories which support both theoretical and practical disciplines.

3.3.2. University of Al-Jabal Al-Gharbi

The University of Al-Jabal Al-Gharbi is located almost 100km southwest of the capital Tripoli. Established in 1985 as a branch of 7th April University in Zawia, it became an independent university in 2004. It is a government-funded university and one of the biggest regional universities in Libya. The University includes several faculties (located in different cities in the state of Al-Jabal Al-Gharbi) and each faculty is divided into several departments. The University provides courses in the disciplines of engineering, medical science, accounting, economics, management, information systems, law, languages, arts and media, social science, political science, and Arabic and Islamic studies.

In 2010, Al-Jabal Al-Gharbi University engaged in collaboration with Salford University in the United Kingdom in order to bring radical improvements in the field of education and curriculum development (Al-Jabal Al-Gharbi University Website, 2011). However, the 2011 armed conflict in Libya hindered the operation and progress of the University and resulted in attrition of students and instructors, extended closures of campuses, and destruction of educational infrastructure.

The Faculty of Engineering was established in 1991 in the city of Jado, and moved to the city of Gharian in 1999. The Faculty offers undergraduate qualifications in various engineering disciplines including electrical and electronic, petroleum, civil, mechanical and industrial, and geological engineering; postgraduate qualifications are offered only in electrical and mechanical engineering.

Department of Electrical and Electronic Engineering (Group C)

Established in 1991, the Department of Electrical and Electronic Engineering is the heart of the Faculty of Engineering. The Department aspires to serve the industry, the profession, and the community at large, and to gain regional and

international recognition through providing quality engineering education, carrying out research programs, and providing exceptional community service.

Department of Petroleum Engineering (Group D)

The Department of Petroleum Engineering, founded in 2004, offers courses in oil exploration, oil and natural gas processing, and environment and safety controls in oil industry. The Department focuses on producing graduate engineers for various areas of the Libyan petroleum industry. It aims to build good scientific relationships with many research centres and institutes to enable practical work experience for students. The Department conducts research associated with the extraction of natural resources, and plays a leading role in providing and applying modern technologies aimed at increasing the petroleum reserves of Libya.

3.4. DATA COLLECTION INSTRUMENTS AND STRATEGIES

A paper-based survey questionnaire was the primary data collection instrument used in this study. Surveys are considered to be an economical, reasonable and trustworthy method for collecting data from a large number of individuals who all respond to identical questions; survey administration can be managed in person or mailed, if the researcher is far from the participants (Cohen et al., 2000).

A self-completion questionnaire was selected as the most appropriate instrument for this study for the instrument's simplicity and to enable the collection of data in a relatively quick and inexpensive manner (Mishra & Panda, 2007). The fixed-alternative format of such an instrument gives the respondents specific alternative responses enabling them to choose the one closest to their own point of view. These types of questions are easier for respondents to answer than open-ended types. The standardisation of alternative responses enables comparability of answers, which in turn facilitates statistical analysis and interpretation of data (Sampson, 2003). Data collected through questionnaires is likely to be more uniform and accurate than that obtained by other methods such as interviews. The participants complete the questionnaires under the condition of anonymity, hence

providing more honest and direct replies (Seliger & Shohamy, 2000). However, this method of data collection requires the gathering of large samples which might be logistically challenging, particularly if participants reside in other countries.

3.4.1. Survey design

In this study, questionnaires for students and instructors contained closed multiple-choice questions and several open-ended questions. The multiple choice questions, measured on a 5-point Likert scale, invited the participants to rate their level of agreement with various statements, while the open-ended (qualitative) questions enabled the participants to provide more detailed information and additional comments.

Questions in the survey instruments were grouped in eight sections (Appendices B and C):

- Section 1, 'Demographics', collected data about participants' demographic characteristics.

- Section 2, 'Access to Technology', asked questions pertaining to the participants' level of access to different types of technologies (mobile phones, computers, memory sticks, digital cameras, video (3G), web cam and the Internet) outside of the university campus.

- Section 3, 'Use of Technology', provided participants with a list of technology based tools (computer-based technology, web-based technology, and mobile-based technology) that might be used in their university studies/teaching or daily life. The participants were asked to indicate how they used various technologies and rate their level of skill in these technologies. In particular, they were asked to indicate if they had used these technologies for 'learning/teaching purposes', 'other purposes' (e.g. entertainment), or both. If participants did not know a technology, they could choose the answer 'do not know this technology'. If they were

familiar with the technology, they could use a rating scale (from "1" *'not skilled at all'*; to "5" *'very skilled'*) to indicate their level of skill.

- Section 4, 'Perceived Usefulness of Technology in Learning', provided participants with a list of various technology-based tools that might be useful in their learning/ teaching. Participants were asked to use a rating scale (from "1" *'strongly disagree'* to "5" *'strongly agree'*, and "6" for *'do not know'*) to indicate the degree of usefulness of these tools to support their learning/teaching. In addition, participants were asked to list three ways in which the technologies they used in everyday life could help them in their learning/teaching.

- Section 5, 'Challenges of ICT and e-Learning Practice', asked participants to list the challenges that they faced as students or instructors when using ICT and e-learning.

- Section 6, 'Technological Characteristics and Technical Support', asked participants to rate the technological characteristics and technical support available in their institution. The participants were requested to rate the provided statements using a rating scale (from "1" *'very poor'* to "5" *'very good'*) to indicate their level of satisfaction with technology.

- Section 7, 'Attitude towards ICT and E-learning', consisted of positive statements to determine participants' attitudes towards ICT and e-learning. The respondents were asked to use a rating scale (from "1" *'strongly disagree'* to "5" *'strongly agree'*) to indicate their perceived attitudes towards ICT and e-learning in learning/teaching.

- The final section, Section 8, asked participants to add any additional comments.

An extensive search was conducted to find a valid/published survey. Questions of the surveys used in this study were developed from different published studies. Sections 2, 3, and 4 of the survey were adapted from a published survey developed by researchers in the Centre for Studies in Higher Education (CSHE) and the Biomedical Multimedia Unit at the University of Melbourne (Kennedy et al., 2008). This survey was used also by the Centre for Innovation in Learning and Teaching at Victoria University in a pilot project, conducted to obtain empirical data regarding first year students' access to, and use of, technology (Sztendur & Milne, 2009).

Section 5 of the survey comprised one open-ended question developed by the researcher. Section 6 was adapted from a published survey called the Teleconference Evaluation Questionnaire (TEQ), which measured student satisfaction with technology (Biner, 1993). Lastly, the researcher developed Section 7 from a number tools used in studies investigating teacher attitudes towards ICT and e-learning (Gasaymeh, 2009; Mishra & Panda, 2007).

3.4.2. Sample size requirements

The number of surveys to be distributed was calculated using Cochran's correction formula for categorical data (Bartlett, Kotrlik, & Higgins, 2001; Cochran, 1977):

$$n_1 = \frac{n_0}{1 + n_0/\text{Population}}$$

where:

n_0 = required return sample size according to Cochran's formula
n_1 = required return sample size because sample $> 5\%$ of $population.$

Table 3.3 presents sample size requirements for given populations of participating students, assuming an alpha level of 0.05 and the margin of error of 0.05

(recommended for categorical data, Krejcie & Morgan, 1970). Table 3.4 presents sample size requirements for given population sizes of participating instructors.

Table 3.3. Students – minimum sample size for a given population size for categorical data (margin of error = 0.05, alpha = 0.05)

University	Group	Population size	Minimum sample size	Sample size adjusted for return rate of 50%
Tripoli	Group A, Elec. Eng.	1150	288	576
	Group B, Petr. Eng.	712	250	500
Al-Jabal Al-Gharbi	Group C, Elec. Eng.	151	109	151*
	Group D, Petr. Eng.	160	113	160*

*Truncated at the population size.

Table 3.4. Instructors – minimum sample size for a given population size for categorical data (margin of error = 0.05, alpha = 0.05)

University	Group	Population size	Minimum sample size	Sample size adjusted for return rate of 50%
Tripoli	Group A, Elec. Eng.	81	67	81*
	Group B, Petr. Eng.	12	12	12*
Al-Jabal Al-Gharbi	Group C, Elec. Eng.	19	19	19*
	Group D, Petr. Eng.	13	13*	13*

*Truncated at the population size.

3.4.3. Pilot survey

Piloting a survey is essential to verify the respondents' understanding of the survey questions. A pilot survey is a minor scale methodological test that provides an opportunity to check the design of the survey and make adjustments before conducting the actual study (Curwin & Slater, 2008; Teijlingen & Hundley, 2001). Pilot surveys can assist in confirming the clarity of items, layout, and instructions, and the suitability of response categories for closed questions (Cohen et al., 2000; Robson, 2002).

A pilot of the surveys used in this study was conducted with several engineering students and instructors from the University of Al-Jabal Al-Gharbi in Libya. The surveys were translated from English to Arabic to ensure that the participants would fully understand the survey questions. The final Arabic version was reviewed by another native Arabic speaker. This step was crucial as the intended participants of this research study had a limited command of English.

The researcher's contact at the University of Al-Jabal Al-Gharbi has volunteered to facilitate the data collection for the study, including the pilot survey. Data from the pilot survey was collected over a period of two weeks in February 2011. An email with soft copies of the student and instructor surveys was sent out to the data collection facilitator. The facilitator printed out the surveys and handed them out to 20 students and 10 instructors. A total number of 15 student responses and 5 instructor responses were collected (a response rate of 67%).

The respondents' feedback helped to improve the quality of the surveys in terms of the content and comprehensibility of the scales. For example, referring to available answers, an amendment was required in Section 3 ('Use of Technology'/ إستخدام التكنولوجيا) of both surveys, as the majority of participants did not respond to several questions in this section. Upon review, a new option, *'I do not know this technology'*, was included.

The pilot survey also enabled improvements to the Arabic version of the questionnaires. In translating the survey from English to Arabic, the researcher endeavoured to select expressions in Arabic which best represented the intended English meaning and applied to the local Libyan context. However, the pilot survey helped to reveal some translational shortcomings. For example, the term "I believe / أؤمن" used in Section 7 ('Attitude towards ICT and e-learning'/ موقفك اتجاه تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني), was translated verbatim, without paying special attention to the selection of an appropriate choice. One of the respondents suggested that this Arabic term in the Libyan culture was mostly used

in a religious context, and that the term "I believe/ أثق" should be used instead; the survey was amended accordingly.

3.4.4. Survey validity and reliability

Validity and *reliability* are considered two vital criteria and fundamental measurements to evaluate the quality of a survey instrument (Cohen et al., 2000; Merriam, 2001).

Validity

Measurement validity refers to the extent to which an instrument measures what it is intended to measure. Validity places an emphasis on the objective of an instrument and the ability of the researcher to make inferences from the collected measurements. Any one test may have many forms of validity; however, *content validity* is particularly important form the research point of view (DeVellis, 2012; Knapp, & Mueller, 2010). Content validity concerns the appropriateness of the content of an instrument (questions) to obtain the required information. It calls for the questionnaire to be free from items that are irrelevant to the purpose of measurement. Content validity is most often determined on the basis of expert judgement (Mertens, 1999). In this study, the instrument items were reviewed by two researchers with domain expertise and knowledge of the cultural context.

Another form of validity that deserves mention in the context of this research is *external validity*, which refers to the extent to which the results of a study can be *generalised* to another study. According to Martens (1998), if the "findings from one study are observed in another situation, the results are said to be generalizable or externally valid" (p. 67). Determining external validity for an instrument follows directly from sampling, as a sample should be an accurate representation of a population. In this study, the use of non-random samples limited the generalisability of the findings.

Reliability

Reliability is the extent to which tests elicit consistent responses (Ary, Jacobs, & Razavieh, 1990; de Vaus, 2002; Miller, n.d.). Reliability is directly related to the validity of the measure (as shown in Figure 3.2). It is important to note that a test can be considered reliable but not valid. Generally, validity is considered more important than reliability, although the most useful instruments are both valid and reliable.

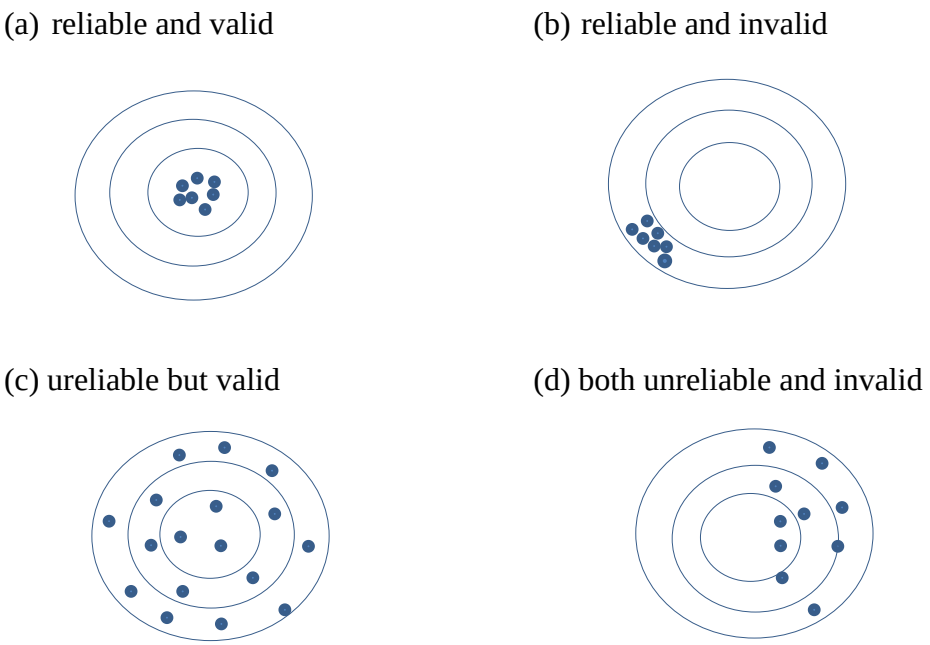

Figure 3.2. The relationship between reliability and validity (sourced from de Vaus, 2002, p. 26).

Cronbach's Alpha (α) is the most commonly applied statistical index used to measure the internal consistency reliability (Aron, Aron & Coups, 2005). The index can be used for scales with items that are dichotomous (yes/no), or for scales with more than two response choices, for example Likert scales. As with other correlation statistics, Alpha coefficient ranges in value from 0 to 1 and the higher the value of the index, the more reliable the generated scale. A minimum recommended standard of Cronbach's alpha is 0.7 and preferably closer to 0.9 (Aron et al., 2005; Hair, Black, Babin, Anderson, & Tatham, 2006).

The reliability of the quantitative data in this study was determined by finding Cronbach's Alpha of the pilot survey data using IBM SPSS v. 21. The reliability results for the pilot survey are presented in Table 3.5.

Table 3.5. Reliability of pilot survey – assessment of Cronbach's Alpha.

Scale	Number of survey items	Cronbach's Alpha
Access to technology	10	0.75
Use of and skill in technology	25	0.93
Usefulness of technology	22	0.89
Satisfaction with technology	9	0.86
Attitude towards technology	8	0.86

3.4.5. Survey data collection

An email with soft copies of student and instructor surveys was sent out to data collection facilitator in Libya. The facilitator first distributed letters of invitation to participate in the survey to all students and instructors in the selected departments. The facilitator printed out 800 student surveys and 125 instructor surveys, and handed them out to a total number of 925 participants in December 2011 (shortly after the cessation of the armed conflict in Libya). Participants were informed in writing of the purpose of the research, conditions of participation, and that their decision to complete the questionnaire signified agreement to participate (Appendix A).

Data was collected in 2011/2012. Participants were asked to either fill out the questionnaire during class time, or return it later to a provided collection box. The survey took approximately twenty minutes to complete. A total number of 348 surveys from students and 43 from instructors were received (response rates of 44% and 34%, respectively), as presented in Table 3.6.

Table 3.6. Usable survey numbers in the selected programmes.

University	Group	Number of student surveys	Number of instructor surveys
Tripoli	Group A, Elec. Eng.	125	24
	Group B, Petr. Eng.	105	6
Al-Jabal Al-Gharbi	Group C, Elec. Eng.	45	7
	Group D, Petr. Eng.	73	6

3.4.6. Interviews

Following the analysis of survey results, short phone interviews were conducted with instructors to obtain a deeper understanding and elaboration of issues arising from survey responses. To ensure that instructors in Libya would completely understand the interview questions, the interview questions were translated from English to Arabic (see Appendix G), and the interviews were conducted in Arabic.

Instructors who had completed the survey were invited to participate in the interviews; only six instructors accepted the invitation. Instructors who agreed to be interviewed were asked to email the researcher directly to set-up a mutually convenient time to conduct the interview. A consent form (Appendix E), translated into Arabic, was emailed to the instructors with a request to return via email a signed copy of the form before the interview. The researcher conducted the interviews herself to be able to monitor the key themes and identify any problems if such emerged. She took notes in Arabic to best capture the respondents' answers, and then translated the Arabic answers into English.

3.5. ETHICAL CONSIDERATION

Permission was obtained from the Human Research Committee at Victoria University to conduct this research; requisite approvals from the participating Libyan universities were obtained as part of the Ethics application. A copy of the approval letter is provided in Appendix H.

Participants were informed in writing of the purpose and duration of the research and the benefits of participation. They were assured of the confidentiality of their responses and their right to withdraw from the research at any point. An explanation of whom to contact for answers to pertinent questions about the research and a statement that participation was voluntary were also included. All forms with information to participants, as well as consent forms, were provided in English and in Arabic (Appendices A, D, and E).

Transcriptions of the phone interviews were assigned codes to de-identify interview participants. Ensuring anonymity was a priority, given the sometimes sensitive nature of individual opinions and beliefs about particular subjects, and the researcher's interest to extract complete and honest information.

3.6. DATA ANALYSIS PROCEDURES

The quantitative data from the surveys was analysed using IBM SPSS v. 21. Descriptive statistics were used to summarise and describe the data collected from the respondents in the four participating groups. Several statistical models were developed to relate the response variables to a number of student demographics. In addition, Pearson Product Moment correlations were used to examine the relationships between the dependent variable and independent variables that were measured on an interval scale.

3.6.1. Multiple linear regression model

For response variables measured on an interval scale, a multiple linear regression model was used:

$$y_i = \beta_0 + \beta_1 x_{1i} + \cdots + \beta_{ki} x \quad + \varepsilon_i$$

where

y_i = response variable for the ith respondent
x_{ji} = jth explanatory variable for the ith respondent
ε_i = random error for the ith respondent, assumed to be Normally distributed with mean 0 and variance σ^2
β_0 = Intercept, the expected value of y when all the explanatory variables are 0
β_j = The regression coefficient for the jth variable, the expected increase in y for a unit increase in the jth explanatory variable, holding all other variables constant.

In this study, the explanatory variables were represented as dummy variables. For example, Gender had two levels Male and Female and the explanatory variable for Gender was given as:

$$x_1 = \begin{cases} 0 & \text{if participant is a Female} \\ 1 & \text{if participant is a Male} \end{cases}$$

The regression coefficient for Gender, β_1, represented the expected increase in the response for Male participants as compared to Female participants. A positive coefficient meant that Male participants provided higher responses than Female participants. A negative coefficient indicated that Male participants gave lower responses than Female participants.

Another variable used in the regression modelling was the Group, i.e. A, B, C, or D. In this case three dummy variables were formed as follows:

$Group$	x_2	x_3	x_3
A	0	0	0
B	1	0	0
C	0	1	0
D	0	0	1

The regression coefficient for x_2 was the difference in the expected response between the participants in Group B as compared to the participants in Group A; the regression coefficient for x_3 was the difference in the expected response between the participants in Group C as compared to Group A; and the regression

coefficient for x_4 represented the difference in the expected response between Group D and Group A.

The regression models were fitted using IBM SPSS Statistics (Version 21). Besides the estimated regression coefficients, the program provided standard errors, so that statistical significance could be assessed, as well as diagnostic plots to assess the validity of the model assumptions.

In addition, the Adjusted R-squared was used to assess the goodness of fit of the multiple linear regression models; it examined how well the models fitted the data. The Adjusted R-squared represents the proportion of the dependent variable (*Y*) variance, which is accounted by the linear combination of the independent variables (X_1, X_2, ..., X_k) (Stevens, 1990). The Adjusted R-squared increases only if the independent variables improve the model more than would be expected by chance. R-squared on the other hand provides a useful summary of the proportion of the variation in a data set explained by a regression.

$$R_a^2 = 1 - (1 - R^2)\left(\frac{n-1}{n-p}\right),$$

where *n* is the number of parameters and $n-p$ is the number of residual degrees of freedom (Bingham & Fry, 2010).

3.6.2. Binary logistic regression model

For dichotomous (binary) responses, logistic regression models were used to examine the relationship between a number of response variables and a set of explanatory variables $X_1 \ldots X_k$. The binary responses in this study represented student use of various technology tools for learning, expressed as two values coded numerically as 0 (*not used for learning*) and 1 (*used for learning*).

Letting probability of success (used for learning) be *p(x) = P(Y = 1 | X = x) = 1 - P(Y = 0 | X = x)*, the logistic regression model is:

$$p(x) = \frac{\exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k)}{1 = \exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k)},$$

or equivalently:

$$\text{logit}[p(x)] = \log\left(\frac{p(x)}{1 - p(x)}\right) = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k,$$

(Agresti, 2002).

Dummy variables on the left hand side of the equation were set up similarly to those for multiple linear regression. However, the interpretation of the regression coefficients was different.

In general, the odds of the dependent variable taking the value of 1, as compared to taking the value of 0 is defined to be:

$$\frac{p(\boldsymbol{x})}{1 - p(\boldsymbol{x})}$$

where **x** is the vector of explanatory variables and the log of the odds is:

$$\log\left(\frac{p(\boldsymbol{x})}{1 - p(\boldsymbol{x})}\right).$$

If x_j increases by one unit, then the log of the odds increases by β_j. Equivalently, the odds is multiplied by $\exp(\beta_j)$. For example, if the coefficient for Gender was $\beta_j = 0.7$, then the odds would be $\exp(\beta_j) \approx 2$, indicating that Males were "twice as likely" to experience an event as Females.

3.6.3. Proportional-odds model

For ordinal responses, a proportional-odds model was used to determine what demographic characteristics of students were associated with the response variable. In this study access to technology was measured on the ordinal scale.

For each technology, separate models were developed, using:

$$\text{logit}\, P(Y \le k \mid x) = \zeta_k - \eta,$$

where the logit transformation:

$$\text{logit}[p(x)] = \log\left(\frac{p(x)}{1-p(x)}\right)$$

ensures the estimated probabilities lie between 0 and 1; *Y* is the response variable with *K* levels, 1,2,…, K; ***x*** is the vector of explanatory variables; ζ_k (pronounced `zeta'), *with* $\zeta_0 = -\infty < \zeta_1 < \ldots < \zeta_K = \infty$, are *estimated thresholds*, discussed below; and η (pronounced 'eta') is the estimated linear predictor of the explanatory variables, $\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k$ (Venables & Ripley, 2002, pp. 204-205).

One way to think about the model is to imagine that there is an unobserved (or latent) response variable for each student. If this response variable for a particular student is less than ζ_1, then the students selects the first response category; if the response variable is between ζ_1 and ζ_2, then the student selects the second response category; and so on. If the response variable is above ζ_K, then the student selects the highest response category. Technically, the distribution of the latent variable follows a standard logistic distribution, which is almost the same as a normal distribution but with a standard deviation of 1.6.

In this study, dummy variables on the right hand side of the equation were set up similarly to those of the multiple linear regression and binary logistic regression models discussed in Section 3.6.1 and Section 3.6.2. If the *j*th explanatory variable increased by one unit then the odds of being in a higher category is multiplied by $\exp(\beta_j)$.

3.6.4. Interpreting the models

Line Graphs were used to fully understand relationships between dependent and independent variables. Predicted values of dependent variables were plotted against levels of independent variables to illustrate the patterns of significant relationships depicted by statistical models.

3.6.5. Analysis and interpretation of qualitative data

Full interview transcripts were analysed in Arabic, the findings were translated to English, and the translation reviewed by the researcher and a native Arabic speaker. It is argued that there are distinct advantages working in the original language and only translating the relatively few chosen passages into English (Vallance & Lee, 2005). Translation of transcripts to English is costly and time consuming, and meaning is easily distorted in translation (Smith, Chen & Liu, 2008; Tsai et al., 2004). Furthermore, the grammatical structure of Arabic differs substantially from that of the English language, which means that the narrative of an interview might not be reflected accurately. In addition, there are words in Arabic for which there is no direct English translation, and other words that can carry several different meanings, rendering the translation task particularly difficult.

Qualitative data can be analysed by browsing, highlighting, coding, developing categories and reducing the information to a meaningful analysis (Creswell, 2005). In this study, interview transcripts were coded and analysed manually. The data was reduced to themes and then interpreted.

3.7. CONCLUSION

This mainly quantitative study utilised a survey methodology to understand the experiences and perceptions of ICT and e-learning of university students and instructors in two Libyan universities; the survey was supplemented by short

phone interviews with instructors. Quantitative data was analysed using descriptive statistics, regression analysis (binary logistic, ordinal, and multiple regression models), and correlation analysis. Qualitative data, collected from open-ended questions and phone interviews, was analysed using hand coding.

The findings of this research study are presented in the following chapter (Chapter 4).

Chapter 4

STUDENT AND INSTRUCTOR EXPERIENCES AND PERCEPTIONS

4.1. INTRODUCTION

Chapter 3 described methods used to generate data on student and instructor experiences and perceptions with respect to ICT and e-learning. This chapter goes on to present a synthesis of the corresponding data collected from students and instructors at two Libyan universities: the urban University of Tripoli, and the regional University of Al-Jabal Al-Gharbi. Section 4.2 describes participant demographics. The following sections present descriptive analyses of student and instructor responses in relation to: participant access to different types of technologies (Section 4.3); the purpose of use of various technologies and the participants' level of skill in these technologies (Section 4.4); the usefulness of technology in learning/teaching (Section 4.5); satisfaction with the available ICT environment (Section 4.6); attitudes and beliefs towards ICT and e-learning (Section 4.7); and, challenges faced by participants when using ICT and e-learning (Section 4.8). Finally, Section 4.9 summarises the chapter.

4.2. PARTICIPANT DEMOGRAPHICS

Table 4.1. Demographic characteristics of participating students.

	University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
Demographic	Group A Elec. Eng. *N*=125 *n (%)*	Group B Petr. Eng. *N*=105 *n (%)*	Group C Elec. Eng. *N*=45 *n (%)*	Group D Petr. Eng. *N*=73 *n (%)*
Gender				
Female	77 (62)	49 (47)	21 (47)	56 (77)
Male	48 (38)	56 (53)	24 (53)	17 (23)
Age				
18 - 20	20 (16)	11 (11)	9 (20)	28 (38)
21 - 22	46 (37)	32 (30)	20 (44)	24 (33)
≥ 23	59 (47)	62 (59)	16 (36)	21 (29)
Study Year				
1	9 (7)	13 (12)	4 (9)	17 (23)
2	13 (10)	7 (7)	17 (38)	24 (33)
3	41 (33)	40 (38)	12 (27)	12 (16)
≥ 4	62 (50)	45 (43)	12 (26)	20 (28)

As presented in Table 4.1, the number of participating urban students was greater than the regional students, and divided nearly equally between groups A and B. Group D represented almost two thirds of all the regional participants. Both genders were well represented in all groups; however, more than three quarters of students in Group D were female. The proportion of participants in their first year of study was considerably lower in groups A, B, and C; this could be attributed to lower enrolment numbers in 2011 and 2012, caused by the outbreak of the armed conflict in Libya in 2011.

Table 4.2. Demographic characteristics of participating instructors.

	University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
Demographic	Group A Elec. Eng. *N*=125 *n (%)*	Group B Petr. Eng. *N*=105 *n (%)*	Group C Elec. Eng. *N*=45 *n (%)*	Group D Petr. Eng. *N*=73 *n (%)*
Gender				
Female	1	2	0	2
Male	23	4	7	4
Age				
25 - 35	1	2	2	1
36 - 50	14	2	5	5
≥ 51	9	2	0	0
Level of education				
Bachelor	0	0	0	0
Master	11	5	5	6
PhD	13	1	2	0

There were 24 instructors in Group A and 6 in Group B; Group A respondents represented 80% of participants from the University of Tripoli. Instructors from the University of Al-Jabal Al-Gharbi were represented evenly between groups C and D. The majority of participating instructors in all groups were male. While all instructors in three groups A, B and C had either Master or PhD degrees, there were no PhD holders in Group D.

4.3. ACCESS TO TECHNOLOGIES

Participants were asked to indicate their level of access (‘*no access’*, ‘*limited access’*, or ‘*unrestricted access’*) to a range of technologies including mobile phones, computers, memory sticks, digital cameras, video (3G) and web cam, and the Internet.

4.3.1. Student access to technologies

Table 4.3. Student access to technologies (represented as observed percentages).

	University of Tripoli (Urban)						University of Al-Jabal Al-Gharbi (Regional)					
	Group A Elec. Eng. *N*=125			Group B Petr. Eng. *N*=105			Group C Elec. Eng. *N*=45			Group D Petr. Eng. *N*=73		
	NA	*LA*	*UA*	*NA*	*LA*	*UA*	*NA*	*LA*	*UA*	*NA*	*LA*	*UA*
Desktop computer	2	18	80	1	17	82	4	27	69	13	7	80
Portable computer	14	30	56	7	30	64	11	31	58	19	25	56
Memory stick	9	24	67	5	23	72	18	22	60	8	14	78
Digital camera	26	35	39	15	38	47	9	53	38	25	22	53
Web camera	43	22	35	24	40	36	38	38	24	31	35	35
Mobile phone	1	5	94	0	6	94	4	22	74	4	8	88
Video 3G	22	30	47	17	28	55	27	24	49	10	23	67
Dial-up Internet	21	29	50	19	37	44	16	47	38	21	40	39
High-speed Internet	9	13	78	6	19	75	11	29	60	7	25	68

NA: no access, LA: limited access, UA: unrestricted access.
(Note: Access to high-speed Internet represents access to either broadband or wireless Internet.)

A high proportion of students in Group A and Group B had unrestricted access to a desktop computer: 80% and 82% respectively. Students in the regional university reported slightly lower levels of unrestricted access to a desktop computer: 69% in Group C and 80% in Group D. More than half of students in all groups reported having unrestricted access to a portable computer.

To determine what demographic characteristics of students were associated with their levels of access to technology, ordinal logistic regression was used (a mathematical description of the model used is provided in Chapter 3, Section 3.6.3). There were five response variables that reflected student access to

technology: (1) access to desktop computer, (2) access to laptop computer, (3) access to mobile phone, (4) access to video 3G, and (5) access to high-speed Internet. The levels of response variables were: 0 – '*no access'*, 1 – '*limited access'*, and 2 – '*unrestricted access'*. The results of the ordinal regression models are presented in Table 4.4 and Figure 4.1.

Table 4.4. Proportional odds models for access to technologies.

		Desktop				Laptop				Memory Stick				Digital Camera				Web Camera			
Variable		B	SE	OR		B	SE	OR		B	SE	OR		B	SE	OR		B	SE	OR	
Threshold	NA vs LA	-2.77	0.50			-0.82	0.38			-1.50	0. 42			-0.07	0.35			0.20	0.36		
	LA vs UA	-0.91	0.45			0.88	0.37			0.13	0.40			1.62	0.37			1.62	0.37		
Gender (Male)		0.64	0.30	1.89	*	0.87	0.24	2.39	***	1.13	0.28	3.10	***	0.39	0.22	1.48		0.89	0.22	2.44	***
Group B		0.12	0.35	1.12		0.30	0.28	1.35		0.18	0.30	1.20		0.38	0.26	1.47		0.29	0.25	1.33	
Group C		-0.66	0.41	0.52		0.03	0.36	1.03		-0.56	0.38	0.57		0.18	0.33	1.20		-0.26	0.34	0.77	
Group D		0.00	0.40	1.00		0.19	0.32	1.21		0.80	0.37	2.22	*	0.50	0.30	1.65		0.44	0.30	1.55	
Age 21-22		0.29	0.49	1.34		0.32	0.39	1.37		0.40	0.43	1.50		0.24	0.37	1.27		0.40	0.37	1.50	
Age ≥ 23		-0.35	0.53	0.70		0.43	0.43	1.53		-0.01	0.47	0.99		0.39	0.41	0.48		0.63	0.42	1.87	
Year 2		0.18	0.53	1.20		0.64	0.42	1.89		0.11	0.47	1.11		1.21	0.42	3.34	**	0.23	0.42	1.26	
Year 3		0.39	0.59	1.48		0.39	0.47	1.48		-0.07	0.52	0.93		0.71	0.45	2.03		-0.16	0.46	0.85	
Year 4		0.42	0.61	1.52		0.54	0.49	1.71		0.83	0.56	2.28		0.66	0.47	1.94		-0.10	0.48	0.91	

** p < 0.05, ** p < 0.01, ***p < 0.001*

NA: no access, LA: limited access, UA: unrestricted access

Table 4.4. Proportional odds models for access to technologies – continued.

		Dial-up Internet				Mobile Phone				Video 3G				High Speed Internet			
Variable		B	SE	OR		B	SE	OR		B	SE	OR		B	SE	OR	
Threshold	NA vs LA	-1.18	0.37			-4.37	0.74			-1.56	0.39			-2.69	0.47		
	LA vs UA	0.51	0.36			-2.46	0.63			-0.20	0.38			-1.15	0.44		
Gender (Male)		0.45	0.22	1.57	*	0.53	0.42	1.70		0.12	0.23	1.13		0.70	0.27	2.02	**
Group B		-0.27	0.26	0.76		0.03	0.58	1.03		0.30	0.26	1.34		-0.20	0.32	0.82	
Group C		-0.37	0.33	0.69		-2.11	0.55	0.12	***	-0.23	0.35	0.80		-1.15	0.39	0.32	**
Group D		0.26	0.29	0.77		-1.00	0.56	0.37		0.65	0.32	1.91	*	-0.56	0.35	0.57	
Age 21-22		0.48	0.38	1.62		-0.36	0.77	0.70		0.28	0.40	1.32		0.63	0.47	1.88	
Age ≥ 23		0.87	0.42	2.38	*	-0.67	0.83	0.51		-0.18	0.43	0.84		0.01	0.51	1.01	
Year 2		0.02	0.42	1.02		1.38	0.80	3.97		-0.05	0.45	0.95		0.19	0.52	1.20	
Year 3		-0.60	0.46	0.55		0.43	0.85	1.53		-0.34	0.48	0.71		-0.77	0.57	0.47	
Year 4		-0.32	0.48	0.72		0.82	0.89	2.27		-0.51	0.50	0.60		-0.22	0.60	0.80	

** p < 0.05, ** p < 0.01, ***p < 0.001*

NA: no access, LA: limited access, UA: unrestricted access

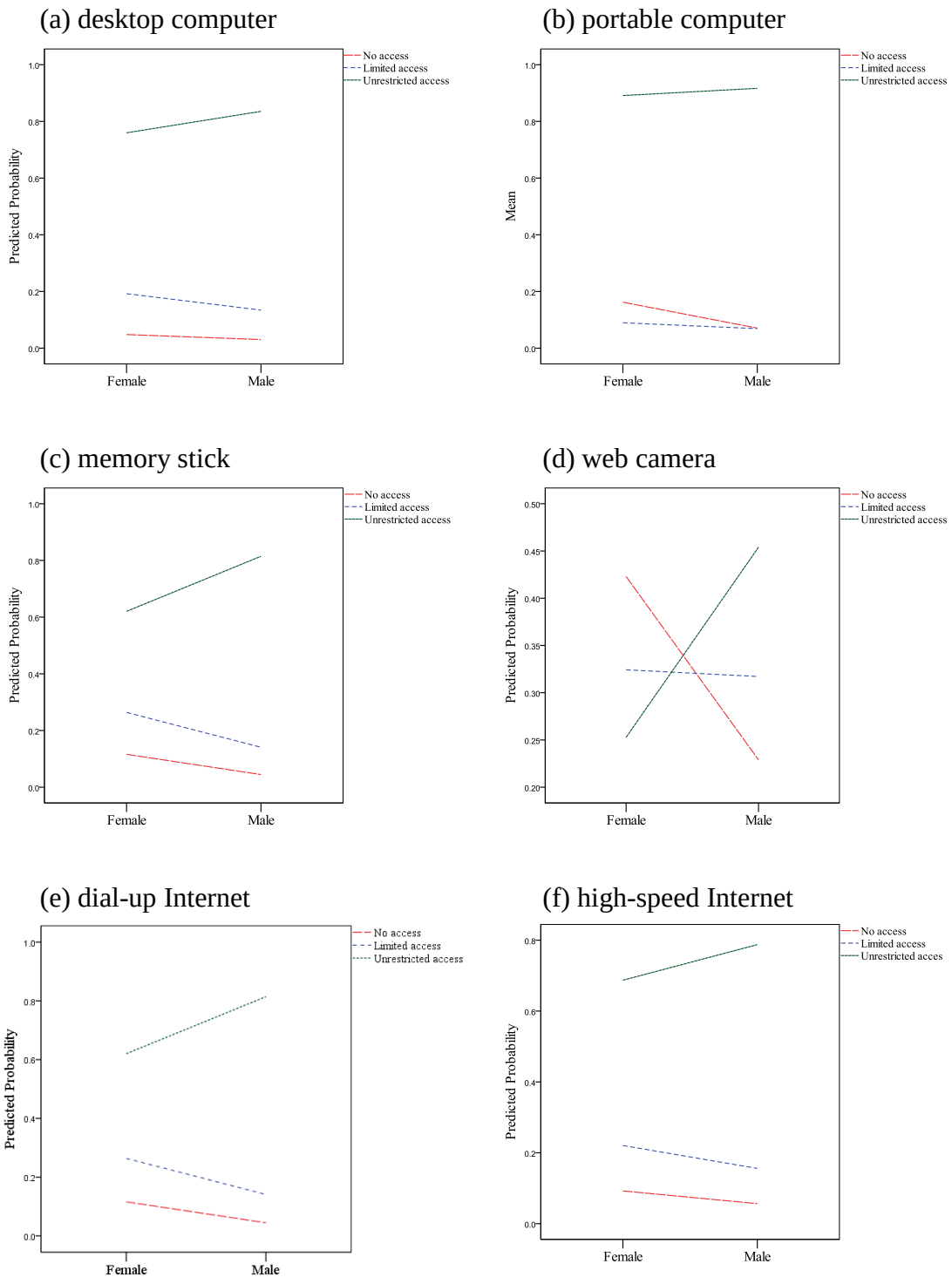

Figure 4.1. Predicted probability for level of access by *gender* to: (a) desktop computer, (b) portable computer, (c) memory stick, (d) web camera, (e) dial-up Internet, and (f) high-speed Internet.

The results presented in Table 4.4 and Figure 4.1 show that there were significant differences in the reported level of access between females and males for a number of technologies:

- female students were less likely than male students to have unrestricted access to a desktop computer; they were more likely to report *'no access'* or *'limited access'* to a desktop computer – Figure 4.1. (a);
- female students were more likely to report *'no access'* to a laptop computer – Figure 4.1. (b);
- female students were less likely than male students to have unrestricted access to a memory stick; they were more likely to report *'no access'* or *'limited access'* to a memory stick – Figure 4.1. (c);
- female students were less likely to have unrestricted access to a web camera and more likely to report *'no access'* to one – Figure 4.1. (d);
- female students were less likely than male students to have unrestricted access to dial-up Internet; they were more likely to report *'no access'* or *'limited access'* to dial-up Internet – Figure 4.1. (e);
- female students were less likely to have unrestricted access to high-speed Internet; they were more likely to report *'no access'* or *'limited access'* to high-speed Internet – Figure 4.1. (f).

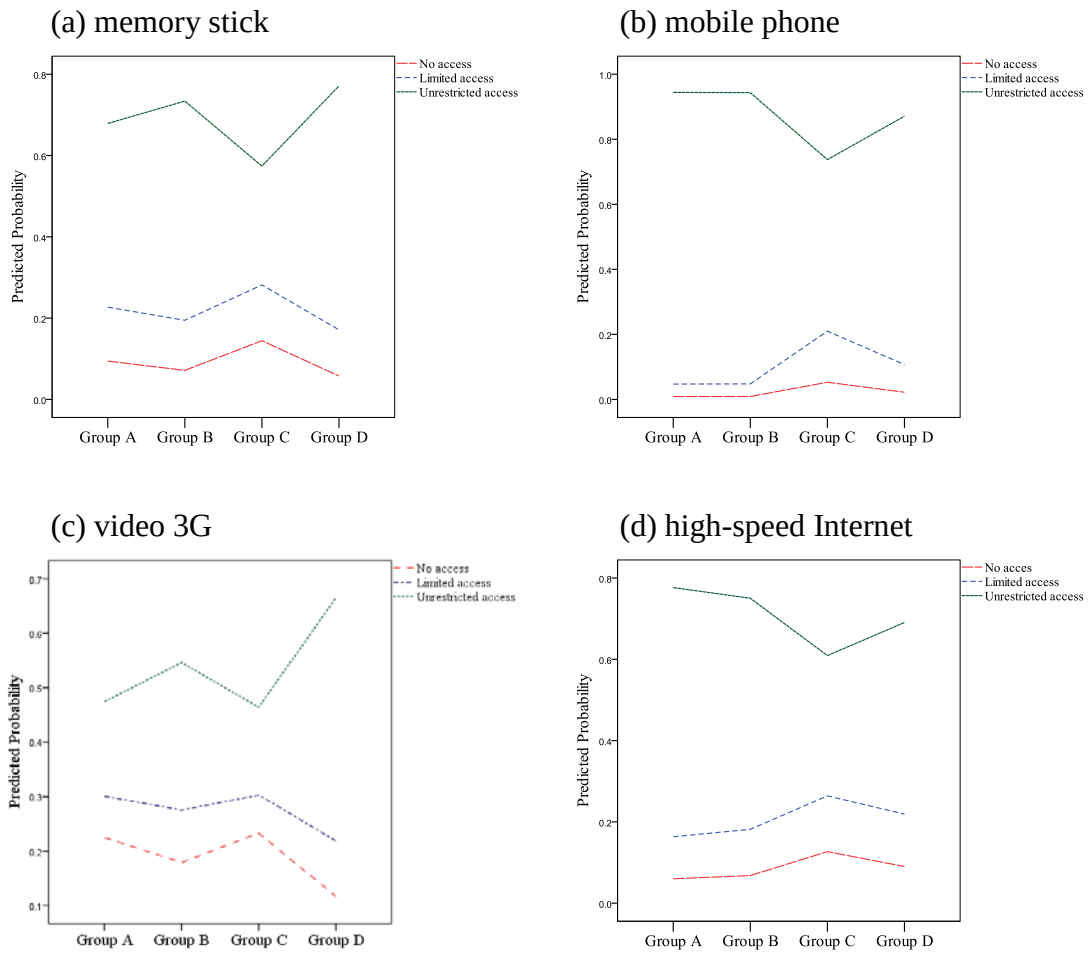

Figure 4.2. Predicted probability for level of access by *group* to: (a) memory stick, (b) mobile phone, (c) video 3G, and (d) high-speed Internet.

The results in Table 4.4 and Figure 4.2 also show that there were significant differences in the reported level of access between students from the urban university (groups A and B) and the regional university (groups C and D):

- students in Group C were less likely than students in other groups to have unrestricted access to a memory stick; they were more likely to report *'no access'* or *'limited access'* to a memory stick – Figure 4.2. (a);
- regional students were less likely than urban students to have unrestricted access to a mobile phone, with students in Group C being least likely to have

unrestricted access to a mobile phone and most likely to report *'limited access'* – Figure 4.2. (b);

- students in Group D were most likely to report unrestricted access to Video 3G technology – Figure 4.2. (c);
- students in Group C were less likely to report unrestricted access to high-speed Internet; they were more likely to report *'no access'* or *'limited access'* to high-speed Internet than students in other groups – Figure 4.2. (d).

4.3.2. Instructor access to technologies

Due to a low response rate, instructor data in Table 4.5 is reported only as actual numbers.

Table 4.5. Instructor access to technologies (represented as actual numbers).

	University of Tripoli (Urban)						University of Al-Jabal Al-Gharbi (Regional)					
	Group A Elec. Eng. *N*=24			Group B Petr. Eng. *N*=6			Group C Elec. Eng. *N*=7			Group D Petr. Eng. *N*=6		
	NA	*LA*	*UA*	*NA*	*LA*	*UA*	*NA*	*LA*	*UA*	*NA*	*LA*	*UA*
Desktop computer	0	13	11	0	0	6	0	4	3	0	1	5
Portable computer	2	8	14	0	0	6	0	1	6	0	1	5
Memory stick	0	8	16	0	0	6	0	4	3	0	2	4
Digital camera	1	14	9	0	0	6	1	4	2	1	1	4
Web camera	1	9	14	0	1	5	3	3	1	1	1	4
Mobile phone	0	6	18	0	0	6	0	4	3	0	2	4
Video 3G	2	13	9	0	0	6	2	4	1	2	2	2
Dial-up Internet	3	8	13	0	1	5	0	5	2	1	2	3
High-speed Internet	0	13	11	0	0	6	0	4	3	0	1	5

NA: no access, LA: limited access, UA: unrestricted access.
(Note: Access to high-speed Internet represents access to either broadband or wireless Internet.)

The majority of participating instructors in all groups reported having unrestricted or limited access to most technology-based tools, the Internet, and a mobile phone.

4.4. TECHNOLOGIES: PURPOSE OF USE AND LEVEL OF SKILL

Participants were asked about the purpose of using the various technologies and their levels of skill with these technologies. In particular, they were asked to indicate if they used these technologies *'for learning[teaching] purposes'*, *'for other purposes'*, or if they *'did not know this technology'*. Participants were allowed to select both *'for*

learning [teaching]' and *'for other purposes'*, if both options applied to them. They were also asked to apply a rating scale (from "1" 'not skilled at all'; to "5" 'very skilled') to indicate their levels of skill in using these technologies.

4.4.1. Student use of computer-based technologies

Table 4.6. Percentage of students who used computer-based technologies for learning purposes, and their average level of skill.

	University of Tripoli (Urban)				University of Al-Jabal Al-Gharbi (Regional)			
	Group A Elec. Eng. *N=125*		Group B Petr. Eng. *N=105*		Group C Elec. Eng. *N=45*		Group D Petr. Eng. *N=73*	
	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$
Use a computer to manage or manipulate digital photos (e.g. using iPhoto, Dig. Image)	52	3.00	36	3.26	45	2.67	35	2.79
Use a computer to create presentations (e.g. PowerPoint)	91	3.14	94	3.28	77	2.55	60	2.93
Use a computer to create or edit audio & video (e.g. iMovie, Movie Maker)	55	2.48	22	2.76	14	3.50	24	2.54
Use a computer to play games	29	3.53	2	3.50	5	3.83	6	3.25
Use the Internet/web or a LAN to play Network games	29	3.44	6	2.60	5	2.50	10	3.43
Use a hand-held computer (e.g. a PDA) as a Personal organiser (e.g. diary, address book)	50	3.23	61	3.32	61	2.90	45	2.83

As shown in Table 4.6, on average, urban students from Group A reported higher levels of use of computer-based technologies for learning purposes. However, urban students from Group B, on average, reported higher levels of skills in computer-based technologies than other groups. All urban students reported quite high levels of using computers to create presentations; their level of skill in using this technology was also relatively high. While almost a third of Group A students reported using

computers for playing games in relation to learning, an overwhelming majority of students in all groups reported playing games for other purposes.

To determine how student gender and location affected their levels of use of computer-based technologies for learning, binary logistic regression was used (Table 4.7). Other variables, such as age and year of study were also included in the models to control for possible confounding influence of these variables; a mathematical description of the models used is provided in Chapter 3, Section 3.6.2. For the purpose of statistical modelling, the response variables were reduced to a dichotomous form (0 - *not used for learning*, and 1 - *used for learning*). A value of "0" was assigned to participants who reported that they did not know a technology and those who reported using it for other purposes.

Table 4.7. Logistic regression models for student use of computer-based technologies for learning.

	Manage/manipulate digital photos			Create presentations			Create/edit audio & video		
Variable	B	SE		B	SE		B	SE	
(Intercept)	0.206	0.413		2.510	0.685		-0.020	0.488	
Gender (Male)	-0.073	0.257		-0.513	0.684		0.834	0.435	*
Group B	-0.677	0.292	*	-0.057	0.706		-1.186	0.453	***
Group C	-0.235	0.386		-1.145	0.756		-2.563	1.075	**
Group D	-0.729	0.354	*	-2.283	0.608	***	-1.284	0.510	**
Age 21-22	0.039	0.450		-0.187	0.672		-0.448	0.567	
Age ≥ 23	0.148	0.488		-0.569	0.721		0.262	0.581	
Year 2	-0.292	0.504		0.294	0.697		-0.531	0.618	
Year 3	-0.228	0.528		-0.115	0.771		0.317	0.632	
Year ≥ 4	-0.139	0.540		0.851	0.795		-0.246	0.637	

** $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$*

Table 4.7. – continued.

	Play games			Play Network games			Use as personal organiser		
Variable	B	SE		B	SE		B	SE	
(Intercept)	-1.463	0.653		-1.109	0.551		0.963	0.461	
Gender (Male)	0.943	0.386	**	0.685	0.353	*	0.034	0.298	
Group B	-3.244	0.755	***	-1.978	0.484	***	0.449	0.348	
Group C	-2.426	0.781	***	-2.209	0.775	***	0.545	0.462	
Group D	-1.852	0.575	***	-1.207	0.473	**	-0.392	0.390	
Age 21-22	0.501	0.703		0.111	0.655		-1.365	0.513	***
Age ≥ 23	0.680	0.733		0.505	0.677		-0.695	0.584	
Year 2	-0.034	0.825		-0.315	0.716		-0.247	0.541	
Year 3	-0.505	0.863		-0.658	0.759		-0.130	0.613	
Year ≥ 4	-0.355	0.861		-0.340	0.751	*	-0.266	0.645	

** $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$*

The results provided in Table 4.7 show that there was a significant difference between female and male students with respect to creating/editing audio or video, playing games, and playing Network games. Male students were more likely to report using these tools for learning; estimated probabilities for female and male students are presented in Figure 4.3.

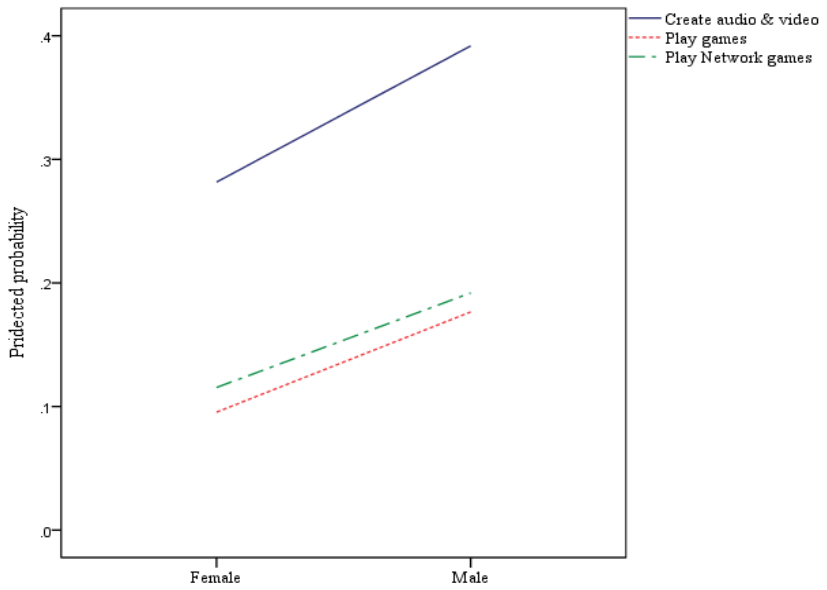

Figure 4.3. Predicted probability of computer use for learning by *gender*.

As shown in Table 4.7 and Figure 4.4, there were significant differences in the level of use of computer-based technologies for learning between student groups:

- students in groups B and D were less likely than students in groups A and C to use a computer to manage/manipulate digital photos for learning purposes.
- students in regional groups C and D were less likely than students in urban groups A and B to use a computer to create presentations.
- students in the urban Group A were more likely to use a computer to create/edit audio and video for learning than students in groups B, C and D.
- similarly, students in Group A reported the highest levels of playing computer games and Network games for learning.

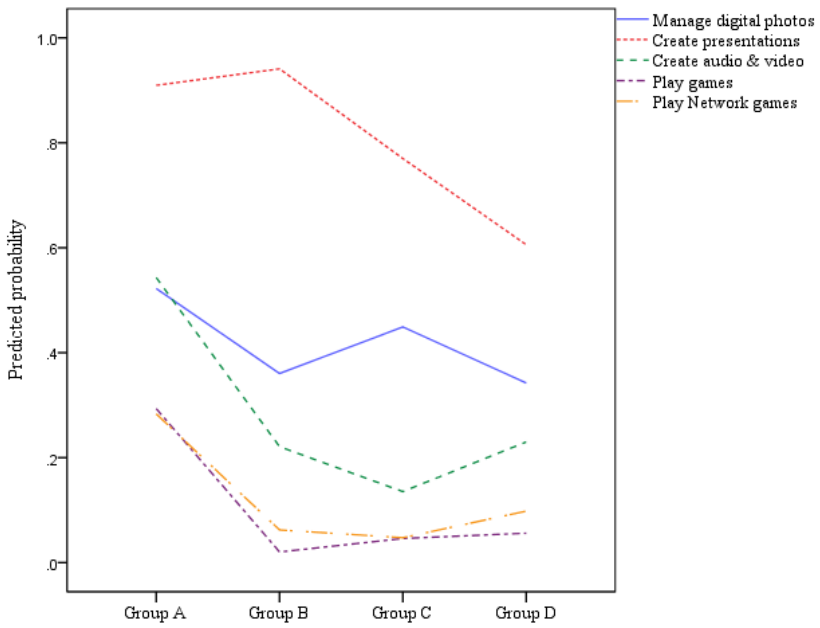

Figure 4.4. Predicted probability of computer use for learning by *group*.

In addition, the results in Table 4.7 show that fourth year students were significantly more likely to play Network games for learning than first year students. Age was also found to be significant with respect to using a computer as a personal organiser; younger students, those aged 18-20, were more likely to use this technology for learning.

4.4.2. Instructor use of computer-based technologies

Table 4.8 presents instructor responses; due to a low response rate, instructor data is reported only as actual numbers.

Table 4.8. Purpose of use and level of skill in computer-based technologies: Instructors.

	University of Tripoli (Urban)																	
	Group A, Elec. Eng. *N*=24										Group B, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use a computer to manage or manipulate digital photos (e.g. using iPhoto, Dig. Image)	5	10	8	1		1	3	6	11	2	3.43	1	5	0	0		0	0	1	3	2	4.17
Use a computer to create presentations (e.g. PowerPoint)	16	3	4	1		1	0	5	13	5	3.88	5	0	1	0		0	0	1	4	1	4.00
Use a computer to create or edit audio & video (e.g. iMovie, Movie Maker)	3	13	3	3		4	6	7	3	1	2.57	1	5	0	0		0	0	0	4	2	4.33
Use a computer to play games	0	17	3	2		1	4	10	5	2	3.14	1	5	0	0		0	1	2	2	1	3.50
Use the Internet/web or a LAN to play Network games	0	17	1	4		1	7	7	3	2	2.90	1	5	0	0		0	0	2	4	0	3.67
Use a hand-held computer (e.g. a PDA) as a Personal organiser (e.g. diary, address book)	4	6	7	5		2	3	5	4	4	3.28	1	3	2	0		0	0	1	4	0	3.80

Table 4.8. Continued.

	University Al-Jabal Al-Gharbi (Regional)																	
	Group C, Elec. Eng. *N*=7										Group D, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use a computer to manage or manipulate digital photos (e.g. using iPhoto, Dig. Image)	0	6	0	1		1	1	1	3	0	3.00	2	3	1	0		0	2	0	4	0	3.33
Use a computer to create presentations (e.g. PowerPoint)	4	1	2	0		0	0	5	2	0	3.29	3	0	3	0		0	0	2	2	1	3.80
Use a computer to create or edit audio & video (e.g. iMovie, Movie Maker)	2	5	0	0		3	0	2	2	0	2.43	0	3	2	1		0	1	1	3	0	3.40
Use a computer to play games	0	6	1	0		0	1	1	4	1	3.71	0	4	2	0		0	1	2	3	0	3.33
Use the Internet/web or a LAN to play Network games	0	7	0	0		1	1	3	1	1	3.00	0	5	1	0		1	1	2	1	1	3.00
Use a hand-held computer (e.g. a PDA) as a Personal organiser (e.g. diary, address book)	3	1	2	1		0	0	2	3	1	3.83	1	2	2	1		0	1	3	1	0	3.00

Results shown in Table 4.8 show that, overall, instructors did not identify teaching as the main purpose for using computer-based technologies; other purposes, such as entertainment, dominated the responses in all groups of respondents. Only presentation software was used mainly for teaching purposes and the self-reported level of skill in using the software was relatively high among most instructors. Hand held computers were also reported to be used mostly for teaching purposes, although there were some instructors who did not know about the technology.

Most instructors in all groups reported using computers for playing games and Network games for other purposes (e.g. entertainment) and most of them were confident in their ability to use a computer for playing games. Similarly, most instructors used a computer to manage or process digital photos for other purposes (e.g. entertainment).

4.4.3. Student use of web-based technologies

Students were asked about the ways in which they used various web-based technologies and their levels of skill with these technologies. To ensure smooth analysis and interpretation of the large number of web-based technology items in the survey (16), the items were grouped into three clusters of loosely related items:

- Cluster 1 – Accessing information and communicating (accessing LMSs, and communicating via email, instant messaging and videoconferencing)
- Cluster 2 – Podcasting and socialising (authoring and use of podcasts, sharing of photographs, and networking via social media)
- Cluster 3 – Web publishing (authoring and use of websites, blogs, vlogs, and wikis)

For each of the clusters, the descriptive results are presented for those students who selected *'for learning'* as a purpose for using a web-based technology; the mean

values for their self-reported levels of skill in using each technology are also included.

To determine how demographic characteristics affect levels of use of web-based technologies for learning, a similar analysis was performed as that for modelling student use of computer-based technologies. Again, variables considered were gender and location, as well as the confouding variables, such as age and year of study. Logistic regression models for student use of web-based technologies for learning are presented for each of the clusters.

Cluster 1 – Accessing information and communicating

Table 4.9. Student use of Cluster 1 technologies for learning: percentage of users and their average level of skill.

	University of Tripoli (Urban)				University of Al-Jabal Al-Gharbi (Regional)			
	Group A Elec. Eng. *N=125*		Group B Petr. Eng. *N=105*		Group C Elec. Eng. *N=45*		Group D Petr. Eng. *N=73*	
	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$
Use the web to access a portal, CMS or LMS	90	2.64	93	2.81	90	2.69	64	2.83
Use the web to look up reference information (e.g. online dictionaries)	97	3.61	93	3.71	98	3.31	90	3.25
Use the web/Internet to send or receive email (e.g. Hotmail, Yahoo, Outlook)	85	3.76	66	4.19	21	3.78	24	3.25
Use the web/Internet for instant messaging / Chat (e.g. MSN, Yahoo)	81	3.69	54	3.94	23	3.40	23	3.21
Use the web to make phone calls (e.g. VoIP using Skype)	77	3.47	22	3.57	17	3.29	15	2.89
Use the web for web conferencing (e.g. using a webcam with Skype)	79	3.01	53	3.18	19	3.00	20	2.73

The results in Table 4.9 indicate that, overall, urban students (groups A and B) were more likely to use most Cluster 1 web-based technologies for learning. While students from Group A reported higher level of use, Group B students reported the highest level of skill. In all groups students reported quite high levels of use of the web to access a portal, CMS/LMS, and online dictionaries.

Table 4.10. Logistic regression models for student use of Cluster 1 technologies for learning.

	Access a portal (CMS)			Access online dictionaries		Send/receive email		
Variable	B	SE		B	SE	B	SE	
(Intercept)	2.270	0.673		2.554	0.773	2.250	0.495	
Gender (Male)	-0.008	0.448		0.431	0.592	0.136	0.290	
Group B	0.465	0.618		-1.131	0.689	-1.108	0.349	***
Group C	-0.115	0.764		0.675	1.174	-3.028	0.476	***
Group D	-1.694	0.552	***	-0.605	0.696	-2.959	0.416	***
Age 21-22	-0.237	0.749		0.715	0.725	-0.673	0.535	
Age ≥ 23	-0.493	0.799		1.213	0.960	0.460	0.577	
Year 2	0.566	0.764		-0.855	0.750	-0.549	0.546	
Year 3	-0.174	0.819		0.511	0.997	-0.237	0.610	
Year ≥ 4	0.477	0.844	**	-0.063	1.029	0.201	0.627	

** $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$*

Table 4.10. Continued.

	Instant messaging/MSN			Phone calls, Skype			Web conferencing, Skype		
Variable	B	SE		B	SE		B	SE	
(Intercept)	2.339	0.481		0.737	0.515		1.582	0.490	
Gender (Male)	0.183	0.278		0.419	0.316		0.286	0.304	
Group B	-1.466	0.326	***	-2.548	0.362	***	-1.342	0.353	***
Group C	-2.706	0.458	***	-2.838	0.506	***	-2.778	0.513	***
Group D	-2.804	0.409	***	-2.895	0.444	***	-2.669	0.437	***
Age 21-22	0.029	0.506		0.675	0.571		-0.355	0.564	
Age ≥ 23	0.551	0.551		-0.234	0.611		-0.034	0.609	
Year 2	-1.315	0.557	*	0.698	0.627		-0.540	0.578	
Year 3	-1.448	0.599	*	0.493	0.686		-0.002	0.638	
Year ≥ 4	-1.212	0.620	*	0.941	0.692		-0.231	0.653	

** $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$*

The results in Table 4.10 and Figure 4.5 show that urban students in groups A and B reported a significantly higher level of using Cluster 1 web-based technologies for learning than regional students in groups C and D. There was no significant difference between male and female students in the level of use of those technologies.

Students in the rural Group D were significantly less likely to use the web to access CMS/LMS than other students. There was also a significant difference in using the web for accessing CMS/LMS between students in various year levels; fourth year students were more likely to use the web for this purpose than students in earlier years. Year of study was also found to be significant with respect to using the web for instant messaging (MSN); first year students were more likely to use this technology for learning.

There were significant differences in the reported level of using the web for sending and receiving emails and MSNs; urban students in Group A were more likely to use

this technology for learning than other students. Group A students were also more likely than other students to use the web for videoconferencing and making phone calls via Skype.

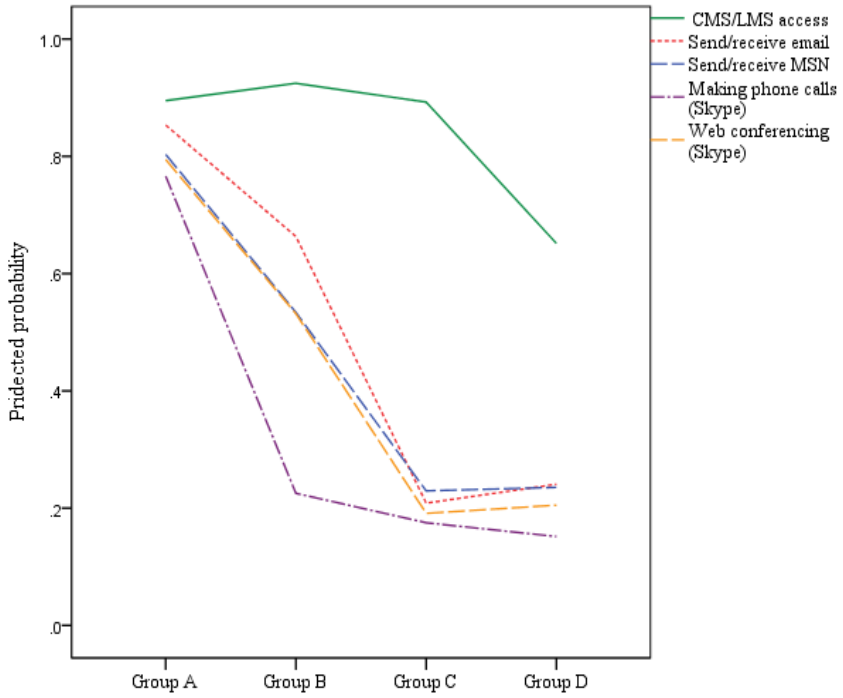

Figure 4.5. Predicted probability of web use for learning (Cluster 1 – Accessing information and communicating) by *group*.

Cluster 2 – Podcasting and socialising

Table 4.11. Student use of Cluster 2 technologies for learning: percentage of users and their average level of skill.

	University of Tripoli (Urban)				University of Al-Jabal Al-Gharbi (Regional)			
	Group A Elec. Eng. *N=125*		Group B Petr. Eng. *N=105*		Group C Elec. Eng. *N=45*		Group D Petr. Eng. *N=73*	
	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$
Use social networking software on the web (e.g. Facebook)	82	3.65	68	3.66	21	3.25	18	3.40
Use the web to download podcasts (e.g. using Juice, iTunes)	70	2.98	34	3.19	30	3.36	26	3.00
Use the web to publish podcasts (e.g. using Podifier, Podcaster, PodProducer)	66	2.66	27	2.32	10	3.33	24	2.44
Use the web to share photographs or other Digital material (e.g. using blinklist, Flickr)	76	3.36	33	3.66	12	3.60	10	3.00
Use the web for pastimes (e.g. for leisure activities)	13	3.73	5	3.20	7	4.00	10	3.00

The results in Table 4.11 indicate that urban students in Group A reported the highest level of using Cluster 2 technologies for learning purposes. Regional students in groups C and D were less likely than urban students to use most of the web-based technologies for learning. The majority of students in all groups felt skilled in using those technologies; the range of mean values was between 2.3 and 4 on a 5-point scale.

Table 4.12. Logistic regression models for student use of Cluster 2 technologies for learning.

	Social networking			Download podcast			Publish podcast		
Variable	B	SE		B	SE		B	SE	
(Intercept)	1.389	0.500		0.019	0.504		-0.079	0.593	
Gender (Male)	0.197	0.306		0.541	0.296		1.168	0.355	***
Group B	-0.778	0.365	*	-1.566	0.351	***	-1.845	0.391	***
Group C	-2.839	0.499	***	-1.798	0.458	***	-3.151	0.686	***
Group D	-3.015	0.451	***	-1.810	0.409	***	-1.663	0.480	***
Age 21-22	-0.403	0.602		-0.183	0.511		-0.493	0.642	
Age ≥ 23	-0.211	0.631		0.035	0.562		-0.451	0.676	
Year 2	-0.009	0.606		0.783	0.598		0.892	0.728	
Year 3	0.202	0.661		0.858	0.631		0.846	0.763	
Year ≥ 4	0.541	0.675		0.615	0.659		0.653	0.771	

** p < 0.05, ** p < 0.01, ***p < 0.001*

Table 4.12. Continued.

	Share digital material			For pastimes		
Variable	B	SE		B	SE	
(Intercept)	1.378	0.494		-1.176	0.562	
Gender (Male)	0.220	0.309		0.318	0.424	
Group B	-2.235	0.358	***	-1.257	0.558	*
Group C	-3.377	0.565	***	-1.043	0.692	
Group D	-3.482	0.492	***	-0.581	0.528	
Age 21-22	0.132	0.552		0.374	0.661	
Age ≥ 23	1.173	0.600	*	0.820	0.708	
Year 2	-0.614	0.617		-0.609	0.674	
Year 3	-0.544	0.622		-1.493	0.759	*
Year ≥ 4	-1.113	0.655		-1.888	0.780	*

** p < 0.05, ** p < 0.01, ***p < 0.001*

The results in Table 4.12 show male students were significantly more likely than female students to publish podcasts for learning. Figure 4.6 displays estimated probabilities of using web to publishing podcasts for learning for female and male students.

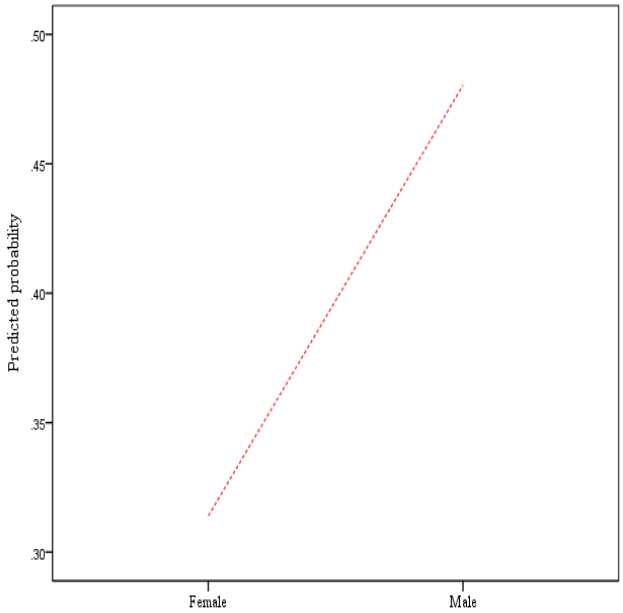

Figure 4.6. Predicted probability of web use to publish podcasts for learning by *gender*.

Table 4.12 and Figure 4.7 also show that there was a significant difference in the level of use of Cluster 2 web-based technologies for learning between the urban and regional students:

- regional students in groups C and D were less likely than urban students in groups A and B to use social networking for learning;
- regional students reported particularly low levels of downloading podcasts for learning;
- urban students in Group A were more likely than students in other groups to publish podcasts for learning. Regional Group C was the least likely of all;

- similarly, students in Group A reported the highest levels of using the web to share digital materials for learning. Regional students in groups C and D used these technologies least.

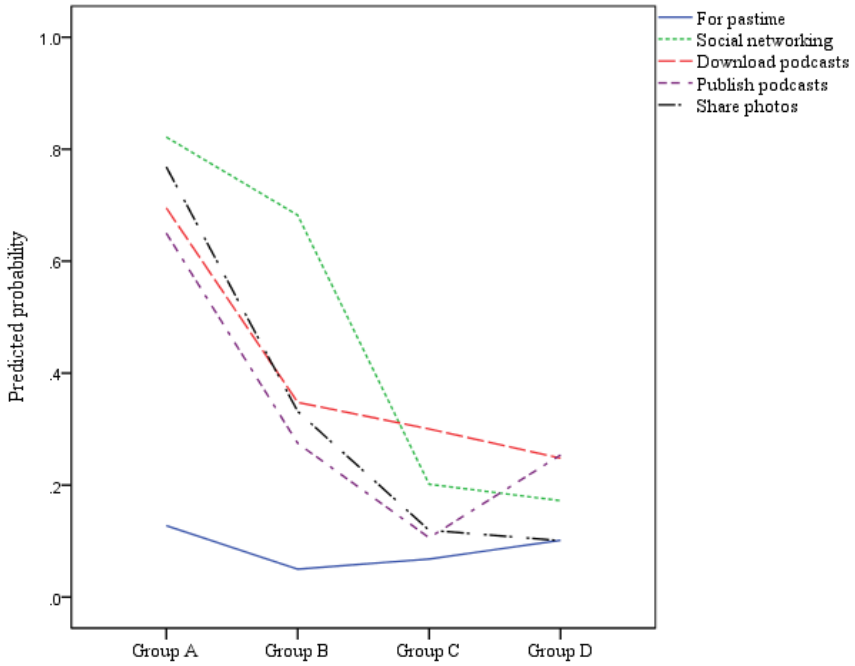

Figure 4.7. Predicted probability of web use (Cluster 2 – Podcasting and socialising) for learning by *group*.

Cluster 3 – Web publishing

Table 4.13. Student use of Cluster 3 technologies for learning: percentage of users and their average level of skill.

	University of Tripoli (Urban)				University of Al-Jabal Al-Gharbi (Regional)			
	Group A Elec. Eng. *N=125*		Group B Petr. Eng. *N=105*		Group C Elec. Eng. *N=45*		Group D Petr. Eng. *N=73*	
	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$
Use the web to build & maintain a website	78	2.46	77	2.35	44	1.64	43	2.13
Use the web to keep your own blog or vlog	54	2.70	23	2.77	6	2.07	15	2.67
Use the web to read other peoples' blogs or vlogs	56	2.71	18	2.33	17	3.00	17	2.00
Use the web to comment on blogs or vlogs	56	2.71	19	2.80	6	2.33	13	2.33
Use the web to contribute to the development of a Wiki	75	2.52	36	1.94	18	1.89	46	1.60

The results in Table 4.13 indicate that urban students in Groups A reported the highest levels of using Cluster 3 web-based technologies for learning. Students in all groups were most likely to use the web to build and maintain a website. The reported level of skill in using these technologies was relatively low; the range of mean scores was between 1.6 and 3.0 on a 5-point scale.

Table 4.14. Logistic regression models for student use of Cluster 3 technologies for learning.

	Build and maintain a website			Keep a blog/vlog			Read others' blogs/vlogs		
Variable	B	SE		B	SE		B	SE	
(Intercept)	1.110	0.502		0.648	0.623		1.014	0.617	
Gender (Male)	0.039	0.344		-0.317	0.455		-0.690	0.469	
Group B	-0.149	0.412		-1.343	0.464	***	-1.801	0.488	***
Group C	-1.448	0.482	***	-2.907	1.102	***	-1.805	0.738	***
Group D	-1.482	0.460	***	-2.065	0.660	***	-2.072	0.670	***
Age 21-22	0.688	0.592		0.050	0.724		-0.370	0.733	
Age ≥ 23	0.689	0.642		0.673	0.767		0.542	0.758	
Year 2	-0.578	0.624		-0.466	0.772		-0.619	0.765	
Year 3	-0.411	0.670		-1.295	0.823		-0.926	0.839	
Year ≥ 4	-0.531	0.685		-0.696	0.805		-0.675	0.811	

** p < 0.05, ** p < 0.01, ***p < 0.001*

Table 4.14. Continued.

	Comment on blogs/vlogs			Contribute to a Wiki		
Variable	B	SE		B	SE	
(Intercept)	1.066	0.654		1.211	0.675	
Gender (Male)	-0.706	0.491		-0.252	0.435	
Group B	-1.745	0.490	***	-1.699	0.513	***
Group C	-2.927	1.103	***	-2.702	0.917	***
Group D	-2.421	0.725	***	-1.360	0.600	*
Age 21-22	-0.823	0.810		0.605	0.876	
Age ≥ 23	0.232	0.803		1.236	0.903	
Year 2	-0.316	0.849		-0.379	0.901	
Year 3	-0.586	.0893		-1.579	0.979	
Year ≥ 4	-0.437	0.865		-0.790	0.953	

** p < 0.05, ** p < 0.01, ***p < 0.001*

The results in Table 4.14 show that there was no significant difference between female and male students in using the Cluster 3 web-based technologies for learning.

The results in Table 4.14 and Figure 4.8 show that there were significant differences in the level of use of Cluster 3 technologies between the urban and regional students:

- regional students (groups C and D) were less likely than urban students to use the web to build and maintain websites for learning purposes;
- regional students reported particularly low levels of using the web to keep their own blogs;
- urban students from Group A reported the highest levels of using the web to read and comment on other peoples' blogs;
- Group A students were more likely than students in other groups to contribute to the development of Wiki for learning purposes.

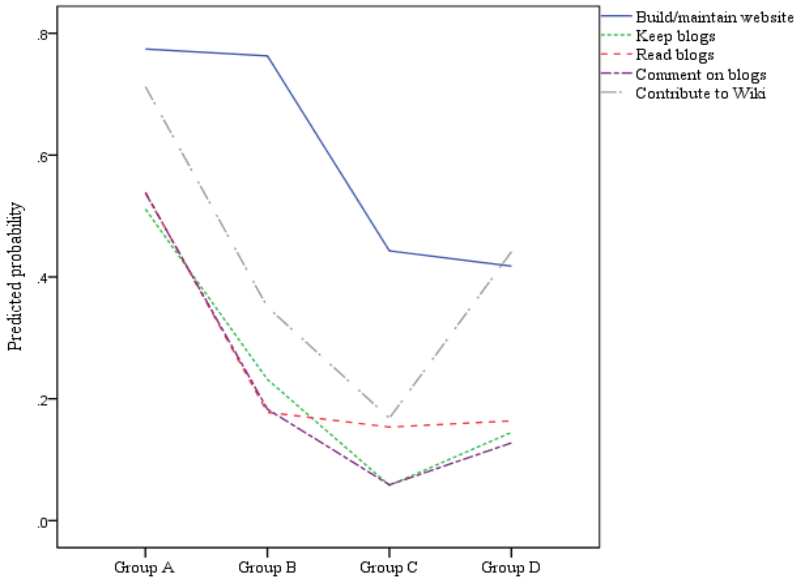

Figure 4.8. Predicted probability of web use (Cluster 3 – Web publishing) for learning by *group*.

4.4.4. Instructor use of web-based technologies

Instructor responses, grouped into clusters, are reported only as actual numbers, due to a low response rate.

Table 4.15. Purpose of use and level of skill in Cluster 1 technologies (Accessing information and communicating): Instructors.

	University of Tripoli (Urban)																	
	Group A, Elec. Eng. *N*=24										Group B, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use the web to access a portal, CMS or LMS	16	0	1	4		2	1	5	9	2	3.42	3	0	3	0		0	1	2	3	0	3.33
Use the web to look up reference information (e.g. online dictionaries)	10	2	10	1		1	0	3	13	6	4.04	4	0	2	0		0	0	1	4	1	4.00
Use the web/Internet to send or receive email (e.g. Hotmail, Yahoo, Outlook)	2	8	13	0		1	0	2	9	11	4.30	0	3	3	0		1	0	0	3	2	4.00
Use the web/Internet for instant messaging / Chat (e.g. MSN, Yahoo)	1	13	9	0		3	0	5	11	5	3.75	0	6	0	0		1	0	0	4	1	3.83
Use the web to make phone calls (e.g. VoIP using Skype)	0	13	9	1		1	2	7	8	4	3.55	1	4	1	0		0	0	3	3	0	3.50
Use the web for web conferencing (e.g. using a webcam with Skype)	4	4	9	5		3	5	5	3	3	2.89	2	3	1	0		0	1	1	3	1	3.67

Table 4.15. Continued.

	University of Al-Jabal Al-Gharbi (Regional)																	
	Group C, Elec. Eng. *N*=7										Group D, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use the web to access a portal, CMS or LMS	5	1	0	1		0	1	1	3	1	3.67	4	0	2	0		0	2	3	1	0	2.83
Use the web to look up reference information (e.g. online dictionaries)	3	0	4	0		0	0	1	4	2	4.14	2	0	4	0		0	0	2	2	2	4.00
Use the web/Internet to send or receive email (e.g. Hotmail, Yahoo, Outlook)	0	3	4	0		1	0	0	1	5	4.43	1	2	3	0		0	0	2	2	2	4.00
Use the web/Internet for instant messaging / Chat (e.g. MSN, Yahoo)	0	7	0	0		2	0	1	1	3	3.71	0	3	3	0		0	0	3	3	0	3.50
Use the web to make phone calls (e.g. VoIP using Skype)	0	7	0	0		0	1	2	2	2	3.71	0	4	2	0		0	1	1	4	0	3.50
Use the web for web conferencing (e.g. using a webcam with Skype)	0	4	0	3		0	4	0	0	0	2.00	2	1	3	0		0	1	1	3	1	3.67

Table 4.16. Purpose of use and level of skill in Cluster 2 technologies (Podcasting and socialising): Instructors.

	University of Tripoli (Urban)																	
	Group A, Elec. Eng. *N*=24										Group B, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use social networking software on the web (e.g. Facebook)	2	6	13	2		0	4	6	9	3	3.50	2	1	3	0		1	0	1	4	0	3.33
Use the web to download podcasts (e.g. using Juice, iTunes)	3	11	2	6		4	4	7	2	1	2.56	1	3	0	2		0	0	2	4	0	3.67
Use the web to publish podcasts (e.g. using Podifier, Podcaster, PodProducer)	1	10	2	9		6	3	4	1	0	2.00	1	5	0	0		0	2	1	3	0	3.17
Use the web to share photographs or other Digital material (e.g. using blinklist, Flickr)	0	13	5	4		1	4	8	6	1	3.10	1	5	0	0		1	2	1	2	0	2.67
Use the web for pastimes (e.g. for leisure activities)	0	18	1	3		1	5	4	7	3	3.30	0	4	2	0		0	1	2	3	0	3.33

Table 4.16. Continued.

	University of Al-Jabal Al-Gharbi (Regional)																	
	Group C, Elec. Eng. *N*=7										Group D, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use social networking software on the web (e.g. Facebook)	0	3	3	1		1	0	1	4	0	3.33	0	4	2	0		0	1	2	3	0	3.00
Use the web to download podcasts (e.g. using Juice, iTunes)	0	4	1	2		0	4	0	0	1	2.60	0	4	1	1		0	3	1	1	0	2.60
Use the web to publish podcasts (e.g. using Podifier, Podcaster, PodProducer)	0	4	1	2		0	4	0	0	1	2.60	1	3	1	1		1	2	1	1	0	2.40
Use the web to share photographs or other Digital material (e.g. using blinklist, Flickr)	0	4	1	2		0	4	0	1	0	2.40	0	4	2	0		0	1	2	3	0	3.33
Use the web for pastimes (e.g. for leisure activities)	0	7	0	0		0	0	4	3	0	3.43	0	5	1	0		0	1	3	1	1	3.33

Table 4.17. Purpose of use and level of skill in Cluster 3 technologies (Web publishing): Instructors.

	University of Tripoli (Urban)																	
	Group A, Elec. Eng. *N*=24										Group B, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use the web to build & maintain a website	7	5	2	7		3	6	2	4	2	2.76	3	3	0	0		0	1	2	2	1	3.50
Use the web to keep your own blog or vlog	0	6	5	9		5	2	5	1	1	2.36	0	3	1	2		0	2	4	0	0	2.67
Use the web to read other peoples' blogs or vlogs	0	12	1	8		4	5	4	3	0	2.38	0	1	3	2		0	2	2	2	0	3.00
Use the web to comment on blogs or vlogs	0	11	1	8		6	4	3	2	0	2.07	0	2	3	1		0	2	3	1	0	2.83
Use the web to contribute to the development of a Wiki	0	10	1	8		7	2	3	1	0	1.85	0	3	0	3		0	2	3	1	0	2.83

Table 4.17. Continued.

	University of Al-Jabal Al-Gharbi (Regional)																	
	Group C, Elec. Eng. *N*=7										Group D, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use the web to build & maintain a website	2	2	0	3		2	1	1	0	0	1.75	0	2	4	0		0	2	2	2	0	3.33
Use the web to keep your own blog or vlog	0	3	0	4		1	1	1	0	0	2.00	0	3	0	3		0	0	2	1	0	3.33
Use the web to read other peoples' blogs or vlogs	0	3	0	4		0	1	2	1	0	3.00	0	3	0	3		0	1	0	2	0	3.33
Use the web to comment on blogs or vlogs	0	3	0	4		1	1	1	0	0	2.00	0	1	1	4		0	1	1	0	0	3.50
Use the web to contribute to the development of a Wiki	0	1	0	6		0	1	0	0	0	2.00	0	2	0	4		0	2	0	0	0	2.00

Findings presented in tables 4.15, 4.16, and 4.17 show that, overall, teaching was not the main purpose for which instructors used web-based technologies in all clusters; other purposes dominated the responses in all groups of respondents. However, there were exceptions. In relation to Cluster 1 technologies (Accessing information and communicating – Table 4.15), online dictionaries were used mainly for teaching purposes and the instructors' self-reported level of skill in using the web to look up reference information was high. Likewise, teaching was the main purpose of using the web to access a CMS or LMS for most instructors. While teaching was not the primary purpose, all instructors used the web to send and receive emails, and reported high levels of skill in using this technology; the use of instant messaging was equally prevalent. Most instructors used Skype for making phone calls for other purposes. Interestingly, although 4 instructors in regional Group C used a webcam with Skype, all of them rated themselves as unskilled in using this technology.

With regards to Cluster 2 technologies (Podcasting and socialising – Table 4.16), most instructors reported using social networking software such as Facebook for purposes other than teaching; instructors' self-reported level of skill in using this technology was relatively high. Sharing photos and digital materials was a popular activity; just 4 instructors in Group A and 2 instructors in regional Group C reported that they had never heard of this activity.

Cluster 3 technologies (Web publishing – Table 4.17) represented a group of technologies which the biggest number of instructors did not use (they responded *'do not know'* this technology). Most instructors reported that they had never heard of blogs, and those who used them, lacked confidence in their skills. Overall, wikis were the least used technology; most instructors indicated that they had never contributed to this type of web publishing tool. The instructors who used Wikis, did so for purposes other than teaching and rated themselves as unskilled in using this technology.

4.4.5. Student use of mobile phone technologies

Table 4.18. Percentage of students who used mobile phone functions for learning and their average level of skill.

	University of Tripoli (Urban)				University of Al-Jabal Al-Gharbi (Regional)			
	Group A Elec. Eng. *N=125*		Group B Petr. Eng. *N=105*		Group C Elec. Eng. *N=45*		Group D Petr. Eng. *N=73*	
	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$	Use %	Skill $\bar{x}$
Use a mobile phone to text/SMS people	98	4.52	88	4.68	75	4.45	86	4.62
Use a mobile phone to access information/ services on the web	95	3.99	86	4.00	40	4.24	32	4.14
Use a mobile phone to send or receive email	94	3.68	87	3.62	33	3.86	13	4.29

Results presented in Table 4.18 show that students in all groups reported quite high levels of using mobile phones to send text messages or SMSs in relation to learning; their reported level of skill in using this technology was also high. While the urban students (groups A and B) were more likely to use their mobile phones to access web information, or send and receive emails, regional students (groups C and D) were more confident of their ability to use mobile phones to engage in these activities.

Table 4.19. Logistic regression models for student use of mobile phone functions for learning.

	Text/SMS			Access web info/service			Send/receive email		
Variable	B	SE		B	SE		B	SE	
(Intercept)	4.21	0.87		2.96	0.62		2.74	0.66	
Gender (Male)	0.88	0.43	*	0.00	0.34		0.16	0.37	
Group B	-1.89	0.67	**	-1.34	0.53	*	-0.99	0.51	
Group C	-3.01	0.72	***	-3.44	0.55	***	-3.55	0.54	***
Group D	-2.11	0.70	**	-3.69	0.52	***	-4.67	0.56	***
Age 21-22	0.19	0.73		0.26	0.57		0.51	0.67	
Age ≥ 23	0.14	0.81		0.98	0.67		0.90	0.75	
Year 2	-0.30	0.82		-0.42	0.60		-0.47	0.74	
Year 3	-0.99	0.93		-0.10	0.71		-0.70	0.82	
Year ≥ 4	-1.02	0.96		-0.84	0.76		-0.76	0.87	

** $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$*

The results provided in Table 4.19 show that there was a significant difference between female and male students with respect to sending text messages or SMSs; male students were more likely to use this tool for learning.

As shown in Table 4.19 and Figure 4.9, there was also a significant difference in the level of use of mobile phone functions for learning between the urban and regional students. Urban students from Group A were most likely to use the various mobile phone functions for learning. Although all other students were less likely to use these functions than students in Group A, regional students in groups C and D reported particularly low levels of using mobile phones for learning.

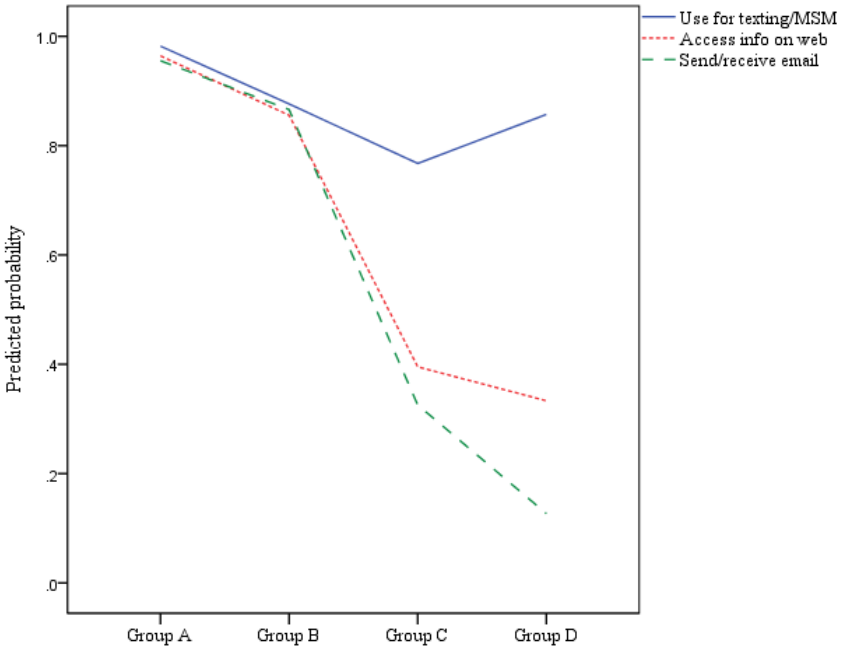

Figure 4.9. Predicted probability of mobile phone use for learning by *group*.

4.4.6. Instructor use of mobile phone technologies

Instructor responses are reported only as actual numbers, due to a low response rate.

Table 4.20. Purpose of use and level of skill in mobile phone technologies: Instructors.

	University of Tripoli (Urban)																	
	Group A, Elec. Eng. *N*=24										Group B, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use a mobile phone to text/SMS people	0	10	12	0		0	1	1	8	14	4.46	0	2	4	0		0	0	0	2	4	4.67
Use a mobile phone to access web info/services	0	15	5	2		3	1	5	8	5	3.50	0	4	2	0		0	0	0	3	3	4.50
Use a mobile phone to send or receive email	0	15	5	2		4	2	6	6	4	3.18	0	3	3	0		0	0	1	3	2	4.17

Table 4.20. Continued.

	University of Al-Jabal Al-Gharbi (Regional)																	
	Group C, Elec. Eng. *N*=7										Group D, Petr. Eng. *N*=6									
	Purpose of use					Level of skill						Purpose of use					Level of skill					
	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean	Teaching	Other	Both	Do not know		Not skilled at all	Not skilled	Neutral	Skilled	Very Skilled	Mean
Use a mobile phone to text/SMS people	0	3	4	0		1	0	0	2	4	4.14	0	3	3	0		0	0	3	1	2	3.83
Use a mobile phone to access web info/services	0	7	0	0		0	1	2	2	2	3.71	0	3	3	0		0	1	2	1	2	3.67
Use a mobile phone to send or receive email	0	7	0	0		0	1	1	4	1	3.71	0	4	2	0		0	1	3	1	1	3.33

Results presented in Table 4.20 show that, while instructors reported a high level of mobile phone usage and skill, their level of use for teaching purposes was moderate.

4.5. USEFULNESS OF TECHNOLOGY IN LEARNING AND TEACHING

Participants were provided with a list of technology based tools that might be used in their learning/teaching. They were asked to apply a rating scale (from "1" *'strongly disagree'* to "5" *'strongly agree'*) to indicate their agreement with how useful each of these technologies would be in supporting their learning/teaching. If the participants were not sure about a particular technology, they were asked to select the *'do not know'* option.

To facilitate statistical analysis and ease of interpretation, the categories *'strongly disagree'* and *'disagree'* were merged into a single category, *'disagree'* and, the categories *'agree'* and *'strongly agree'* were combined into a single category, *'agree'*.

4.5.1. Usefulness of technology in learning – student perceptions

Students were asked to indicate whether they perceived technologies useful in supporting their learning; they were provided with a selection of common ways in which a technology could be utilised in a learning environment. The results are reported as a percentage of those respondents who disagreed, agreed, or were neutral toward each of the technologies (the percentages have been rounded to the nearest integer). Respondents who indicated that they did not know a technology are not included in this analysis.

Usefulness of computer-based technologies

Table 4.21. Percentage of students who found computer-based technologies useful for learning.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng	Group B Petr. Eng	Group C Elec. Eng	Group D Petr. Eng
		% *(N)*	% *(N)*	% *(N)*	% *(N)*
Create and present multimedia shows (e.g. Power Point)	*Agree*	89 (96)	85 (79)	83 (30)	81 (46)
	Neutral	8 (9)	14 (13)	17 (6)	18 (10)
	Disagree	3 (3)	1 (1)	0 (0)	1 (1)
Create and present audio/video (e.g. iMovie, Movie Maker)	*Agree*	73 (80)	81 (75)	78 (31)	76 (45)
	Neutral	22 (24)	16 (15)	20 (8)	19 (11)
	Disagree	5 (5)	3 (3)	2 (1)	5 (3)
Create spreadsheets (Excel, etc.)	*Agree*	82 (87)	90 (86)	88 (37)	76 (44)
	Neutral	15 (16)	10 (10)	10 (4)	22 (13)
	Disagree	3 (3)	0 (0)	2 (1)	2 (1)
Use programming languages (C++, Java, etc.)	*Agree*	73 (71)	78 (72)	93 (38)	69 (40)
	Neutral	18 (18)	20 (19)	7 (3)	26 (15)
	Disagree	9 (9)	2 (2)	0 (0)	5 (3)
Use Matlab to simplify the implementation of numerical linear algebra routines	*Agree*	75 (68)	82 (65)	94 (30)	73 (40)
	Neutral	21 (19)	14 (11)	3 (1)	26 (14)
	Disagree	4 (4)	4 (3)	3 (1)	1 (1)
Use Labview to develop high-performance applications	*Agree*	69 (52)	78 (59)	78 (21)	68 (29)
	Neutral	24 (18)	18 (14)	15 (4)	30 (13)
	Disagree	7 (5)	4 (3)	7 (2)	2 (1)

As shown in Table 4.21, overall, students in all groups perceived computer-based technologies as useful for learning. In particular, creating Power Point presentations was seen as very useful – more than 80% of respondents in each group agreed. All groups perceived using Excel to create spreadsheets as very useful, with students in Group D indicating somewhat lower levels of usefulness as compared to other students. The highest levels of usefulness were attributed by students in Group C to the use of Matlab (94% of students

agreed), and to the use of programming languages (93% of students agreed). Using Labview to develop high-performance applications was perceived least favourably by all groups of students.

Usefulness of web-based technologies

Table 4.22. Percentage of students who found web-based technologies useful for learning.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng	Group B Petr. Eng	Group C Elec. Eng	Group D Petr. Eng
		% *(N)*	% *(N)*	% *(N)*	% *(N)*
Download or access online audio/video recordings of lectures	*Agree*	85 (96)	92 (87)	93 (37)	82 (54)
	Neutral	11 (12)	7 (7)	5 (2)	14 (9)
	Disagree	4 (5)	1 (1)	2 (1)	4 (3)
Download or access online audio/video recordings of supplementary content material	*Agree*	91 (105)	88 (85)	98 (41)	80 (53)
	Neutral	5 (6)	10 (10)	0 (0)	17 (11)
	Disagree	4 (5)	2 (2)	2 (1)	3 (2)
Use the web to access University based services (e.g. enrolment, sign up for tutes, pay fees)	*Agree*	93 (109)	95 (95)	95 (39)	90 (57)
	Neutral	4 (5)	5 (5)	0 (0)	5 (4)
	Disagree	3 (4)	0 (0)	5 (2)	5 (3)
Use the web to share digital files related to your course (e.g. sharing photos, audio files, movies, websites, etc.)	*Agree*	86 (97)	88 (89)	81 (34)	72 (47)
	Neutral	12 (13)	10 (10)	19 (8)	25 (16)
	Disagree	2 (3)	2 (2)	0 (0)	3 (2)

Overall, students in all groups perceived web-based technologies as very useful technologies in learning (Table 4.22). In particular, using the web to access university based services (e.g. enrolment, payment of fees) was seen as useful by over 90% of respondents in each group. Also, downloading or accessing online audio/video recordings of lectures and downloading or accessing online audio/video recordings of supplementary content material were perceived as most useful – over 80% of respondents in each group agreed.

Usefulness of web-based communication

Table 4.23. Percentage of students who found web-based communication useful for learning.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng	Group B Petr. Eng	Group C Elec. Eng	Group D Petr. Eng
		% *(N)*	% *(N)*	% *(N)*	% *(N)*
Use instant messaging/chat (e.g. MSN, Yahoo, ICQ) on the web to communicate/ collaborate with other students in the course	*Agree*	83 (97)	83 (84)	70 (28)	64 (40)
	Neutral	13 (15)	15 (15)	25 (10)	33 (21)
	Disagree	4 (5)	2 (2)	5 (2)	3 (2)
Use instant messaging/chat (e.g. MSN, Yahoo) on the web to communicate with lecturing and administrative staff	*Agree*	81 (96)	81 (81)	77 (29)	63 (40)
	Neutral	16 (19)	15 (15)	18 (7)	31 (20)
	Disagree	3 (4)	4 (4)	5 (2)	6 (4)
Use social networking software (e.g. Facebook) on the web to communicate/collaborate with other students	*Agree*	83 (96)	75 (73)	69 (27)	64 (43)
	Neutral	15 (17)	19 (18)	23 (9)	28 (19)
	Disagree	2 (3)	6 (6)	8 (3)	8 (5)
Use web conferencing or video chat to communicate/ collaborate with other students	*Agree*	76 (84)	68 (65)	68 (27)	62 (40)
	Neutral	19 (21)	24 (23)	25 (10)	30 (20)
	Disagree	5 (5)	8 (8)	7 (3)	8 (5)

As shown in Table 4.23, all students perceived the web as a useful tool for communication in relation to learning with urban students rating its usefulness somewhat higher than their regional counterparts. In particular, using instant messaging/chat to communicate/collaborate with other students in the course or with lecturing and administrative staff were seen by the urban students as very useful – more than 80% of respondents agreed. Students in urban Group A perceived using social networking software to communicate/collaborate with other students as very useful; however, students in regional Group D reported the lowest levels of usefulness of this technology. Using web conferencing or video chat to communicate/collaborate with other students was perceived least favourably by students in all groups.

Usefulness of blogs, Wikis and web pages

Table 4.24. Percentage of students who found blogs, Wikis, and web pages useful for learning.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng	Group B Petr. Eng	Group C Elec. Eng	Group D Petr. Eng
		% *(N)*	% *(N)*	% *(N)*	% *(N)*
Keep your own blogs as part of your course requirements	*Agree*	66 (42)	65 (43)	65 (11)	43 (15)
	Neutral	27 (17)	32 (21)	24 (4)	54 (19)
	Disagree	7 (5)	3 (2)	11 (2)	3 (1)
Contribute to a blog as part of your course requirements	*Agree*	56 (35)	72 (45)	82 (14)	53 (18)
	Neutral	32 (20)	25 (16)	18 (3)	47 (13)
	Disagree	12 (8)	3 (2)	0 (0)	0 (0)
Contribute with other students to the development of wiki as part of your course requirements	*Agree*	60 (44)	75 (50)	68 (15)	65 (24)
	Neutral	30 (23)	24 (16)	27 (6)	35 (13)
	Disagree	10 (7)	1 (1)	5 (1)	0 (0)
Design and build web pages	*Agree*	80 (83)	84 (75)	74 (29)	74 (45)
	Neutral	15 (16)	14 (12)	23 (9)	26 (16)
	Disagree	5 (5)	2 (2)	3 (1)	0 (0)

The results presented in Table 4.24 show that designing and building web pages was perceived most useful of all the options provided, particularly by the urban students. On the other hand, keeping blogs as part of the course requirements was perceived as least useful. Contributing to blogs and Wikis as part of the course requirements was regarded as relatively useful, although student perceptions of the usefulness of such activities varied somewhat between the groups.

Usefulness of mobile phones

Table 4.25. Percentage of students who found mobile phones useful for learning.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng	Group B Petr. Eng	Group C Elec. Eng	Group D Petr. Eng
		% *(N)*	% *(N)*	% *(N)*	% *(N)*
Use your mobile phone to access web-based University services information or services	*Agree*	89 (105)	86 (85)	91 (38)	78 (52)
	Neutral	9 (10)	10 (10)	7 (3)	16 (11)
	Disagree	2 (3)	4 (4)	2 (1)	6 (4)
Receive grades/marks from your Lecturer via text message on your mobile phone	*Agree*	92 (100)	87 (87)	81 (35)	90 (61)
	Neutral	5 (6)	7 (7)	14 (6)	4 (3)
	Disagree	3 (4)	6 (6)	5 (2)	6 (4)
Receive pre-class discussion questions from your Lecturer via text message on your mobile phone	*Agree*	79 (93)	73 (73)	64 (31)	88 (61)
	Neutral	13 (15)	18 (18)	19 (8)	9 (6)
	Disagree	8 (10)	9 (9)	7 (3)	3 (2)
Receive administrative information about the course via text message on your mobile phone	*Agree*	87 (104)	91 (93)	91 (38)	87 (60)
	Neutral	9 (11)	6 (6)	9 (4)	12 (8)
	Disagree	4 (4)	3 (3)	0 (0)	1 (1)

Results presented in Table 4.25 show that students in all groups perceived mobile phones as very useful, particularly with respect to administrative tasks related to their studies; over 80% of students in each group regarded as useful the ability to receive grades and course information via text messages. While receiving pre-class discussion questions via text message was perceived relatively useful, this application of mobile phones was rated lowest in comparison to the other applications.

Overall usefulness of technology

The level of overall usefulness of technology was determined by finding the average of items discussed in previous subsections; the dependent variable had an approximate normal distribution (skewness statistic = 0.363, SE=0.131; kurtosis statistic = 0.644, SE=0.262). Multiple linear regression was used to determine how the overall usefulness of a technology

was related to student gender and location, as well as other independent variables such as age, year of study, student access to technology, student use of technology for learning, student skill in technology, and student satisfaction with technology (a mathematical description of the model used is presented in Chapter 3, Section 3.6.1). The model was not statistically significant ($F_{(14,45)}$=0.803, p=0.661), and none of the independent variables were significantly related to the overall usefulness of technology (details are presented in Appendix I).

4.5.2. Usefulness of technology in teaching – instructor perceptions

Instructors were asked to indicate whether they perceived technologies useful in supporting their teaching. The results are reported as actual numbers of those instructors who disagreed, agreed, or were neutral toward each of the technologies included in the survey. Respondents who indicated that they did not know a technology are not included in this analysis.

Usefulness of computer-based technologies

Table 4.26. Number of instructors who found computer-based technologies useful for teaching.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=24	Group B Petr. Eng *N*=6	Group C Elec. Eng *N*=7	Group D Petr. Eng *N*=6
Create and present multimedia shows (e.g. Power Point)	*Agree*	20	5	7	4
	Neutral	2	1	0	2
	Disagree	0	0	0	0
Create and present audio/video (e.g. iMovie, Movie Maker)	*Agree*	16	5	6	3
	Neutral	4	1	0	2
	Disagree	0	0	0	0
Create spreadsheets (Excel, etc.)	*Agree*	21	5	3	3
	Neutral	1	0	3	2
	Disagree	0	0	0	0
Use programming languages (C++, Java, etc.)	*Agree*	19	5	2	3
	Neutral	2	1	0	2
	Disagree	0	0	1	0
Use Matlab to simplify the implementation of numerical algebra routines	*Agree*	17	5	5	3
	Neutral	2	0	1	2
	Disagree	0	0	1	0
Use Labview to develop high-performance applications	*Agree*	14	4	2	3
	Neutral	3	0	0	2
	Disagree	0	0	1	0

Overall, instructors in all groups perceived computer-based technologies as a useful tool in teaching (Table 4.26); creating Power Point presentations was regarded as particularly useful. Using Excel to create spreadsheets was perceived as very useful too, although instructors in regional groups reported lower levels of usefulness of this technology. Using Labview to develop high-performance applications was perceived least favourably of all technologies.

Usefulness of the web-based technologies

Table 4.27. Number of instructors who found web-based technologies useful for teaching.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=24	Group B Petr. Eng *N*=6	Group C Elec. Eng *N*=7	Group D Petr. Eng *N*=6
Upload online audio/video recordings of lectures	*Agree*	15	5	2	3
	Neutral	4	1	0	2
	Disagree	1	0	1	0
Upload online audio/video recordings of supplementary content material	*Agree*	14	5	2	3
	Neutral	7	1	3	2
	Disagree	0	0	1	0
Use the web to share digital files related to your course (e.g. sharing photos, audio files, movies, websites)	*Agree*	16	5	6	3
	Neutral	5	0	1	3
	Disagree	0	0	0	0

All the web-based technologies presented for the instructors' consideration were regarded by them as useful in teaching (Table 4.27). While the levels of perceived usefulness were similar for all the technologies, using the web to share digital files related to courses was seen as most useful.

Usefulness of web for communication

Table 4.28. Number of instructors who found web-based communication useful for teaching.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=24	Group B Petr. Eng *N*=6	Group C Elec. Eng *N*=7	Group D Petr. Eng *N*=6
Use instant messaging/chat (e.g. MSN, Yahoo, ICQ) on the web to communicate with students	*Agree*	11	2	5	3
	Neutral	6	2	0	2
	Disagree	4	1	1	0
Use instant messaging/chat (e.g. MSN, Yahoo) on the web to communicate with other instructors & administrators	*Agree*	18	4	4	3
	Neutral	3	1	0	2
	Disagree	2	0	1	0
Use social networking software (e.g. Facebook) on the web to communicate with students	*Agree*	16	3	6	3
	Neutral	4	1	1	3
	Disagree	4	1	0	0
Use web conferencing or video chat to communicate with students	*Agree*	14	2	3	2
	Neutral	5	4	4	4
	Disagree	1	0	0	0

Overall, instructors in all groups perceived the web as a useful tool for communication in relation to teaching (Table 4.28). Using instant messaging/chat to communicate with other instructors and administrative staff was seen by instructors as particularly useful. Instructors in all groups perceived the use of web conferencing or video chat to communicate with students as relatively less useful than the other web-based communication options.

Usefulness of blogs, Wikis and web pages

Table 4.29. Number of instructors who found blogs, Wikis and web pages useful for teaching.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=24	Group B Petr. Eng *N*=6	Group C Elec. Eng *N*=7	Group D Petr. Eng *N*=6
Keep your own blogs as part of the course	*Agree*	9	3	2	1
	Neutral	3	1	2	4
	Disagree	1	0	0	0
Keep a Wiki as part of the course	*Agree*	7	2	2	2
	Neutral	3	2	1	3
	Disagree	1	0	0	0
Design and build web pages	*Agree*	17	4	5	4
	Neutral	4	1	1	2
	Disagree	0	0	1	0

Instructors in all groups perceived designing and building web pages as very useful to support their teaching (Table 4.29). Blogs and Wikis were regarded to be of lesser usefulness.

Usefulness of mobile phones

Table 4.30. Number of instructors who found mobile phones useful for teaching.

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=24	Group B Petr. Eng *N*=6	Group C Elec. Eng *N*=7	Group D Petr. Eng *N*=6
Receive grades/marks for students via text message through mobile phone	*Agree*	9	1	4	3
	Neutral	7	3	1	3
	Disagree	6	2	1	0
Provide pre-class discussion questions for students via text message through mobile phone	*Agree*	8	1	2	4
	Neutral	9	2	3	1
	Disagree	6	2	1	1

The results provided in Table 4.30 show that the urban instructors' views on the usefulness of mobile phones for teaching were divided; just as many of them agreed as disagreed with the usefulness of this technology. Regional instructors regarded the usefulness of mobile phones more favourably.

4.6. SATISFACTION WITH THE AVAILABLE ICT ENVIRONMENT

Participants were asked to indicate their level of satisfaction with the various aspects of the available ICT environment using a rating scale (from "1" *'very poor'* to "5" *'very good'*). To facilitate statistical analysis and ease of interpretation, the categories *'very good'* and *'good'* were merged into a single category, *'good'* and, the categories *'poor'* and *'very poor'* were combined into a single category, *'poor'*.

4.6.1. Student satisfaction

Table 4.31. Student satisfaction with the available ICT environment (represented as observed percentages).

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng	Group B Petr. Eng	Group C Elec. Eng	Group D Petr. Eng
		N=125	*N*=105	*N*=45	*N*=73
The quality of the Internet access in the institute	*Good*	16	10	7	2
	Average	16	27	26	8
	Poor	68	63	67	90
The necessary ICT infrastructure	*Good*	10	10	13	0
	Average	27	26	18	16
	Poor	63	64	69	84
The quality of the technology used in classes	*Good*	8	8	2	4
	Average	25	23	29	11
	Poor	67	69	69	85
The ease of use of technology	*Good*	20	20	13	3
	Average	37	34	40	38
	Poor	43	46	47	59
The extent to which the courses relied on the use of technology in the classrooms	*Good*	2	11	5	7
	Average	19	26	24	18
	Poor	69	63	71	75
The extent to which the courses relied on the use of technology at home	*Good*	22	36	22	28
	Average	39	37	49	46
	Poor	39	27	29	26
The degree of confidence you had that classes would not be interrupted or cancelled due to technical problems	*Good*	34	22	5	12
	Average	31	44	46	46
	Poor	35	34	49	42
The quality of technical support provided	*Good*	10	11	5	6
	Average	31	33	20	19
	Poor	59	56	75	75
The overall usefulness of technology used in classes	*Good*	31	31	27	21
	Average	22	31	22	23
	Poor	47	38	51	56

As shown in Table 4.31, student satisfaction with the available ICT environment was generally low among all groups of participants. Satisfaction was particularly low among regional students from Group D. These students were least satisfied with the quality of the Internet access (90% of students rated it *'poor'*), the ICT infrastructure (84% of *'poor'* responses), and the quality of technology used in classes (85% of *'poor'* responses). Students in all groups found the quality of technical support lacking. While more than half of the students in urban groups A and B felt dissatisfied with the quality of technical support provided, the level of dissatisfaction among the regional students was even higher (75% of *'poor'* responses).

In addition to student satisfaction with the ICT environment, their interest in studying courses that use e-learning was also gauged.

Table 4.32. Student interest in studying courses that use e-learning (represented as observed percentages).

	University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
	Group A Elec. Eng *N*=125	Group B Petr. Eng *N*=105	Group C Elec. Eng *N*=45	Group D Petr. Eng *N*=73
Agree	85	89	78	94
Neutral	9	6	18	6
Disagree	6	5	4	0

As shown in Table 4.32 student interest in an e-learning mode of study was high across all groups, and it was highest among regional students from Group D (94% of respondents agreed).

The average level of student interest in studying a course that uses e-learning was also compared with their average level of satisfaction with the various aspects of the available ICT environment (Figure 4.10).

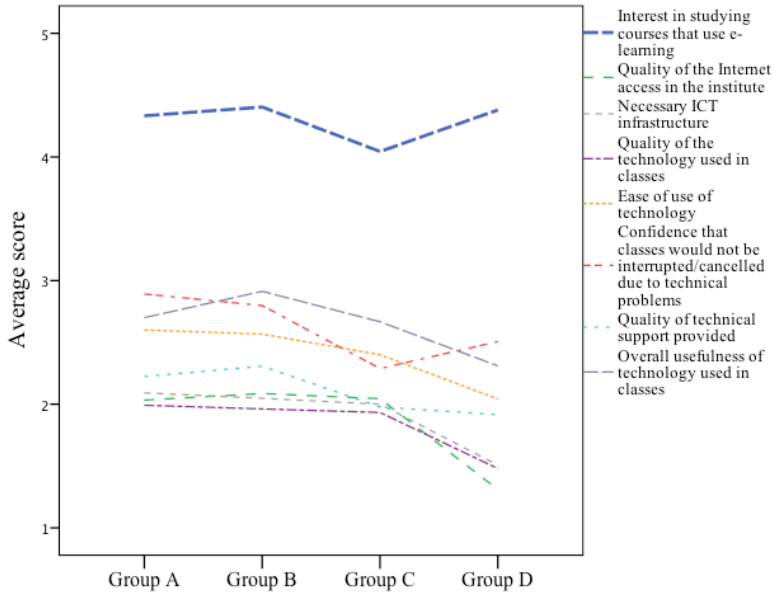

Figure 4.10. Student interest in studying e-learning courses and their satisfaction with the available ICT environment (represented as mean scores).

As illustrated in Figure 4.10., the high level of student interest in studying courses that use e-learning did not seem to be affected by their level of satisfaction with the ICT environment, which was generally low among all groups of participants. Interest was high even among students in Group D, although their levels of satisfaction were particularly low.

4.6.2. Instructor satisfaction

Table 4.33. Instructor satisfaction with the available ICT environment (represented as actual numbers).

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=24	Group B Petr. Eng *N*=6	Group C Elec. Eng *N*=7	Group D Petr. Eng *N*=6
The quality of the Internet access in the institute	*Good*	2	3	0	1
	Average	5	3	0	1
	Poor	17	0	7	4
The necessary ICT infrastructure	*Good*	2	0	0	1
	Average	5	4	1	1
	Poor	17	2	6	4
The quality of the technology used in classes	*Good*	1	3	0	2
	Average	5	3	1	4
	Poor	18	0	6	0
The ease of use of technology	*Good*	7	1	2	3
	Average	7	5	3	3
	Poor	9	0	2	0
The degree of confidence you had that classes would not be interrupted or cancelled due to technical problems	*Good*	6	2	1	2
	Average	10	4	3	3
	Poor	8	0	3	1
The quality of technical support provided	*Good*	1	2	0	1
	Average	5	3	3	3
	Poor	17	1	4	2
The overall usefulness of technology used in classes	*Good*	16	1	6	2
	Average	5	5	0	4
	Poor	3	0	1	0

The participating instructors reported low levels of satisfaction with the available ICT environment (Table 4.33). The aspects that were rated lowest included the quality of the Internet access, the ICT infrastructure, the quality of technology used in classes, and the quality of technical support; instructors in Group C reported the lowest levels of satisfaction among all groups. However, instructors in all groups were relatively satisfied with the overall usefulness of technology use in classes.

Instructor interest in providing e-learning courses was also gauged (Table 4.34) and compared with their satisfaction with the available ICT environment (Figure 4.12).

Table 4.34. Number of instructors interested in providing e-learning courses.

	University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
	Group A Elec. Eng *N*=24	Group B Petr. Eng *N*=6	Group C Elec. Eng *N*=7	Group D Petr. Eng *N*=6
Agree	20	6	5	2
Neutral	4	0	1	4
Disagree	0	0	1	0

Instructor interest in providing e-learning courses was high, particularly among the urban groups A and B (Table 4.34). As illustrated in Figure 4.11, instructor interest was high in spite of their low levels of satisfaction with the available ICT environment.

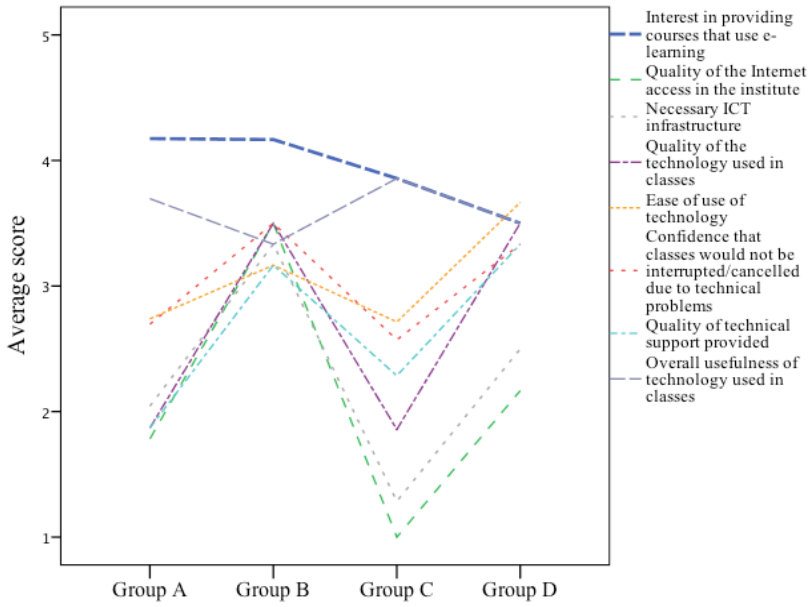

Figure 4.11. Instructor interest in providing e-learning courses and their satisfaction with the available ICT environment (represented as mean scores).

Elaborating about the reasons behind their willingness to provide e-learning in the future, instructors identified e-learning's capacity to improve communication, facilitate student learning, and enable incorporation of new teaching methods:

> "Yes, I am highly interested to use e-learning because it strengthens and makes communication more convenient among students and colleagues. It also allows students to access materials anytime and anywhere; I believe that this will have a huge positive impact on students' learning and instructors' teaching."

"Yes, because teaching in e-learning will allow me to use new technologies and try new methods for teaching."

"Yes, of course I would like to use e-learning in my teaching because of its benefits for both the instructor and the student. It increases and facilitates communication between students and colleagues, while also helping them to exchange information, opinions and ideas that serve the educational process."

"Yes, I would like to use e-learning for my teaching because I believed that e-learning would make the education and training more accessible for all Libyans; it will increase the number of educated people who in turn participate in the development of the new Libya."

4.7. ATTITUDES AND BELIEFS TOWARDS ICT AND E-LEARNING

Participants were asked to indicate their level of agreement with various statements related to attitudes and beliefs using a rating scale (from "1" *'strongly disagree'* to "5" *'strongly agree'*). To facilitate statistical analysis and ease of interpretation, the categories *'strongly agree'* and *'agree'* were merged into a single category, *'agree'* and, the categories *'disagree'* and *'strongly disagree'* were combined into a single category, *'disagree'*.

4.7.1. Student attitudes and beliefs

Table 4.35. Student attitudes and beliefs towards ICT and e-learning (represented as observed percentages).

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=125	Group B Petr. Eng *N*=105	Group C Elec. Eng *N*=45	Group D Petr. Eng *N*=73
I feel confident in using computers	*Agree*	71	87	89	82
	Neutral	22	10	7	16
	Disagree	7	3	4	2
I enjoy using ICT for my studies	*Agree*	63	70	73	69
	Neutral	27	21	18	19
	Disagree	10	9	9	12
I believe that e-learning gives me the opportunity to acquire new knowledge	*Agree*	86	93	91	88
	Neutral	10	7	5	10
	Disagree	4	0	4	2
I believe that e-learning enhances my learning experience	*Agree*	86	93	90	89
	Neutral	12	7	9	11
	Disagree	2	0	1	0
I believe that convenience is an important feature of e-learning	*Agree*	76	91	87	88
	Neutral	21	8	9	11
	Disagree	3	1	4	1
E-learning increases the quality of learning because it integrates all forms of media	*Agree*	80	87	78	85
	Neutral	17	10	15	12
	Disagree	3	3	7	3
Adopting ICT and e-learning allows for increased student satisfaction	*Agree*	79	83	84	89
	Neutral	17	14	11	11
	Disagree	4	3	5	0

The results presented in Table 4.35 reveal that students in all groups felt confident in using computers, enjoyed using computers in their studies, and believed in the benefits of e-learning. Most students held positive beliefs about the capabilities of e-learning; they believed particularly strongly that e-learning facilitates better acquisition of new knowledge and enhances learning experience. Among all the groups, students from the urban Group A were somewhat less likely to believe in the convenience of e-learning and its capacity to increase their learning satisfaction.

Student attitudes and beliefs were also checked against their overall levels of access to technology, skill, and satisfaction to explore possible relationships.

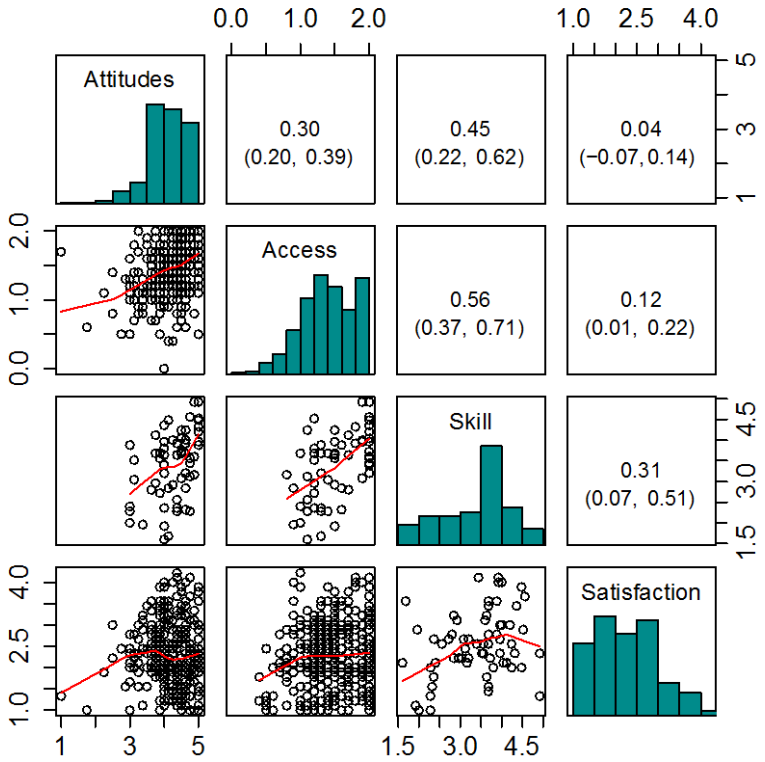

Figure 4.12. Scatterplots (lower triangle), histograms (diagonal), and correlations with 95% confidence intervals (upper triangle) for student average scores on attitudes/beliefs, access, skill and satisfaction levels.

As illustrated in Figure 4.12, the relationships were approximately linear between student attitudes/beliefs and other variables: student access to technologies, student use of technology for learning, student skill in technologies, and student satisfaction with technologies. The Pearson Product Moment correlation coefficients were used to measure the relationships between the variables. The correlation coefficients were interpreted by using Davis (1971) descriptors (negligible = 0.00 to 0.09; low =0.10 to 0.29; moderate = 0.30 to 0.49; substantial =0.50 to 0.69; very strong = 0.70 to 1.00). There was a moderate positive relationship (r =0.45, p<0.01) between student attitudes/beliefs towards ICT and e-learning and their levels of skills in technology-based tools. The results also show a moderate positive correlation between student attitudes/beliefs and their levels of access to various technologies (r =0.30, p<0.01). Moreover, a substantial positive relationship (r =0.56, p<0.01) was found between student level of skill in technology-based tools and their level of access to a range of technologies.

To study the relationships between student attitudes/beliefs (the dependent variable) and their characteristics including gender, study group, age, year level, level of access to technology, use of technology for learning, level of skill in technology, and satisfaction with technology, a multiple regression analysis was conducted (Table 4.36). The dependent variable was moderately skewed to the left (skewness statistic = -1.086, SE=0.132; kurtosis statistic = 2.787, SE=0.263).

Table 4.36. Multiple regression model for student attitudes/beliefs towards ICT and e-learning.

Variable	B	SE	
Constant	2. 27	0.52	
Gender (Male)	- 0.10	0.16	
Group B	0.18	0.19	
Group C	0.08	0.33	
Group D	0.01	0.30	
Age 21-22	-0.08	0.33	
Age ≥ 23	-0.52	0.36	
Year 2	0.26	0.31	
Year 3	0.41	0.37	
Year ≥ 4	0.58	0.37	
Access	0.09	0.25	
Use	0.49	0.40	
Skill	0.32	0.11	*
Satisfaction	0.13	0.11	

** $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$*

Table 4.36 shows that only the level of skill was statistically significant (t = 2.822; p = 0.007). There was no significant difference between female and male students, or between urban and regional students with respect to their attitudes towards ICT and e-learning. While the model was significant at the 0.05 level of significance ($F_{(4, 54)}$ =5.73; p=0.001), only 25% of the variance in student attitudes and beliefs was explained by the independent variables included in this model (Adjusted R Square=0.246) – further details are presented in Appendix J.

4.7.2. Instructor attitudes and beliefs

Table 4.37. Instructor attitudes and beliefs towards ICT and e-learning (represented as actual numbers).

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=24	Group B Petr. Eng *N*=6	Group C Elec. Eng *N*=7	Group D Petr. Eng *N*=6
I feel confident in using computers	*Agree*	23	6	7	5
	Neutral	1	0	0	1
	Disagree	0	0	0	0
I enjoy using ICT for my teaching	*Agree*	16	5	6	5
	Neutral	7	0	0	1
	Disagree	1	1	1	0
I believe that e-learning gives me the opportunity to better convey new knowledge	*Agree*	19	6	5	4
	Neutral	5	0	2	2
	Disagree	0	0	0	0
I believe that e-learning enhances my teaching capacity	*Agree*	16	6	6	4
	Neutral	8	0	1	2
	Disagree	0	0	0	0
I believe that convenience is an important feature of e-learning	*Agree*	17	6	3	2
	Neutral	6	0	4	3
	Disagree	1	0	0	1
E-learning increases the quality of teaching because it integrates all forms of media	*Agree*	19	6	6	4
	Neutral	4	0	1	1
	Disagree	1	0	0	1

The results presented in Table 4.37 show that the majority of instructors in all groups felt confident in using computers, enjoyed using ICT for teaching, and believed in the benefits of e-learning in relation to teaching. Instructors who participated in the phone interviews confirmed these beliefs with the following comments:

> "E-learning can improve my ability to use new technology and multimedia facilities to adapt to this 'information age'. It could also improve student learning outcomes by providing more resources and support".

> "Via the Web, I will exchange ideas and experiences with my colleagues and other instructors from other institutions. This will help me and my fellow instructors to enhance our teaching".

> "E-learning enables students to learn collaboratively from one another; this is significant for their learning. I believe that students become more motivated and will make better progress".

4.8. CHALLENGES FACED WHEN USING ICT AND E-LEARNING

Students and instructors were asked to list three challenges that they faced when using ICT and e-learning. Qualitative data was collected from student and instructor responses to the open-ended questions in the surveys and from short phone interviews with instructors.

4.8.1. Challenges faced by students

Table 4.38. Perceived challenges of ICT and e-learning faced by students (as observed percentages).

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=125	Group B Petr. Eng *N*=105	Group C Elec. Eng *N*=45	Group D Petr. Eng *N*=73
Individual challenges	Lack of knowledge and experience	15	12	11	16
	Lack of necessary technology skills	13	7	0	0
Contextual challenges	Lack of training	9	7	0	3
	Limited command of English	4	6	3	13
	Limited awareness of technology-based learning	11	4	11	2
Technological challenges	Lack of infrastructure	39	18	7	7
	Limited Internet access	36	34	34	48
	Computer storage	4	2	3	2
Pedagogical challenges	Traditional ways of teaching	14	7	0	15

Four dominant types of challenges were synthesised from the student responses including individual, contextual, technological, and pedagogical challenges (Table 4.38). The majority of students in all groups regarded technological challenges as the most dominant obstacle with the urban students identifying the lack of infrastructure and limited Internet access as the biggest challenge; this might be explained by the destruction of the educational infrastructure, particularly in the urban areas, during the 2011 armed conflict.

4.8.2. Challenges faced by instructors

Table 4.39. Perceived challenges of ICT and e-learning faced by instructors (as actual numbers).

		University of Tripoli (Urban)		University of Al-Jabal Al-Gharbi (Regional)	
		Group A Elec. Eng *N*=24	Group B Petr. Eng *N*=6	Group C Elec. Eng *N*=7	Group D Petr. Eng *N*=6
Individual challenges	Lack of experience	1	0	0	0
	Limited awareness of technology-based learning	3	1	0	1
Contextual challenges	Lack of motivation among students	4	1	2	2
	Shortage of student's self-efficacy	2	0	0	0
	Shortage of e-learning developers and teachers	2	2	0	0
	Lack of training	3	2	0	0
	Lack of budget & resources	10	1	0	0
	Lack of adequate administrative support	1	0	0	0
Technological challenges	Lack of infrastructure	17	4	5	6
	Limited Internet access	15	4	5	6
	Computer storage	1	0	0	0
Pedagogical challenges	New curriculum design	6	0	2	1
	New teaching methods	7	3	2	2

Similar to student responses, four types of challenges emerged from instructor responses including individual, contextual, technological, and pedagogical challenges (Table 4.39). Like the students, the majority of instructors in all groups regarded technological challenges as the most dominant obstacle. The instructors who participated in the phone interviews further reiterated these views:

> "The network systems should be improved; internet speed should be fast during the day to accommodate an increased number of students that are using the internet during the day. This seems to be a challenge that is affecting most of the instructors and students".

> "Computers and networks have either worked badly or encountered low bandwidth connections with frequent breakdowns".

> "Instructors and students face limited Internet access, an insufficient number of computers to use, and unsuitable computers in terms of their capacity and speed".

> "Due to a shortage of computers, instructors have to share one computer in an office with many officemates, and for students the situation is worse".

Lack of experience and computer skills was mentioned as a potential challenge to engaging in e-learning:

> "I struggle with computers. I do not have computer literacy skills and feel a sense of incompetence. Thus I tend to feel anxious and even worried about engaging in e-learning".

Among the contextual challenges, inadequate technical support, lack of training, lack of motivation among some students, and a lack of experts and university support were also emphasised by interview participants:

> "When technical problems arise, I get frustrated. Each time I need technical assistance, I go to the help desk, but no one is available. This inhibits the use of e-learning".

> "I lacked confidence that technical support would be available and able to solve the technical problem when I needed it. I see this as a great barrier. Also, training is not available at all. I still rely on the training courses such as the modern teaching methods, and use the online feedback and e-assessment that I received in the UK while I was doing my PhD study".

> "Some students lack good technical knowledge and skills to access online materials and tests; they therefore do not participate in learning activities. This challenge hinders student engagement in e-learning".

> "Good e-learning course illustrations are necessary to learn how to design good e-learning courses and share experiences. E-learning experts are needed to assist instructors with solving all e-learning related problems. Also, the university should provide some awards for those instructors involved in e-learning teaching to encourage others to engage in e-learning teaching".

Commenting on the pedagogical challenges, the interviewed instructors noted that some of the engineering courses they taught seemed unsuitable for e-learning settings:

> "Some engineering laboratory courses are complicated and difficult to design and upload online".

> "I need to provide various types of e-content online, so I had to learn new curriculum design and new teaching methods for my e-learning courses; this takes so much of my time and effort, it is time consuming".

4.9. CONCLUSION

This chapter provided results of the main study. The survey data analysis was presented beginning with descriptive statistics of student and instructors' demographic characteristics, and then statistical analysis of student and instructor experiences and perceptions of technology based tools, and an analysis of the qualitative data were presented.

Chapter 5 presents the conclusions and limitations related to this research study, contributions of the research, and recommendations for future research related to understanding of the issues related to the introduction and adoption of ICT and e-learning in Libyan higher education.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

5.1. INTRODUCTION

E-learning is increasingly becoming a vital modern model of education worldwide, including developing countries. In Libya, e-learning has been a major focus of the e-Libya policy which gives it the potential to play a vital role in re-developing the country's higher education system. Using student and instructor perceptions as a framework, this research study has identified the characteristics, enablers, and challenges of educational settings as related to ICT and e-learning in higher education in Libya and has developed a set of recommendations for the advancement of e-learning in the country.

This chapter begins with a summary of my thesis in Section 5.2, with each chapter summarised. Section 5.3 addresses the major findings of my study which led to the development of recommendations for the integration of e-learning into Libyan higher education system, outlined in Section 5.4. Section 5.5 describes the contributions of my study, and Section 5.6 summarises its constraints and limitations. Recommendations for future studies related to my research are outlined in Section 5.7.

5.2. OVERVIEW OF THE THESIS

The first chapter of this thesis provides a general background to the evolution of e-learning in higher education, in addition to presenting the aims and significance of this study. The overview of e-learning (Section 1.1) focuses on its development in higher education in developing countries in general and, in particular, in Libya. I highlight the progress made so far; identify the challenges for integrating e-learning in higher education in those countries, and underline the potential of e-learning in re-building and re-developing the higher education system in post-war Libya. I identify the research problem and questions (Section 1.2), followed by an

outline of methods and significance of this study (Sections 1.3 & 1.4). The aims of my study are: (1) to determine the preparedness for e-learning of students and instructors at two typical Libyan public universities by investigating their experiences and perceptions of ICT and e-learning; and, (2) to develop a set of recommendations that will assist Libyan higher education institutions in developing future e-learning initiatives. Finally, I point out the significance of this study.

Chapter 2 provides a review of literature in five areas related to this research study: higher education context in Libya; e-learning in Libyan higher education; challenges and prospects for e-learning in Libya; success of e-learning in higher education; and, the main factors contributing to e-learning success. Sections 2.2 and 2.3 give an overview of higher education in developing countries and describe the higher education context in Libya. The following section (Section 2.4) explores the fundamental role that ICT and e-learning have played in education. Section 2.5 presents the applications of ICT and e-learning in developing countries, and discusses the challenges and prospects for e-learning in those countries. Following on, Section 2.6 focuses on e-learning in Libyan higher education and discusses the issues that need to be considered and addressed in adapting ICT for learning and teaching including technological infrastructure, curriculum development, cultural and linguistic aspects, and administrative support. Then, Section 2.7 examines the success of e-learning in higher education including the determinants and measures of success. As this research study investigated the readiness for adopting e-learning among students and instructors in selected higher education programmes in Libya, Section 2.8 considers how student and instructor experiences and perspectives of e-learning influence the success of e-learning programmes.

Chapter 3 discusses the research methodology that I used in this study; it describes the research design, the participants and settings, instrumentation, data collection, and data analyses. Section 3.2 outlines the research design and goals. Section 3.3 provides a description of data sources. Sections 3.4 and 3.5 describe

the means by which the data was collected, as well as the ethical considerations associated with data collection. Finally, Section 3.6 describes the methods used for data analysis.

Chapter 4 presents a synthesis of the collected data regarding student and instructor experiences and perceptions of ICT and e-learning in the participating Libyan universities. Section 4.2 outlines participant demographics. The following sections present analyses of student and instructor responses for each of the components of this study: access to technologies (Section 4.3); purpose of use of technologies and the participants' level of skill in using those technologies (Section 4.4); usefulness of technology in learning and teaching (Section 4.5); satisfaction with the available ICT environment (Section 4.6); attitudes and beliefs towards ICT and e-learning (Section 4.7); and, challenges faced by students and instructors when using ICT for learning and teaching.

5.3. MAJOR FINDINGS

The overall goal of this research was to gain a better understanding of the experiences and perceptions of ICT and e-learning among students and instructors in higher education engineering programmes in Libya. It fills an identified research gap regarding the student and instructor experiences and perceptions of ICT and e-learning in higher education in Libya. The following research questions guided the collection and analysis of data:

1. What are the differences in the participant access to technologies?
2. What are the differences in the participant levels of use of ICTs for learning/teaching?
3. Given the participants' experiences with ICT, what are their perceptions of the usefulness of technology for learning/teaching?
4. What is the participants' satisfaction with the available institutional ICT infrastructure?

5. Given the participants' experiences with ICT, what are their attitudes towards ICT and e-learning?
6. What are the challenges faced by the participants when using ICT and e-learning?

Participants in this research study were students and instructors from four engineering departments in two Libyan higher education institutions, the University of Tripoli and the University of Al-Jabal Al-Gharbi. Data were collected through a survey administered to 800 students and 125 instructors (348 student surveys and 43 instructor surveys were returned), and through short phone interviews with six instructors.

The following sections describe the major findings emerging from this research study; the findings are framed around the research questions which guided the investigation. The findings are comparable to the findings of other research studies in various developing countries. The recommendations for future integration of e-learning in the Libyan higher education that have been developed on the basis of these findings are also included.

5.3.1. Access to technologies

Overall, student access to key technologies including desktop computers, laptops, high-speed Internet, and mobile phones was relatively high among both urban and regional participants. In particular, almost all urban students had unrestricted access to a mobile phone. While access to a mobile phone was also relatively high among regional students, it was significantly lower than that for their urban peers. The reported high levels of mobile phone penetration, as well as differences between urban and regional users, concur with the findings on access to mobile phones in developing countries reported in the literature (Andrews et al., 2011; Cherrayil, 2010; Gallup, 2011; Muttoo, 2011; UNESCO, 2012; Uys et al., 2012; Zuckerman, 2009). It is anticipated that the high level of mobile phone access can

assist in making future learning/teaching more effective in Libyan higher education institutions.

Female students reported significantly lower levels of access to the majority of technologies, including desktop and laptop computers, and high-speed Internet, as compared to their male counterparts. The identified gender inequalities in access to technology align with the findings of other studies on access to technology in developing countries (Gill, Brooks, Dougall, Patel, & Kes, 2010; Gillwald, Milek, & Stork, 2010; UNESCO, 2012). However, the role of gender was not significant with respect to student access to a mobile phone; Sabry, Al-Nakeeb, and Alrawi (2011) came to a similar conclusion in their study conducted in the Gulf region.

5.3.2. Use of ICTs for learning/teaching

Participants reported the purpose for which they used various ICTs including computer-based technologies, web-based technologies, and mobile phones; this indicates a degree of familiarity with these technologies and skills needed for using them. With respect to computer-based technologies, learning and teaching was not identified by the students and instructors as the main purpose of use, with the exception of creating presentations (e.g. PowerPoint).

On the other hand, web-based technologies facilitating access to information (using the web to access LMSs or online dictionaries) were used for learning and teaching purposes by a majority of students and instructors. While the use of web-based communication technologies (e.g. email, MSN, Skype) was relatively high among urban students, it was significantly lower among their regional counterparts. Similarly, the use of social networking, podcasting, and web publishing for learning was high among urban students and significantly lower among regional students. It is expected that the high level of using technologies, mainly social networking and email, can assist in sharing learning information and materials. There were no significant differences in the use of web-based technologies for learning between male and female students; this aligns with Kuo

and Kuo (2013) who contend that gender has an impact on using web-based technologies. Most instructors used social networking software for purposes other than teaching and reported lack of familiarity with web publishing technologies. Participating students and instructors reported quite low levels of using blogs and Wikis activities, which could be attributed to poor familiarity with technologies in the Libyan society. This concurs with the findings of a study conducted by Tyagi (2012) in six Indian universities in the National Capital Region of India. On the other hand, Chen and Bonk (2008) found that blogs are widely used in China for student assessments as well as facilitating communication and sharing of ideas among students and their instructors in terms of receiving feedback and questions.

With respect to mobile phone functions, a vast majority of students reported using text and SMS communication to support their learning. However, while a great majority of urban students used Internet-enabled mobile phone functions (e.g. accessing information on the web, communicating via email) for learning, regional students were significantly less likely to use these functions. The high level of usage of mobile phones reported in this study confirms that fast communication and convenient access to information and services is of great importance to students (Williams & Ng'ambi, 2009). While instructors used mobile phones extensively, their level of use for teaching purposes was moderate.

5.3.3. Usefulness of technology for learning/teaching

Overall, all participating students and instructors perceived computer, web, and mobile phone technologies as useful, and most of the participants indicated that they would like to use these technologies in learning and teaching; these perceptions align with the findings of similar studies including Buabeng-Andoh (2012), Nihuka (2011), and Tagoe (2012). These positive perceptions were held by urban and regional, and male and female, participants alike.

Students regarded as particularly useful the web-based technologies that could facilitate access to university-based services (e.g. enrolment, payment of fees) and

Internet-based course materials (e.g. recordings of lectures). Technologies enabling web-based communication (e.g. instant messaging, social networking) were also regarded as very useful, particularly by urban students; this might be attributed to the higher level of usage of such technologies for learning by urban students. In addition, a large proportion of all students considered designing and building web pages for learning as useful.

Mobile phone technologies were rated as very useful by most students, particularly for the purpose of receiving grades and course information via text messaging, and communicating with the university on course-related administrative issues.

Overall, instructors in both urban and regional areas perceived most technologies as useful for teaching. They found the tools for creating presentations and spreadsheets, and web-technologies to share digital files particularly useful. Like the students, the instructors also rated web-based technologies facilitating communication highly, and viewed designing and building web pages for teaching as useful. Instructors were unsure about the usefulness of mobile phone technologies for teaching. Unlike the students, who expressed an almost universal approval, instructors' views were divided: just as many of them agreed as disagreed with the usefulness of mobile phones for teaching. Such reservations about the usefulness of mobile phones for teaching were also reported in other studies including Campbell (2005), Smith (2006), and UNESCO (2012).

5.3.4. Satisfaction with technology

Satisfaction with the available institutional technological infrastructure was very low among all the participating students and instructors in both urban and regional areas; the quality of the Internet access was rated particularly low. This concurs with the findings of a study conducted by Asunka (2008) in a Ghanaian private university. The author found that the students did not respond favourably to e-learning courses, and perceived online learning as a more complex and demanding

process than face-to-face learning. The latter suggested that the lack of adequate access to computer and Internet facilities could have contributed in making students less satisfied and enthusiastic about technologies.

The low level of satisfaction could be attributed to the considerable damage to the educational infrastructure caused by the 2011 armed conflict in Libya. In addition to the low levels of satisfaction with the quality of the available infrastructure, the quality of technical support was also found wanting, particularly by students in the regional university.

In spite of the low level of satisfaction with the available technological infrastructure, an overwhelming majority of students and instructors expressed their interest in studying and providing courses that use e-learning in the future. Elaborating on their willingness for e-learning provision, instructors identified as the main reasons e-learning's capacity to improve communication, to facilitate student learning, and to enable incorporation of new teaching methods. Similar findings were reported by Rahamat, Shah, Din, Puteh, Aziz, Norman and Embi (2012). In this study, students viewed e-learning as an enjoyable environment. It was also revealed that students reported greater satisfaction with the new learning environment. Nihuka and Voogt (2012) also found that instructors at Open University of Tanzania were motivated to and satisfied with delivering courses via e-learning medium.

5.3.5. Attitudes towards ICT and e-learning

The majority of all the participating students and instructors were in favour of e-learning and believed in its benefits. Participants believed particularly strongly in e-learning's potential to facilitate better acquisition of new knowledge and to enhance the learning experience. These findings align with the findings of other studies including a study conducted in India by Suri and Sharma (2013), a study conducted in the Gulf region by Al-Doub, Goodwin and Al-Hunaiyyan (2008), and a Saudi Arabian study reported by Hussain (2011).

Students who reported higher levels of skill in technologies were more likely to hold positive attitudes towards e-leaning; the level of skill was found to be the most significant predictor of student attitudes. These results support findings from previous research studies on the relationships between skills and attitudes (Liaw, Chang, Hung, & Huang, 2006; Liaw & Huang, 2003; Liaw & Huang, 2011). A moderate positive correlation was also found between students' access to technology and their attitudes towards e-learning. This finding agrees with the results of studies by Papaioannou and Charalambous (2011), Paris (2004), and Sweeney and Geer (2010).

There were no significant differences between female and male students in respect of their attitudes towards ICT and e-learning; this finding aligns with Hussein (2011) who reported similar results in Saudi universities. Likewise, other demographic characteristics such as student location (urban/regional), age, or year of study were not significant predictors of student attitudes.

5.3.6. Challenges faced by e-learning users

Four types of challenges were synthesised from student and instructor responses, namely individual, contextual, technological, and pedagogical challenges. Technological challenges, particularly limited Internet access and a lack of ICT infrastructure, were identified as the most dominant impediment to the use of e-learning. This finding mirrors the findings about participant satisfaction with technology (Section 5.3.4) and could be one of the consequences of the 2011 armed conflict.

Students regarded individual challenges such as the lack of knowledge and experience, and the lack of necessary technology skills, as a major hindrance when using ICT and e-learning. However, instructors identified pedagogical challenges, such as the demands of new curriculum design and new teaching methods, as the second most dominant obstacle. For students, the prevalence of traditional teaching methods was the only important pedagogical barrier. Among

the contextual challenges, limited awareness of technology-based learning and limited command of English were pointed out by students. Instructors identified the lack of motivation among students as the main contextual barrier.

The above findings concur with the results of a number of studies conducted in Nigeria (Ajadi et al., 2008), in Tanzania (Sife et al., 2007; Nyandara, 2012), in Egypt (El-Gamal, 2005), and in Sri Lanka (Andersson, 2008).

5.4. RECOMMENDATIONS FOR THE INTEGRATION OF E-LEARNING INTO LIBYAN HIGHER EDUCATION

The findings of this research study indicate that most of the participating students and instructors have good levels of use and skill in ICTs, have positive attitudes towards e-learning, and are willing to engage in e-learning programmes. This holds promise for further integration of e-learning in Libyan higher education, as students and instructors have recognised the benefits of e-learning.

This study provides evidence-based information that could be useful to be considered by administrators, decision-makers, and instructors when implementing the new Libyan government's plans of advancing the integration of e-learning in the Libyan higher education. Based on the study findings, it is recommended that:

1. Access to the fixed ICT infrastructure and the Internet be improved, with a focus on alleviating gender and regional inequalities. Increased student and instructor access to ICTs and the Internet would improve their technology use and skills and would positively influence their attitudes towards technology and e-learning.

2. Mobile phone technologies be promoted as a viable e-learning platform, especially at a time when the available Internet infrastructure is limited and unreliable. This could provide new means for communication, open up accessible educational opportunities, and improve access to educational materials.

3. Web-based technologies and applications that facilitate access to university-based information and services be continually developed and improved. Such technologies have been considered as particularly useful by students and instructors, and their further development could lead to increased interest in, and consequent acceptance of, e-learning.

4. Initiatives be launched to improve the English language skills of students and instructors to facilitate their access to internationally available resources, including the all-important freeware. The ability to utilise resources in English would help address the current lack of such resources in Arabic.

5. Development of local e-learning content be promoted with a view to generating materials that are culturally appropriate and accessible to all Libyan users (i.e. available in Arabic). Improved availability of suitable Arabic resources would engage a wider population of students and instructors in e-learning. The ability to create such content would also improve Libya's standing as a provider of e-learning.

6. Training be provided to instructors for developing the necessary ICT and e-learning skills. ICT competent instructors could champion the e-learning cause and motivate their students. In addition, ICT capacity building in instructors could assist in enabling a shift from teacher-centred pedagogy to a more effective learner-centred pedagogy.

7. Adequate technical support be provided to e-learning users in higher education institutions. The lack of such support is of major concern to students and instructors at present, because the provision of adequate technical support is undoubtedly essential for the success of e-learning initiatives.

8. Collaborations be forged with neighbouring Arab countries, and a wider international community, to draw upon their e-learning experience and expertise to facilitate and accelerate the advancement of e-learning in Libya.

5.5. CONTRIBUTIONS OF THIS STUDY

My study, the first of its kind in Libya, offers contributions in three areas. First, the study extends the existing research on e-learning in higher education in developing countries, and in Libya, by providing a broader evidence base. Second, in terms of contributing to knowledge regarding the preparedness for e-learning adoption, it incorporates much needed student and instructor perceptions into the framework. Third, by identifying specific attributes and enablers of successful e-learning settings and experiences, it provides a source of information that can facilitate the design, development and review of e-learning programmes in higher education in Libya.

5.6. CONSTRAINTS AND LIMITATIONS

With any research study there is a possibility of flaws in design, and data collection and interpretation. In my study, the data was collected in 2011/2012 shortly after the cessation of the armed conflict in Libya and the timing of this collection may have influenced participant responses. Most of the survey questions were related to participant access and use of technology, and their satisfaction with the available ICT infrastructure, and since at that time Libya's ICT infrastructure was suffering from post-war destruction, the responses could be biased.

It is important to note that the findings of my research are based on a study of only engineering students in two Libyan universities. Engineering students may be regarded as more progressive in ICT adoption than other student groups; this might also limit the generalisation of my research findings.

Another potential limitation comes from the use of a paper-based survey questionnaire. As reported in the literature, such questionnaires may suffer from low response rates and misinterpretation issues. In this study, the questionnaire was distributed to all accessible participants in the selected institutions and the response rates were 44% for students and 34% for instructors. The low response rates and the use of non-random samples allow only limited generalisability of the findings (Hibberts, Johnson, & Hudson, 2012; Kelley, Clark, Brown, & Sitzia, 2003; Schutt, 2011; Temple, 2001; Visser, Krosnick, & Lavrakas, nd).

Lastly, the survey questions referred to technologies and tools which were current at the time of survey design. Given the rapid advances in ICTs, these technologies and tools might have been superseded by the time of data collection.

5.7. RECOMMENDATIONS FOR FURTHER RESEARCH

To facilitate the planning, integration, and implementation of e-learning in Libyan higher education, it is necessary to gain a comprehensive nation-wide understanding of student and instructor preparedness to engage in e-learning. Thus, there is a need for large scale studies that would involve participants from more higher education institutions and different disciplines, and would employ a variety of data collection methods.

In addition, an investigation of the existing views on ICT and e-learning among administrative and technical staff in Libyan higher education institutions could be carried out to gain a fuller perspective of the prospects of e-learning advancement in Libya. Such an investigation could also illuminate the reasons behind the low levels of institutional support reported by instructors in this research study.

Finally, as mobile technologies can offer a much more accessible and affordable alternative to land-line and Internet-based infrastructure, further research could be

carried out to investigate the prospects of adoption of m-learning in Libyan higher education institutions.

5.8. CONCLUDING REMARKS

While e-learning is increasingly considered as an important success factor in building the new Libya, research pertinent to ICT-supported learning in Libya is scarce. Educational institutions in developing countries, including Libya, face unique challenges in comparison to developed countries and must understand what drives students and instructors towards e-learning. A better understanding of these challenges allows for taking appropriate actions to ensure e-learning success. Thus, it is hoped that the findings of this research will provide a useful evidence-based source of information for academics, administrators, and other decision-makers involved in planning, design and implementation of e-learning in Libya.

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Appendix A

Information for survey participants

Information for Participants

Dear Participant,

You have been kindly requested to participate in a research – *"An analysis of experiences and perceptions of ICT in higher education institutions in Libya: informing the advancement of e-learning in Engineering through case studies"*.
Over the last twenty years, information and communication technologies (ICT) have been widely used in all sectors of society including the educational sector. However, there is little information about the adoption of ICT and e-learning in Libyan higher education institutions. This research aims to collect this information. It will study and document the experiences and perceptions of ICT and e-learning among students and educators in selected Libyan higher education institutions to determine their preparedness to adopt e-learning. Following the collection of data, set of recommendations for successful implementation and further integration of e-learning in Libyan higher education will be developed. The attached survey aims to collect information about your experiences and perceptions of ICT and e-learning.

Your participation in this study is voluntary, and your decision to complete the survey means that you have read this document and agreed to participate. Please note that participation in this survey will not affect you in any way whatsoever. Your responses will be anonymous and results will not be released in any identifiable form.

Procedures:
If you are willing to participate, please complete the survey and drop it in the "Survey collection box" available in the Administration Office (Office number XXX). The survey should take about twenty minutes to complete. Please complete all sections printed on each page.
The study is undertaken by research student, Mrs Amal Rhema, as part of her PhD research in the School of Engineering and Science at Victoria University in Melbourne, Australia.

Thanking you in advance for your time and helpful participation.

Any queries about your participation in this study may be directed to the researcher (Amal Rhema: **amal.rhema@live.vu.edu.au** or Prof. Richard Thorn: Richard.thorn@vu.edu.au or Assoc. Prof. Iwona Miliszewska: **Iwona.Miliszewska@vu.edu.au** or Dr. Ewa M. Sztendur: **Ewa.Sztendur@vu.edu.au**. If you have any queries or complaints about the way you have been treated, you may contact the Secretary, University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, 8001 (telephone no: +613-9919 4710).

(Arabic Version)
معلومات حول البحث للمشاركين

عزيزي المشارك ،

أود أن أدعوك للمشاركة في دراسة بعنوان "-- تحليل الخبرات و التصورات نحو تكنولوجيا الاتصالات والمعلومات في مؤسسات التعليم العالي في ليبيا : اعلام تطورات التعليم الالكتروني في الاقسام الهندسية من خلال منهج دراسة الحالة".

على مدى السنوات العشرين الماضية ، تكنولوجيا المعلومات والاتصالات استخدمت على نطاق واسع في جميع قطاعات المجتمع بما فيها القطاع التعليمي. ومع ذلك ، هناك القليل من المعلومات حول اعتماد تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني في المؤسسات الليبية للتعليم العالي. هذا البحث يهدف إلى جمع هذه المعلومات. وسوف يتم دراسة وتوثيق خبرات وتصورات الطلاب والمعلمين في مجموعة مختارة من مؤسسات التعليم العالي الليبي نحو تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني لتحديد استعدادها لاعتماد التعليم الإلكتروني. بعد تجميع البيانات، سيقدم البحث مجموعة من التوصيات و المقترحات لدعم تنفيذ وزيادة تطويرالتعليم الإلكتروني في التعليم العالي في ليبيا.

الاستبيان المرفق يهدف إلى جمع معلومات عن خبراتك مع وتصوراتك حول تكنولوجيا الاتصالات والمعلومات والتعليم الإلكتروني. مشاركتك في هذه الدراسة اختيارية وطوعية. وقرارك الخاص لإكمال الاستبيان يعني أنك قد قرأت هذه الوثيقة و وافقت على المشاركة.
الرجاء ملاحظة أن مشاركتك في هذه الدراسة لا تؤثر عليك بأي شكل من الأشكال. ومن المؤكد أن اجاباتك ستكون سرية، ولن يتم ذكر اسمك في النتائج في أي شكل يمكن التعرف عليك.

الإجراءات :

إذا كنت على استعداد للمشاركة ، يرجى إكمال الاستبيان و ترجيعه في صندوق تجميع الاستبيانات " المتاحة في مكتب الإدارة (مكتب رقم ....)". ملئ الاستبيان لن يستغرق اكثر من حوالى عشرين دقيقة. يرجى استكمال جميع الأجزاء في كل صفحة مطبوعة.

هذه الدراسه تعد استكمالا لمتطلبات الحصول على درجه الدكتوراه في كلية العلوم و الهندسة في جامعة فيكتوريا - ملبورن - استراليا، مقدمة من قبل الطالبة أمل ناجي رحيمة.

تقبلوا مني فائق الشكر والاحترام على تقديم هذه المعلومات.

يمكنك توجيه أي استفسارات عن مشاركتك في هذه الدراسة إلى الباحث :
Amal Rhema: amal.rhema@live.vu.edu.au or
Prof. Richard Thorn: Richard.thorn@vu.edu.au or
Assoc. Prof. Iwona Miliszewska: Iwona.Miliszewska@vu.edu.au or
Dr. Ewa M. Sztendur: Ewa.Sztendur@vu.edu.au.
وإذا كان لديك أي استفسارات أو شكاوى حول الطريقة التي تم التعامل بها معك ، يمكنك الاتصال ب:
University Human Research Ethics Committee, Victoria University, PO Box

Appendix B

Survey instrument for students

VICTORIA UNIVERSITY | A NEW SCHOOL OF THOUGHT

Experiences with and perceptions of ICT and E-learning Survey for Students

Section 1: Demographics

Gender: ❒ Male ❒ Female

Age: ❒ 18 – 20 ❒ 21 – 22 ❒ 23 and older

Year of studies: ❒ 1 ❒ 2 ❒ 3 ❒ 4 and higher

Section 2: Access to Technology

Please indicate your level of access to different types of technologies (**outside University**). Please tick only one answer.

Types of Technology	No Access	Limited or Inconvenient Access	No Problem with Access
Desktop computer	❒	❒	❒
Portable computer (i.e. laptop or notebook)	❒	❒	❒
Dedicated digital camera	❒	❒	❒
Mobile phone	❒	❒	❒
Video (3G) capable phones	❒	❒	❒
Memory stick (e.g. flash drive, USB stick)	❒	❒	❒
Web cam	❒	❒	❒
Dial-up internet access	❒	❒	❒
Broadband internet access (ADSL or cable)	❒	❒	❒
Wireless internet access	❒	❒	❒

Section 3: Use of Technology

Below is a list of different ways in which ICT can be used. **Please indicate:**

1. If you have used technology for learning purposes and/or other purposes (e.g. entertainment); tick **all** that apply.
2. How skilled you are at using technology in general; circle the number that best represents your opinion – 1 indicates "Not Skilled at All" and 5 indicates "Very Skilled".

Types of Technology	For learning	For other purposes	Don't know this technology	Not Skilled at All	Not Very Skilled	Neutral	Skilled	Very Skilled
Use a computer to manage or manipulate digital photos (e.g. using iPhoto, Dig. Image)	❒	❒	❒	1	2	3	4	5
Use a computer to create presentations (e.g. PowerPoint)	❒	❒	❒	1	2	3	4	5
Use a computer to create or edit audio & video (e.g. iMovie, Movie Maker)	❒	❒	❒	1	2	3	4	5
Use a computer to play games	❒	❒	❒	1	2	3	4	5
Use the Internet/web or a LAN to play Network games	❒	❒	❒	1	2	3	4	5
Use a hand-held computer (e.g. a PDA) as a Personal organiser (e.g. diary, address book)	❒	❒	❒	1	2	3	4	5
Use the web to access a portal, 'Course or Learning Management System'	❒	❒	❒	1	2	3	4	5

Types of Technology	For learning	For other purposes	Don't know this technology	Not Skilled at All	Not Very Skilled	Neutral	Skilled	Very Skilled
Use the web to look up reference information (e.g. online dictionaries)	❒	❒	❒	1	2	3	4	5
Use the web for pastimes (e.g. for leisure activities)	❒	❒	❒	1	2	3	4	5
Use the web/Internet to send or receive email (e.g. Hotmail, Yahoo, Outlook)	❒	❒	❒	1	2	3	4	5
Use the web/Internet for instant messaging / Chat (e.g. MSN, Yahoo)	❒	❒	❒	1	2	3	4	5
Use the web to build & maintain a website	❒	❒	❒	1	2	3	4	5
Use social networking software on the web (e.g. Face book)	❒	❒	❒	1	2	3	4	5
Use the web to download podcasts (e.g. using Juice, iT unes)	❒	❒	❒	1	2	3	4	5
Use the web to publish podcasts (e.g. using Podifier, Podcaster, PodProducer)	❒	❒	❒	1	2	3	4	5
Use the web to share photographs or other Digital material (e.g. using blinklist, Flickr)	❒	❒	❒	1	2	3	4	5
Use the web to make phone calls (e.g. VoIP using Skype)	❒	❒	❒	1	2	3	4	5
Use the web for web conferencing (e.g. using a webcam with Skype)	❒	❒	❒	1	2	3	4	5
Use the web to keep your own blog or vlog	❒	❒	❒	1	2	3	4	5
Use the web to read other peoples' blogs or Volgs	❒	❒	❒	1	2	3	4	5
Use the web to comment on blogs or vlogs	❒	❒	❒	1	2	3	4	5
Use the web to contribute to the development of a Wiki	❒	❒	❒	1	2	3	4	5
Use a mobile phone to text / MSM people	❒	❒	❒	1	2	3	4	5
Use a mobile phone to access information/ services on the web	❒	❒	❒	1	2	3	4	5
Use a mobile phone to send or receive email	❒	❒	❒	1	2	3	4	5

Section 4: Perceived Usefulness of Technology in Learning

Below is a list of different ways in which technology may be used to help you with your studies at University.
Please indicate your agreement with how useful each of the following technologies is in your study; circle the number that best represents your opinion – 1 indicates "Strongly disagree" and 5 indicates "Strongly agree". If you are not sure about a particular technology, please tick "Don't know".

In your studies, how useful do you think it would be to:	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't Know
Design and build web pages?	1	2	3	4	5	❒
Create and present multimedia shows (e.g. Power Point)?	1	2	3	4	5	❒
Create and present audio/ video (e.g. i Movie, Movie Maker)?	1	2	3	4	5	❒
Create spreadsheets (Excel, etc.)?	1	2	3	4	5	❒
Use programming languages (C++, Java, etc.)?	1	2	3	4	5	❒
Use Matlab to simplify the implementation of numerical linear algebra routines?	1	2	3	4	5	❒
Use Labview to develop high-performance applications?	1	2	3	4	5	❒

In your studies, how useful do you think it would be to:	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't Know
Download or access online audio/video recordings of lectures?	1	2	3	4	5	❒
Download or access online audio/video recordings of supplementary content material?	1	2	3	4	5	❒
Use the web to access University based services (e.g. enrolment, sign up for tutes, pay fees)?	1	2	3	4	5	❒
Use your mobile phone to access web-based University services information or services (e.g. enrolment, sign up for tutes, pay fees)?	1	2	3	4	5	❒
Use instant messaging/chat (e.g. MSN, Yahoo, ICQ) on the web to communicate/ collaborate with other students in the course?	1	2	3	4	5	❒
Use instant messaging/chat (e.g. MSN, Yahoo) on the web to communicate with lecturing and administrative staff?	1	2	3	4	5	❒
Use social networking software (e.g. Facebook) on the web to communicate/collaborate with other students?	1	2	3	4	5	❒
Use the web to share digital files related to your course (e.g. sharing photos, audio files, movies, websites, etc.)?	1	2	3	4	5	❒
Use web conferencing or video chat to communicate/collaborate with other students?	1	2	3	4	5	❒
Keep your own blogs as part of your course requirements?	1	2	3	4	5	❒
Contribute to another blog as part of your course requirements?	1	2	3	4	5	❒
Contribute with other students to the development of wiki as part of your course requirements?	1	2	3	4	5	❒
Receive grades/marks from your Lecturer via text message on your mobile phone?	1	2	3	4	5	❒
Receive pre-class discussion questions from your Lecturer via text message on your mobile phone?	1	2	3	4	5	❒
Receive administrative information about the course via text message on your mobile phone (e.g. timetable or assessment changes, information on new learning resources?	1	2	3	4	5	❒

Please list three ways in which you think the technologies that you use in your everyday life could be useful in your studies.
1) **2)** **3)**

Section 5: Challenges of ICT and e-Learning Practice

What challenges do you face as a student when using ICT and e-learning? (E.g. a role change, learning methods, doing assignments, etc.)

Section 6: Technological Characteristics and Technical Support

Please rate the following statements. For each item, circle the number that best represents your opinion – 1 indicates "Very poor" and 5 indicates "Very good".

Statement	Very poor	Poor	Average	Good	Very Good
The quality of the Internet access in the institute	1	2	3	4	5
The necessary ICT infrastructure	1	2	3	4	5
The quality of the technology used in classes	1	2	3	4	5
The ease of use of technology	1	2	3	4	5
The extent to which the courses relied on the use of technology in the classrooms	1	2	3	4	5
The extent to which the courses relied on the use of technology at home	1	2	3	4	5
The degree of confidence you had that classes would not be interrupted or cancelled due to technical problems	1	2	3	4	5
The quality of technical support provided	1	2	3	4	5
The overall usefulness of technology used in classes	1	2	3	4	5

Section 7: Attitude towards ICT and e-Learning

Please indicate your agreement with the following statements; circle the number that best represents your opinion – 1 indicates "Strongly disagree" and 5 indicates "Strongly agree".

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I feel confident in using computers.	1	2	3	4	5
I enjoy using ICT for my studies	1	2	3	4	5
I believe that e-learning gives me the opportunity to acquire new knowledge	1	2	3	4	5
I believe that e-learning enhances my learning experience	1	2	3	4	5
I believe that convenience is an important feature of e-learning	1	2	3	4	5
E-learning increases the quality of learning because it integrates all forms of media (print, audio, video)	1	2	3	4	5
Adopting ICT and e-learning allows for increased student satisfaction	1	2	3	4	5
I would be interested in studying courses that use e-learning	1	2	3	4	5

Section 8: Other Comments

Any additional comments or suggestions.

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إستبيان لمعرفة خبرات الطلبة وإنطباعاتهم نحو تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني

القسم الأول: معلومات شخصية

الجنس: ❒ ذكر ❒ انثى

العمر: ❒ 18 - 20 ❒ 21 – 22 ❒ 23 او اكثر

السنة الدراسية: ❒ الأولى ❒ الثانية ❒ الثالثة ❒ الرابعة او اكثر

القسم الثاني: إمكانية الوصول إلى التكنولوجيا

يرجى الإشارة إلى مستوى امكانية وصولك (Access) إلى أنواع مختلفة من التكنولوجيا (خارج الجامعة). يرجى وضع علامة على إجابة واحدة فقط.

نوع التكنولوجيا	لا يمكن الوصول مطلقا	وصول محدود او غير ممكن احيانا	لا توجد أى مشاكل مع الوصول
الكمبيوتر المكتبي (دسك توب)	❒	❒	❒
الكمبيوتر المحمول (لاب توب)	❒	❒	❒
كاميرا إلكترونية (دجيتل)	❒	❒	❒
الهاتف المحمول (موبايل)	❒	❒	❒
الفيديو (3G) بواسطة الهاتف المحمول	❒	❒	❒
الذاكرة المرنة (مثل فلاش USB،)	❒	❒	❒
ويب كام (Web cam) كاميرات الويب	❒	❒	❒
الاتصال الهاتفي بواسطة الانترنت	❒	❒	❒
الوصول الى شبكة الانترنت السريعة (ADSL or cable)	❒	❒	❒
الوصول اللاسلكي للإنترنت (Wireless)	❒	❒	❒

القسم الثالث: استخدام التكنولوجيا

فيما يلي قائمة بالطرق المختلفة التي يمكن فيها إستخدام تكنولوجيا المعلومات والاتصالات, يرجى اختيار :

1. إذا استخدمت/ تستخدم التكنولوجيا لأغراض الدراسة و / أو لأغراض أخرى (مثل الترفيه) / أو **لا اعرف هذه التكنولوجيا؛ ضع علامة على كل ما ينطبق مع مهاراتك.**
2. ما هو مستوى مهارتك في استخدام التكنولوجيا بشكل عام ؟ اختار الرقم الذي يمثل أفضل وأدق رأي لديك - حيث يشير الرقم 1 إلى "ليس لديك مهاره على الإطلاق" ، والرقم 5 " لديك مهارة عالية".

نوع التكنولوجيا	لأغراض الدراسة	لأغراض أخرى	ليس لديك مهاره على الإطلاق	لديك مهاره ضعيفة	لديك مهاره متوسطة	لديك مهاره	لديك مهارة عالية	لا اعرف هذه التكنولوجيا
استخدام الكمبيوتر لإدارة أو التعامل مع الصور الرقمية (e.g. using iPhoto, Dig. Image)	❒	❒	1	2	3	4	5	❒
استخدام الكمبيوتر لتحضير و لتقديم عرض (e.g. PowerPoint)	❒	❒	1	2	3	4	5	❒

نوع التكنولوجيا	لأغراض الدراسة	لأغراض أخرى	ليس لديك مهاره على الإطلاق	لديك مهاره ضعيفة	لديك مهاره متوسطة	لديك مهاره	لديك مهارة عالية	لا اعرف هذه التكنولوجيا
استخدام الكمبيوتر لإنشاء أو تعديل الصوت والفيديو(e.g. iMovie, Movie Maker)	❒	❒	1	2	3	4	5	❒
استخدام الكمبيوترفي اداء بعض الألعاب	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لإداء بعض الألعاب	❒	❒	1	2	3	4	5	❒
استخدام الكمبيوتراليدوي PDA لإداء بعض الأغراض الشخصية (e.g. diary, address book)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للوصول إلى portal ، "البوابة التعليمية الإلكترونية"	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للبحث عن مناهج أو المعلومات المرجعية (القواميس الإلكترونية)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للتسلية والترفيه	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لإرسال او استقبال رسائل البريد الإلكتروني (e.g. Hotmail, Yahoo,)	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لتبادل الرسائل الفورية / المحادثة (e.g. MSN, Yahoo)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لبناء موقع على شبكة الانترنت	❒	❒	1	2	3	4	5	❒
استخدام برمجيات الشبكات الاجتماعية على الإنترنت (e.g. Face book)	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لتنزيل podcasts (e.g. using Juice, iT unes)	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لنشرpodcasts (e.g. using Podifier, Podcaster, PodProducer)	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لتبادل الصور و غيرها (e.g. using blinklist, Flickr)	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لإجراء مكالمات هاتفية (e.g. VoIP using Skype)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لإجراء حلقات نقاش (e.g. using a webcam with Skype)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للحفاظ على blog أو vlog الخاص بك	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لقراءة blogs أو vlogs الخاص بالآخرين	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للتعليق على blogs أو vlogs	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للمساهمة في تطوير ويكي (Wiki)	❒	❒	1	2	3	4	5	❒
استخدام الهاتف المحمول لكتابة رسائل قصيرة للآخرين	❒	❒	1	2	3	4	5	❒
استخدام الهاتف المحمول للوصول إلى المعلومات أو الخدمات على شبكة الإنترنت	❒	❒	1	2	3	4	5	❒
استخدام الهاتف المحمول لإرسال أو استقبال رسائل البريد الإلكتروني	❒	❒	1	2	3	4	5	❒

القسم الرابع: تصوراتك اوآرائك لفوائد استخدام التكنولوجيا في التعلم/ الدراسة

فيما يلي قائمة بالطرق المختلفة لإستخدم التكنولوجيا التي قد تساعدتك في دراستك في الجامعية. يرجى إبداء رأيك الخاص حول مدى فائدة كل واحدة من التقنيات التالية في دراستك ؛ اختار الرقم الذي يمثل أفضل و أدق رأي لديك - حيث يشير الرقم 1 إلى "أعارض بشدة" ، والرقم 5 إلى "أوافق بشدة". إذا كنت غير متأكد/ متأكدة من تكنولوجيا معينة ، يرجى إختيار "لا أعرف".

أثناء دراستك ، إلى أى مستوى تعتقد انه سيكون من المفيد استخدام :	أعارض بشدة	أعارض	محايد	أوافق	أوافق بشدة	لا أعرف
إنشاء وتصميم صفحات الإنترنت؟	1	2	3	4	5	❒
إنشاء وتقديم العروض (e.g. Power Point) ؟	1	2	3	4	5	❒
إنشاء وعرض الصوت / الفيديو(e.g. i Movie, Movie Maker) ؟	1	2	3	4	5	❒
إنشاء جداول البيانات (Excel, etc.)؟	1	2	3	4	5	❒
استخدام لغات البرمجة (C++, Java, etc.)؟	1	2	3	4	5	❒
استخدام Matlab لتبسيط إجراءات تنفيذ الجبرالعددي الخطي؟	1	2	3	4	5	❒
استخدام Labview لإنشاء تطبيقات خاصة الأداء؟	1	2	3	4	5	❒
تنزيل أو الوصول إلى التسجيلات الصوتية / الفيديو للمحاضرات عبر الإنترنت؟	1	2	3	4	5	❒
تنزيل أو الوصول إلى الصوت / تسجيلات فيديو للمواد الدراسية عبر الإنترنت؟	1	2	3	4	5	❒
استخدام الإنترنت للحصول على خدمات الجامعة (كالتسجيل و دفع الرسوم)؟	1	2	3	4	5	❒
استخدام الهاتف المحمول للوصول إلى الشبكة الإلكترونية للمعلومات و خدمات الجامعة (كالتسجيل و دفع الرسوم)؟	1	2	3	4	5	❒
استخدام الرسائل الفورية / المحادثة (e.g. MSN, Yahoo, ICQ) بواسطة الإنترنت للاتصال / التعاون مع الطلاب الآخرين في الفصل الدراسي؟	1	2	3	4	5	❒
استخدام الرسائل الفورية / المحادثة (e.g. MSN, Yahoo, ICQ) بواسطة الإنترنت للاتصال مع المدرسين والإداريين؟	1	2	3	4	5	❒
استخدام برمجيات الشبكات الاجتماعية (e.g. Face book) بواسطة الإنترنت للاتصال / التعاون مع الطلاب الآخرين؟	1	2	3	4	5	❒
استخدام الإنترنت لتبادل الملفات الإلكترونية الخاصه بالمواد الدراسيه (e.g. sharing photos, audio files, movies, websites, etc.)?	1	2	3	4	5	❒
استخدام الإنترنت لإجراء حلقات نقاش أو المحادثة بالفيديو للتواصل / التعاون مع الطلاب الآخرين؟	1	2	3	4	5	❒
استخدام blog الخاص بك كجزء من متطلبات البرنامج الدراسي؟	1	2	3	4	5	❒
المساهمة في blog آخر كجزء من متطلبات البرنامج الدراسي الخاص بك؟	1	2	3	4	5	❒
المساهمة مع الطلاب الآخرين لإستعمال و لتطوير Wiki كجزء من متطلبات البرنامج الدراسي؟	1	2	3	4	5	❒
الحصول على درجاتك / علاماتك من مدرسيك عن طريق رسالة نصية على هاتفك المحمول؟	1	2	3	4	5	❒
تلقي أسئلة النقاش قبل المحاضرات من مدرسيك عن طريق رسالة نصية على هاتفك المحمول؟	1	2	3	4	5	❒
الحصول على معلومات حول البرنامج الدراسي من خلال رسالة نصية على هاتفك المحمول (على سبيل المثال الجدول الدراسي أوتغيير مواعيد الإمتحانات)؟	1	2	3	4	5	❒

يرجى ذكر ثلاث طرق تستخدم فيها التكنولوجيا في حياتك اليومية تعتقد انها يمكن أن تكون مفيدة لك في دراستك.
(1
(2
(3

القسم الخامس: صعوبات استخدام تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني

ما هي الصعوبات التي تواجهك كطالب عند استخدامك تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني؟ (مثلا أساليب الدراسة اوأداء الإمتحانات اوالقيام بواجباتك الدراسية ، الخ.)

القسم السادس: خصائص وجودة التكنولوجيا والدعم الفني

يرجى تقييم العبارات التالية. لكل عبارة اختار الرقم الذي يمثل أفضل و أدق رأي لديك – حيث يشير الرقم 1 إلى "سيئ جدا" ، والرقم 5 إلى "جيد جدا".

البيان/ التعبير	سيء جدا	سيء	متوسط	جيد	جيد جدا
جودة وسهولة الدخول إلى الإنترنت في الجامعة	1	2	3	4	5
البنية التحتية الضرورية لتكنولوجيا المعلومات والاتصالات	1	2	3	4	5
جودة التكنولوجيا المستخدمة في الفصول الدراسية	1	2	3	4	5
مدى سهولة استخدام التكنولوجيا	1	2	3	4	5
مدى اعتماد المواد الدراسية على استخدام التكنولوجيا في الفصول/ قاعات الدراسة	1	2	3	4	5
مدى اعتماد المواد الدراسية على استخدام التكنولوجيا في المنزل	1	2	3	4	5
درجة ثقتك في ان المحاضرات لا تتوقف أوتلغى بسبب مشاكل فنية/ تقنية	1	2	3	4	5
جودة الدعم التقني المتاح	1	2	3	4	5
الفائدة العائدة من استخدام التكنولوجيا في المحاضرات الفصول الدراسية بصفة عامة	1	2	3	4	5

القسم السابع: موقفك اتجاه تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني

يرجى الإشارة إلى رأيك الخاص حول مدى قبولك للعبارات التالية. اختار الرقم الذي يمثل أفضل و أدق رأي لديك - حيث يشير الرقم 1 إلى "أعارض بشدة" ، والرقم 5 إلى "أوافق بشدة".

البيان/ التعبير	أعارض بشدة	أعارض	محايد	أوافق	أوافق بشدة
أثق بقدراتي في امكانية استخدام أجهزة الكمبيوتر	1	2	3	4	5
أتمتع باستخدام تكنولوجيا المعلومات والاتصالات في الدراسة	1	2	3	4	5
أثق أن التعليم الإلكتروني يتيح لي الفرصة لاكتساب معارف جديدة	1	2	3	4	5
أثق أن التعليم الإلكتروني يزيد خبراتي الدراسية	1	2	3	4	5
أثق أن السهولة والمرونة هي سمة مهمة من سمات التعلم الإلكتروني	1	2	3	4	5
التعليم الإلكتروني يزيد من جودة التعليم لأنه يوفر جميع أشكال الوسائط (print, audio, video)	1	2	3	4	5
اعتماد تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني يزيد رضى الطلبة	1	2	3	4	5
أرغب في إستخدام التعليم الإلكتروني في دراسة المقررات الدراسية	1	2	3	4	5

القسم الثامن: تعليقات أخرى

أي تعليقات أو اقتراحات إضافية

Appendix C

Survey instrument for instructors

VICTORIA UNIVERSITY | A NEW SCHOOL OF THOUGHT

Experiences with and perceptions of ICT and E-learning Survey for Staff

Section 1: Demographics

Gender: ❒ Male ❒ Female

Age: ❒ 25 – 35 ❒ 36 – 50 ❒ 51 and older

Highest level of education ❒ Bachelor ❒ Master ❒ PhD

Section 2: Access to Technology

Please indicate your level of access to different types of technologies (**outside University**). Please tick only one answer.

Types of Technology	No Access	Limited or Inconvenient Access	No Problem with Access
Desktop computer	❒	❒	❒
Portable computer (i.e. laptop or notebook)	❒	❒	❒
Dedicated digital camera	❒	❒	❒
Mobile phone	❒	❒	❒
Video (3G) capable phones	❒	❒	❒
Memory stick (e.g. flash drive, USB stick)	❒	❒	❒
Web cam	❒	❒	❒
Dial-up internet access	❒	❒	❒
Broadband internet access (ADSL or cable)	❒	❒	❒
Wireless internet access	❒	❒	❒

Section 3: Use of Technology

Below is a list of different ways in which ICT can be used. **Please indicate:**

1. If you have used technology for teaching purposes and/or other purposes (e.g. entertainment); tick **all** that apply.
2. How skilled you are at using technology in general; circle the number that best represents your opinion – 1 indicates "Not Skilled at All" and 5 indicates "Very Skilled".

Types of Technology	For teaching	For other purposes	Don't know this technology	Not Skilled at All	Not Very Skilled	Neutral	Skilled	Very Skilled
Use a computer to manage or manipulate digital photos (e.g. using iPhoto, Dig. Image)	❒	❒	❒	1	2	3	4	5
Use a computer to create presentations (e.g. PowerPoint)	❒	❒	❒	1	2	3	4	5
Use a computer to create or edit audio & video (e.g. iMovie, Movie Maker)	❒	❒	❒	1	2	3	4	5
Use a computer to play games	❒	❒	❒	1	2	3	4	5
Use the Internet/web or a LAN to play Network games	❒	❒	❒	1	2	3	4	5
Use a hand-held computer (e.g. a PDA) as a Personal organiser (e.g. diary, address book)	❒	❒	❒	1	2	3	4	5
Use the web to access a portal, 'Course or Learning Management System'	❒	❒	❒	1	2	3	4	5

Types of Technology	For teaching	For other purposes	Don't know this technology	Not Skilled at All	Not Very Skilled	Neutral	Skilled	Very Skilled
Use the web to look up reference information (e.g. online dictionaries)	❒	❒	❒	1	2	3	4	5
Use the web for pastimes (e.g. for leisure activities)	❒	❒	❒	1	2	3	4	5
Use the web/Internet to send or receive email (e.g. Hotmail, Yahoo, Outlook)	❒	❒	❒	1	2	3	4	5
Use the web/Internet for instant messaging / Chat (e.g. MSN, Yahoo)	❒	❒	❒	1	2	3	4	5
Use the web to build & maintain a website	❒	❒	❒	1	2	3	4	5
Use social networking software on the web (e.g. Face book)	❒	❒	❒	1	2	3	4	5
Use the web to download podcasts (e.g. using Juice, iT unes)	❒	❒	❒	1	2	3	4	5
Use the web to publish podcasts (e.g. using Podifier, Podcaster, PodProducer)	❒	❒	❒	1	2	3	4	5
Use the web to share photographs or other Digital material (e.g. using blinklist, Flickr)	❒	❒	❒	1	2	3	4	5
Use the web to make phone calls (e.g. VoIP using Skype)	❒	❒	❒	1	2	3	4	5
Use the web for web conferencing (e.g. using a webcam with Skype)	❒	❒	❒	1	2	3	4	5
Use the web to keep your own blog or vlog	❒	❒	❒	1	2	3	4	5
Use the web to read other peoples' blogs or Volgs	❒	❒	❒	1	2	3	4	5
Use the web to comment on blogs or vlogs	❒	❒	❒	1	2	3	4	5
Use the web to contribute to the development of a Wiki	❒	❒	❒	1	2	3	4	5
Use a mobile phone to text / MSM people	❒	❒	❒	1	2	3	4	5
Use a mobile phone to access information/ services on the web	❒	❒	❒	1	2	3	4	5
Use a mobile phone to send or receive email	❒	❒	❒	1	2	3	4	5

Section 4: Perceived Usefulness of Technology in Teaching

Below is a list of different ways in which technology may be used to help you with your teaching at University.
Please indicate your agreement with how useful each of the following technologies is in your study; circle the number that best represents your opinion – 1 indicates "Strongly disagree" and 5 indicates "Strongly agree". If you are not sure about a particular technology, please tick "Don't know".

In your teaching, how useful do you think it would be to:	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't Know
Design and build web pages?	1	2	3	4	5	❒
Create and present multimedia shows (e.g. Power Point)?	1	2	3	4	5	❒
Create and present audio/ video (e.g. i Movie, Movie Maker)?	1	2	3	4	5	❒
Create spreadsheets (Excel, etc.)?	1	2	3	4	5	❒
Use programming languages (C++, Java, etc.)?	1	2	3	4	5	❒
Use Matlab to simplify the implementation of numerical linear algebra routines?	1	2	3	4	5	❒
Use Labview to develop high-performance applications?	1	2	3	4	5	❒

In your teaching, how useful do you think it would be to:	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't Know
Upload online audio/video recordings of your lectures?	1	2	3	4	5	❒
Upload online audio/video recordings of supplementary content material?	1	2	3	4	5	❒
Use instant messaging/chat (e.g. MSN, Yahoo) on the web to communicate with your students?	1	2	3	4	5	❒
Use instant messaging/chat (e.g. MSN, Yahoo) on the web to communicate with other lecturing and administrative staff?	1	2	3	4	5	❒
Use social networking software (e.g. Facebook) on the web to communicate with your students?	1	2	3	4	5	❒
Use the web to share digital files related to your course (e.g. sharing photos, audio files, movies, websites, etc.)?	1	2	3	4	5	❒
Use web conferencing or video chat to communicate with your students?	1	2	3	4	5	❒
Keep your own blogs as part of your course?	1	2	3	4	5	❒
Keep a wiki as part of your course?	1	2	3	4	5	❒
Provide grades/marks for your students via text message through your mobile phone?	1	2	3	4	5	❒
Provide pre-class discussion questions for your students via text message on your mobile phone?	1	2	3	4	5	❒

Please list three ways in which you think the technologies that you use in your everyday life could be useful in your teaching.
1) **2)** **3)**

Section 5: Challenges of ICT and e-Learning Practice

What challenges do you face as a teacher when using ICT and e-Learning? (E.g. a role change, teaching methods, providing assignments, etc.)

Section 6: Technological Characteristics and Technical Support

Please rate the following statements. For each item, circle the number that best represents your opinion – 1 indicates "Very poor" and 5 indicates "Very good".

Statement	Very poor	Poor	Average	Good	Very Good
The quality of the Internet access in the institute	1	2	3	4	5
The necessary ICT infrastructure	1	2	3	4	5
The quality of the technology used in classes	1	2	3	4	5
The ease of use of technology	1	2	3	4	5

Statement	Very poor	Poor	Average	Good	Very Good
The extent to which the courses relied on the use of technology in the classrooms	1	2	3	4	5
The extent to which the courses relied on the use of technology at home	1	2	3	4	5
The degree of confidence you had that classes would not be interrupted or cancelled due to technical problems	1	2	3	4	5
The quality of technical support provided	1	2	3	4	5
The overall usefulness of technology used in classes	1	2	3	4	5

Section 7: Attitude towards ICT and e-learning

Please indicate your agreement with the following statements; circle the number that best represents your opinion – 1 indicates "Strongly disagree" and 5 indicates "Strongly agree".

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I feel confident in using computers.	1	2	3	4	5
I enjoy using ICT for my teaching	1	2	3	4	5
I believe that e-learning gives me the opportunity to better convey new knowledge to students	1	2	3	4	5
I believe that e-learning enhances my teaching capacity	1	2	3	4	5
I believe that convenience is an important feature of e-learning	1	2	3	4	5
E-learning increases the quality of teaching because it integrates all forms of media (print, audio, video)	1	2	3	4	5
I would be interested in providing courses that use e-learning	1	2	3	4	5

Section 8: Other Comments

Any additional comments or suggestions.

Survey instrument for instructors - Arabic Version

VICTORIA UNIVERSITY | A NEW SCHOOL OF THOUGHT

إستبيان لمعرفة خبرات المدرسين وإنطباعاتهم نحو تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني

القسم الأول: معلومات شخصية

الجنس: ❒ ذكر ❒ انثى

العمر: ❒ 25 - 35 ❒ 36 - 50 ❒ 51 او اكثر

أعلى مستوى تعليمي ❒ بكالوريوس ❒ ماجستير ❒ دكتوراه

القسم الثاني: إمكانية الوصول إلى التكنولوجيا

يرجى الإشارة إلى مستوى امكانية وصولك (Access) إلى أنواع مختلفة من التكنولوجيا (**خارج الجامعة**). يرجى وضع علامة على إجابة واحدة فقط.

نوع التكنولوجيا	لا يمكن الوصول مطلقا	وصول محدود او غير ممكن احيانا	لا توجد أى مشاكل مع الوصول
الكمبيوتر المكتبي (دسك توب)	❒	❒	❒
الكمبيوتر المحمول (لاب توب)	❒	❒	❒
كاميرا إلكترونية (دجيتل)	❒	❒	❒
الهاتف المحمول (موبايل)	❒	❒	❒
الفيديو (3G) بواسطة الهاتف المحمول	❒	❒	❒
الذاكرة المرنة (مثل فلاش USB،)	❒	❒	❒
ويب كام (Web cam) كاميرات الويب	❒	❒	❒
الاتصال الهاتفي بواسطة الانترنت	❒	❒	❒
الوصول الى شبكة الانترنت السريعة (ADSL or cable)	❒	❒	❒
الوصول اللاسلكي للإنترنت (Wireless)	❒	❒	❒

القسم الثالث: استخدام التكنولوجيا

فيما يلي قائمة بالطرق المختلفة التي يمكن فيها إستخدام تكنولوجيا المعلومات والاتصالات, يرجى اختيار :

1. إذا استخدمت/ تستخدم التكنولوجيا لأغراض التدريس و / أو لأغراض أخرى (مثل الترفيه) / أو **لا اعرف هذه التكنولوجيا ؛ ضع علامة على كل ما ينطبق مع مهاراتك.**
2. ما هو مستوى مهارتك في استخدام التكنولوجيا بشكل عام ؟ اختار الرقم الذي يمثل أفضل وأدق رأي لديك - حيث يشير الرقم 1 إلى "ليس لديك مهاره على الإطلاق" ، والرقم 5 " لديك مهارة عالية".

نوع التكنولوجيا	لأغراض الدراسة	لأغراض أخرى	ليس لديك مهاره على الإطلاق	لديك مهاره ضعيفة	لديك مهاره متوسطة	لديك مهاره	لديك مهارة عالية	لا اعرف هذه التكنولوجيا
استخدام الكمبيوتر لإدارة أو التعامل مع الصور الرقمية (e.g. using iPhoto, Dig. Image)	❒	❒	1	2	3	4	5	❒
استخدام الكمبيوتر لتحضير و لتقديم عرض e.g. (PowerPoint)	❒	❒	1	2	3	4	5	❒

نوع التكنولوجيا	لأغراض الدراسة	لأغراض أخرى	ليس لديك مهاره على الإطلاق	لديك مهاره ضعيفة	لديك مهاره متوسطة	لديك مهاره	لديك مهارة عالية	لا اعرف هذه التكنولوجيا
استخدام الكمبيوتر لإنشاء أو تعديل الصوت والفيديو(e.g. iMovie, Movie Maker)	❒	❒	1	2	3	4	5	❒
استخدام الكمبيوترفي اداء بعض الألعاب	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لإداء بعض الألعاب	❒	❒	1	2	3	4	5	❒
استخدام الكمبيوتر اليدوي PDA لإداء بعض الأغراض الشخصية (e.g. diary, address book)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للوصول إلى portal ، "البوابة التعليمية الإلكترونية"	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للبحث عن مناهج أو المعلومات المرجعية (القواميس الإلكترونية)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للتسلية والترفيه	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لإرسال أو استقبال رسائل البريد الإلكتروني (e.g. Hotmail, Yahoo,)	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لتبادل الرسائل الفورية / المحادثة (e.g. MSN, Yahoo)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لبناء موقع على شبكة الانترنت	❒	❒	1	2	3	4	5	❒
استخدام برمجيات الشبكات الاجتماعية على شبكة الإنترنت (e.g. Face book)	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لتنزيل podcasts (e.g. using Juice, iT unes)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لنشرpodcasts (e.g. using Podifier, Podcaster, PodProducer)	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لتبادل الصور و غيرها (e.g. using blinklist, Flickr)	❒	❒	1	2	3	4	5	❒
استخدام الانترنت لإجراء مكالمات هاتفية (e.g. VoIP using Skype)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لإجراء حلقات نقاش (e.g. using a webcam with Skype)	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للحفاظ على blog أو vlog الخاص بك vlog	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت لقراءة blogs أو vlogs الخاص بالأخرين	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للتعليق على blogs أو vlogs	❒	❒	1	2	3	4	5	❒
استخدام الإنترنت للمساهمة في تطوير ويكي (Wiki)	❒	❒	1	2	3	4	5	❒
استخدام الهاتف المحمول لكتابة رسائل قصيرة للأخرين	❒	❒	1	2	3	4	5	❒
استخدام الهاتف المحمول للوصول إلى المعلومات أو الخدمات على شبكة الإنترنت	❒	❒	1	2	3	4	5	❒
استخدام الهاتف المحمول لإرسال أو استقبال رسائل البريد الإلكتروني	❒	❒	1	2	3	4	5	❒

القسم الرابع: تصوراتك اوآرائك لفوائد استخدام التكنولوجيا في التدريس

فيما يلي قائمة بالطرق المختلفة لإستخدم التكنولوجيا التي قد تساعدتك في التدريس بالجامعة. يرجى إبداء رأيك الخاص حول مدى فائدة كل واحدة من التقنيات التالية في التدريس؛ اختار الرقم الذي يمثل أفضل و أدق رأي لديك -

حيث يشير الرقم 1 إلى "أعارض بشدة" ، والرقم 5 إلى "أوافق بشدة". إذا كنت غير متأكد/ متأكدة من تكنولوجيا معينة ، يرجى إختيار "لا أعرف".

أثناء تدريسك بالجامعة ، إلى أى مستوى تعتقد انه سيكون من المفيد استخدام :	أعارض بشدة	أعارض	محايد	أوافق	أوافق بشدة	لا أعرف
إنشاء وتصميم صفحات الإنترنت ؟	1	2	3	4	5	❒
إنشاء وتقديم العروض (e.g. Power Point) ؟	1	2	3	4	5	❒
إنشاء وعرض الصوت / الفيديو(e.g. i Movie, Movie Maker) ؟	1	2	3	4	5	❒
إنشاء جداول البيانات (Excel, etc.)؟	1	2	3	4	5	❒
استخدام لغات البرمجة (C++, Java, etc.)؟	1	2	3	4	5	❒
استخدام Matlab لتبسيط إجراءات تنفيذ الجبرالعددي الخطي؟	1	2	3	4	5	❒
استخدام Labview لإنشاء تطبيقات خاصة الأداء؟	1	2	3	4	5	❒
تحميل التسجيلات الصوتية / الفيديو للمحاضرات عبر الإنترنت؟	1	2	3	4	5	❒
تحميل الصوت / تسجيلات فيديو للمواد الدراسية عبر الإنترنت؟	1	2	3	4	5	❒
استخدام الرسائل الفورية / المحادثة (e.g. MSN, Yahoo, ICQ) بواسطة الإنترنت للاتصال مع طلابك؟	1	2	3	4	5	❒
استخدام الرسائل الفورية / المحادثة (e.g. MSN, Yahoo, ICQ) بواسطة الإنترنت للاتصال مع المدرسين الآخرين والإداريين؟	1	2	3	4	5	❒
استخدام برمجيات الشبكات الاجتماعية (e.g. Face book) بواسطة الإنترنت للاتصال مع طلابك؟	1	2	3	4	5	❒
استخدام الإنترنت لتبادل الملفات الإلكترونية الخاصه بالمواد الدراسيه (e.g. sharing photos, audio files, movies, websites, etc.)?	1	2	3	4	5	❒
استخدام الإنترنت لإجراء حلقات نقاش أو المحادثة بالفيديو للتواصل مع طلابك؟	1	2	3	4	5	❒
استخدام blog الخاص بك كجزء من متطلبات البرنامج الدراسي؟	1	2	3	4	5	❒
استخدام Wiki كجزء من متطلبات البرنامج الدراسي؟	1	2	3	4	5	❒
إرسال درجات / علامات طلابك عن طريق الرسائل النصية من خلال هاتفك المحمول؟	1	2	3	4	5	❒
إرسال أسئلة النقاش قبل المحاضرات لطلابك عن طريق رسالة نصية من خلال هاتفك المحمول؟	1	2	3	4	5	❒

يرجى ذكر ثلاث طرق تستخدم فيها التكنولوجيا في حياتك اليومية تعتقد انها يمكن أن تكون مفيدة لك في تدريسك.
(1
(2
(3

القسم الخامس: صعوبات استخدام تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني

ما هي الصعوبات التي تواجهك كمدرس عند استخدامك تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني؟ (مثلا أساليب التدريس او توفير أسئلة الواجبات الدراسية ، الخ.)

القسم السادس: خصائص وجودة التكنولوجيا والدعم الفني

يرجى تقييم العبارات التالية. لكل عبارة اختار الرقم الذي يمثل أفضل و أدق رأي لديك – حيث يشير الرقم 1 إلى "سيئ جدا" ، والرقم 5 إلى "جيد جدا".

البيان/ التعبير	سيء جدا	سيء	متوسط	جيد	جيد جدا
جودة وسهولة الدخول إلى الإنترنت في الجامعة	1	2	3	4	5
البنية التحتية الضرورية لتكنولوجيا المعلومات والاتصالات	1	2	3	4	5
جودة التكنولوجيا المستخدمة في الفصول الدراسية	1	2	3	4	5
مدى سهولة استخدام التكنولوجيا	1	2	3	4	5
مدى اعتماد المواد الدراسية على استخدام التكنولوجيا في الفصول/ قاعات الدراسة	1	2	3	4	5
مدى اعتماد المواد الدراسية على استخدام التكنولوجيا في المنزل	1	2	3	4	5
درجة ثقتك في ان المحاضرات لا تتوقف أوتلغى بسبب مشاكل فنية/ تقنية	1	2	3	4	5
جودة الدعم التقني المتاح	1	2	3	4	5
الفائدة العائدة من استخدام التكنولوجيا في المحاضرات الفصول الدراسية بصفة عامة	1	2	3	4	5

القسم السابع: موقفك اتجاه تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني

يرجى الإشارة إلى رأيك الخاص حول مدى قبولك للعبارات التالية. اختار الرقم الذي يمثل أفضل و أدق رأي لديك - حيث يشير الرقم 1 إلى "أعارض بشدة" ، والرقم 5 إلى "أوافق بشدة".

البيان/ التعبير	أعارض بشدة	أعارض	محايد	أوافق	أوافق بشدة
أثق بقدراتي في امكانية استخدام أجهزة الكمبيوتر	1	2	3	4	5
أتمتع باستخدام تكنولوجيا المعلومات والاتصالات في التدريس	1	2	3	4	5
أثق أن التعليم الإلكتروني يتيح لي الفرصة يتيح لي الفرصة لتوفيرأفضل معارف جديدة للطلاب	1	2	3	4	5
أثق أن التعليم الإلكتروني يزيد خبراتي في التدريس	1	2	3	4	5
أثق أن السهولة والمرونة هي سمة مهمة من سمات التعلم الإلكتروني	1	2	3	4	5
التعليم الإلكتروني يزيد من جودة التدريس لأنه يوفر جميع أشكال الوسائط (print, audio, video)	1	2	3	4	5
أرغب في إستخدام التعليم الإلكتروني في تدريس المقررات الدراسية	1	2	3	4	5

القسم الثامن: تعليقات أخرى

أي تعليقات أو اقتراحات إضافية

Appendix D

Information for interview participants

Information for Interview Participants (English version)

I would like to invite you to participate in a study, titled *"An analysis of experiences and perceptions of ICT in higher education institutions in Libya: informing the advancement of e-learning in Engineering through case studies"*, conducted by a PhD candidate Mrs Amal Rhema from the School of Engineering and Science at Victoria University in Melbourne, Australia.
In the interview, of approximately an hour's duration, you will be asked to talk about your experiences and perceptions of ICT and e-learning, as well as discuss your preferences for ICT and e-learning.

Please note, that during the interview session, you do not have to answer any questions that you do not wish to answer. You will also be free to leave the interview at any time. You can also request that the recording be erased, and that your feedback not be used as data for this research. You may also ask questions about research procedures at any time and these questions will be answered. You may direct further questions to the researchers (refer to the contact details provided at the bottom of this page).

Taking part in this research is voluntary. All discussions in the interview and the audiotape of it will be kept totally confidential and anonymous, and these materials will only be accessed by the researchers. The information will not jeopardise you in any way. You will be instructed on confidentiality obligations at the commencement of the interview. To maintain the accuracy of your statements, digital recording and notes of the discussion will be taken. The information that you give will be confidential. To protect your identity, you will not be identified personally in any way. The notes will be kept under lock and key until the completion of data analysis. Upon completion of the analysis, the digital recordings will be destroyed.

The notes will be coded for themes in the comments. It is possible that specific comments will be reported in relation to a particular theme. Real names will not be tied to these comments. In the event of publication of this research, no personally identifying information will be disclosed.

Any queries about your participation in this study may be directed to the researcher (Amal Rhema: **amal.rhema@live.vu.edu.au** or Prof. Richard Thorn: Richard.thorn@vu.edu.au or Assoc. Prof. Iwona Miliszewska: **Iwona.Miliszewska@vu.edu.au** or Dr. Ewa M. Sztendur: **Ewa.Sztendur@vu.edu.au**. If you have any queries or complaints about the way you have been treated, you may contact the Secretary, University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, 8001 (telephone no: +613-9919 4710).

Information for Interview Participants (Arabic version)

معلومات حول البحث للمشاركين في المقابلات الشخصية

أود أن أدعوك للمشاركة في دراسة بعنوان "-- تحليل الخبرات و التصورات نحو تكنولوجيا الاتصالات والمعلومات في مؤسسات التعليم العالي في ليبيا : اعلام تطورات التعليم الالكتروني في الاقسام الهندسية من خلال منهج دراسة الحالة". التي تعد استكمالا لمتطلبات الحصول على درجه الدكتوراه في كلية العلوم و الهندسة في جامعة فيكتوريا - ملبورن - استراليا، مقدمة من الطالبة أمل ناجي رحيمة.

في المقابلة التي تستغرق حوالي ساعة من الزمن ، سوف يطلب منك التحدث عن تجاربك مع وتصوراتك حول تكنولوجيا الاتصالات والمعلومات والتعليم الإلكتروني. يرجى ملاحظة أنه خلال المقابلة، يمكنك عدم الرد على أي أسئلة لا ترغب في الإجابة عنها، و لديك الحرية التامة في مغادرة المقابلة في أي وقت، و يمكنك أيضا طلب محى تسجيلك الصوتي ، وأن لا يستخدم ردك كبيانات لهذا البحث. ويمكنك أيضا طرح أسئلة حول إجراءات البحث في أي وقت وهذه الأسئلة سوف يتم الرد عليها من قبل الباحثة.
ويجوز لك توجيه المزيد من الأسئلة المباشرة للباحثين (يرجى الرجوع إلى المعلومات المتاحة للاتصال بالباحثين المدونة في الجزء السفلي من هذه الصفحة).

مشاركتك في هذه الدراسة اختيارية وطوعية. وستعامل جميع المناقشات التي دارت في المقابلة والتسجيل الصوتي بسرية تامة، ولن تكون متاحة الا للباحثين فقط، ولن تعرضك لاي مساءلة بأي شكل من الأشكال. ومن أجل الحفاظ على دقة البيانات الخاصة بك سيتم استخدام مسجل صوتي بالاضافة الى كتابة بعض الملاحظات من قبل الباحثة. ولحماية هويتك ، لن يذكر اسمك و لن يكون ممكنا التعرف عليك شخصيا بأي شكل من الأشكال. وستحفظ كافة البيانات في مكان آمن إلى حين الانتهاء من تحليلها، و عند الانتهاء من التحليل ، سيتم إتلاف كافة التسجيلات الصوتية.

وفي حالة نشر هذا البحث، من الممكن أن يتم نشر تعليقات محددة ولكن لن تكون مرتبطة بالأسماء الحقيقية لأصحاب هذه التعليقات.

يمكنك توجيه أي استفسارات عن مشاركتك في هذه الدراسة إلى الباحث :
Amal Rhema: amal.rhema@live.vu.edu.au or
Prof. Richard Thorn: Richard.thorn@vu.edu.au or
Assoc. Prof. Iwona Miliszewska: Iwona.Miliszewska@vu.edu.au or
Dr. Ewa M. Sztendur: Ewa.Sztendur@vu.edu.au.
وإذا كان لديك أي استفسارات أو شكاوى حول الطريقة التي تم التعامل بها معك ، يمكنك الاتصال ب:
University Human Research Ethics Committee, Victoria University, PO Box

Appendix E

Consent form for interview participants

Consent Form for Interview Participants (English version)

INFORMATION TO PARTICIPANTS:

The interview in which you will be participating is part of a research study investigating the experiences with, and perceptions of, ICT among students, academics, administrators, and technical support staff in selected higher education institutions in Libya (engineering programs) to determine their preparedness to adopt ICT and e-learning in teaching and learning.

Your participation in the interview is strictly voluntary and anonymous. Neither you nor your answers will be identifiable in any way, and all the information gathered in this study will be confidential.

CERTIFICATION BY PARTICIPANT

I, ----------, of ----------

Certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the research study entitled: *"An analysis of experiences and perceptions of ICT in higher education institutions in Libya: informing the advancement of e-learning in Engineering through case studies"***,** that is being conducted in the School of Engineering and Science at Victoria University in Melbourne, Australia by PhD student Mrs Amal Rhema.

I certify that the objectives of the study, together with any risks have been fully explained to me by Mrs Amal Rhema, and that I freely consent to participation by being interviewed by Mrs Amal Rhema.

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential

Sign: ---------- Date: ----------

Any queries about your participation in this study may be directed to the researcher (Amal Rhema: **amal.rhema@live.vu.edu.au** or Prof. Richard Thorn: Richard.thorn@vu.edu.au or Assoc. Prof. Iwona Miliszewska: **Iwona.Miliszewska@vu.edu.au** or Dr. Ewa M. Sztendur: **Ewa.Sztendur@vu.edu.au**. If you have any queries or complaints about the way you have been treated, you may contact the Secretary, University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, 8001 (telephone no: +613-9919 4710).

Consent Form for Interview Participants (Arabic version)

نموذج موافقة للمشاركين في المقابلات الشخصية

المقابله الشخصية التي ستشارك فيها هي جزء من دراسة بحثية لمعرفة تجارب وتصورات الطلاب والمدرسين والإداريين وموظفي الدعم التقني في مجموعة الاقسام الهندسية المختارة من مؤسسات التعليم العالي في ليبيا ، لتحديد تأهبها على اعتماد تكنولوجيا المعلومات والاتصالات والتعليم الإلكتروني في التعليم والتعلم.
مشاركتك في هذه الدراسة اختيارية وطوعية. وستعامل جميع المناقشات التي ستدور في المقابلة والتسجيل الصوتي بسرية تامة، ولن تكون متاحة الا للباحثين فقط، ولن تعرضك لاي مساءلة بأي شكل من الأشكال.

اقرار المشارك:

أنا----------، من قسم ----------

أقر أن عمري لا يقل عن 18 سنة وأنني موافق/ موافقة على المشاركة في الدراسة البحثية بعنوان : " تحليل الخبرات و التصورات نحو تكنولوجيا الاتصالات والمعلومات في مؤسسات التعليم العالي في ليبيا : اعلام تطورات التعليم الالكتروني في الاقسام الهندسية من خلال منهج دراسة الحالة"، التي تجرى حاليا في كلية العلوم و الهندسة في جامعة فيكتوريا - ملبورن - استراليا، مقدمة من الطالبة أمل ناجي رحيمة.

و أقر أن أهداف الدراسة وكذلك كل المخاطرالمتوقعة قد أوضحت لي تماما من قبل الباحثة أمل رحيمة ، وانني بحرية تامة موافق / موافقة على أن (يتم سؤالي) اكون مستجوبه من قبلها.

وأقركذلك أنه يمكني طرح أسئلة حول إجراءات البحث في أي وقت وهذه الأسئلة سوف يتم الرد عليها من قبل الباحثة، وأنني أستطيع الانسحاب من هذه الدراسة في أي وقت ، وأن هذا الانسحاب لن يعرضني لأي مسآلة بأي شكل من الأشكال.

وأقرانه قد تم إبلاغي ان كل المعلومات التي سأقدمها ستعامل بسرية تامة.

التوقيع ---------- التاريخ ----------

يمكنك توجيه أي استفسارات عن مشاركتك في هذه الدراسة إلى الباحث :
Amal Rhema: amal.rhema@live.vu.edu.au or
Prof. Richard Thorn: Richard.thorn@vu.edu.au or
Assoc. Prof. Iwona Miliszewska: Iwona.Miliszewska@vu.edu.au or
Dr. Ewa M. Sztendur: Ewa.Sztendur@vu.edu.au.
وإذا كان لديك أي استفسارات أو شكاوى حول الطريقة التي تم التعامل بها معك ، يمكنك الاتصال ب:
University Human Research Ethics Committee, Victoria University, PO Box 14428,

Appendix F

Obtaining informed consent - procedure

Obtaining Informed Consent – Procedure

1. Translation of “Information to Interview Participants” and “Consent Form for Interview Participants” into Arabic; verification of translation.

2. Call for volunteers to participate in interview (an Arabic version of “Information to Interview Participants” will be included in the call); announcements will be made via faculty email and posted on departmental noticeboards to reach students and instructors; emails will be issued to administrators and technical staff to invite them to participate in interviews.

3. Collection of responses from volunteers; information about interview dates and times will be provided to the volunteer participants at this stage. To allow the volunteers adequate time to carefully consider their participation, an Arabic version of “Consent Form for Interview Participants” will also be sent.

4. At the time of the interview:

    - The interviewer will explain the study to potential participants verbally, providing all pertinent information (purpose, procedures, risks, benefits, and alternatives to participation), allowing the potential participants ample opportunity to ask questions.
    - Following verbal explanation, the potential participants will be asked to read the study information sheet (“Information to Interview Participants”) again, and having been given sufficient time to consider their participation, they will make a decision.
    - Individuals who agree to participate in the interview will be given the opportunity to ask additional questions; the interviewer will provide responses.
    - Once the potential participants have had all their questions answered and have agreed to participate in the study, they should sign, date, and return the consent form to the interviewer.
    - The participants will be provided with a copy of the consent form.

Appendix G

Interview questions

Interview Instrument (English Version)

1. What kind of teaching methods have you used in your teaching? (e.g. traditional, blended, fully online)
2. Do you use ICT in your teaching? (Yes/No)

If 'Yes', please answer questions 3, 4, 5.

3. To what extent have you used ICT in your teaching? (What types of technologies have you used and for how long?)
4. What kind of experiences have you gained when using ICT for teaching? (e.g. successful implementation without any technical issues, implementation with technical problems which do not interrupt the class, continuous technical support)?
5. Do you find the application of ICT for teaching purposes useful and beneficial for you and your students? Why?/Why not?

   Continue with questions 8 and 9.

If 'No', please answer question 6, 7.

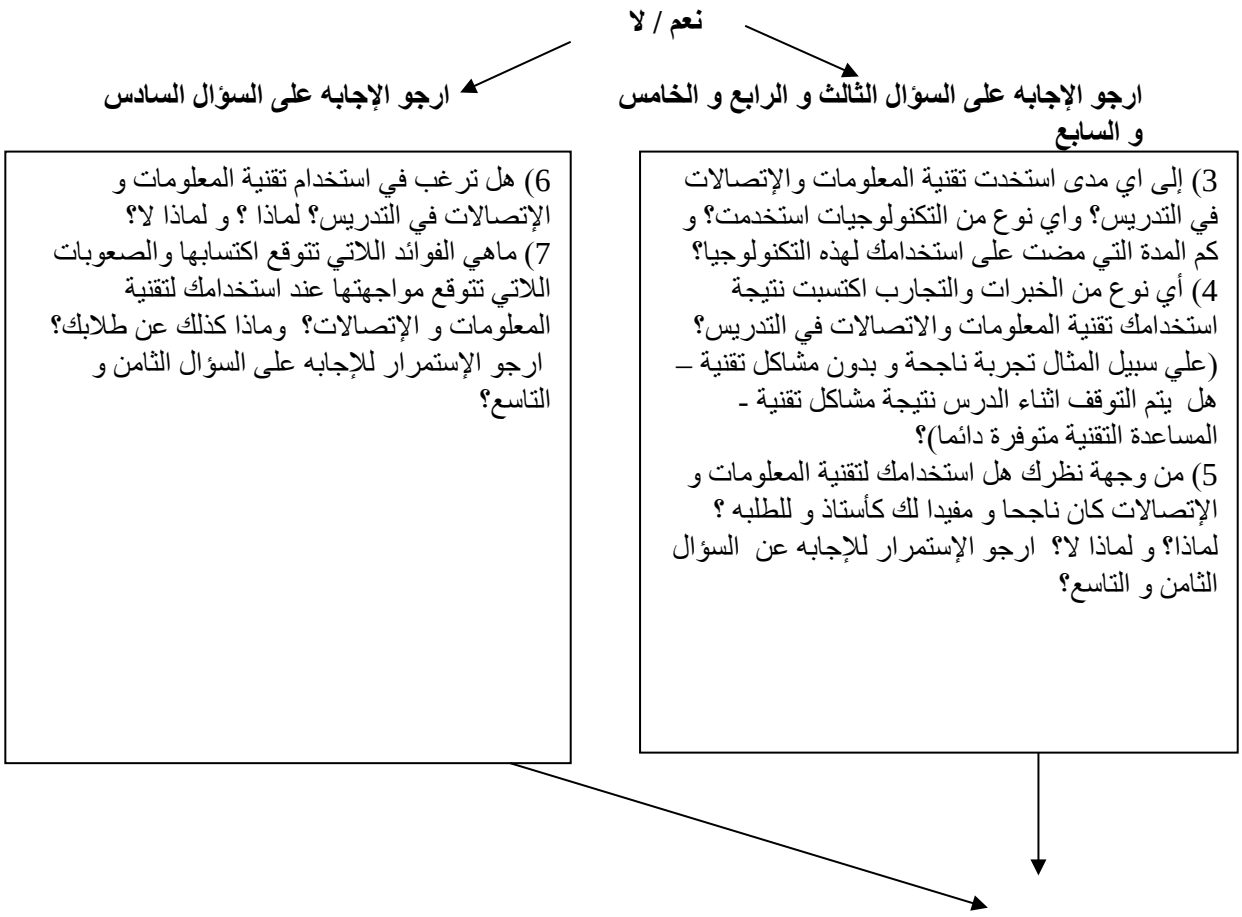
6. Would you like to use ICT for teaching? Why? Why not?
7. What benefits and challenges would you expect to gain and face if you started using it? What is about your students?

   Continue with questions 8 and 9.

8. What kind of training have you received to deliver e-learning, if any?
9. Please make any other comments/suggestions.

Interview Instrument (Arabic Version)

1) اي طريقة من طرق التدريس تستخدم في تدريسك للمنهج؟ (على سبيل المثال التعليم التقليدي - مزيج من التعليم التقليدي و الالكتروني - التعليم الالكتروني فقط)؟
2) هل تستخدم تقنية المعلوماتيه و الاتصالات اثناء تدريسك للمنهج؟ إذا اجبت بنعم ارجوا الاجابة على السؤال 3 و 4 و 5 و 8 و 9؟ و إذا اجبت بلا ارجوا الاجابة على السؤال 6 و 7 و 8 و 9؟



8) هل تلقيت أي تدريب ذا صلة بالتعليم الالكتروني؟ اذا اجبت بنعم اي نوع من التدريب تلقيت؟
9) هل ترغب في إضافة أي شيء آخر؟

Appendix H

Ethics application approval letter

MEMO

TO Prof Richard Thorn
School of Engineering and Science
Footscray Park Campus

A/Prof Iwona Miliszewska
School of Engineering and Science
Footscray Park Campus

Dr Ewa Sztendur
CILT
Newport Campus

DATE 28/2/2011

FROM Dr Josef Rojter
Acting Deputy Chair
Faculty of Health, Engineering and Science Human Research Ethics Committee

SUBJECT Ethics Application – HRETH 10/177

Dear Prof Thorn, A/Prof Miliszewska and Dr Sztendur,

Thank you for submitting this application for ethical approval of the project:

HRETH 10/177 An analysis of experiences and perceptions of ICT in higher education institutions in Libya: informing the advancement of e-learning in Engineering through case studies

The proposed research project has been accepted and deemed to meet the requirements of the National Health and Medical Research Council (NHMRC) 'National Statement on Ethical Conduct in Human Research (2007)' by the Faculty of Health, Engineering and Science Human Research Ethics Committee. Approval has been granted from 28th February 2011 to 30th December 2012.

Continued approval of this research project by the Faculty of Health, Engineering and Science Human Research Ethics Committee is conditional upon the provision of a report within 12 months of the above approval date (by 28th February 2012) or upon the completion of the project (if earlier). A report proforma may be downloaded from the VUHREC web site at: http://research.vu.edu.au/hrec.php

Please note that the Human Research Ethics Committee must be informed of the following: any changes to the approved research protocol, project timelines, any serious events or adverse and/or unforeseen events that may affect continued ethical acceptability of the project. In these unlikely events, researchers must immediately cease all data collection until the Committee has approved the changes. Researchers are also reminded of the need to notify the approving HREC of changes to personnel in research projects via a request for a minor amendment.

If you have any further queries please do not hesitate to contact me on 9919 2252.

On behalf of the Committee, I wish you all the best for the conduct of the project.

Kind regards,

Dr Josef Rojter
Acting Deputy Chair
Faculty of Health, Engineering and Science Human Research Ethics Committee

The above electronic approval was received from the University Ethics Officer via the following email:

Iwona Miliszewska

From:	Miles Hamilton on behalf of HES Ethics
Sent:	Monday, 28 February 2011 3:41 PM
To:	Iwona Miliszewska
Cc:	Richard Thorn; Ewa Sztendur
Subject:	RE: Revised ethics application HRETH 10/177 electronic copy
Attachments:	HRETH_10_177_FA.doc.html

Dear Iwona,

The Acting Chair has reviewed your revised application and has approved it. Please find the approval memo attached.

Kind regards,
Miles

Miles Hamilton
Ethics Officer
Office for Research
Victoria University
Phone 61 3 9919 4781
Fax 61 3 9919 5515
Email Miles.Hamilton@vu.edu.au
Web http://research.vu.edu.au/ordsite/ethics0.php

Appendix I

Model of student perceptions of usefulness of technology

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.447[a]	.200	-.049	.606

a. Predictors: (Constant), Average_attitude, Y4, Gender, DummyB, DummyC, DummyD, D21_22, Y2, Average_Access, Average_satisfaction, Purpose_of_use, Y3, Averagr_Level_of_skill, D23_and_more

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.126	14	.295	.803	.661[b]
	Residual	16.514	45	.367		
	Total	20.640	59			

a. Dependent Variable: Usefulness_of_technology

b. Predictors: (Constant), Average_attitude, Y4, Gender, DummyB, DummyC, DummyD, D21_22, Y2, Average_Access, Average_satisfaction, Purpose_of_use, Y3, Averagr_Level_of_skill, D23_and_more

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.394	.896		3.788	.000
	Gender	-.246	.180	-.209	-1.364	.179
	DummyB	.199	.215	.168	.928	.359
	DummyC	-.237	.340	-.112	-.696	.490
	DummyD	.062	.331	.032	.187	.852
	D21_22	-.397	.362	-.299	-1.097	.279
	D23_and_more	-.657	.399	-.560	-1.646	.107
	Y2	-.034	.345	-.020	-.099	.921
	Y3	.361	.388	.260	.931	.357
	Y4	.453	.394	.383	1.151	.256
	Average_Access	.019	.297	.012	.063	.950
	Purpose_of_use	.436	.349	.232	1.250	.218
	Averagr_Level_of_skill	-.067	.150	-.091	-.445	.659
	Average_satisfaction	.015	.134	.020	.114	.910
	Average_attitude	.072	.172	.072	.419	.677

a. Dependent Variable: Usefulness_of_technology

Appendix J

Model of student attitudes towards ICT and e-learning

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.546[a]	.298	.246	.511

a. Dependent variable: Attitude towards ICT and e-learning
b. Predictors: (Constant), Use for learning, Level of skill, satisfaction, Access

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.987	4	1.497	5.730	.001[b]
	Residual	14.105	54	.261		
	Total	20.093	58			

a. Dependent Variable: Attitude towards ICT and e-learning
b. Predictors: (Constant), Use for learning, Level of skill, satisfaction, Access

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.619	.370		7.087	.000
	Access	.051	.226	.032	.227	.821
	Level of skill	.327	.102	.453	3.195	.002
	satisfaction	.081	.100	.101	.811	.421
	Use for learning	.363	.278	.156	1.306	.197

a. Dependent Variable: Attitude towards ICT and e-learning